

OCTOBER 2021 • ISSUE 36

THINK

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EDITORIAL

DESTRUCTION

War, famine, pestilence, and death. In Christian literature, these are the harbingers of the end times. The four horsemen of the apocalypse mark the beginning of the end, the ultimate destruction of the world. While in the West, we view Armageddon as the ultimate end, the East tends towards a more cyclical view. Rather than a final, abrupt end, our destruction marks the beginning of a new cycle.

In scientific literature, the dramatically named 'ultimate fate of the universe' presents several hypotheses including The Big Freeze, Heat Death, and the Big Crunch. Based on observations and mathematical formulae, researchers theorise that the world might collapse into another singularity or continue expanding until all the stars snuff out. These possibilities depend on the structure and shape of the universe as well as the amount of dark matter and energy, elusive concepts we are only just starting to understand.

While destruction conjures images of explosions, ravaged buildings, and deadly hellfire, destruction also leads to new life. Forest fires revitalise the earth, making way for fresh growth. Armageddon makes way for revelation. Destruction wipes the slate clean, allowing creation to flourish – unless it consumes us in the process!

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COVER STORY



DESTRUCTION

The cover for this issue of THINK blends deep colours, sharp edges, and the random placement of shapes to visually communicate the theme of destruction. This chaotic imagery completes and complements the previous two covers, tying together a thematic triad through intentional design.

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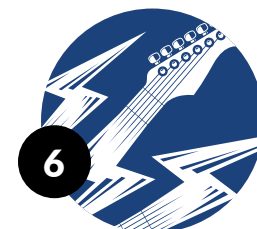
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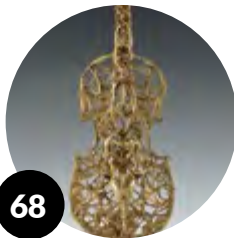


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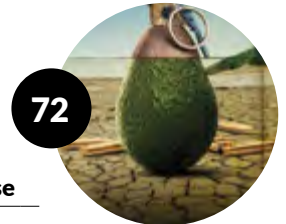
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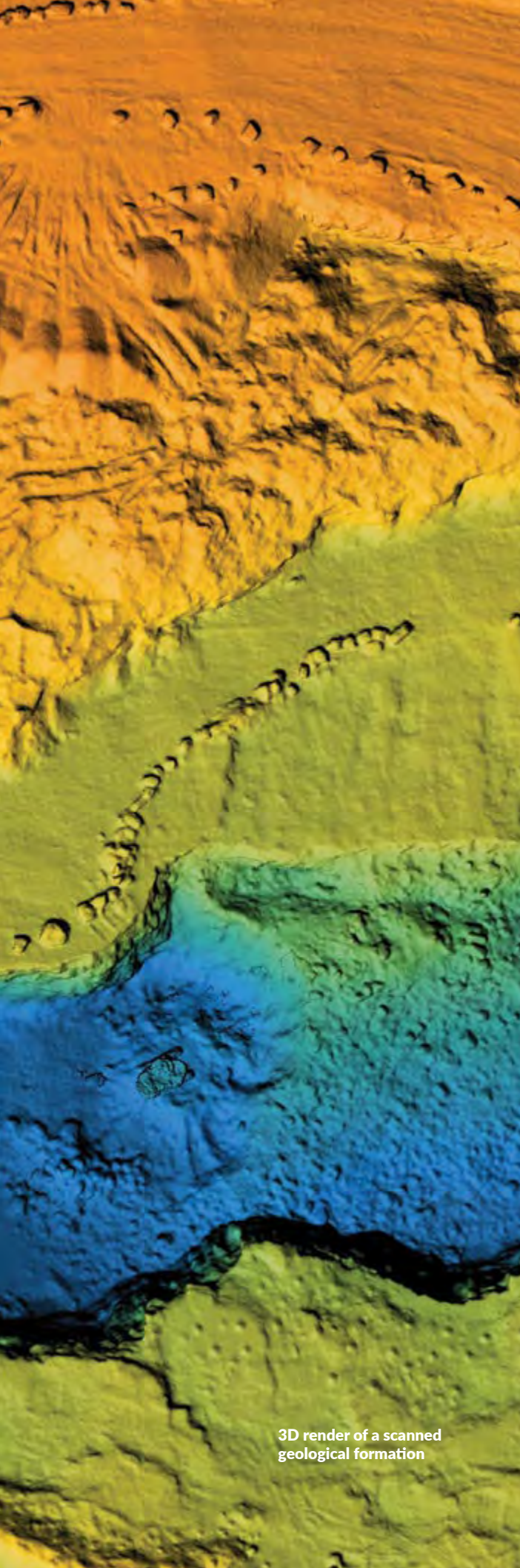
**ERRATUM
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In **Designing a Dream** (pg. 9), we would like to mention that Dr Victor Calvagna is sitting as an advisor on the project.

In **Uncovering History** (pg. 19) Pierre Bugeja from Prevariti was mistakenly captioned as Dr Davide Melica. The photo features Jamie Farrugia, Dr Charlene Vella, and Pierre Bugeja (left to right).

TOOLKIT

A topographic map of a mountain range, likely the Alps, showing various elevations and geographical features. The map is color-coded: dark brown and black for the highest peaks, transitioning through yellow, green, and light blue to dark blue for the lowest elevations. The word 'TOOLKIT' is printed in large, white, sans-serif capital letters across the upper portion of the map.



3D render of a scanned geological formation

We need to dig deeper

Author: Ian Farrugia

Instruments are at the heart of geophysics. Their tech is vital to being able to look underground without needing to dig the whole world up. The University of Malta's (UM) geophysical laboratory has recently attracted funding to help them see our Earth in clearer detail, helping to better understand the ground beneath us.

Researcher Dr Sebastiano D'Amico (Department of Geosciences, UM) describes how technical developments have allowed for notable improvements in the instruments at the UM's geophysics laboratory. Their on-site lab work requires portability. Improved battery life has allowed teams like D'Amico's to take these instruments to remote places.

The team combines multiple techniques that allow them to clearly see objects above and below ground. They map surfaces in high resolution using LIDAR (Light Detection and Ranging) based photogrammetry. These images are then coupled with data from seismometers, resistometers, and magnetometers to provide a more holistic picture of the Earth.

This technology allows researchers to form a clearer picture of the ground beneath us. This holds true when assessing the impact geological disasters could have on an area. Geoscientific teams use their arsenal of instruments to spot potential links between the composition of the ground and its susceptibility to earthquakes.

D'Amico and his team are mapping Maltese coastlines to see how stable they are. The department uses their equipment to map out 3D visual projections of cliff faces to decipher cracks and boulder extensions. These details need study to assess whether the next storm might crumble a cliff face, which can be very dangerous for hikers and hunters alike. Such monitoring helped capture the last few seconds of the Azure Window in Gozo. Now the team assesses the arch at Wied il-Mielah nearby – analysing its stability and its degradation process.

The data D'Amico collects doesn't only help predict and safeguard the environment from disaster. His work also helps archeologists uncover beautiful histories from our past. Understanding the ground beneath us requires us to wear a different pair of eyes. These technological improvements not only help to further research, but allow us to better understand the world we live in. **T**

WITHOUT BORDERS





Destructive, creative, PUNK!

Author: Zippy Tseng

Music knows no barriers. How Finnish punk has become popular in Brazil and Japan might be the best proof for this point. Walking down the street in São Paulo, Brazil, Lasse Ullvén found that punk music from his native Finland is surprisingly popular in Brazil. Some punk bands even learn Finnish to emulate the right sounds. Ullvén, a punk rocker and now a doctoral student in Literary Tradition and Popular Culture at the Faculty of Arts of the University of Malta, decided to research the music that influences his life and others across the continent.

Finnish hardcore punk has been popular in Brazil's underground community since the 1980s. Brazil is not the only country where Finnish punk has been noted. Japanese punk bands are fanatic about Finnish punk since their music styles both tend to be more rough, dirty, and raw. Interestingly, at least 10 Japanese punk bands sing in Finnish just to fit the style and make their songs sound exotic.

To uncover Finnish punk's success abroad, Ullvén contacted people in punk bands worldwide and interviewed them to learn their personal experiences and feelings about Finnish punk. The approach he uses is ethnography, a qualitative method where researchers observe or interact with a study's participants in their environment.

Through interacting with punk rockers around the world, Ullvén found that part of the appeal of punk music comes from the lack of strict rules. Unlike other music genres, punk doesn't have to be perfect. It can be crude, raw, or even vulgar so long as the music conveys strong emotion and messages. It doesn't matter if the listener can understand the lyrics so long as they can relate to the feeling.

These alternative characteristics make punk popular with teenagers and other groups. Despite the linguistic barrier, punk inspires those eager to express their feelings or raise

awareness on different topics. The messages delivered through the music are easy to relate to and spread across various nations because the destructive aspect of punk music makes it very human. Ullvén thinks that 'Punk has managed to empower individuals to work as a force of de-alienation.'

Punk is usually seen as anti-system and anarchistic. Finnish punk has brought these aspects to an extreme, making it stand out by transcending borders and gaining popularity in countries with very different cultural backgrounds. Just as the Russian revolutionary anarchist Mikhail Bakunin stated, 'The urge to destroy is also a creative urge.' The destructiveness of punk music might be its key to creating a global connection. **T**

Lasse Ullvén would like to thank the Tertiary Education Scholarship Scheme (TESS) by Malta's Ministry of Education for their support during his research.



DESIGN

Malta in Minecraft: Junior College block by block

Author: Sam Ridgeway

Last year, many students were unable to go to school due to the COVID-19 pandemic. However, what would happen if you could build your school at home? A group of proactive students at Junior College set themselves the ambitious task to recreate their massive campus block by block in Minecraft.

Jake Camenzuli and Nathaniel Gauci offered us a tour of an incredible Minecraft virtual space. They are members of the core student team that spent hundreds of hours building the college campus in this world of blocks. It is a testament to their hard work and detailed approach that you could navigate your way to the canteen without having ever physically set foot on the college campus.


The idea spawned in response to a call by Roberto Calleja, Youth Worker (Junior College). He suggested using Minecraft, as that was a project the Youthhub could run online, to the students. They quickly took the idea and proposed building their campus, Junior College, in Minecraft.

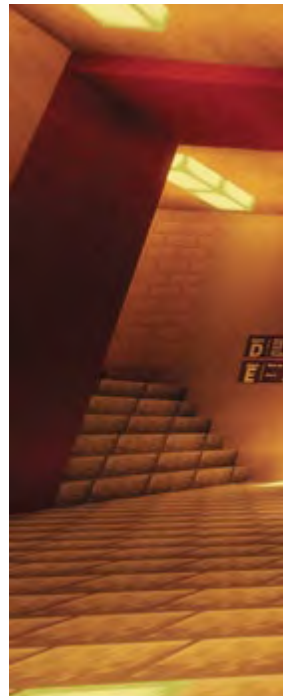
Jake, Nathaniel, and the other team members initially based their Minecraft model on photographs of the school. However, the real breakthrough came when they contacted the school architect for the campus floor plans. Armed with the architectural drawings, the students could correct scaling issues and align windows with walls. Using mods and plug-ins, Jake and Nathaniel could paint tiles and add details — such as the red '25 years' that is emblazoned on the school entrance or the giant, colourful artwork in the foyer. Now, even with the limitation of building with 1m³ blocks, the Minecraft version of Junior College serves as a great online substitute to the real thing for Open Days and

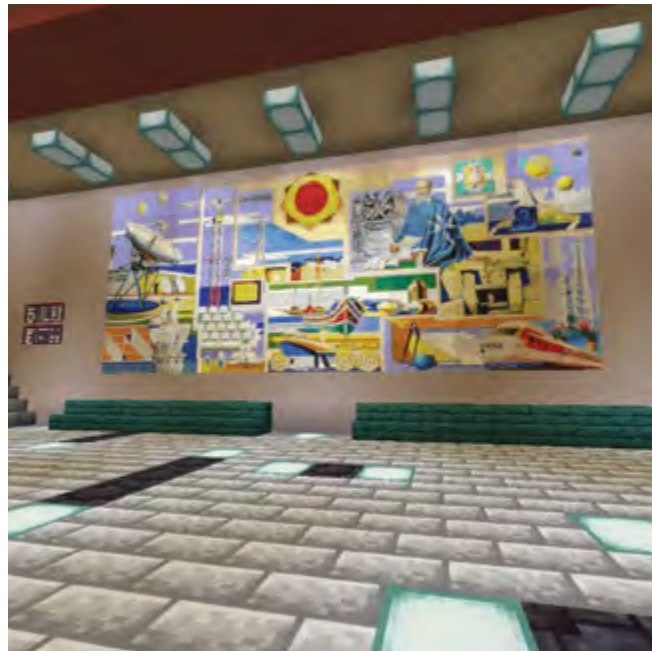
tours. 'It is impressive — once you visit here, it's like you've visited the college,' says Roberto. 'Although, it still doesn't beat the real experience, of course!' he laughs.

It was not all fun and games for the students. They experienced many challenges and lessons along the way. Roberto reported the toughest challenge was 'Coordination with others, how to deal with different people.' The Minecraft builder team fluctuated in size throughout the year, from six students to 17 and back down to three, and team leaders had to cope with the disappointment when students were unexpectedly absent. Nathaniel claimed the most valuable lesson he learned was the 'importance of planning things — plan things before you jump into it.' Jake agreed, 'Planning is number 1! Having a clear idea of the project from the start makes work much easier.' Jake spent over 124 hours on the project and took photos throughout the whole process.

Whilst the finishing touches are still being made to the virtual Junior College, Nathaniel and Jake have continued to apply their Minecraft expertise in creative pursuits. Collaborating with the Youthhub content creation group, they are producing awareness campaigns in response to the IPCC reports on climate change. They used Minecraft's WorldPainter program to build a South American inspired rainforest and other threatened environments to highlight the consequences of climate change.

While some may view video games such as Minecraft as a way to pass the time, they can inspire our creativity and bolster education. The only limit is our imagination! 





Images courtesy of Nathaniel Gauci





Lies, damned lies, and statistics

Dr Joaquin Baruch

The way we understand the causes and patterns of COVID has been stirred by a chaos of statistics. As an epidemiologist, here are three takeaways that I believe we must communicate, at least for vaccine-preventable diseases.

Firstly, what is vaccine effectiveness? For the sake of the argument, let's say our aim is to prevent COVID-19 hospitalisations. Next, let's look at Vaccine A.

Vaccine A has an effectiveness of 93%, which means that the incidence (new cases per population per time) of hospitalisations would be 93% lower if our population is vaccinated. However, it does not mean that 7% of the people will be hospitalised.

Let's assume three things. a) a population of 1,000,000, b) an incidence of 600 cases per 100k per week, and c) 10% of cases are hospitalised.

If people are not vaccinated, we would expect 60 people hospitalised per week per every 100k (10% of cases). But, in our vaccinated population, a 93% vaccine effectiveness would mean that instead of 60 people hospitalised per week, we would observe 4 ($60 \times 93\%$), or 0.004% ($4/100,000 \times 100$).

Only four people would be hospitalised instead of 60.

Secondly, should people receive a "booster" vaccination? Waning immunity over time is a recurrent hot topic.

Let's get back to Vaccine A, and let's assume that the 93% effectiveness would be 83% in 6 months – a fictitious number for the sake of this argument. Decreasing 10 percentage points means the vaccine is less effective. Correct. But what does this mean when we look at the number of hospitalisations?

With an 83% vaccine effectiveness, we would observe 10 hospitalisations instead of 60 without vaccination, which is still remarkably better than no vaccination. However,

if we administer a booster, we are using more doses of the vaccine, all while a large majority of other countries have vaccinated less than 20% of their populations. So in this case, we need to ask ourselves: should we issue boosters, or work to vaccinate other countries?


A ten-point effectiveness reduction sounds alarming, but the statistics show us that these vaccines could be better used by another country.

Preventing high infection rates in other countries reduces the possibility of new variants.

Thirdly, can we expect many vaccinated people to get COVID-19? Does this number increase as more people get vaccinated? It has been publicly announced, for example, that 90% of COVID cases were among unvaccinated individuals, and this statistic will undoubtedly give people hope. But what of increased cases among vaccinated people?

Let's assume 600 COVID cases per 100,000 people. Of these 100k, 80% (80,000 people) are vaccinated. From the 600 COVID cases, 30% are vaccinated (180 of the 600 cases) – alarming, right? However, the weekly incidence per 100k vaccinated is 225 [$(180/80,000) \times 100,000$], whereas the weekly incidence per 100k unvaccinated is 2,100 [$(420/20,000) \times 100,000$].

The incidence is ten times higher for the unvaccinated population. Vaccination protects.

Applying simple statistical concepts to public health communication might help explain science and help us to better understand the COVID-19 pandemic. Mark Twain was right; statistics are tricky, 'but it is undoubtedly easier to lie without them.' 

20%
UNVACCINATED
(20,000 people)

100,000
PEOPLE

80%
VACCINATED
(80,000 people)



30%
VACCINATED
(180 people)

600
COVID-19 CASES

WEEKLY
INCIDENCE



Vaccinated
225 cases

Unvaccinated
2,100 cases

The incidence is
10 TIMES HIGHER
for the unvaccinated

VACCINATION
PROTECTS

STUDENTS

Leading with balance

Shirley Cutajar



While I was a full-time student, I had a part-time job. I always found it hard to balance my work and studies. This personal experience that I share with many others inspired my research study about University of Malta (UM) staff.

My work had three goals. Firstly, I wanted to explore the relationship between work-life balance (WLB), employee performance, and job satisfaction. Secondly, I examined whether WLB policies increase employee performance and job satisfaction. Thirdly, I wanted to know whether age, gender, or the employee's own culture positively impacted WLB and employee performance.

WLB is a concept built around striking an ideal balance between an individual's personal life, work, and home. Nowadays, this concept is a predominant matter for workers and organisations around the world. Several businesses want to offer a healthy lifestyle to their employees but expect high performance and satisfaction levels. These levels vary according to the WLB of every single worker.

To investigate this, I circulated a questionnaire amongst 257 support staff, of which 216 are administrative and clerical staff, 22 have managerial jobs, and 19 are industrial staff. The findings revealed that employee performance and job satisfaction are positively impacted by WLB. WLB is affected by age, gender, and the employee's

own culture — especially for employees that have children. Technology within the workspace also affects employee performance, and job satisfaction is influenced by the employee's well-being levels and family satisfaction. Essentially, this means the more fulfilling personal and family life is for an employee, the more satisfied the individual will be with their career. My findings showed that WLB policies at UM are satisfactory; however, employees still recommended customising WLB policies to individual needs. The participants also wanted technology that is adapted to their needs. Some participants commented that work and family are no longer separate, but instead they merge, since employees take their work culture home.

My research can help policymakers in Malta better understand employees' problems. The goal would be to introduce new WLB policies. Focusing on workers' lifestyles would be an easy way to develop a strategic WLB policy. The process isn't easy, but with the right implementation, workers' lives can be improved. **T**

This research was carried out as part of the Master of Science Programme in Management at the Faculty of Business and Management, University of Chester, in collaboration with Global College Malta under the supervision of Ray Micallef.



The psychology of colour in cinema

Sarah Zammit

Colour is not just something we see; it is something we feel. It is the most immediate form of non-verbal communication. Colours can induce instinctive feelings, like how blue makes us feel safe while red alerts us to danger. Such principles can also be applied to the art of cinematography.

Ever since the introduction of colour in films, the cinematic world has experienced a radical shift, and what was once conveyed through numerous black and white images is now enhanced through different hues, shades, and tints. Colour has made it possible for filmmakers to add another layer to their narrative interpretation, throwing their audiences into a vast ocean of colour.

Taking a look at Steven Spielberg's *Schindler's List*, the clever use of black and white cinematography, mimicking World War II footage from the 1940's, complements the plot. However, by singling out the red coat of a little girl, Spielberg manages to produce one of the most powerful moments in filmmaking. Without

any use of dialogue, the director represents the innocence and suffering of the Jewish population during the Holocaust.

