

SEPTEMBER 2017 • ISSUE 21

THINK

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TIMES MALTA





EDITORIAL

EARTH

'Earth and sky, woods and fields, lakes and rivers, the mountain and the sea, are excellent schoolmasters, and teach some of us more than we can ever learn from books,' said British statesman John Lubbock. University of Malta researchers have also learnt from our planet; this special EARTH focus packs 31 pages chock-full of studies that could transform the Maltese Islands.

While research into concrete is investigating new ways of sustaining development by adding plastic and waste limestone into the mix (page 26), the LifeMedGreenRoof project plans to make Malta's buildings green, revitalising aerial views of the islands (page 20). The seas around Malta also hold another bonanza, with pockets of fresh water beneath the saltwater that could be tapped (page 32). And speaking of ambitious projects, new microgrid networks could see Malta become the EU's first green island (page 36).

The rest of this edition looks into games as a philosophical and teaching tool, a food app for dietary requirements (page 54), and gender and language issues (pages 10 and 11). We have an opinion piece on a new unit supporting researchers (page 12), an interview with a filmmaker (page 68), and a visit to the Joint Research Centre by Malta's best and brightest (page 50). The Valletta 2018 Foundation talks about the need to listen to the Valletta community (page 64) and we find out more about a big donation to research in Malta by the island's largest charity (page 62).

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COVER STORY



EARTH

Issue 21's cover takes us back to our roots. Designed by illustrator Roberta Scerri, its use of texture and earthy tones is contrasted with light, bright greens, blues, and whites, which builds on **THINK**'s elements theme.

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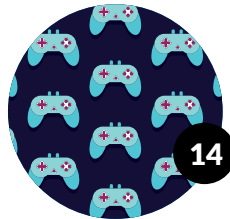
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How digital technology impacts early childhood development

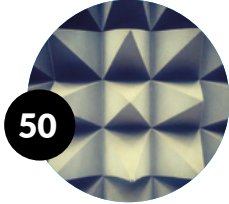


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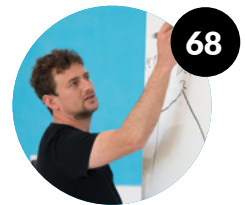


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TOOLKIT




Malta Seismic Network

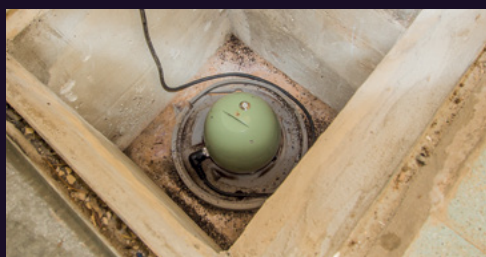
The earth's surface is never still. And that is why over the past three years the Seismic Monitoring and Research Group (Faculty of Science, Department of Geosciences), has been placing its ears more firmly to the ground, listening to the smallest vibrations of our Earth.

Since 1995 the Malta Seismic Network has grown from a single seismic station at Wied Dalam to a network of six broadband instruments all over the Maltese Islands.

Stations are installed in several locations. The sensitivity of the instruments means that they need to be homed in places where human interference is minimal. Church crypts and underground tunnels are perfect. Being broadband instruments, they can detect very slow vibrations from frequencies less than a millihertz (the whole Earth's normal mode frequencies), to tens of hertz (ground motion from anthropogenic noise and near earthquakes).

The network can record close "microearthquakes" with equal clarity to large earthquakes from all over the globe. These massive quakes send seismic waves travelling through the planet's interior at several kilometres per second. All of this data is transmitted to a University of Malta server, which distributes the information to data centres worldwide.

But what is the advantage of having so many stations in such a small area? Firstly, researchers can gather valuable information and share it with the seismological community to build more detailed models of the Earth's interior. Secondly, an immediate advantage is the enhanced detection and analysis of smaller and smaller earthquakes from all sides of the island, leading to a deeper insight of active faults. Thirdly, the network gives precious information on the properties and structure of the rocks of Malta. More accurate information about our islands' composition and behaviour will help make Malta earthquake-ready. 



QUICK SPECS

- Sensors: Trillium 120PA/ Trillium Compact
- Technology : 3 symmetric triaxial sensors with force feedback
- Bandwidth: 8mHz to 150Hz
- Weight: 7.2kg/1.2kg
- Height: 20cm/10cm
- Power consumption: 600mW/160mW
- Data Loggers: Centaur 24-bit ADC, Internet-enabled

WITHOUT BORDERS

We still live in a world where being beautiful is vastly important.

Throughout history the concept of 'beauty' has been merged with our concept of what is morally 'good'. Since the Ancient Greeks, who thought that beauty was inherently good and ugliness was inherently evil, we have struggled to move away from this way of thinking. A 'normal' individual is usually defined as 'beautiful' in some sense, be it through