Yet, what if the girl's coat had been another colour? Would it have altered the viewer's perception and interpretation of the scene? Colour interpretation is a learnt behaviour – influenced and affected by one's cultural beliefs and traditions. While the colour red has associations of alarm, blood, and danger in the West, in China, for instance, red represents luck and happiness. At the same time, white, usually a symbol of peace and purity, is interpreted as the colour of death in eastern cultures.

Colour interpretation remains fascinating, providing ample investigations into how it affects our psychological and emotional responses – evidence that colour is truly a visual language and a powerful tool for storytelling. **T**

Sarah Zammit is a 2nd year student reading for an M.A. in Film Studies at the University of Malta.





DESTRUCTION

Destruction is often associated with demolition, violence, and extinction, yet it is also a preamble to life and new beginnings. It forms part of the Hindi concept of Trimurti, which views Creation,

Preservation, and Destruction as crucial parts of life's cycle - each phase requiring and leading into the other. In this FOCUS we examine the destructive side of human nature as well as the research trying to curb it.



Sounds of war

What do war poems and songs from 3 different periods of history have in common?

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Sounds of war

Author: David Mizzi

War songs are designed to unite armies against a common enemy. David Mizzi talks to three academics to examine jihadist war poetry (including ISIS), ancient Hebrew war poetry, and Chinese/Korean war songs from WWII. They all share universal themes like land and unity and the rhetoric of revolution.

When we think about poetry, we might conjure images of soppy love sonnets or poems from our secondary school days. However, poetry (and literature in general) has tackled more destructive themes such as war and conflict. It has the power to shape political choices, inspire us to commit great (or terrible) acts, and give form to our identity.


For Dr Lehyla Heward (Department of Oriental Studies, University of Malta), this is evident in the war songs of Korean and Chinese insurgents during WWII. As we discussed the rousing tunes of these communist freedom fighters, similarities to other traditions, such as the jihadist war poetry used by ISIS as well as ancient Hebrew war poetry found in the War Scroll (a Dead Sea Scroll from Qumran) began to crop up. Dr Kurstin Gatt and Dr Dennis Mizzi (both from the Department of Oriental Studies) both shared their insights. What makes this particularly exciting is how these three traditions — separated by time and space and with virtually no communication with one another — developed poetic traditions with overlapping themes. It's a testament to the universality of poetry and humans' penchant for destruction and violence.

FROM EAST TO WEST

The language we use reflects the way we think. Poetry's messages can be decoded to understand the mindset (gestalt) of the groups who used them. So, what makes these three poetic traditions distinct?

Manchuria (a region in Northeastern China) is flanked by the Korean peninsula. Two rivers spring from the Changbai mountain and run east and west through the region, forming a natural border between China and Korea. In 1931, the Japanese staged a bombing as a pretense to invasion, alienating both the Chinese and Korean inhabitants and leading to a strong anti-Japanese sentiment. Heward explains how this was the catalyst that led them to join forces against a common enemy.

The war songs of the Northeast Anti-Japanese United Army (NAUA) offer us a glimpse into the ways Chinese and Korean fighters interacted and viewed one another. But while the songs were designed to unite these two factions, Heward explains how 'we can clearly see cultural differences in the songs, for instance in the language. There are both Chinese and Korean versions of the same song.'



*We come to you with slaughter and death,
With fear and silence, we sever the bonds,
You have failed publicly, so taste the defeat,
Return in flight, under cover of night.*

Heading towards the Middle East, Gatt's dissertation project analyzes both jihadist language as well as their poetry. Specifically he takes a look at the poetry used by the Islamic State (IS). For jihadists, poetry is one of the most popular forms of media communication. It is used as both propaganda and recruitment. When we say poetry in jihadist literature, we refer to structured poetry in Arabic, with a rigid end-rhyme, metre, and fixed themes.

Jumping back in time, Mizzi speaks about his preliminary insights into Hebrew war poetry, the eldest of the three poetic traditions. 'One noteworthy text is the "War Scroll," which was discovered among the Dead Sea Scrolls,' he explains. This manuscript describes an eschatological battle (a battle fought at the end of time) between the forces of good and evil, providing a scripted narrative about how this battle will unfold. It describes battle formations, weapons, armour, military banners, and much more in great detail, but the text also includes some war songs.

Scholars generally attribute the Dead Sea Scrolls to the Essenes, one of a number of Jewish groups (including the Pharisees, the Sadducees, and the early Christians) active during the 1st centuries BCE and CE. The final redaction of the War Scroll is dated to the 1st

century BCE, though it is clear that the document is a composite text, made up of earlier texts. Mizzi explains how ancient scribes would literally copy and paste older sources. 'It's effectively plagiarism,' he laughs. 'We can tell because there is a major shift in the tone and style.'

That being said, while both jihadist war poetry and the war songs of the NAUA have been used in actual wars, there is no evidence that the War Scroll was ever used in an actual war setting, and the manner in which it was read remains a matter of speculation.

US VS.THEM

The first step to violence is to identify and dehumanize your enemy.

In the case of jihadist poetry, enemies are threatened (*tawa'ud*) and ridiculed (*hija'*) in verse. Gatt gives a specific example through, 'Soon, soon.'

*We come to you with slaughter and death,
With fear and silence, we sever the bonds,
You have failed publicly, so taste the defeat,
Return in flight, under cover of night. ➤*

Dr Leahya Heward
Photo by James Moffett

The War Scroll distinguishes between the Sons of Light and the Sons of Darkness. The Essenes viewed themselves as being on the right side of history, believing themselves to be the Sons of Light, while the Sons of Darkness were deemed wicked and unclean. God will smite them.

*Lay Thy hand on the neck
of Thine enemies
And Thy feet [on the pile of the slain!
Smite the nations, Thine adversaries],
And devour flesh with Thy sword!
Fill Thy land with glory
And Thine inheritance with blessing!*

In column XIII, the scroll discloses how the High Priest and the elders of the army shall bless the army and curse the enemy, who is aided by Belial, a demonic entity similar to Satan:

*Cursed be Belial for his sinful
purpose and may he be
execrated for his wicked rule!
Cursed be all the spirits
of his company for their
ungodly purpose and may
they be execrated for all their*

*service of uncleanness!
Truly they are the company
of Darkness, but the
company of God is one
of [eternal] Light.*

Just like in jihadist and Hebrew poetry, the songs of the NAUA unite soldiers against a common enemy. Unique to the NAUA is the challenge of overcoming the cultural and linguistic differences between Chinese and Korean soldiers. In order to instill a sense of camaraderie, war songs referred to the natural landscape of Manchuria. While the rivers might seem to divide the country, they too come together. The aptly named, 'China and Korea Have come together' goes:

*The mountain streams and
rivers of the countries,
China and Chosŏn,
have come together.
History has been raised like a building
On the two plots of the Amnok
River and Changbai Mountain.*

'Essentially,' Heward explains, 'it emphasises that if the land can be

thought of as one, then so can the people who live there. It engendered a dual Chinese-Korean community.'

Regardless of what is shown in movies, killing another human being is psychologically challenging. This kind of poetry dehumanises the enemy, viewing them as the servants of darkness, an invader, or an affront to your way of life. By depicting the enemy as something evil or subhuman, poetry can 'trick' us into viewing the enemy as something rather than someone, which enables the committing of violence and atrocities.

A CAUSE GREATER THAN THE INDIVIDUAL

It takes a powerful tool to convince people to lay down their lives for a cause. On the battlefield, where death is a constant and imminent possibility, poetry serves to reassure the combatants and prevent the fear of death from routing them.

According to Gatt, 'poetry changes reality by manipulating jihadists into performing "martyrdom" for the group with the illusion of a paradisiacal promise.' While blood vengeance is a pre-Islamic concept,

Dr Dennis Mizzi
Photo by James Moffett



in fact the Qur'an aimed to overcome violence by introducing the belief in the afterlife. Meanwhile, jihadist war poetry perverts this message. It makes the quest for vengeance seem legitimate and part of the Islamic tradition. Die for the cause and enjoy eternal paradise.

Similarly, the War Scroll evokes biblical traditions to legitimise its position. By recalling past divine interventions in history, it aimed to instil confidence in the army of the eschatological war and strengthen their resolve. In column XI, the text refers to how God delivered Goliath of Gath into the hands of David, leading to triumph over the Philistines. It also highlights how the Sons of Light are chosen by God himself. '[...] Thy people Israel, which Thou hast chosen for Thyself' This could be seen as reassuring to the soldiers as, besides being chosen by God, they have heard the 'voice of Majesty', and wisdom has been revealed to them.

*Who is like Thy people Israel
Which Thou hast chosen for Thyself
From all the peoples of the lands;
The people of the saints*

*of the Covenant,
Instructed in the laws
And learned in wisdom...
Who have heard the voice of Majesty
And have seen the Angels of Holiness,
Whose ear has been unstopped,
And who have heard profound things?*

For its actual readers outside the constructed world of the text, the scroll may have served as an ideological tool, strengthening the resolve of what was essentially a minority group and justifying its ambivalent attitude towards outsiders. Who knows, perhaps when war broke out with Rome in 66 CE, some Essenes took the War Scroll to heart and joined the war effort, presuming it to be the onset of the eschatological war.

While the other traditions appeal to God to provide reassurance, the NAUA referred to another military favourite – patriotism. In 'Four Seasons of Guerilla Warfare', the song ends with the question: 'Patriotic men don't fear death, so how could they fear affliction?' Heward explains this as the 'logic of suffering'. They present two

unwelcome circumstances, such as death and affliction, to show how one is better than the other – so long as the enemy is defeated, of course. What does it matter if one suffers frostbite while fighting the Japanese? It is still better than living under an oppressive regime.

These three traditions developed independently, yet they use the same techniques to inspire communities to war. Each group attempts to dehumanise their enemy while legitimising their own cause. They romanticise the atrocities of war behind promises of glory in an attempt to unite people under their banner. While the circumstances of each war may change, the destructive trail they leave behind is always a tragedy. It seems that even poetry is not safe from the horrors of war. **T**

Extracts of the War Scroll are taken from Geza Vermes' The Complete Dead Sea Scrolls in English. NAUA war songs used are translated by Dr Lehyla Heward. Extracts of jihadist poetry are taken from Dr Kurstin Gatt's book 'Decoding DĀ'ISH,' which is available Open Access.



The great
BIG
floating
landfill



Author: Caroline Curmi

An astounding 91% of litter found floating around the Maltese Islands is plastic waste, but it is not the only pollutant scarring our seas. **Caroline Curmi** speaks to marine biologist and University of Malta guest lecturer **Marta Curmi** about Malta's marine pollution crisis and how the nation can tackle it.

Until a few years ago, very little was known about Malta's marine litter situation. After years of international debates and awareness campaigns, it has finally become a nationwide hot topic. Focusing both dissertations on marine ecotoxicology (i.e. the effects of toxic compounds on the marine environment), marine biologist Marta Curmi (University of Malta) was able to use her passion for the environment towards a national cause: studying the effects of pollutants in our seawater. Her findings are astounding.

A LOCAL CRISIS

Maltese citizens' generally nonchalant attitude towards the waste crisis is disconcerting: 'It is a gross underestimation thinking that by not throwing away litter directly into the sea – such as on the ground and in fields –

it will not wind up there,' Marta explains. 'After a storm, you will see the sea being more polluted with litter than it was before on a calm day.' Her findings point to a higher amount of marine litter in winter, likely due to rainfall and run-off.

These can also cause fertilisers used in farming to seep into the open sea, causing eutrophication to occur. That is when excessive nutrients are present in a body of water. These act as 'fertilisers' in the sea, nourishing the growth of algae. When the algal growth becomes excessive, it leads to serious problems. For example, algal blooms rob the sea of oxygen, affecting the health of the marine environment, including important seagrasses, fish, and other creatures. While this has not yet been observed to large extents in Maltese waters, the threat is imminent.

Eutrophication also occurs in harbours: 'In ports, you can have discharges or ships that are incorrectly

disposing of their sewage material. There's a whole spectrum, but in more enclosed areas, such problems amplify.' Somewhat unsurprisingly, Birżebbuġa harbours one of Malta's worst marine litter spots: 'One of the features that came out of my thesis was that Malta's ports and marinas are high accumulation points of litter. The freeport has high activity – the market, beaches, shipping, fishing – there's a whole problem there that just gives, gives, gives,' Marta says. Gozo's Ta' Ċenc area also falls high on the list: 'I have some assumptions which would need to be confirmed, but one possible reason behind this is because of a sewage water treatment plant in the area which sometimes overflows,' Marta explains.

A PLASTIC SOUP

Pinpointing the origin of marine pollution is a complex task which is often deterred due to two natural

elements: winds and currents. These transport litter across seas and oceans, which makes tracing efforts challenging. An infamous incident in 1992 perfectly illustrates the problem. A cargo ship accidentally spilt around 29,000 rubber ducks into the Northern Pacific Ocean. Almost forty years later, the ducks are still bobbing across the world and washing up in surprising places, including Hawaii, Australia, and Indonesia – track that!

Winds and currents also contribute towards the accumulation of floating litter, which is further heightened by certain geographical features. Marta uses the Mediterranean to highlight the severity of such a combination: 'The Mediterranean Sea's setup, with its limited exchanges to other oceans, acts like an entrapment mechanism,' she explains. This, coupled with its popularity in tourism, high coastal population, many shipping links, and a number of rivers flowing into the sea, contribute to the large mass of rubbish currently floating around. 'Not only has the Mediterranean become known as the Mediterranean plastic soup, it is also the sixth highest accumulation point in the world,' Marta reveals.

YOU'RE OIL I (DON'T) NEED

A fourth element is litter thrown away by people. While plastic waste is a huge worry, oil, contaminants, and certain metals also harm the environment. 'One thing I noted during my research was that oil was serving as a sticking device and causing litter to stick together in oil in one place,' Marta says. With most of the litter consisting of plastic waste

comes another blow: 'Plastic is an oil-loving (oleophilic) and highly absorptive material. Plastic is known to cause harm after ingestion due to its own chemicals, and such consequences only multiply when it becomes exposed to oil.'

While animals are the ones to suffer the first blow, the second is often served piping hot at the dinner table. Whilst a fish's digestive tract is removed prior to cooking, the same cannot be said for seafood such as mussels and oysters: 'Organisms that are consumed whole, that are being ingested with their gut, are more likely to have a higher presence of microplastics inside them, which we would then ingest,' Marta explains.

OF XENOESTROGEN AND EXTINCTION

Suffocation and abrasions are unavoidable threats to sea life due to pollution, as is litter preventing sunlight from reaching the bottom of the seabed, thus robbing creatures, habitats, and algae of essential nutrients. Litter also causes sea animals to starve as it takes up space in their stomach. An even more pressing issue is '[...] that because of the contaminants that are being emitted from plastics, changes in the form of chemical imbalances are being noted in a fish's hormones,' Marta explains: 'Male fish are producing xenoestrogen, a compound similar to estrogen, hence affecting essential male reproductive functions.' With the biological balance disrupted, the risk of extinction has now grown exponentially for these species.



Fish and oysters
Your oil I (don't) need



Marta Curmi
Photo by James Moffett

'Scientists are predicting that by 2050, there will be more garbage and litter in the ocean than actual fish,' asserts Marta. Despite such a daunting forecast, positive change is possible if the problems are tackled at their source.

FUNDS, SCHEMES AND INITIATIVES

'When there are multiple sources to a problem, you cannot focus solely on one issue and forget about the rest,' she insists, highlighting the need for a more widespread holistic approach to address the problem. 'In the Mediterranean, with the seascape shared among so many countries, this is certainly not a one-nation job,' she says, adding that: 'It's not a government initiative, or a private entity initiative, or a personal initiative, it's an ALL initiative because industry is a problem, lack of management can be a problem, overflowing landfills near the sea are a problem, the list goes on...'

Marta commends the success of the EU Directive that banned single-use plastics that can be replaced with alternatives and its related ongoing awareness initiatives: 'It tackles the problem directly. We had grown dependent on several single-use plastic items, but now we have alternatives.' Marta also mentions the Marine Strategy Framework Directive (MSFD), an ambitious EU-wide marine strategy to protect the marine environment: 'This has created targets for all EU member states to achieve or maintain a good environmental status

for their waters.' Among the challenges being tackled are underwater noise, unsustainable fishing, litter, eutrophication, and contaminants.

Malta must supplement such achievements with the creation or adoption of structures such as the beverage refund scheme, which exchanges empty plastic bottles for cash. Another initiative worth considering is the fishing for litter scheme – working with or commissioning fishers to collect litter while out at sea. Already implemented in numerous Mediterranean countries, involving a stakeholder directly could prove extremely powerful: 'Fishers are aware of the impact of marine litter on their catch. While the fishing industry is part of the source, such an initiative would be somewhat mitigating, as long as more litter isn't generated in the process,' Marta says. The implementation of such a scheme would give fishers a secondary source of income during their low season, which hits two birds with one stone. Marta points to a number of EU fisheries funds that could help implement such ideas, especially if combined with national funds. Political willpower is essential for Malta.

While large-scale solutions are crucial in order to curb marine litter, that doesn't mean we are helpless. Being careful with the way citizens dispose of their rubbish is vital, as is choosing more environmentally conscious brands. Citizens can also hold their governments and private companies accountable. Our oceans belong to all of us, and allowing a small minority to profit from its destruction is unacceptable. **T**

Anthony 'Twanny' D'Amato
Photo courtesy of Inigo Taylor



WHAT FISHERMAN HAVE TO SAY

Retired fisherman Anthony 'Twanny' D'Amato agrees with the implementation of a fishing for litter scheme: 'It would work 100%, so long as there is financial compensation.' While he hesitates to comment about dubious practises observed on other fishing boats, D'Amato clarifies that good waste management during fishing trips would be an equally good start: 'I remember we would collect our litter in black plastic bags and throw them away when we disembarked,' he recalls, adding that not everyone was as careful. D'Amato echoes Marta's belief that a large-scale relief effort is required: 'Fishermen cannot chase litter; their priority is their catch. If everyone disposed of their waste responsibly, it would be a far greater achievement.'



Cast in concrete

Author: Becky Catrin Jones

*A reinforced concrete water tower, dated from the early 20th century and a unique reminder of Malta's industrial heritage, was in desperate need of extensive repair and attention. Combining a wealth of expertise, cutting-edge technology, and a community of support, **Prof. Ruben Paul Borg** and **Prof. Edward Gatt** tell **Becky Catrin Jones** how they brought a new lease of life to an important aspect of modern history.*

An old, 15m-high water tower, with a concrete shell tank resting on 12 slender columns, stood unused and superfluous over the Public Abattoir in Marsa, Malta. A lasting relic of the British period of Maltese history and the intense industrial activity in the inner harbour area, the 1930s tower lay disused, having been replaced at the abattoir by newer technology, leading to its gradual degradation. With no need for it, given the danger presented, the local authorities at the time were considering pulling it down.

For Prof. Ruben Paul Borg (Faculty for the Built Environment, University of Malta), this was a tragedy. While to some, the tower looked like nothing more than a degrading structure, Borg was aware of its significance. Constructed in reinforced concrete and with technologies illustrative of the period, the tower was an important part of industrial heritage in Malta. So how could he convince the authorities to give it a second lease of life?

'I am very passionate about preserving our industrial heritage,' says Borg. Combining this with his expertise as a structural and materials engineer, he was determined to find a way to use his academic research as a means to save the tower. His latest project, a high-performance,

durable, sustainable concrete developed at the University of Malta, might just be the answer. Following the signature of a collaboration agreement between the University of Malta and what was then the Ministry for Sustainable Development, the Environment and Climate Change on the restoration of the Water Tower, work started apace.

THE SALTY PROBLEM

Funded by an EU HORIZON 2020 project (supported by the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 760824), Borg had been working on the development of a highly durable concrete, designed to be used in aggressive environments, particularly in coastal regions. The ReSHEALience Ultra High Durability Concrete research project, combining the expertise of 13 partners across Europe, including Borg and the University of Malta, aimed to produce materials which would protect structures in extreme climates or environments.

The Water Tower is one of the key pilot projects in the ReSHEALience Research project.

The new self-compacting fibre-reinforced concrete would should be based on new nano-materials for higher performance, with self-healing characteristics.



The tower before and after restoration.

Before: the tower restoration showing extensive degradation, including spalling (detached concrete) and loss of section.

After: Restored structure through the application of advanced materials including: self-healing properties, ultra-high performance and self compacting concrete for the columns, and carbon-textile reinforced concrete for the tank.

Photo courtesy of Prof. Ruben Paul Borg



With careful monitoring, it should provide a more environmental and sustainable alternative to current construction materials. Developing state-of-the-art material requires considerable research.

Borg had been working in this area for some time, using nano-technology within concrete to give it extra properties to improve its performance, including durability and sustainability. He was confident in a prototype which, in the lab at least, was performing well in challenging situations.

The EU project required real-world test sites to demonstrate the possibilities of the new materials. These locations would need to be in extreme environments to really push the materials. In Italy, the research group found a geothermal power plant basin that needed to resist an acidic environment; in Spain and

Ireland, a floating concrete platform and a floating pontoon must survive aggressive marine environments.


Malta is a hot, wind-swept, rocky island, and the water tower sits on the coast of Marsa in an industrial area making it a perfect place to test whether the new concrete can resist a highly aggressive, salty coastal environment. The ResHEALience project would provide part of the funding necessary to support the research and make this possible; all Borg needed to do was convince the local authorities to get on board.

A HIGH TECH SOLUTION

The Public Abattoir, agreed to embark on the restoration of this unique structure using such cutting-edge technology and support it financially. The project was then taken on by the Ministry for Agriculture, Fisheries and Animal Welfare. Permissions for

restoration were sought with the Planning Authority, who also financially supported the project. Borg was free to go ahead and start the rescue mission.

Using the new high-performance concrete to repair the tower was one thing, but Borg wanted to go one step further. Calling on previous collaborations, he reached out to Prof. Edward Gatt (Faculty of ICT, Dept of Micro and Nano Electronics, University of Malta), an expert on sensors, in order to develop an advanced structural health monitoring system together. Incorporating the sensors would give the project an extra dimension, allowing the team to gain a better understanding of how the concrete responds to its environment.

Working together, Borg and Gatt planned how the restoration effort would incorporate different sensors inside the concrete, integrating the sensor network in the architectural 



Detail of the tower structure
Photo courtesy of Prof. Ruben Paul Borg

fabric as well as developing a long-term monitoring and control station. 'We needed three monitoring systems,' recalled Gatt. Structural monitors would measure movement of the tower in response to wind, earthquakes, and water pressure. Durability sensors would record any degradation in the concrete by checking for changes within the concrete, including moisture, temperature, or salt concentration. Finally, environmental sensors would be included to assess the weather and atmosphere around the tower.



Prof. Ruben Paul Borg
Photo by Sarah Zammit

'Other pilot projects which we developed in the ReSHEALience scheme include sensors for structural monitoring, but this has by far the most,' says Gatt. The water tower includes both off-the-shelf and custom-made sensors, with over 150 in total across the structure.

The perfect balance of their expertise, with a multidisciplinary approach to tackle new challenges and big projects, meant the two could combine their expertise to develop new solutions. Pulling in PhD students and researchers under their joint supervision, the team set about testing the nanomaterials and sensors on the different parts of the water tower structure. What was necessary for the 12 pillars that support the large water tank might not have applied to the circular shell elements of the tank.

Using laboratory-based research on materials and structural elements, combined with advanced finite element computer modelling approaches, the team could assess how different repairs and reinforcements using the new high-performance concrete might work in the real world and decide which would be most appropriate for the tower. Before any work was

done on the water tower, Borg built replicas of the structure's columns and shell pieces. These were used to test the materials and sensor installation processes, ensuring their theories were correct without risking any unnecessary harm to the tower.

TEAMWORK TO MAKE THE DREAM WORK

'We really must stress the importance of having a diverse team working on this project,' remarks Gatt. This mammoth task, carried out over two



Prof. Edward Gatt
Photo by Sarah Zammit



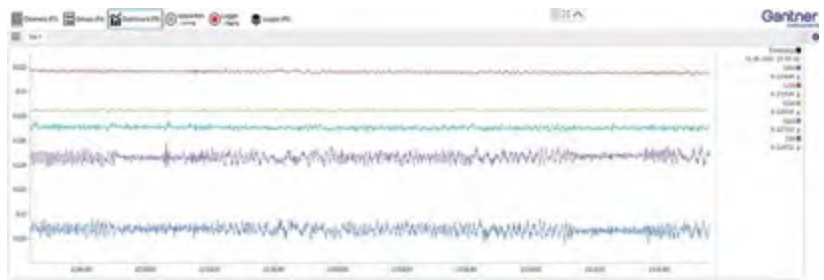
The structure performance was validated through monitoring during the filling up and emptying process with 400m³ of water
Photos courtesy of Mediacoop (Left)

Below: Data logging stations are used to read the signals from the 150 sensors in the tower for durability and structural health monitoring.
Photo courtesy of Prof. Ruben Paul Borg



years but with more than a decade of groundwork, involved students, laboratory researchers, computer modellers, contractors, site inspection teams, and many more, including the ongoing support of the Senior Management of the Public Abattoir.

The final stage of the project required further expertise, involving a collaboration to produce an engineering platform where students, researchers, professionals, and citizens can access the data produced by the sensors. Interested visitors will be able to see how the water tower performs and how the concrete materials and structure change in their environment over time: the impact of the changing weather, salt exposure, and increasingly hot summers.



Top: The data is stored on the cloud, viewed and processed on an online platform for research and learning purposes.
Image courtesy of Prof. Edward Gatt

The University of Malta and the Ministry for Agriculture, Fisheries Food and Animal Rights have now agreed to extend their collaboration beyond the restoration of the Water Tower, and set the basis for further collaboration using the restored structure as a platform. The water tower can now be counted as an extra research station for the University of Malta providing teaching and learning opportunities for students in architecture, materials and structural engineering, ICT, and other subjects. By including a virtual learning platform, the reach goes far further than Malta. Inviting international collaborators to partake in research analysing the data produced by the mass of sensors hopes to encourage further investment in and development of these new materials.

SET IN HISTORY

After a huge amount of work, what now for the water tower? 'The best way to preserve a public structure is to use it and make people feel they need it,' says Borg. Following the successful completion of the project, the Public Abattoir is planning to reincorporate the water tower into the daily running of the site.

Borg and Gatt were anxious to validate the restored structure by filling the tank with 400 cubic meters of water and putting it back in operation. 'It's one thing to know that the materials work in the lab but another thing entirely to know if they are ready for the real world,' Borg remarks. The successful validation exercise further confirmed the possibilities of the new high-performance materials developed and the technologies applied in the conservation process. The pioneering work has now opened new opportunities for the team in research and applications in industrial concrete heritage structures.

Perhaps the greatest success for Borg, though, is the recognition of the water tower as an important and significant structure for Maltese heritage, and the Ministry's commitment to preserve and valorise it. Following the restoration project, the tower is in the process of being recognised as a listed heritage structure, protected to preserve this piece of culture with so much historical significance. It's a perfect example of how today's latest innovations and cutting-edge technologies can help protect the 20th century's industrial heritage. **T**

Breaking the glass ceiling in academia:

The challenges female academics face at University

Author: Belle de Jong

*Our 'Big Science in Little Malta' article only featured male academics. This got us thinking, what about female academics at the University of Malta? For this **THINK** article, we want to take a closer look at the academic glass ceiling. What are some of the struggles female academics face? And what can we do to overcome these barriers?*

In October 1919, Tessi Camilleri, the University of Malta's (UM) first female student, enrolled. Today, almost 60% of all UM students are female. But that doesn't mean gender gaps are non-existent at the institution. The majority of the university's top management, deans, and directors are male.

Roderick Vassallo, co-chair of the Gender Equality and Sexual Diversity Committee, explains: 'You'll see that there's quite a number of female academics at the bottom – assistants, lecturers, and senior lecturers. But they start fizzling out at the top.'

THE NATURE OF PROMOTIONS

A lot of it boils down to the way promotions are given. When it comes to professorship, a promotion is given based on research conducted, administration work, and teaching hours.

Research is given way more importance than the other two. 'If you don't have research published in international journals, you might find that you will not be given a promotion,' Vassallo says.

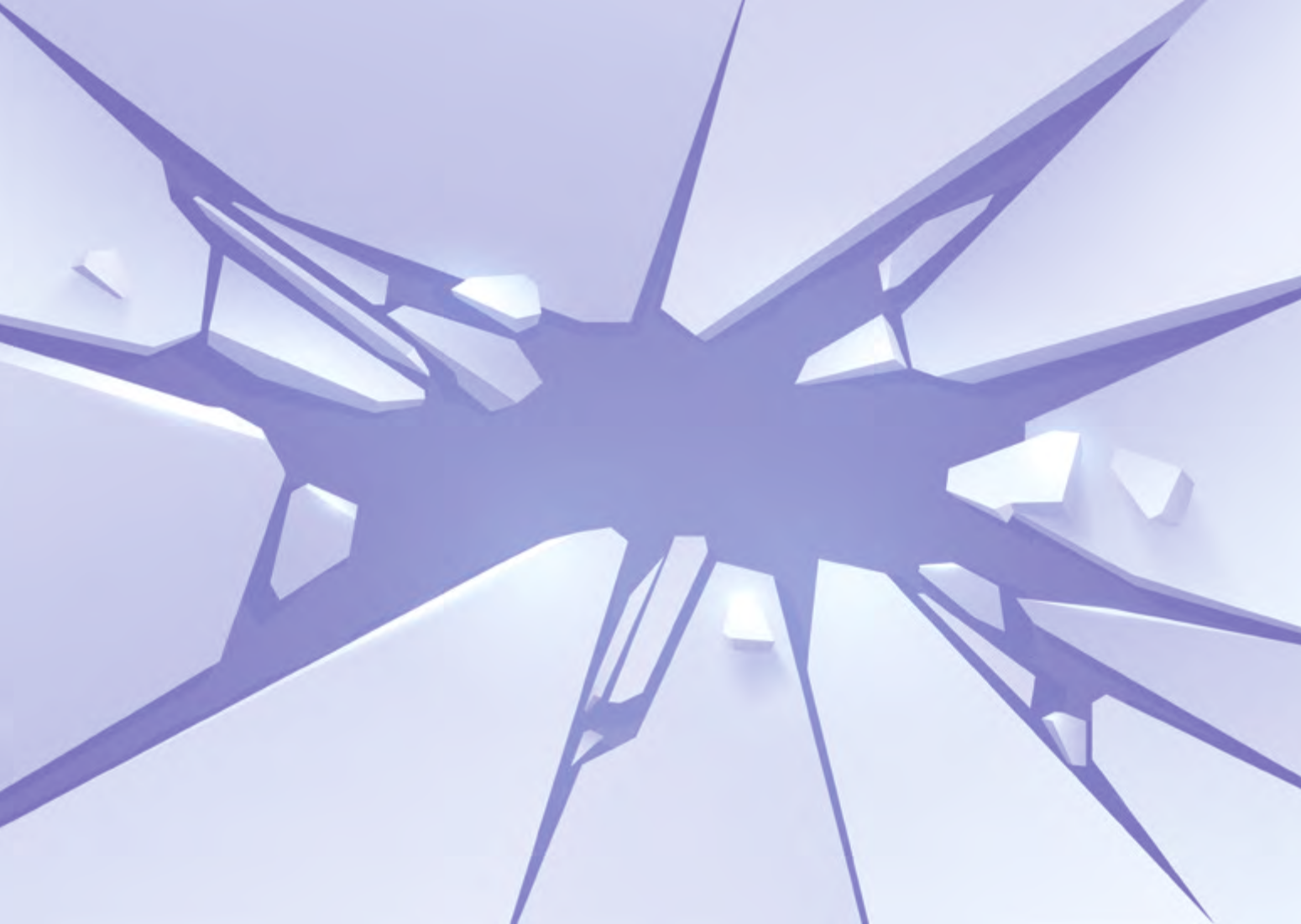
JosAnn Cutajar, associate professor in Gender and Sexualities, says: 'Women do very well in teaching. But when it comes to assessment, nobody in university gives promotions on the basis of your teaching acumen.'

WORKING WEEKENDS

On top of that, the current standards are mainly shaped by men. In order to get a promotion, you are expected to work overtime and during weekends – something most men can afford due to societal gender roles.

But that's not the case for everyone. Artificial Intelligence lecturer Dr Claudia Borg says: 'I consider myself lucky to be single. It gives me the opportunity to work over the weekend if I want to. I really can't imagine myself doing the same amount of work if I had a family.'

'But why should a promotion depend on my work on the weekend? Why can't a promotion be based on working my 40-hour job? The bar is set high by those who have the time to work overtime, but it shouldn't be there



for everyone. The bar should be where we consider it reasonable in terms of output,' Borg continues.

'These are the ways in which university doesn't support academics. These issues are creating division. There is a gap between those able to do overtime and those who can't because they have a life and a family outside their job.'

WHY DOES THIS IMPACT WOMEN?

These things impact women more than men because in general women are expected to take care of the kids. Kids are time-consuming. 'Some are lucky and have a more balanced load, but parenthood in general more strongly impacts the mother,' Borg said.

Vassallo strongly agrees. 'We need to constantly invest energy and mechanisms to help people understand

'We need to constantly invest energy and mechanisms to help people understand this reality. There needs to be a negotiation between the quality of work and the quality of academics' lives.'

this reality. There needs to be a negotiation between the quality of work and the quality of academics' lives.'


That isn't the only way motherhood infringes on women's promotion prospects or recruitment. Cutajar says, 'If you are female, employers will ask you: "What is your fertility plan?"'


Vassallo confirms that this doesn't happen at UM — it is in fact illegal — but Borg has experienced it before in other companies. 'We've had to deal with it time and time again. I have been in a position where I sat

for an interview and was specifically asked: "Do you have children?" or: "Why did you get married?"'

The problem is cultural, Vassallo says. 'The idea that the family is always dumped on the female counterpart is wrong. Why is the female always in charge?'

PAY GAP

Part of the reason women are more likely to stay home with the children is the pay gap. In Malta, men are paid 12% more on average 



for the same job as women. 'If my husband is earning more for the same job, I'm going to give up my job because he earns more, which is better for the family,' Borg explains.

At university, the gender pay gap exists in indirect ways. 'On paper, there isn't a pay gap. In practice, there probably is. Because women will always fall back on not having time to apply for funds and projects,' Borg says. 'The gap comes in at projects where your time is actually paid. The more time you have to work and apply for funding, the more likely you are to receive additional payment for your work.'

Cutajar adds, 'There are other things you can be doing, like being the Head of Department. The majority of Head of Departments and assistant deans are men. So they get an allowance for extra duties.'

COMMUNITY CARE

The University of Malta Academic Staff Association (UMASA) has proposed a more holistic approach towards promotions. This would still include a focused approach on research output, but it would also include the option of taking a balanced approach that gives weight either to an academic's commitment to university, society, and the academic profession or to demonstrated quality in teaching. The existing promotions criteria will again be up for review when the next collective agreement is discussed.

Many female academics are involved in community issues. 'Research around the world underlines that female academics spend more time with students and advocating for vulnerable social groups,' says Cutajar.

Unfortunately, taking community work into consideration hasn't been operationalised yet. 'That is, we don't know on which basis you can get a promotion. We haven't been told what amount of hours equals a promotion,' Cutajar says.

There is also the community within UM to take into account. Helping students is another area that doesn't currently factor into promotions, but perhaps should.

'We have students with awful problems – suicide, matrimonial issues, abortion... Two of my students had girlfriends who had an abortion, so they couldn't cope. We've had a student who got divorced because her husband didn't allow her to continue her studies,' Cutajar says.

Spending time and effort on helping students infringes on lecturers' time to do research. Patricia Hill Collins, an American academic specializing in race, class, and gender, said, 'If you want to proceed in academia, don't provide any social help.'

GLASS ESCALATOR

'It doesn't only depend on the amount of time men and women have to spend on their academic careers. Though there is definitely a glass ceiling in academia, there is also such a thing as a glass escalator,' Cutajar explains.

'As a lecturer, your role model is a professor. When you look up and just see men, you think: "oh my god, I'm never going to get there." We have glass ceilings, but men have glass escalators.'

She elaborates by giving the example of social work 'Social workers are usually female. When men go into this field, they usually don't spend as much time at the bottom – they will get to the top really fast. The same in academia: it takes female academics more time than men to reach their goal.'

UNCONSCIOUS BIAS

The issue goes beyond rules and expectations – it is culturally ingrained. 'We call it internalised oppression,' Cutajar says. Internalised oppression occurs when women think that they are not capable as decision makers.

Borg also spoke about the fact that academics and students are concentrated in some fields and not others. We are socially ingrained to think that engineering is for men, nursing for women. Some parents tell their daughters: 'Don't take computing, that's for boys.'

'I have experienced setbacks, but I can't always pinpoint whether those setbacks are because I am a woman. The thing is that we have a lot of unconscious biases when it comes to gender,' Borg says.

Not all departments are working equally to diversify their lecturing staff. This results in embedding our pre-existing biases. Without diversification, we develop tunnel vision. Issues that do not directly affect our group are sidelined and ignored.

'In our faculty, out of 46 lecturers, three are women, and they are all within a single department. There's an unconscious bias.' And as the criteria for the promotions aren't strictly defined, it leaves space for that same unconscious bias.



Dr Claudia Borg

No one will literally say: 'There's a female application; it's not right to promote her yet. Let's promote this male applicant.'

'But if you are looking at the female's CV and you see 10 publications, and then you see 50 publications on a male CV straight after, you will likely think she didn't do enough. Although she may have done a lot of administration, or maybe she has 50 teaching hours.'

A panel made up exclusively of men is more likely to hire a male candidate. We are more likely to select a candidate based on how we identify, whether that's race, religion, or gender identity. It is precisely for this reason that diverse interviewing panels are needed: to overcome our unconscious bias.

SOLUTIONS

From the way promotions are granted to unconscious bias, there are many factors that lead to women being underrepresented in the upper part of academia. Luckily, there are plenty of solutions that can break this glass ceiling.

Borg, Cutajar, and Vassallo agree that there needs to be more transparency in the way promotions are given, as only the amount of publications is set on paper. Marks should be given for teaching hours, community work, and administrative work, too.

Another important step towards gender equality is equal pay and equal maternity and paternity leave.

'We need the responsibility of the child to be equally distributed between the father and the mother. Then, anyone who will be interviewed who has a child will be liable for the same thing, not just the woman,' said Vassallo.

'And more complaints', Vassallo adds. Cutajar continues, 'When men complain, they listen.' Borg replies, 'When women complain, we are considered hysterical females. Of course I am the hysterical female complaining. We're not going to move forward unless we are shouting.' If we want to move forward, we need to be shouting together. **T**



**CAN
PLASMA
GUNS
SAVE THE
WORLD?**

Author: Antónia Ribeiro

WHO recommends hand sanitizers which are 80-96% ethanol and 3% hydrogen peroxide. The problem with hydrogen peroxide is its short shelf life and its cost to transport. This makes it a logistical nightmare to procure in large doses. A research team from the University of Malta has found a way to create hydrogen peroxide with a technique that seems like science fiction.

Antónia Ribeiro gets in touch.

and sanitizers have inserted themselves in our everyday language. In response to a global pandemic, disinfection has become the cardinal rule.

At the Department of Food Safety and Nutrition and the Metamaterials Unit of the University of Malta, researchers have been playing with plasma, the most common state of matter in the known universe. Dr Dmytro Kozak (Division BioTeC+, Department of Chemical Engineering at KU Leuven, Belgium) was working at the Metamaterials Unit, trying to develop a technology using atmospheric plasma. He brought the technology to the attention of Dr Jefferson de Oliveira Mallia (Research Support Officer within the Faculty of Health Sciences), as a way to disinfect seeds for human consumption. But when COVID-19 hit and hand sanitizer became scarce, they realised they may have been tinkering with a novel way to produce disinfectant.

This is how project SANITAS was born, out of the hard work and personal care of researcher Dr Sholeem Griffin (Centre for Biomedical Cybernetics, University of Malta) and Mallia. SANITAS is developing novel techniques to produce disinfectants that protect against disease. The project's most infamous target is SARS-CoV2, but


the final disinfectant should work on any pathogen, be it virus, bacteria, or fungi. To make this possible quickly and inexpensively, SANITAS proposes using atmospheric plasma.

PLASMA-ACTIVATED WATER

Besides solid, liquid, and gas, there is a fourth state of matter: plasma. Its particles rarely collide, so it can be described as similar to a gas. However, the particles' movements are synchronised, making it behave as a fluid, much like a body of water. Plus, plasma is so electrically charged that it can create its own magnetic field. It is also the most common type of matter in the universe, even if rare on Earth. You can find it in lightning storms, in the aurora borealis (Northern Lights) or in light sabers.

The SANITAS team makes their disinfectant with a bit of water, a sprinkle of air, and a lot of energy. But don't go microwaving water just yet – plasma is the key ingredient, and it is very hard to stabilise. Before researchers were able to produce and manipulate plasma at our normal atmospheric pressure, they needed very strict conditions, which meant a painfully expensive process.

Plasma is key because of its high electric charge. Plasma can strip away electrons from particles, leaving them ionised. Point plasma at water, and when it hits, ➤



Left and right: Apparatus used during the SANITAS Project
Photos by James Moffett



Dr Jefferson de Oliveira Mallia
Photo by James Moffett

it energises the hydrogen atoms in the water molecules, making it possible for the water molecules to join and form H_2O_2 , or hydrogen peroxide. Hydrogen peroxide is one example of many reactive oxygen species (ROS) created through this process. In high amounts, these charged particles cause damage to cells' components, affecting their

equilibrium and potentially causing death – that is why plasma guns are so popular in sci-fi movies.

The chemical works by destabilising the protective coatings around viral particles as well as bacterial and fungal cells. The microbes end up dying when what keeps them together just comes apart. Disrupting these structures is what makes disinfectant so powerful and useful, an essential sanitiser during the COVID-19 pandemic.

FROM WATER TO DISINFECTANT

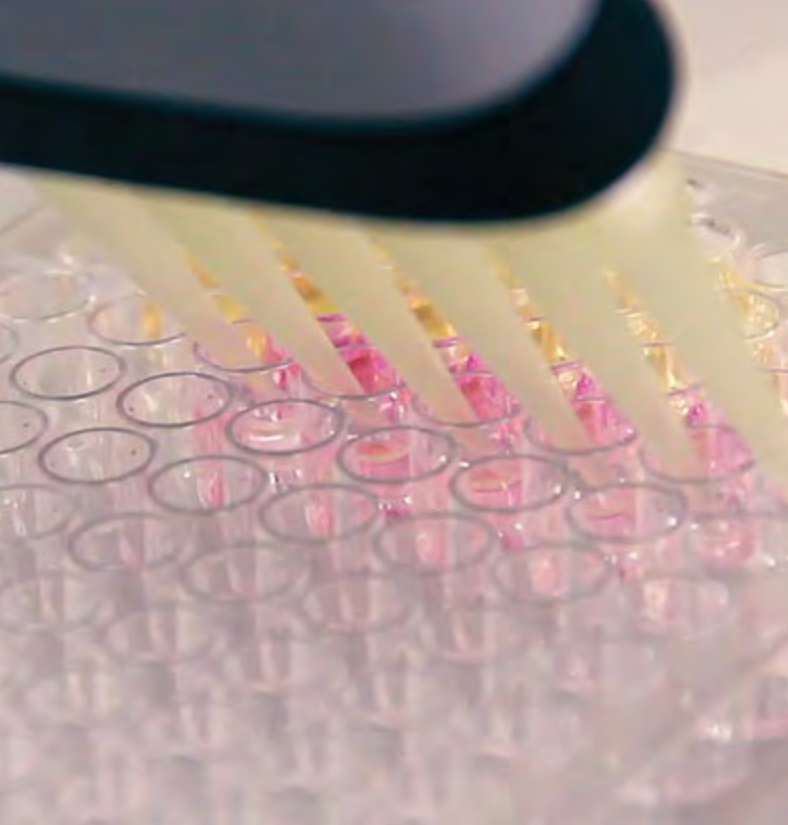
What started as a way to clean seeds has become a new way to protect against COVID-19. The base technology may be the same, but it still needs some adaptation to become usable. The team doesn't just want to produce ROS, they want to create a medical grade disinfectant. This means the product has to be effective and safe for human use.

According to legislation from the European Parliament, the approval of any biocidal product,



Dr Sholeem Griffin
Photo by James Moffett

stuff that can kill microorganisms or viruses chemically, has to follow a set of conditions. The purity of the substance has to be within strict parameters, and the substance cannot harm the environment or other beings that are not the target of the product being developed. Testing is key to make sure a new product is safe.



Due to the tight regulations, the project is evaluating the efficacy and safety of the disinfectant. For example, they conducted tests to see their product's efficiency. To comply with regulations, it has to kill a myriad of bacteria, fungi, yeast, and virus strains. If it doesn't pass the tests, it won't be fit for medical use.

Besides being effective, it is important for the product to be safe for human use. The team has to test the liquid formulation to guarantee it doesn't lead to gene mutations or toxicity in skin cells. Similarly, sensitivity tests are being conducted to guarantee the disinfectant doesn't cause skin irritations. No one wants to harm themselves using disinfectant.

A PHYSICIST, A BIOLOGIST, AND A CHEMIST ENTER A BAR

Producing a medical grade disinfectant proved to be a truly transdisciplinary endeavour. Prof. Vasilis Valdramidis (Faculty of Health Sciences) and Prof. Ruben Gatt (Metamaterials Unit at the Faculty of Science) introduced the plasma technology to Kozak, who refined the methodology; Griffin ran the efficacy and safety tests; and Mallia idealised the chemical composition of the disinfectant. Take one member out of this equation, and the project would have become impossible.

Kozak developed the plasma technology, which injects plasma into water. The intensity and duration of the plasma discharge, the chemical characteristics of the water, and even the gas that transports the current (for this particular

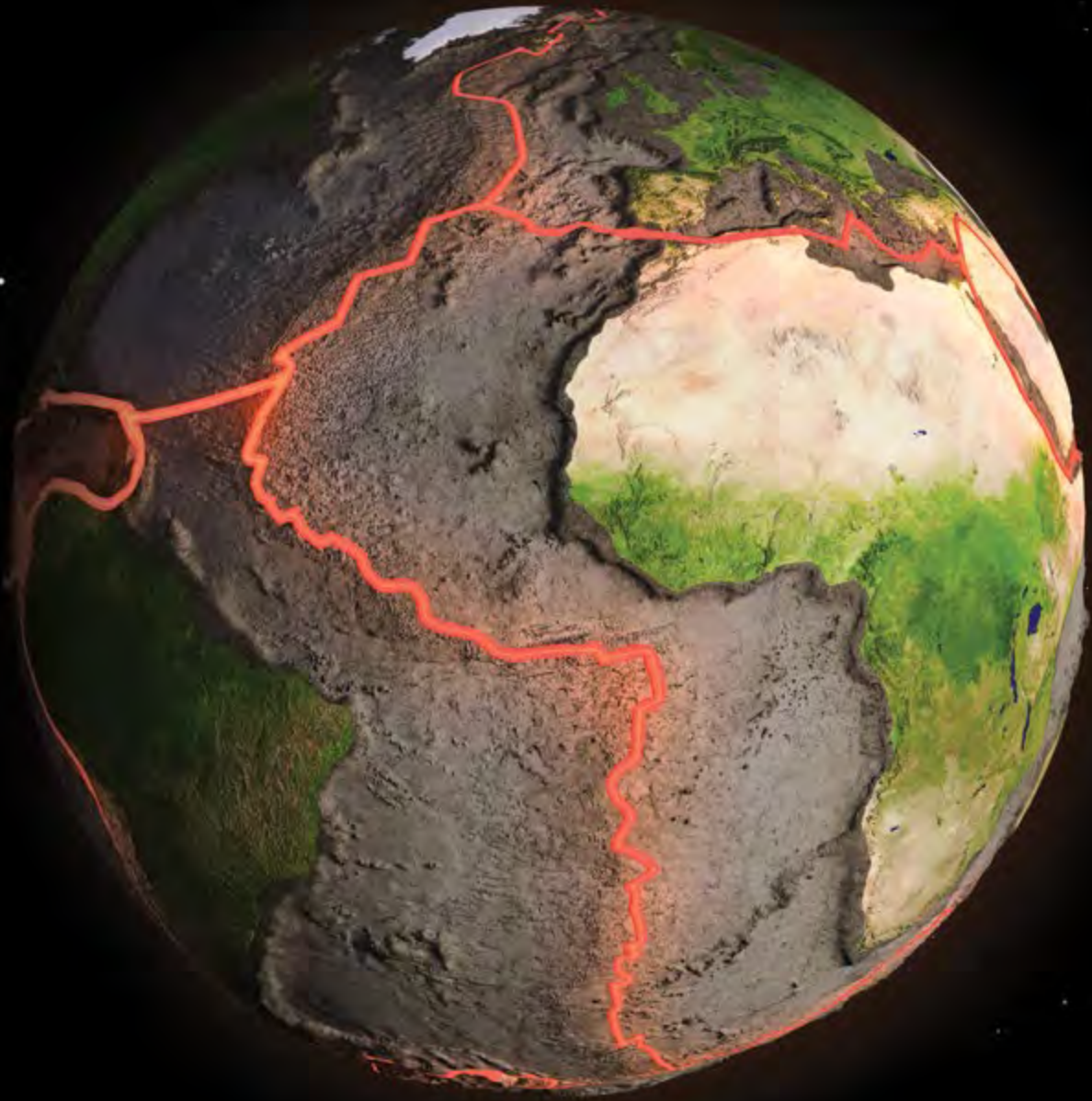
Producing a medical grade disinfectant proved to be a truly transdisciplinary endeavour.

case, air) were initially decided by him. Griffin and Mallia took his initial set-up and started tweaking it to try to produce their disinfectant. Every detail had to be tested – each step in production affects the next. Was the plasma discharge too intense? Was it too long? Was the water pure enough? Was it too pure? Did it need more salts? Each change results in a slightly different final composition, with different effects on animal cells, viruses, bacteria, and fungi.

The team is currently still testing the protocol to efficiently produce the disinfectant. In the near future, they plan to commercialise the machine to companies and services in health-related departments. They believe that this will prevent shortages of disinfectant during periods of high demand, especially in essential services like hospitals and healthcare facilities.

SANITAS is an unexpected product of a very particular period in our history. Yet, the project is leading to new innovations that will benefit humanity for decades. **T**

Project SANITAS is funded by the Malta Council for Science and Technology and Malta Enterprise through the COVID-19 R&D Fund.



Breaking the mantle

Author: Emma Clarke

*Maltese seismologist **Matthew Agius**, alongside an international team of researchers, has just identified a thinner-than-average zone in the Earth's mantle below the mid-Atlantic Ocean. The finding helps explain how the Atlantic Ocean is opening up. The story left ripples worldwide. Words by **Emma Clarke**.*

The inner workings of our own planet can seem as mysterious as the reaches of outer space. For years, scientists debated how our lands and seas formed, until the theory of plate tectonics went mainstream in 1967, the same year that NASA launched its first attempt at a moon landing.


In 1912, German scientist Alfred Wegener first proposed the theory of continental drift. He suggested that today's land masses had once existed as the huge supercontinent Pangea, which broke into pieces and gradually spread across the world. Wegener's theory was ridiculed, but 40 years later, new data gave the idea traction. Soon after, researchers found evidence that the Earth's surface was mobile not static, just as Wegener predicted. The pieces of our world fit together like a huge continental puzzle. Today, we understand a lot more about the geology that supports our everyday lives, but there is still much we don't know.

Dr Matthew Agius, a Maltese researcher, is working with a team of international scientists to understand more about the tectonic activity of the mid-Atlantic ridge. This ridge separates the American continents from the continents

of Europe and Africa. As these continents gradually move further apart, the Atlantic ocean steadily widens. Agius's work, which is the result of an epic 10-week sea voyage, may explain how the Atlantic ocean was created around 140 million years ago. The study was one of the largest to have ever been performed and was recently published in the prestigious journal *Nature* and covered by media worldwide.

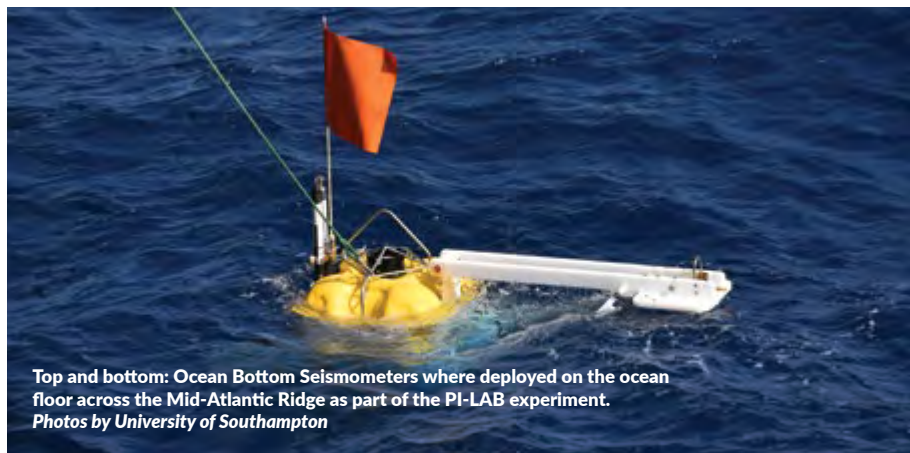
PLATE TECTONICS

The revelation of plate tectonics demonstrated how the outer layer of the earth is made up of a patchwork of rocky plates. These plates float on a bed of molten rock called the mantle. Intense heat from the core of the earth triggers a convection system, where hot rock close to the core rises and the cold outer rock at the surface sinks back inside the Earth. Like a conveyor belt, these currents slowly shift the plates on the outer shell of the earth.

This means that even though the outer layer of the earth feels pretty stable most of the time, it's actually in a constant state of change. Granted, this change happens very slowly. The tectonic plates at the mid-Atlantic ridge move at about 



Matthew Agius
Photo by University of Southampton



Top and bottom: Ocean Bottom Seismometers where deployed on the ocean floor across the Mid-Atlantic Ridge as part of the PI-LAB experiment.
Photos by University of Southampton

2.5 centimetres per year — that's about the same rate that human fingernails grow. It might not sound like a lot, but over geological time spans, these powerful forces can shift continents, drive mountain ranges thousands of metres high, and trigger deadly volcanic activity.

MIND THE GAP!

Around 200 million years ago, the supercontinent Pangea started to break apart and in the process started to form the Atlantic Ocean. As the dinosaurs had started to roam the Earth, the different land masses which formed the supercontinent Pangea were beginning to break apart. Until this point, Europe, Africa, and America had been physically connected, but over the next 100 million years, they would gradually move apart until it became *literally* impossible for the European dinosaurs to get to a Taco Bell. Now, London and New York are separated by around 3500 miles of Atlantic ocean, a distance which continues to increase.

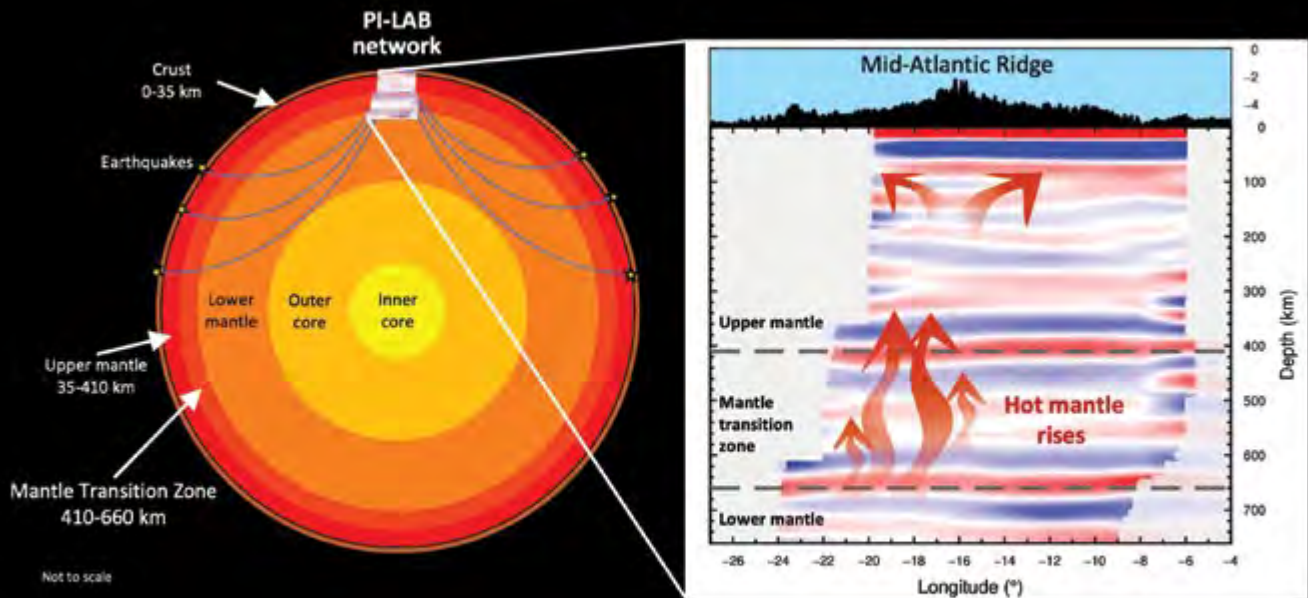
Scientists have hotly debated the mechanisms involved in this geological area. They agree that the tectonic plates are moving apart, but we are only seeing one side of the story. Until now, the school of thought was that the opening of oceans was caused by distant gravitational forces pulling the dense plates back deep inside the Earth, creating a gap. This gap is filled with new matter that rises from just below the ridge. We can see these processes

happen today: the pulling of plates takes place beneath mountain ranges such as the spectacular Himalayas and Andes, and where material rises to fill the gaps, lands such as the amazing volcanic island of Iceland form. Most of this understanding emerged thanks to the hundreds of seismometers deployed on land during the last few decades. However, because there are very few instruments beneath the sea, this limits our knowledge on what is happening, especially since 70% of our planet is covered with water.

GROUND-BREAKING RESEARCH

To settle the matter, a team of scientists led by principal investigator Dr Catherine Rychert from the University of Southampton undertook a gargantuan experiment. Over the course of 10 weeks spent adrift in the middle of the Atlantic ocean on large ships, the researchers dropped a total of 39 seismometers to the ocean floor. These highly specialised instruments can detect movement from within the earth, usually used to analyse earthquakes. The seismometers were left at the bottom of the ocean to collect data over the course of an entire year.

Very few experiments of this size have ever been done before, and this was the first time the Atlantic ridge had been imaged to such a high standard. The team's efforts were rewarded when the scientists finally recovered their findings. The results were (literally) groundbreaking.



Seismic waves from earthquakes around the world travel deep inside the Earth and are recorded on the PI-LAB seismic network. The data are then analysed to image the structures inside the Earth. The thinner than average mantle transition zone suggests anomalous high temperatures that facilitate material transfer from the lower to the upper mantle that may play a role in driving plate tectonics. Diagram by University of Southampton

Dr Nick Harmon, one of the lead researchers, said, 'There is a growing distance between North America and Europe, and it's not driven by political or philosophical differences – it is caused by mantle convection.'

Dr Agius led the study that mapped the area between the upper and the lower mantle, known as the Mantle Transition Zone, located between 410 and 660km in depth inside the Earth. They discovered that the transition zone beneath the ridge is thinner than average as a result of an anomalous higher temperature. They concluded that upwelling beneath the ridge is coming from deep within the mantle (over 600km down), much deeper than previously thought. Before, it was thought that surges in the mantle happened at a depth of about 60km, so these findings have shifted how scientists are thinking about tectonic forces. 'These incredible results shed new light on our understanding of how the earth's interior is connected with plate tectonics,' said Agius.

WHAT DOES IT ALL MEAN?

Their work showed that this 600km-deep surge could be pushing these massive continents apart. We now have a better understanding of the mechanism that is widening the mid-Atlantic ocean. Ocean ridges like the mid-Atlantic had been assumed to play a passive role in geological processes like the shifting of landmasses. This study shows how they can actively drive our planet's changing

landscape. Agius believes a similar mechanism could be taking place at other plate boundaries, and his goal is to carry out similar experiments in other parts of the world.

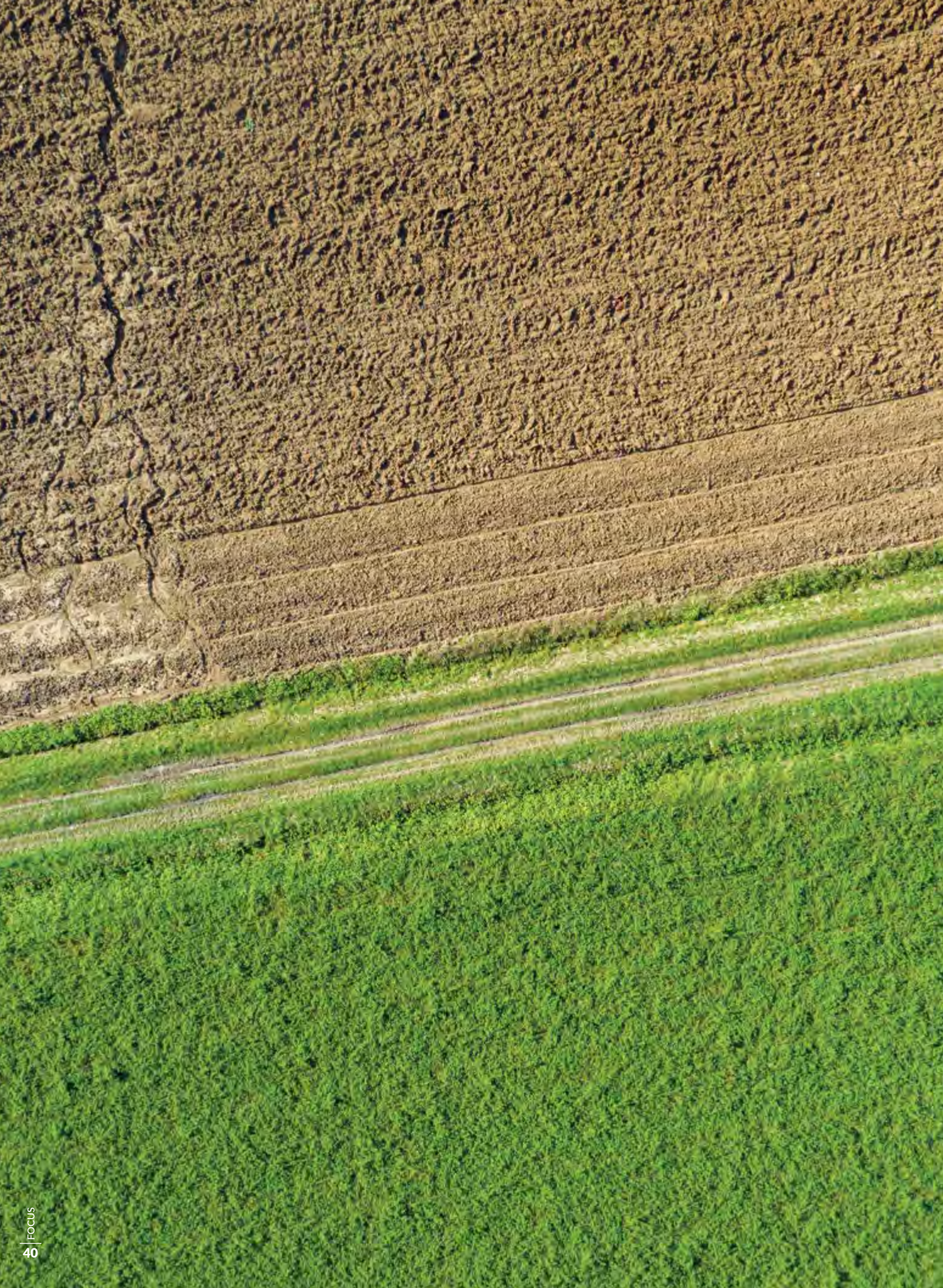
A better understanding of plate tectonics has a whole host of important implications. For one thing, the more we understand, the better we can make predictions about natural disasters such as tsunamis and volcanic eruptions. It also gives us an insight into how sea levels and climate change might be affected by tectonic activity. Essentially, tectonic activity can cause uplifting or sinking of land in a particular location, which affects sea levels.

Just as we are slowly starting to unravel the mysteries of space, research into tectonic plates can help us better understand our planet and our role in it. Taking a closer look at what lies beneath the surface of the earth can help scientists piece together the global puzzle of tectonic plates as well as understand how other planets might have evolved. The results might surprise us!

The experiment is funded by the European Research Council (ERC) and Natural Environment Research Council (UK) and directed by Dr Catherine Rychert and Dr Nicholas Harmon at the University of Southampton (UK).

The publication, "A thin mantle transition zone beneath the equatorial Mid-Atlantic Ridge" can be found online.





Malta's contribution to climate change policy

Author: Timothy Alden

The latest IPCC report on climate change offered the world a stark warning. **Timothy Alden** speaks to academic **Prof. Simone Borg**, Malta's Ambassador for Climate Action and Chairperson of the University of Malta's Climate Platform and the National Climate Action Board. She recently reiterated the Maltese Islands vulnerability to climate change.

Q: Prof. Simone Borg, the climate crisis which humanity is facing is now being felt ever closer to home. However, you have been involved in researching and pushing for action on climate for many years. How did you start working on climate change?

A: In December 1988, Malta asked the United Nations General Assembly to include climate change as a topic on its agenda. Malta's proposal brought the scientific debate on climate change to the attention of the world's politicians. It warned them that this was an existential threat. Back then, I was a student looking for a thesis topic for my dissertation. Prof. David Attard, who today is the university's Chancellor, was my tutor. He also happened to be the advisor to the government at the time, so he was best placed to persuade the Prime Minister to take this issue onto the world stage.

Q: So Malta raised the issue of climate change at the United Nations. As a topic, did it do so in the broadest sense?


A: Yes, and as a common concern for humankind. At first, the larger states were quite skeptical, but Malta found a lot of support from smaller countries. The resolution UNGA 43/53 to this very day is considered to be a

legendary one and is considered the genesis of this whole process. By bringing this topic to the General Assembly, it becomes a global topic for research, discussion, and action. It puts the issue on the global agenda.

Q: So in a way, as regards climate change, you could say that Malta broke the ice?

A: That's right, Malta broke the ice. It alerted the international community about what was being said on the scientific level. The United Nations then decided to set up the Intergovernmental Panel on Climate Change. It is the entity which gives us all the reports. We have just been presented with the latest one, the IPCC 6th Assessment Report.

Q: Have you seen a change in attitude as regards climate change over the years? Are people taking it more seriously? Are they taking it seriously enough?

A: There definitely has been a change in attitudes. It has been slow because it has taken 30 years to get to this point. But climate change effects are being felt now more than ever before. Even in Malta. With the proposal of having carbon neutrality as an economic pillar and the launch 



Monument commemorating the 1988 Maltese UN initiative which led to the recognition of climate change.
Photo by James Moffett

of the Low Carbon Strategy, we are taking important steps to move towards decarbonisation. One must say achieving it locally is not completely under our control. Malta is an importer of technology, for example. We cannot completely decarbonise as long as exporting countries are producing goods that work with fossil fuels. But of course in Malta, there are other sectors where we as a nation can still do better.

Q: How is Malta going to be affected by climate change?

A: The lack of precipitation is one facet, but so is extreme heat. The impact will be felt mostly in agriculture and food production, for example. Malta imports more than 80% of its food, which creates a trade imbalance and affects our expenditure. Beyond the cost of importing even more food in the future, however, there is the question of food security. In times of crisis, like COVID-19, where the ports and factories are suddenly closed, the importation of food and resources becomes an issue. This is a part of our critical infrastructure which is going to become more vulnerable. Predictions for the Mediterranean indicate more severe weather events.

We will also be affected in other areas, such as tourism. Will tourists want to come here in the summer months? Even if Malta is sought after as a destination throughout the year, it's the summer period which is the most popular and most lucrative.

As regards sea level rise, we can have inundation in the low-lying east coast. Saltwater intrusion into our water table is a real danger. Sea level rise will also affect us in terms of coastal erosion. Saltwater will infiltrate low-lying areas like


Pwales, Burmarrad, Marsa, Qormi, and others. Currently a study on coastal erosion is taking place that will take sea level rise predictions, but we still need more studies and modelling to know what to expect as regards sea level rise.

Q: Then one can expect more of this, as heat waves become more frequent and more intense. Has Malta been able to tackle this subject diplomatically on a European level, too?

A: On the topic of adaptation, Malta had a very important role, as it was a chief actor in putting it on the agenda of the European Union. The European Union has an interesting, interactive website called Climate ADAPT (climate-adapt.eea.europa.eu). It gives one a picture of how climate will affect various countries. Another aspect Malta has focused on in terms of climate change is its impact on oceans. Malta has also worked hard to put the impact of climate change on our oceans on the map. If one looks at the Planetary Boundaries report, it explains the linkages between our natural resources. If one part of the system fails, the rest collapses. It is important we do not work in policy silos. There is also the IPCC SROCC report (www.ipcc.ch/srocc) which examines the climate-oceans nexus.

Q: So, how can Malta actually adapt?

A: The best thing we can do to adapt to climate change is to implement the laws we have that protect the sustainability of resources such as water, habitats, and biodiversity. For example, Malta has been working on holistic water management projects to repolish waste water and has been fixing leakages in our water infrastructure. However, although we can adapt to the problems, this comes at an economic



The best thing we can do to adapt to climate change is to implement the laws we have that protect the sustainability of resources such as water, habitats, and biodiversity.

price, and the continued drought and desertification will definitely impact the agricultural sector and its community. The agricultural community is a very unique feature of Maltese culture. It is a vulnerable cultural group, characteristic of our nation. While preparedness can help, adaptation may still not be enough for some impacts, and at times, we can only facilitate adaptation. Such as, for example, with natural habitats. Human beings can protect them better but not directly ensure their adaptation. That is in nature's hands.

Q: Will farmers truly be able to adapt or is the sort of desertification we are talking about taking us beyond a point of no return?

A: Supplying water as needed can help. Various nations have deserts which can grow crops due to technology, but desertification will definitely lead to a more vulnerable community, which requires change and a shift from current practices. There are some countries we can look at for inspiration, like Israel, which has successfully lived with aridity and manages to conduct desert agriculture. This comes at a cost, however, and although humans can imitate nature, they can never replace it altogether or replace its beneficial functions.

Q: Would you know how we can adapt in terms of the impact on our biodiversity?


A: That is more difficult because natural biodiversity depends on natural precipitation. We can water natural habitats, but the animals in a natural habitat will find it more difficult to adapt. There is not enough time for species to adapt with the sort of changes we are facing in such a short time. Furthermore,

being a small country, some habitats are completely unique to their location, and species have nowhere else to go especially due to Malta's small size and urbanisation.

We are also witnessing an influx of alien species due to the increased temperatures. This is being felt to an even worse degree in the marine environment.

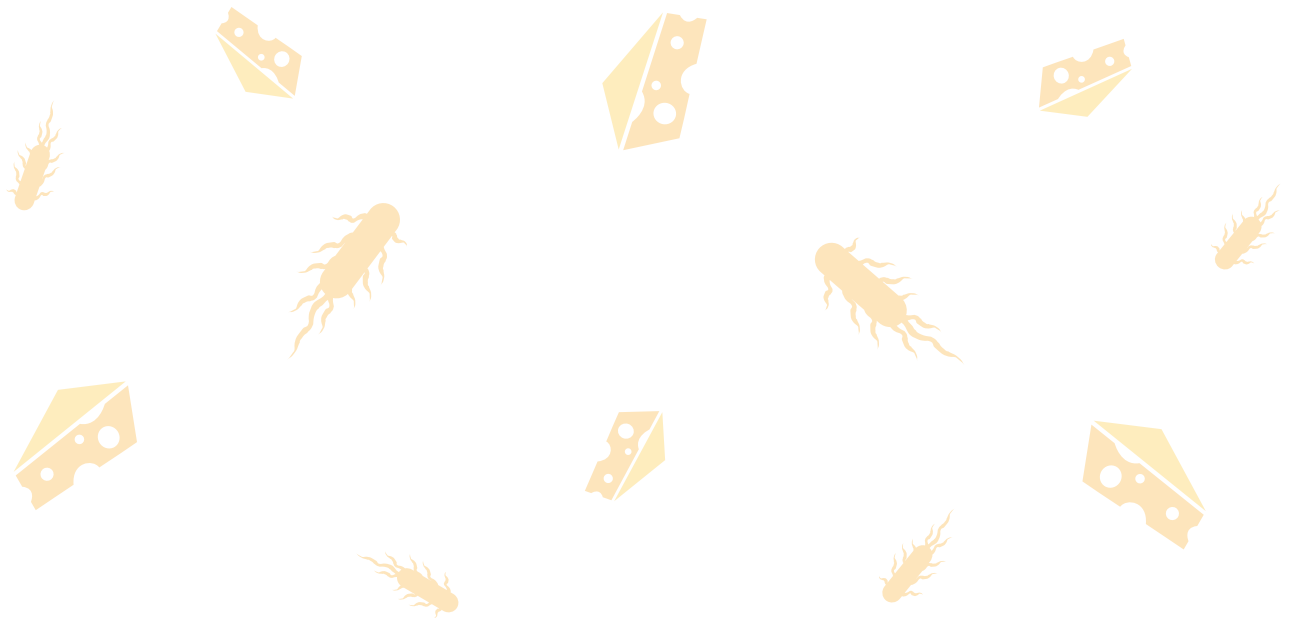
Q: So it seems Malta has played quite a role in climate change policy, but clearly a lot still needs to be done. Where might readers find more sources of information?

A: The University of Malta is doing a lot of work through the Institute for Climate Change and Sustainable Development, the Institute for Earth Systems, the Institute for Renewable Energy, the Faculty for the Built Environment, the Institute for Small Island States, the Faculty of Engineering, and the Centre for Environmental Education and Research. There are others as well. All these institutes form part of the university's Climate Platform. We are a group of academics who promote research and exchange academic learning on climate change.

The University of Malta gave an honoris causa degree to the Secretary General of the United Nations, Ban Ki-Moon, in 2009. Secretary General Ban Ki-Moon had mentioned Malta in his very first address due to its work on climate change. In his visit to Malta, he inaugurated a monument on climate change at the University of Malta. He was instrumental in achieving the Paris Climate Accord. Malta has quite a legacy, and we need to be more ambitious to live up to that legacy. 



Climate change could destroy your cheese



Author: Andrew Firbank

As our climate degrades, the consequences are felt even on a microscopic level. E. coli, a bacteria responsible for severe food-poisoning, seems to be benefitting from the crisis.

Andrew Firbank speaks with PhD researcher **Styliani Roufou** to discover the consequences that this could have for dairy.

Rivers flood, oceans rise, glaciers melt, and wildfires burn with new-found ferocity due to climate change. Most media coverage focuses on these large catastrophes because there is a very clear and visceral human toll. But what if we take a look through a microscope? PhD researcher Styliani Roufou (University of Malta) is studying how the climate crisis impacts one of our planet's tiniest organisms, *Escherichia coli* (better known as *E. coli*). Her findings point to an important prospect — this bacterium and some of its strains could thrive thanks to climate change. *E. coli* flourish in cattle and dairy products, making them particularly vulnerable. Roufou and her colleagues are investigating the ramifications for our cheese.

Surprisingly, *E. coli* is actually essential for our health. It forms part of a gut's healthy microflora, providing us with Vitamin K₂ which helps our blood to clot. Unfortunately, other strains of *E. coli* can cause serious food poisoning when ingested. Symptoms range from mild diarrhoea to death. In 2011, almost 3,000 people were infected and 55 died from an *E. coli* outbreak in Germany. The source was Fenugreek seeds from Egypt. More recently in 2018, Arizonan romaine lettuce spread *E. coli* across the US. Around 210 people were infected, and of those, 5 died.

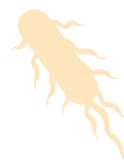
Although these outbreaks weren't directly linked to dairy, the cause is often animal manure. 'E. coli mainly comes from waste and manure in farms,' Roufou explains. 'Contamination

from this waste can then spread through the entire food chain.' Thankfully, *E. coli* can't normally survive for long without a host. They persist in feces for just a few hours or days before they die. Using manure to fertilise crops is therefore normally safe. Likewise, cow udders and milking equipment may come into contact with *E. coli* on a farm, but this rarely endangers the dairy. 'There are some strains of *E. coli* that can produce toxins, and they are very strong, surviving for a long time outside of a host,' Roufou notes. Some of these strains may manage to reach consumers.

TURNING UP THE HEAT

Since the 1860s, the dairy industry has had an action plan to kill contaminating bacteria. The key is pasteurisation. Raw milk is quickly heated (typically to 71.7°C) for just long enough (15 seconds) to destroy any harmful microorganisms. Drinking milk straight from the udder or eating raw-milk cheeses therefore carries greater risk. High-temperature treatments act as a screen between our bodies and the farm. Unfortunately climate change may render that screen ineffective.

Roufou is testing *E. coli*'s ability to adapt to new and extreme environments. For most organisms, we assume that the instability and adversity caused by climate change will limit their chances for survival. For *E. coli*, that doesn't seem to be the case. 'So far, we can say that *E. coli* still grows' ➔



well under climate change conditions,' warns Roufou. 'And we are using a simple strain, not one of the more resistant ones.' Her findings indicate that rising atmospheric CO₂ at certain levels benefit *E. coli*, enabling it to survive for longer in harsher conditions. The danger is that they have the potential to adapt to withstand the pasteurisation process.

SAVING OUR STILTON

So, how is the dairy industry addressing this? That's exactly where Roufou comes in. Working alongside her research supervisors Prof. Vasilis Valdramidis and Dr Sholeem Griffin (Faculty of Health Sciences, Department of Food Sciences and Nutrition University of Malta), Roufou is part of Protect ITN, an EU Marie Skłodowska-Curie initiative to predict and prepare for food challenges caused by the climate crisis. Eight early stage researchers and their universities across Europe are leading projects to safeguard our future food safety, with participation from dairy giants like Nestlé.

Based on her findings so far, Roufou recommends a multi-pronged approach to tackle the future. 'We cannot just increase pasteurisation temperatures, because that could destroy vitamins and other beneficial components of the milk,' she points out. 'We may need to combine different techniques: pasteurisation, filtration, etc. to make sure we can produce a safe dairy product.' With quick and comprehensive action, Roufou believes that the European dairy industry can handle the dangers of enhanced microorganisms like climate adaptable *E. coli* strains.



Styliani Roufou
Photo by James Moffett

Unfortunately, *E. coli* isn't the only problem that climate change presents for dairy. Rising temperatures will inflict heat stress on cattle, reducing their milk yields. Extreme weather events like flooding will endanger animals whilst spreading disease. Heightened levels of atmospheric CO₂ will dissolve into our water systems, forming carbonic acid. This water acidification could harm all levels of the dairy supply chain as well as causing a myriad of other environmental dangers, like acid rain. To combat or even just comprehend the breadth of climate-induced difficulties this industry faces, skilled young researchers like Roufou are desperately needed.


GROWING PAINS

By 2050, the UN predicts our population will reach 9.7 billion. That's roughly a 26% increase from today. If the average person continues to consume dairy as they do now, then land requirements for dairy may be unsustainable. Already, over 264 million cows are used worldwide for dairy production. To meet present demands, another 69 million cows would be needed by 2050.

The problem is: we're a little short on land. Cities are expanding, and coastlines are being engulfed by rising seas, leaving our food supplies and wildernesses to compete for what's left. Those 69 million cows would need swathes of land to rear and feed. Finding that space in a rapidly shrinking world is going to be difficult.

Despite everything, the future of dairy is less determined by the climate crisis than it is by us — the consumers. The dairy industry likely has enough resources and influence to preserve itself, but it is our purchasing habits that drive its expansion to satisfy demand.

But in order for our consumer decisions to trigger change, governments and the industry itself also need to be receptive and willing to develop long-term solutions. Through research, they are proactively seeking the knowledge required to meet buyer demands, even down to a microscopic level. The question remains whether these solutions will consider environmental impact or be purely-profit driven.

Scientists like Roufou and her colleagues strive to protect our future food safety, but much of the strain could be eased if we were willing to make more sustainable food choices. 'As consumers, I think that we shouldn't be so dependent on single food sources. We should also be considering balanced diets that include both animal and plant-based products.' Roufou ends our interview with a common saying too often ignored: 'In life, I believe in balance.' 

By **2050**

if a population of

9.7 billion

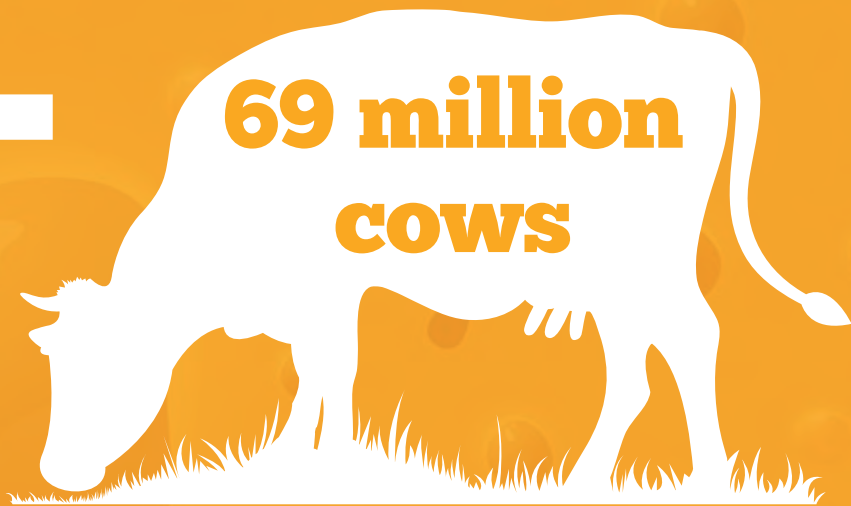


consumes **dairy** the
same way we do now

264 million

+

**69 million
COWS**



will be required to
keep up with **demand**



THE INVISIBLE HAND OF KNOWLEDGE-INTENSIVE COMPANIES

Author: **Christian Keszthelyi**

*Trading goods has moved to virtual space. Market boundaries have collapsed as digital solutions are being sold worldwide, pushing the knowledge-based economy to thrive. **Christian Keszthelyi** discusses the internationalisation potential and successes of Malta-based companies with lecturer **Joe Schembri** (Faculty of Economics, Management and Accountancy, University of Malta).*

For such a small country, Malta has been immensely successful in exporting knowledge and internationalising digital solutions.

Why? 'I have always been curious about how Malta-based companies can be successful in

internationalising their products and growing despite all the barriers, hindrances, and disadvantages that come with being a small island nation,' lecturer Joe Schembri (Faculty of Economics, Management and Accountancy, University of Malta) says. This curiosity drove him to carry out a two-year study on seven local knowledge-intensive firms.

THE KNOWLEDGE BEHIND KNOWLEDGE-INTENSIVE FIRMS

Any company that sells a product or service depends on the knowledge of its human resources. Schembri has found that, apart from the core innovation behind the solution, excellent internal communication is necessary for a company to internationalise their solutions successfully. Also, being heavily digital is a vital prerequisite for success.

'As I spent more time with the researched knowledge-intensive companies and interviewed them, I realised that knowledge flows internally within these companies much

faster than traditional businesses. This helps them approach their clients, develop new opportunities, gather new leads, and enter new markets,' Schembri explains.

KNOWLEDGE IS POWER

Technical and digitally switched on entrepreneurs naturally create internal systems where employees can record knowledge that is accessible for everyone. This can manifest in shared databases of reports about client interactions or hands-on customer relationship management (CRM) software, all of which help to capture the necessary knowledge. Establishing such systems and practices can help retain knowledge in the company, ensuring that it does not migrate if a key employee leaves the company.

'A lot of the companies I studied tend to organise internal management meetings, where the salesperson is expected to do a presentation on a trade fair they attended, for example. Therefore, a person needs to first reflect on the attended event and the knowledge they acquired, process it, and then present it to their colleagues who did not attend. Such simple practices support fast knowledge flow within the organisations, allowing them to learn faster,' Schembri outlines.



While prices compete against each other in our economies, traditionally, keeping production costs at the lowest possible level to increase profits is of utmost importance. In knowledge-based economies, the mechanism differs significantly. If a knowledge-intensive company produces a unique service and offers solutions to a niche market, the solution itself trumps the price. In such circumstances, a company can charge premium fees for its services.

'Charging a premium means that the company can grow faster because it has better cash flow. People are paid better; they typically work flexibly. Therefore, operations are typically greener and more sustainable. Working this way in the digital space allows employees to communicate seamlessly across countries and time zones. Such an approach is in line with the idea of a circular economy,' Schembri describes, offering a possible way to create sustainable models.

COMMERCE WITHOUT BORDERS

The knowledge-based economy can offer a viable alternative in situations where traditional business models fail temporarily. The COVID-19 pandemic forced borders to close, which hurt countries like Malta that are dependent on trade and tourism. 'If you base your economy on people coming from abroad and consuming locally, your GDP does grow, but that also has a substantial impact on your infrastructure and environment. However, if you are selling software or any other knowledge-based service abroad, such an impact is nearly negligible. You are selling the capability of your human capital to provide a solution, not the location,' Schembri explains.

The issue is a worldwide one. Knowledge-intensive approaches currently seem crucial to the European continent's competitiveness, especially as the pandemic has severed supply chains, halting globalisation. Conversely, knowledge-intensive businesses can deliver high value-added services in the digital space, even if borders are closed, a fundamental difference from our traditional economic models.

According to Schembri, 'Knowledge-intensive services are produced and consumed remotely. While the debate about globalisation and companies moving to low-cost countries is present, the opportunity to participate internationally thanks to the digital world is much better with knowledge-based companies. I do not believe that the relocation of businesses that we see in some sectors will affect the knowledge-based economy model significantly.'

With the emergence of this knowledge-based economy model, businesses can withstand external physical shocks, such as grounded planes and crippled international transport. Does this mean that traditional economic models could be replaced in the future?

'I do not think there is a conflict between these models. Rather, the knowledge-intensive approach will start complementing traditional models. Even in the most traditional sectors, there are certain activities already utilising knowledge-intensive software and solutions,' Schembri says.

THE FOURTH INDUSTRIAL REVOLUTION

Essentially, knowledge-intensive businesses are powering the fourth industrial revolution, or Industry 4.0. As companies

integrate new technologies into their manufacturing and distribution processes, we shall see more intelligent allocation and use of resources. With this approach, technologies such as the internet of things (IoT), artificial intelligence (AI) and machine learning, cloud computing, and analytics are being improved faster than ever. Ideally, it will be a self-generating cycle – as digital solutions improve, our traditional processes will get better, increasing the need for even better technologies. The growth of knowledge-intensive companies depends on their competitiveness. These businesses are plugged into the same value chains as traditional corporations; in fact, they embellish each others' workflows.

Based on his findings, Schembri argues that businesses typically go through three phases of opportunity-driven international growth. First, a company usually learns about the business model, service, and industry it wants to participate in from an early international opportunity, often serendipitously. This period of 'clarifying the opportunity space' typically includes the establishing or re-design of the company's core service offering based on an initial project, sometimes even a local project.

Once some clarity is established, and especially following a strategically significant opportunity, firms typically start replicating that opportunity. This is the second phase, a process of learning in which they use client feedback to identify new opportunities. It is also the period when the company sets up some basic structure to accelerate this replication. It is here that new persons are typically employed to help lead generation and new tools and practices are introduced.

As time goes by, the company increases its commitment to international markets as it formalizes its organisational structure and adopts a hybrid approach between seeking replications of past opportunities and being open to totally new ones. This represents the third phase, in which the company is an international enterprise.

'Knowledge-intensive companies are very good at developing opportunities based on the network of people they know in a particular industry. Also, they are focused on delivering a specific solution that fills a gap in their market.



Joe Schembri
Photo by James Moffett

Suppose you have a good product and a good service that targets a global niche. In that case, you strive to build a positive reputation, become dominant in the market, and grow as the company becomes more and more of an insider in that market niche,' Schembri summarises.

The term 'knowledge economy' has come a long way since it was popularised by business management consultant Peter Drucker in his books *The Effective Executive* (1966) and *The Age of Discontinuity* (1969). Today, the knowledge economy has become the primary trading arena between developed nations, resulting in the rising significance of ICT industries as the engine for economic growth. While traditional economic models have depended on unskilled labour, the knowledge economy has created an insatiable need for highly skilled employees. Education systems, innovations, and research practices all need further investment and professional attention so we can ensure a better future.

These companies show the way to a sustainable economy for Malta. Based on human capital and less dependent on transport and physical space, they offer innovative solutions to international clients, commanding margins that translate into quality jobs. This is a transformation that requires some serious thinking on the level of education, government aid, and our international positioning. **T**

WHAT IS THE KNOWLEDGE-BASED ECONOMY?

The knowledge-based economy is fueled by intellectual capital and has become a significant component of economic activity in developed countries. Companies involved in fund management, human resources, and software all produce knowledge-based products and services. Beyond capitalising on scientific discoveries and applied research, the knowledge-based economy is moved by the international trade of intangible, intellectual assets from innovation and research.

LAUGHING IN BINARY

Author: Jasper Schellekens

*Video games might not be your first thought when it comes to comedy. Some people doubt whether games can even pull it off. **THINK** gets in touch with **Dr Krista Bonello Rutter Giappone** to talk about how comedy works in video games.*

Getting a joke isn't always easy. That's part of the fun! The principles of comedy might be universal across media, but games are a new interactive medium for laughter. Not only can the player play the game, but the game can play with the player.

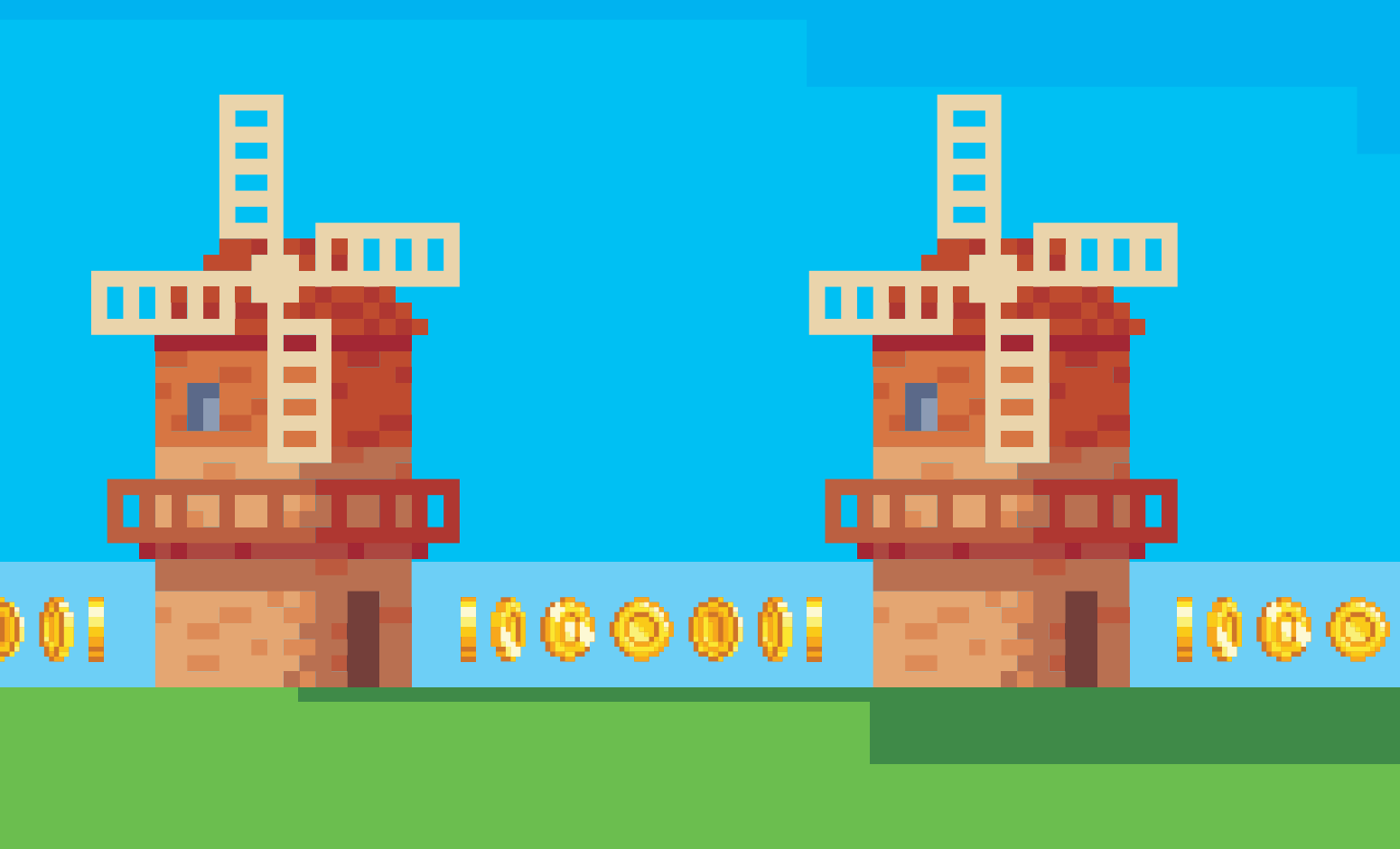
The adventure game – a game driven by exploration and puzzle-solving – lends itself particularly well to parody and playful interaction. A recent analysis of the top 100 adventure games by *Adventure Gamers* showed over half were explicitly humorous, including classics such as *Broken Sword*, *Grim Fandango*, and *Monkey Island*.

IT'S A SET-UP

A joke's set-up always contains crucial information that the audience needs to 'get'. Often (even in games) the joke relies on external information; for example, the jokes in comedian Conan O'Brien's monologues often rely on the viewers' knowledge of current events and politics. A game can quickly become dated if it uses

such comedic devices. Humour in games can better stand the test of time when it is self-referential, and puzzles in games have similar structures to jokes.

Many adventure games use a structure defined as a 'fiction puzzle', a term coined by game researcher Karhulahti. Essentially the puzzle is integrated into the 'old school' point-and-click 'adventure game', and solving the puzzle leads to 'getting' the joke. For example, in the game *Monkey Island*, the protagonist, Guybrush Threepwood, can pick up all kinds of ridiculous objects (e.g. a burning fire or a monkey) from the screen and add them to his inventory. The items are later used when least expected. At one point, when Guybrush is tied to a heavy idol and thrown in the water, the player needs to solve the puzzle to save Guybrush's life. Despite the numerous sharp implements around him, the solution lies in simply picking up the idol and placing it in the inventory. The crux of the joke is how ridiculous the inventory system (where everything picked up becomes weightless) really is. Using the mechanics as a type of riddle ensures that the game is self-referential and the joke can be ▶



contained within the game. No external knowledge is required to 'get' the joke.

Some scholars argue that adventure games and even videogames are a rebellion against the culture of seriousness — in a new medium. And with new media come new possibilities.

Dr Krista Rutter Bonello Giappone (Faculty of Arts, University of Malta) uses critical and literary theory to explore comedy in games, from sexual innuendo to political satire. In particular, she highlights the effects of interruption and digression, the connection of the player with the game avatar, and the role of nostalgia.

PLAYER INTERRUPTED

Breaking immersion, the fourth wall, is a staple of humour in performative art. Whether this is the porter providing a bit of comic relief in Shakespeare's *Macbeth* or the class-clown interrupting a lecture with a well- (or ill-) timed quip, an interruption breaks the flow and offers the opportunity for digression.

In *Monkey Island*, the main character, a 17-18th century pirate in the Caribbean, can call the game's production company — LucasArts — from a phone booth in the middle of the jungle. The interaction offers no useful game information, but does offer a number of self-referential jokes. Unexpectedly tearing the player out of their immersion is important to humour, as Giappone points out. These types of 'dead ends' do nothing to further the story or plot. They explore a form of uselessness that provides an opportunity for comic punchlines or parody. This break transforms the player from active story protagonist to audience member. The transformation helps players laugh at the characters without necessarily laughing at themselves.

THE JOKE IS ON YOU

Giappone and Veli-Matti Karhulahti explain how 'the adventure game [...] has always relied on players needing to try out every single option and

collecting useless objects ("pathological kleptomania") that generates constant failures and errors, typically making a fool out of the protagonist.'

But no one wants to be made a fool of. Laughing at the misfortunes of others is the underlying assumption of the 'superiority' theory of humour, but game developers need to tread more carefully since players are both the protagonist and audience. The player is both the butt of the joke and the person laughing at it.

In humorous games, it is often important to have a disconnect between player and character. As Giappone observes, the comedy often requires a certain emotional detachment and critical distance. LucasArts even went so far as to institute a policy to never use the word 'you' in game design documents, careful to always refer to the character making the action.

Players can still be mocked by a game. When they are, it is usually for being too familiar with genre conventions, or being 'too good' at the game.



New players find a joke humorous because of surprise, awe, and the way it defies expectations. In some cases, this nostalgic distance can reinforce parodic distance.

These games often encourage the character to interact with everything to see if it will open up new storylines or alternate solutions. Ultimately, the genre encourages 'pixel hunting', where the player makes sure to click on every pixel to make sure they aren't missing out. In *Thimbleweed Park*, the player has a number of tiny specs of dust they can find throughout the game which serve no real purpose, except to earn the tongue-in-cheek 'Dust Hoarder' achievement.

NOSTALGIA

There is another layer of distance in classical adventure games played today: nostalgia. Replaying some games is like returning to the magic moment where you thought, 'Wow, I didn't even know this was possible in the medium.' In a way, you don't only go back to a character that isn't you, you go back to a you that isn't you anymore either.

Despite knowing what to expect, veteran players can still enjoy a game's humour through nostalgia.

New players find a joke humorous because of surprise, awe, and the way it defies expectations. In some cases, this nostalgic distance can reinforce parodic distance.

THE THREE WINDMILLS

The rule of three in comedy is how a joke is established, reinforced, then overturned.

Don Quixote was written as a parody of the established romance novel genre, and now it is recognised as a classic in the same genre. *Don Quixote* was the overturn in the rule of three. As Giappone observes, parody makes us aware that the romance genre it is mocking is now 'established'.

The recent Telltale offshoots of the adventure game genre are more serious, exploring the interactive nature of horror. Players are often faced with deciding the gruesome fate of the characters. These games create a situation where immersion adds to the emotional weight of the decisions. Design-wise, these games are the polar

opposite of humorous games. And yet, their popularity could be because they subvert the genre's expectations. Analysing and fully understanding the full range of comedic potential will allow designers to find novel ways to play the audience for laughs.

Technological progress in games offers new possibilities. *Surgeon Simulator* has paved the way for physics-based comedy games in VR, but there is a whole uncharted (virtual) world of interactive gags waiting to be uncovered by clever game designers.

In her upcoming book (co-edited with Jaroslav Švelch and Tomasz Z. Majkowski), Giappone is working with a number of leading scholars in the field to provide an overview of the crucial theoretical pieces in the riddle of humour in games. They detail the dual position of the player and character, interactive gags, and puzzle punchlines. The adventure game genre isn't dead, nor is comedy in games at its end, but rather it may be time to overturn it. **T**



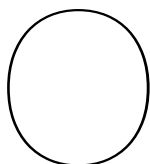
TIMED CITIES

THE CITY DESIGNED FOR ITS PEOPLE

Author: **Sam Shingles**

Timed Cities, such as those being planned for Milan and Paris, are aimed to change the way cities work. The idea is to create a community where all amenities are within walking distance.

Sam Shingles from **THINK** gets in touch with researchers at the University of Malta who are examining what these timed cities would look like in the Maltese Islands.



Over the past couple of years, the global pandemic forced unimaginable changes on how we use and value the spaces we call our homes as well as the cities and towns they reside in.

In a *Times of Malta* article, lawyer Simon Micallef Stafrace (a specialist in traffic issues), spoke about the link between traffic and the pandemic. With more people spending their time indoors, they were more 'aware of the environmental impact that traffic has on their lives'. Whether we want to get our children to school or buy groceries, for many, the only viable option is using a car. Not out of choice, but out of necessity because of limited viable alternatives.

The 'Timed City' concept can make cars less necessary. We got in touch with three researchers at the University of Malta (UM), Dr Thérèse Bajada (Lecturer with the Institute for Climate Change and Sustainable Development), Dr Wendy Jo Mifsud (Lecturer of Spatial Planning &

Infrastructure, Faculty for the Built Environment, UM) and Dr Sarah Scheiber (Assistant Lecturer of Spatial Planning & Infrastructure, Faculty for the Built Environment, UM), to find out more about this idea, what it could mean for the Malta of the future, and how society can start the changes needed.

LA VIDA LOCAL

A Timed City, as Bajada explains, 'refers mainly to reaching a destination within a selected time frame' in the city. The exact time frame for these journeys varies around the world, but commonly commutes are aimed to be '15-30 minutes'. The idea is that this travel uses 'active modes of transport: walking, cycling', and other forms of sustainable travel, rather than using a car. Other definitions of this idea also feature the concept of 'community life and living locally, which implies the idea of buying things from within the neighbourhood, joining the community (especially if there are open green spaces) and getting to know your neighbours, as well as working within that same community'.

The concept of a Timed City started in the 1920s with Clarence Perry, an American urban planner who developed the concept of a 'Neighbourhood Unit'. It promoted a community-centric lifestyle that was hidden away from the ugly factories and noise of the industrial world. This was followed up in the 1960s by Jane Jacobs when the car was beginning to become a common sight. In *The Death and Life of Great American Cities*, Jacobs describes 'cities as integrated systems' that 'would change over time



Aerial view of Barcelona Superblocks
Image courtesy of Westend61 / Amazing Aerial

according to how they were used'. She believed strongly in 'the importance of local residents' and was opposed to the 'car-centred approach' within cities. Bajada explains that Jacobs envisioned 'frequent streets, which means moving around slowly within your community, and short blocks, meaning the ability to reach destinations within them by active mobility', or walking and cycling around.

Cities are still being designed for cars rather than people. Urbanized areas still suffer from air pollution and congestion, road accidents, and less active societies. Today the Timed City idea is being re-energised by Carlos Moreno, who is championing the concept of a Timed City or the 15-minute city and the 'return to a local way of life'. As Bajada explains, his concept features 'six essential functions: the living aspects of the community, the working aspect, commerce, healthcare (due to more active lifestyles), better education, and entertainment, with more activities happening in open spaces that encourage people to entertain themselves within the community and to get to know each other.'

SUPERBLOCKS

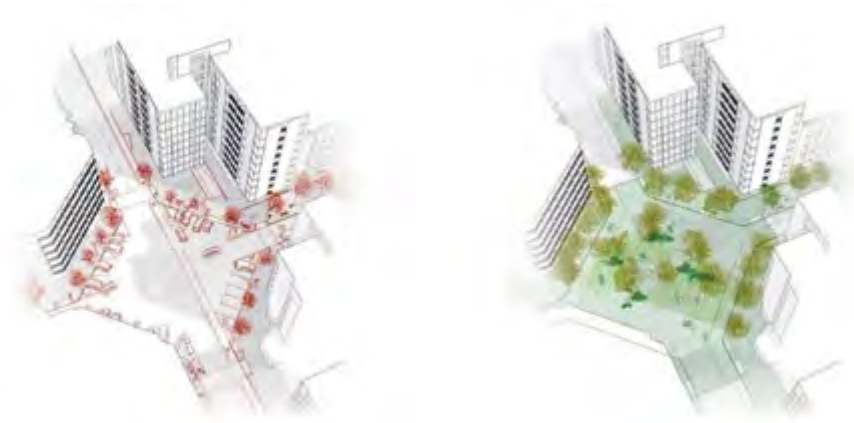
Timed City concepts are taking hold in Seattle, Paris, Melbourne, and other cities worldwide. Barcelona's answer for a more community-driven city was to create what is known as 'Superblocks'. As Scheiber explains, 'currently we expect every street within urban areas to have the same level of access for cars; anybody can pass through them.' The design is also the same throughout, typically with a 'pavement on each side, cars in the middle, and parking on either side'. Instead, the Superblock model, as the name

suggests, groups a series of smaller blocks together. Car access is limited within the inner streets, with 'the main vehicular traffic confined to the outer streets'. This then allows the inner streets to be treated differently 'and create space for people to be able to engage with the community and more green space.' Due to speed restrictions and the design approach, any vehicles coming into the Superblock travel very slowly, and as Scheiber highlights, it allows people to 'take ownership of the space, and so there are other things happening in streets, for example, social activity.'

THE BEATING HEART

These theories of city design all aim to create a city around its people and not their cars. Everything that a community needs is within this 15–30 minute travel window, but as Scheiber explains 'we've become so used to what we see around that maybe we forget that there are alternatives' to this car-based city design. Green recreational spaces and basic facilities should be within reach without needing a car. A city designed with this principle helps children, the elderly, and those with limited mobility. By helping those who cannot drive, a greater community feel develops in a city. This in turn helps provide an innovative solution to tackle climate change and reduce fossil-fuelled cars' environmental impact.

These city-changing ideas need citizen champions. As Mifsud explains, the Superblocks in Barcelona were 'very much people led. People lobbied for this change to happen for several years. People need to fight for the change that they want to see.' This can prompt politicians to 'implement policy and give the go ahead' for the planners to then enact that change. ➔



Ajuntament de Barcelona rendering
Image courtesy of bloomberg.com

THE MALTA OF TOMORROW

But how can these ideas be applied to Malta? A Local Councils' Association initiative, called Slow Streets, supported by the Ministry for National Heritage, Arts and Local Government, Ministry for Transport, Infrastructure and Capital Projects, and Transport Malta, are looking to put similar ideas into practice.


Despite Bajada, Scheiber, and Mifsud having different research backgrounds, all share an interest in exploring what Malta could look like in the future. As Mifsud eloquently describes, 'we come from very different backgrounds, but they're related, because you place the people and the community at the centre. You analyse what is needed, and then you respond to that, whether you respond to it from a transport planning point of view, from a green infrastructure point of view, or from a building of social capital point of view. These are

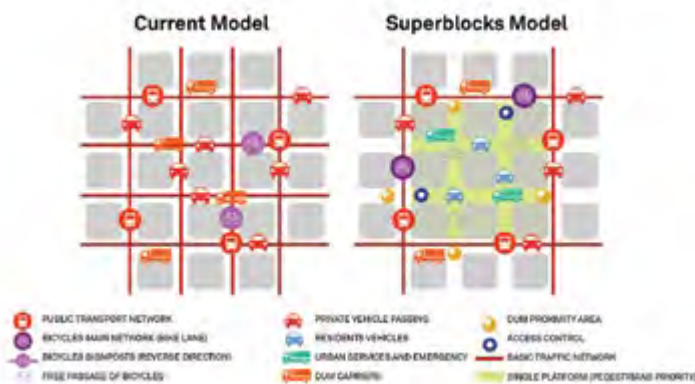
all disciplines which we are experts in individually and which we can apply to creating better spaces.'

The Slow Streets initiative aims to have temporary removal of cars from village cores. They encourage more community involvement and more people actively moving around their village. Bajada informs us that 48 local councils have signed up out of a possible 69, and some are starting to actually implement the idea. Ideas such as Superblocks might also provide an interesting solution for an island like Malta because it doesn't involve building new structures, just re-organising and re-imagining the space that is already there.

You could plan Malta as one whole city. As Scheiber puts it, 'we have our different localities, but it works as a city, with a main urban centre or maybe a couple.' In Malta, Scheiber suggests that we need to study whether the Timed City concept should be applied

to each individual town centre or to two or three key urban centres or maybe both in parallel. With this method, 'we can start to reclaim our centres as they used to be, still send our children to buy food or meet up with friends at local recreational spaces.' However, what might work in one place might not work elsewhere both on the local and global level, hence why the discussion needs to begin around what people want Malta to be like.

There isn't a one-size-fits-all approach. Each community and each member within it has their own needs, which have to be addressed. They must speak up about what they value most about the places they live so those creating new policies and designs can understand these values. As Mifsud reiterates, 'two years or more of living in a different world; people have changed.' Bajada, Scheiber, and Mifsud hope that making these people and others aware of some of the alternatives will ignite the discussion around what Malta can look like in the future. Only then can we move away from car dependence towards a future with people at its heart! 



Superblocks Model
Image courtesy of Ajuntament de Barcelona

Further reading:
Dawra Madwarna. (2021).
Networks of Green Open
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IDEA

Memento Mori: The key to living a good life

Author: Christian Keszthelyi

What would our existence look like if death didn't exist? Would our lives lose all meaning or gain new ones? **THINK** Magazine explores the ubiquitous psychological approaches to death with mental health senior lecturer **Dr Michael Galea** (Faculty of Health Sciences, University of Malta) and scholar **Prof. Michael Zammit** (Department of Philosophy, University of Malta) to see whether living forever would change our attitudes towards life and death.

In ancient Rome, slaves accompanying generals on victory parades whispered the Latin phrase *memento mori*, 'remember that you must die', as a reminder of their commanders' mortality. The reminder was intended to prevent them being consumed by their pride. Some two millennia later, do we live our lives remembering that they will come to an end? And would our lives be changed if we didn't die?

AWARENESS OF DEATH

Humans seem to be the only animal that is aware of their own death. 'The fact that somehow, at some time, we are going to die seems to be some kind of human element affiliated with our species. In psychology, the fear of death has been widely discussed. We are aware of this reality.

It is an excruciating reality, and therefore we do all that it takes, and normally do so reasonably, to try to keep death at a distance,' says mental health lecturer Dr Michael Galea (Faculty of Health Sciences, University of Malta).

The older we get, the more present a reality our death becomes. As a clinical psychologist, Galea has often seen how people react when they receive a terminal disease diagnosis. Reactions span from denial to acceptance of this painful experience. And usually, this reaction is carried to their death. 'I have witnessed people who lived their last hours with a terminal illness like cancer and died peacefully,' Galea says. 'However, I have seen people stuck to their unacceptance till the last seconds of their lives. This struggle shows even after their death. The tension would show in their complexion and muscles, for example.' ▶



In light of such a crucial moment, human relationships with death vary greatly. 'The problem is that we end up assuming that we are not going to die – at least, not for the time to come. Although we know very well that death is part of life and we hear of death stories near and far, we somehow believe – or rather, assume – that it won't touch our skin, not for the time being,' Galea says. Galea believes that humans carry a number of assumptions to ease their minds about existential worries, such as that we are innately good people, that life always makes sense, or that we may be somehow immune to death for the time being. Yet, although these assumptions may shield us from certain existential realities and challenges, in truth they remain nothing but assumptions.

Take a person who has high cholesterol and has recently had heart bypass surgery. They are faced with a choice. Either live a healthier life to postpone death or carry on as they were, leading to an early demise. However, after surviving such an operation and being inebriated by denial, a person can embrace *carpe diem* by sticking to an unhealthy lifestyle. 'While in psychology, defence mechanisms may assist us in the short term, they are quite risky in the long term. Living in denial is one such scenario,' Galea explains.

A LIFE WITHOUT DEATH

How would our lives change if we could live forever? It is hard to say, especially considering that we rarely think about dying. However, philosophers and theologians have long thought about death and eternal life. Prof. Michael Zammit raises the Sanskrit story *Markandeya* as an example.

Childless parents were presented with two options by Lord Shiva (known as 'The Destroyer'). They could either be given a child of long life but not of great wisdom, or a child of short life but great knowledge. The parents chose the second option, and thus Markandeya was born. As his sixteenth birthday approached, together with his certain death, Markandeya sat in deep meditation as the God of Death, Yama, placed a noose around his neck to pull him into death.

However, as town residents were so fond of Markandeya, they convinced Shiva to save the boy's life for an eternity. As death was eliminated, the town soon realised that insects would swarm their fields, their fruits would rot but never disappear, and trees would grow dead leaves that remained. People learned that the elimination of death eliminates life.

'Mythology is claiming that there is life and death, and they need each other. Indeed, they are parts of the same realm. And yet, at the very centre of this circle of life and death, there is the eternal. It is distinct from both life and death,' Zammit explains, considering the essence of the Markandeya story.

At face value, the idea of eliminating death and living forever may sound attractive. However, as soon as one looks at life without death, it quickly becomes apparent that it raises more problems than benefits.

'If you scratch a bit beyond, there is something unnatural about the thought of living forever. Once death is conditionally removed, there is no meaning to life. Life would be removed alongside it. They are intricately entwined in a deep embrace,' according to Zammit.

'The realm of life needs to express itself in terms of becoming. Without death lubricating the becoming nature of life, life itself is paralysed, turns static,' Zammit explains. Without death, there is no change. Just as the trees in the story rot but don't die, our lives would also stagnate. 'And yet, the non-dual philosophy (that life and death are not distinct, but different aspects of the same) goes a step further, saying that even these two are indeed illusory when compared to what is eternal, what is real,' Zammit adds, leaving it to the reader's philosophical experience to decide and/or seek what the 'eternal' may mean.

Living in the present moment and being grateful for what we have is the mindset that helps people accept death.

A DEATH WORTH LIVING FOR

So what useful advice can be learnt from these ideas? 'A lot of psychotherapists and psychologists speak about focusing on the here and now. Mindfulness is just that: being in touch with your reality,' Galea says. But what is somebody's reality? Not the past and not even the future, but the present moment.

Living in the present moment and being grateful for what we have is the mindset that helps people accept death. We may easily forget that we have an expiry date. We do not know when the time will come. But what if we knew? 'If I knew that today

was my last day, how would I see my life? Would I have regrets? Would it change how I spend my last day? Think about it as a box of chocolates that you bring home from the supermarket. There is an expiration date on it, and you will eat it before that, not wanting anything to spoil. So why do some people forget about their life having an expiration date and not living to their full potential?' Galea poses the eternal enigma.

He says that through his practice, he has come across many people who have completely changed their lives for the better, who have become more positive and improved their own lives and their communities after learning that they would be dying soon.

So how do we make our lives better? 'I cannot escape death, but at least I can escape the fear of it,' said the great Stoic philosopher Epictetus. Modern psychological research suggests that to address the fear of death, one needs to remember that their days are numbered: *memento mori*. People need to make the best out of their lives, whatever awaits after death. **T**

QUOTE BOX

"Death is very likely the single best invention of Life. It is Life's change agent. It clears out the old to make way for the new."

Steve Jobs - Stanford University graduation address, 2005



START UP



The proof is in the pudding

Author: **Martina Borg**

*We hardly spare a second thought for our food. We assume that the food we eat is safe and up to standard, right? Before food reaches our supermarkets, restaurants, and plates, it needs to undergo quality assurance. This is where local start-up Q2 comes in. **THINK** gets in touch.*

Consumers and companies alike might only think of food safety in terms of health issues, but Maltese start-up Q2 Consult knows that it also has an influence on a company's bottom line. The start-up is on a mission to educate and equip companies to better understand the importance of food safety standards and how they can ultimately benefit their operation.

'Through my studies and work in the industry, I began to realise that most companies do not pre-empt or plan for issues that could come up, wasting funds and resources in the process. When businesses are reactive, it leads to them forking out substantial funds to solve said issues,' explains Food Safety Technician and Consultant Jean Pierre Sant over a video call. Issues such as product recalls cost businesses reputational damage as well as losses in revenue.

Launched in 2014, Q2 Consult is Sant's brainchild, and it is largely a one-man operation. The consultancy offers food safety training programmes and works as something of a one-stop shop for food businesses. Sant described an exhaustive list of services the consultation has carried out to assist companies in complying with standards and ultimately to create more efficient operations.

WHETTING HIS APPETITE

Sant explains how it was the unsavoury experience of buying a bag of mouldy oats that set the wheels in motion.

'I was shocked, and I also noticed that the labelling on the packaging was all wrong. So I called the company in question and ended up working with them on improving their labelling, and it snowballed into various other small projects.'

Sant then went on to find more clients in need of help with their labelling practices, but he soon realised that he needed to diversify his portfolio. So he decided to become a food handling trainer to combine two of his passions together.

'I've always enjoyed the dynamic nature of teaching and discussing issues with students, so having the chance to impart anything I learned in this subject was immediately appealing to me,' he says, adding that he also sometimes tutors students at the University of Malta.

His enterprising spirit later pushed him to come up with an online system to store his training materials and allow students to have access to them outside of contact hours. He explained that although he stood to lose some of his favourite parts of teaching (ie. the human interactions) the move allowed him to pursue more projects and grow his business.



'I started conducting what are known as HACCP studies (Hazard Analysis and Critical Control Points), which are crucial for food businesses in identifying risks and potential issues specific to them.'

While these studies are extremely detailed and time consuming for him, they also require collaboration and participation from the company itself. In other words, it isn't an issue that companies can just throw money at; they need to take ownership of the processes and keep up with them accordingly.

'Part of my job is to train companies to take responsibility for these studies, so I designed three levels of training they can undergo, going from a basic Awareness Course, on to a Foundation Course, and finally to an Intermediate understanding of the process.'

BITING INTO THE MARKET

Being a young and flexible project, Q2 Consult often offers more bespoke services such as hygiene audits and consultations to ensure businesses

comply with Quality Management Standards. He also frequently assists fledgling food businesses, by pointing them in the correct direction and representing them in all dealings with the Environmental Health Directorate. Individual projects present him with the opportunity to explore new courses of action or ways in which he can use his expertise to address new areas of business.

Discussing all his past work gives the clear sense that Sant is very keen to impart any and all knowledge that he gains from these experiences, and looking back at his history reveals an openness to new subjects as well as enviable stamina leading him to develop innovative ideas on multiple occasions.

'When I was doing my A-levels, I stubbornly refused to study the more logical routes such as a Maths and Physics combinations, but decided to follow subjects I was passionate about, namely Physics and Biology,' he explains, adding that the two subjects

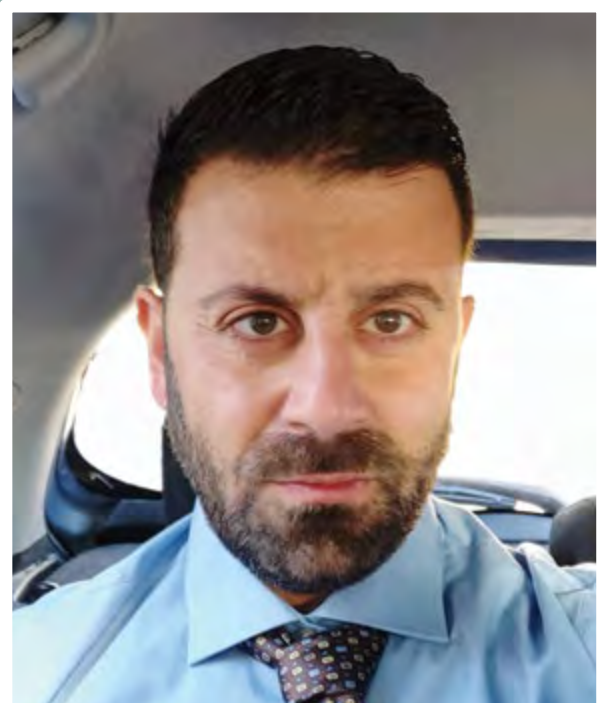
were not enough for him to step into a University Degree. He chose instead to study for a Diploma at the Institute of Fisheries Management.

'One of the modules focused on the previously mentioned HACCP studies,' he says, adding that his tutor, perhaps spotting his aptitude and interest in the subject, asked him to assist in further research.

'I instantly fell in love with the subject, and although it would be some years before I would be able to use that knowledge in my job, it was a subject that stayed with me and which I continued to research in my spare time.'

Sant then went on to hold a range of jobs in Fisheries, Shipping, and later on at a company doing Fossil Fuel Analysis. Finally, however, his old tutor pushed him to take on a job as a Food Safety & Quality Manager at a local food manufacturing company.

'At that point I had no official experience in food safety, but I had the instincts and energy for the role.'



Jean Pierre Sant

Although it is perhaps facing its biggest hurdle yet, Q2 Consult is taking up arms against all things waste and steering the local industry to a more sustainable future.

Even though I met considerable resistance from some of the team members, I persevered and helmed a project to reorganise the way the company managed its data and handled its food safety operations.'

Although slightly disheartening as an experience, the job left him with an ability to deal with people in management positions and galvanise companies into action in spite of any general culture of apathy, which is undoubtedly invaluable to his work now.

FOOD FOR THOUGHT...

Since setting up the consultation, Sant has also read for a Masters in Entrepreneurship, where his thesis focused on creating software to incorporate the Food Safety Management Systems he works with.

'This was in 2018, and by 2019 I had created a business plan and was ready to create the software,' he said, explaining that he had even lined up a software engineer to assist

him in the project. 'Sadly, however, by 2020, the Covid pandemic put a spanner in the works, and many businesses are still not confident enough to invest in new software.'

In his original plan, the software would have been available to businesses in exchange for a monthly subscription, and it would have dealt with all matters of food safety and associated regulations. Despite the setback, Sant is demonstrating characteristic adaptability and resilience. The new plan is to release the software in modules for businesses to purchase as and when they need them.

'We would offer individual modules like the HACCP module or a nutritional calculation module for instance, and businesses will then hopefully be able to pick and choose the modules that best suit their needs.'

The software hopes to guide businesses through the procedures and requirements of their individual businesses and to prompt them

to do any checks when they are necessary. In Sant's vision, it would ultimately give businesses the ability to do away with having to hire Quality Managers for the most basic of checks. Q2 Consult hopes to continue expanding the program, allowing it to store nutritional and company data, generate templates for labelling, and give users access to important data to facilitate their transactions, all at the touch of a button.

Although it is perhaps facing its biggest hurdle yet, Q2 Consult is taking up arms against all things waste and steering the local industry to a more sustainable future. Taking his inspiration from circular economies, Sant seeks to prove that adequate preparation and the correct technology can lead companies to be more sustainable and eliminate waste altogether. 'It might seem reductive and obvious, but the less waste we have — be it food waste or money — the richer the business will be, so why not attempt something that seems so logical?' 

LAB TO LIFE

A digital future for physical rehabilitation

Author: James Moffett

*For some, recovery can be a long and expensive process, as well as psychologically trying. Can virtual reality games hold the key to a speedy recovery? **James Moffett** from **THINK** gets in touch with the team behind the PRIME-VR2 project to find out.*

Half a century ago, the sight of virtual reality (VR) goggles and a set of controllers being waved aimlessly around would have been considered unreal. Nowadays, we regularly see children and adults using this technology with smiles on

their faces. And yet, what is taking place within a particular lab goes far beyond your typical zombie survival game or a virtual roller coaster ride in one's own living room.

The University of Malta (UM) is currently involved in PRIME-VR2, a Horizon 2020 funded research project related to the use of VR for rehabilitation purposes. The UM research team, led by Prof. Ing. Philip Farrugia (Department of Industrial Manufacturing Engineering, UM) is collaborating with project leaders from the University of Pisa and 12 other EU organisations, including universities, SMEs, and living labs. The goal is to create customised, low-cost, wearable devices that provide accessible and effective rehabilitation methods for individuals lacking motor functions, either through accidents or disease.

ONE CONTROLLER TO RULE THEM ALL

While several off-the-shelf VR controllers are available, these exist solely for gaming purposes. The idea behind the project is to create a 3D-printed VR controller which is specifically designed for rehabilitation purposes.

The main challenge is how to strike a balance between the needs of people and commercialising the product. The team needs to consider what patients and therapists need while keeping things user friendly and financially competitive.

Doctoral student Ing. Edward Abela (Department of Industrial Manufacturing Engineering, UM) is carrying out research aimed at identifying these challenges and bringing together a cohesive assessment in order to better analyse, assess, and document all requirements from different perspectives.

THE ROAD TO RECOVERY

Recovery can be a long and expensive process. The research team behind this project is investigating the best and most cost-effective 3D-printed technology for rehabilitation purposes. The main component of this technology comprises the use of a joystick or controller to assist the wearer in managing the use of their arms.

THNK met up with Farrugia, who talked about how they are making this technology as adaptable as possible to people's needs. 'In order to cut costs, we came up with a modular design, where one can shift the controller band according to whether one requires just therapy or otherwise.' The therapy module on the controller can be worn according to the wearer, and its use and function can vary significantly. The project is targeting three types of patients: those with musculoskeletal conditions, which usually involve injuries

caused through sports activities, together with post-stroke patients and individuals suffering from dystonia, a movement disorder where muscles contract involuntarily.

'We are currently on the third design iteration, and we are almost there,' remarks Farrugia on the development of the controller. With this device comes an array of games that help simulate the required therapeutic movements for the wearer. 'The games featured include sports, painting, and similar daily activities. It all depends on the target user for whom we're developing the games,' he adds.

TESTING ALL THE WAY

Recovery can be a long and expensive process. The research team behind this project is investigating the best and most cost-effective 3D-printed technology for rehabilitation purposes. The main component of this technology comprises the use of a joystick or controller to assist the wearer in managing the use of their arms. **T**

This research is part of a €4M Horizon 2020 project, titled 'Personalised Recovery Through A Multi-User Environment: Virtual Reality for Rehabilitation' (PRIME-VR2, project ref. H2020-856998).

HORIZON EUROPE

NATIONAL CONTACT POINT SERVICES

- Dedicated workshops and trainings
- Tailored one to one meetings and consultations
- Partner searches
- Proposal review before submission
- Personalised support during application and project implementation stages
- Additional support through National Schemes

GOVERNMENT OF MALTA
 MINISTRY FOR EQUALITY, RESEARCH AND INNOVATION

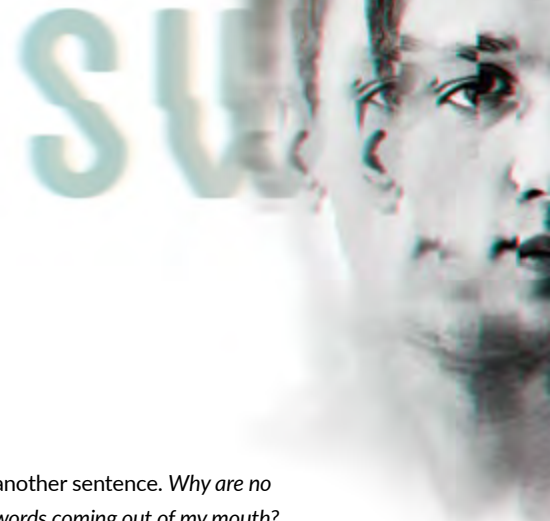
European Commission

The Malta Council for Science & Technology

FICTION

SWITCH

Written by
Kirk Grech



Blood.
'What was that?'
'Blood.'
'What do you mean?'
'Blood.'

'You have to give me more than that.
Why do you see blood, Jacob?'

'Splatter.'

'Again, I need more than that.'

'Blood go splatter!'

'Hmm okay... At least we're on to
phrases now.'

Jacob shifts and holds on to
the edges of his chair as he sees
the next card, eerily illuminated
by the sterile white light present
all around them.

'What do you see now, Jacob?'

A powerful force wells up inside
him, uncomfortable in its intensity,
washing over him like the waves
of a tsunami. Temperature rising.
Blood boiling. Head throbbing.
Sweating profusely as his body
attempts to lower its temperature.

'Jacob, what's happening?'

The powerful force leaves as a
blood-curdling scream, forcing him
to bang his head on the table.

'Make it stop! Please make it stop!'

He attempts to free his hands from
the binding cuffs. 'My hands! I need
my hands!'

Shaken, the interviewer calls for
security. Jacob sinks his teeth into his
arms, ripping his skin and swallowing
the pieces.

'BLOOD... GO.... SPLATTERRRRRR.'

His screams turn to laughter;
his eyes dart around, their gaze
landing on the interviewer,
'YOUR TUUUUUUUUUUUUUUURN!'

Security enters the room and
attempts to contain Jacob with shocks
and restraints, ensuring he can hurt
neither himself nor anyone else.

As they are moving him out of the
room, Jacob looks at a corner. His
mouth opens, but no sound comes out.

Darkness.

INITIALIZATION: 25%

'Blood.'

'What was that?'

'I said, weren't we here already?'

'What do you mean?'

'What do you mean? We've already
been through this.'

'You have to give me more than that.
Why do you see blood, Jacob?'

'I didn't even say "blood" once! What
the hell are you on?'

'Again, I need more than that.'

He rolls his eyes. 'Wait... wasn't that
light white before? Why is it blue now?'

'Hmm okay... At least we're on to
phrases now.'

'What do you see now, Jacob?'

Enraged, he slams his hands on
the table. 'Are you even listening
to me?! What's with you not fucking
answering me?!'

As the room fills with the loud sound
of skin against metal, he attempts to
speak but is only successful in mouthing
a sentence... *What the actual shit?*

The sound gets louder as he mouths

another sentence. *Why are no
words coming out of my mouth?*

'Jacob, what's happening?'

'What do you mean what's
happening?! I can't speak for some
reason!' He covers his mouth.

'Why the hell can I speak now when
I couldn't before?!'

With rage-filled eyes, he walks
towards the interviewer, opening
his mouth to speak. He halts in his
tracks. *What?! Again?! What the
hell is going on?!*

Shaken, the interviewer calls for
security. While attempting to speak,
he reaches for the interviewer's arm
and grabs it. 'What is happening?!
Tell me!'

Suddenly, droplets of blood appear
on their clothes and on the table.
Perplexed, he lets go of their arm.
'Why is there blood all of a sudden?!'

Security enters the room and shocks
and restrains Jacob. *OW! JESUS CHRIST,
TAKE IT EASY! I'M NOT EVEN PUTTING
UP A FIGHT!*

As they are walking towards the door,
he looks at the corner and opens his
mouth. No sound comes out.

Blinding light.

INITIALIZATION: 50%

'What's going on?'

'What was that?'

'Oh God, not this again!'

'What do you mean?'

'Listen to me! This has already
happened twice!'

'You have to give me more than that.'



Why do you see blood, Jacob?

'Fucking hell! Why am I the only one that's aware?'

'Again, I need more than that.'

'Stop repeating the same shit!'

'Hmm okay... At least we're on to phrases now.'

'What do you see now, Jacob?'

Tears well in his eyes as he groans in disbelief. *I need to find a way out of this hell... Maybe this'll work.* Shaking, he grabs the pen and clicks it on. Tears run down his cheeks and he closes his eyes.

'Jacob, what's happening?'

'Let me do this, please!' His hand goes red. The red-stained pen escapes from his hand, falling onto the floor.

'Shit! That hurts!' A red geyser squirts out from his wrist, painting wherever it touches red. Suddenly, the throbbing stops. *What? Why did it stop already?*

'Security!'

'No! Stop! Not again, please!'

More bright red spots decorate the polka-dotted table.

'Please! Stop this! I can't handle this anymore!'

NO! NO! PLEASE! NOT THE DOOR AGAIN! WHAT DID I DO TO DESERVE THIS?! PLEASE NO! NONONONONONONONONO!

His gaze turns to the corner and he mouths a phrase.

Static.

INITIALIZATION: 75%

Erica presses the pause button on the video player and instantly sanitises her hands after.

'Hey... So... ummm, can I go get a glass of water please?'

The guard looks at her with a smile.

'Sure, go ahead! How's the tape going?'

'Ummm... I don't know. It's very... weird?'

'How so?'

'Well ummm... it feels like I've been watching it for longer than I actually have. Like I've been in there for an hour or so.'

The guard looks at her inquisitively. 'That is weird. The tape replayed every ten minutes or so, so you've been in there for half an hour... Give or take.'

'Yeah...exactly. It just feels strange.'

There's also a... how do I put this?

A peculiar "initialization" message that comes up. It's been increasing by 25% each time.'

'So that means it's now at 75%, right? Any clue what happens when it hits a 100?'

'No idea. One way to find out, right?'

She chuckles. 'Anyway... I'm going to grab my water and wash my hands, thank you.'

'Okay, time to continue. Oh no, why can't I hear anything? Thank God it's the same thing as always,' sighed Erica.

A yawn escapes her lips as she witnesses the same scene for the fourth time in a row. The white numbers on her phone tell her that nine minutes have passed.

'IT'S TIME!'

'What?!' Her eyelids grow heavy as fatigue envelops her body. 'No... I have to... see... what... happens...'

INITIALIZATION COMPLETE

She opens her eyes and feels confused.

'Hey! I'm coming in!'

Looking up, she sees a uniformed man in front of her whom she has never met before.

'Are you okay? I heard you scream.'

Her eyes open and close a few times; she attempts to expel the fatigue by rubbing them. 'Where am I?'

The guard laughs. 'Wish I had such a good nap that I forget where I am. You're in an asylum researching a case, remember?'

Laughing, she puts her hand on her chest, 'Nah come on! Oh shit you're serious?'

He nods, worry replacing the smile on his face. 'Yeah, 'course I am. You've been in here for the past forty minutes, watching the same scene on this tape.'

Sighing, she looks at the TV screen, seeing in front of her the reflection of two people; she lowers her arm. The reflection does the same. 'Oh that's right! I can't believe I forgot...'

The guard chuckles and stands up. 'Want me to get you another glass of water?'

She nods.

'I'll be right back, Erica'

Erica, huh? I don't know what happened, but I don't really care. The important thing is that I'm finally fucking free.

The guard looks at her in awe. 'Wow, you were parched.'

'Ha! Yeah, no kidding.' Erica puts her glass on the table.

'Anything new on the tape?'

'Oh, uh not really. Didn't help with the case at all.'

'Damn, well, that's normal in a case. Right?' He chuckles.

'Oh yeah, very normal. You can put it back where it was.'

She slaps her hands against her thighs and gets up. 'Can you clean up here? I'm gonna head home.' *Wherever that fucking is.*

'Yeah sure!'

'Hell yeah! Bye!'

'Bye... That was weird. Anyway, what was this about?'

'Blood!'

'What was that?'

'Blood!'

'What do you mean?'

'Blood!'

'You have to give me more than that.'

Why do you see blood, Erica?'

Blood dripped from her hands, but her usual urge to cleanse them was strangely absent.



Art *from*
DEATH

Untitled 2009

Author: **Ahmed Taha**

Local artist and University of Malta alumni, **John Paul Azzopardi**, uses some unique materials to create his works of art. Using rabbit and chicken bones, he has managed to create complex artworks. But why this particular medium? And what's the underlying message? **Ahmed Taha** gets in touch to find out more.

Wandering the British Museum's massive halls, each room lined with magical artifacts in glass boxes creating an otherworldly scene, a younger John Paul Azzopardi did not know that this moment would unconsciously attract him to the arts.

Born in East London, England, Azzopardi started his professional life as an electrical engineer but never felt connected to it. 'I spent four years studying, and I was just depressed all the time. And I was pretty crap at it as well,' he says. 'I did manage to find work in London, but I was never really in my element and ended up having a breakdown.'

After moving back to Malta at the age of 25, Azzopardi left London with so many questions. 'I always had these existential questions about life. What is the meaning of life? Who am I? All these are important questions in a very basic sense,' he says. These questions led him to enroll as a B.A. (Hons) Philosophy student at the University of Malta, graduating in 2008.

FROM AN ALUMNI TO AN ARTIST

Azzopardi joined the University of Malta to study philosophy and anthropology, but he soon shifted his focus towards philosophy. 'Philosophy in general helps you in any kind of subject as it makes you think. It's a vast subject, and any topic can be looked at through a philosophical lens,' he continues. 'In the arts, it gives you a kind of grounding. Every time I create something, I look at what philosophers wrote about these things.'

University life helped Azzopardi become an artist. 'It was a life-changing experience because it gave a little rigor to my thinking. It also gave me a lot of discipline, because there's always a lot of reading and assignments to do. It's like a form of exercise; you're always building up this brain power,' he says. 'All this discipline at the university has helped me not only in my artistic output but also in films. In the film industry, it's all about deadlines. And before that, I never really saw myself as disciplined. University changed that.'

CREATING ARTS

One of the most exciting things about Azzopardi's art is the materials he uses. Using organic materials such as bones to create a violin or a moth takes months. The process results in mesmerising works that instantly capture the imagination. Azzopardi walks us through the steps of creating his art.

'First of all, I'm always looking for forms in nature which are attractive. I believe that beauty lures a person to look at it. Whether it's a human being, an animal, a landscape, or the sea. There's something about it, that beauty really draws you toward it. Sometimes if it's intensely beautiful, it almost doesn't even allow you to reflect on what you're seeing. You just become trapped at that very moment, and you lose yourself in it. I'm always seeking out objects that have that kind of quality,' Azzopardi continues.

'I'm interested in objects that have almost certain exaggerated qualities to them. Take the Maltese fertility goddess. She has large bosoms and hips. She's exaggerated; ▶



Study of a late 19th century French harpo-lyre



Study; Detail from D. Mylius Opus Medico-Chymicum



Untitled No.3 (Shadow Time/ Studies in Esoteric Calibration)



we get excited because we're seeing larger proportions. In the same way, when you think of a mosque and you see all these details of pattern, that's also a form of exaggeration. I like those two qualities: beauty and exaggeration. They go hand in hand with the kinds of objects that I'm creating.'

Taking a closer look at his bone violin, the intricate mesh of bones gives the artwork an eerie and fragile beauty. 'The violin was one of the earliest figures I created. An actual violin has a beautiful outline in and of itself. It's the outline that draws your eye, just like when you see, for example, a beautiful person, and you see how they look. But then you want to go into the center of it; you want to better understand the person. With the bone violin, I want the viewer to understand that it is silent,' Azzopardi explains. In fact, the lack of strings is testament to this.


THE BARE BONES

Bones aren't the most conventional medium when it comes to fine art and sculpture. For Azzopardi though, the use of rabbit and chicken bones is central to the aptly named Bone collection. The exhibition features a late 19th century French harpo-lyre, a death's-head hawkmoth, a vampire bat, and a violin – all made exclusively of bones. 'I use bones as a metaphor for your ego-death, meaning a space within you that


is not judgemental or critical. So although bone is the presence of an actual death, in the artwork, it serves as a form of death, a letting go of one's critical thinking.'


'The silence around death is also an appreciation of life. When you see something and you allow yourself and your desires to wash away, you feel more alive. We're always running after things, but when you allow your desire to dissolve, you feel more alive and happy because you don't feel that you need to run after anything,' Azzopardi explains.

Azzopardi has participated in many exhibitions with his work. His first solo show, called *Ħlejriet*, took place in Malta in 2006. In 2010, he participated in the exhibition *New Generation* at the Malta Contemporary Arts in Valletta. Then in 2011, Heritage Malta hosted *Curved Silence* at the National Museum of Fine Arts in Valletta, showing his violin masterpiece. In 2017, he exhibited at The Venice Biennial in the Maltese Pavilion.

As he remembers that moment at the British Museum wandering and watching the beautiful art all around him, Azzopardi says that true inspiration can be found in the darkest of times. 'I try to make my inner life meaningful, because I find life really difficult and depressing. And that is my source for inspiration: how to fight depression through art and through creation.' 

TO-DO LIST

PODCAST 



Unexplainable
by Vox


Hear from experts about how they apply the scientific method to questions that, for various reasons, remain unsolved


BOOK 



Weapons of Math Destruction
by **Cathy O'Neil**


An award-winning book investigating how big-data algorithms can exacerbate social inequality

MOVIE 




76 Days


This (subtitled) Chinese-language documentary follows the COVID-19 outbreak in China from a fly-on-the-wall perspective, showcasing human stories of sacrifice and perseverance throughout


YOUTUBE CHANNEL 

Real Engineering

This channel explains engineering principles and shows their real-world applications in aerospace, civil infrastructure, and materials science



TV 




Rotten


The stories behind your food are not often publicised. Rotten showcases the dark side of agri-business across the globe and offers potential solutions


MUSIC 

Lake Street Dive

The latest album from the American group merging R&B, pop, and funk elements, **Obviously** provides a dozen infectious tracks perfect for a city stroll or finishing up work



INSTAGRAM 



Refik Anadol

Turkish artist Refik Anadol uses computational processes to beautifully translate raw data and media sources into immersive, kaleidoscopic installations

We are busy
THINKing...

about
something
new



Stay in touch for more updates

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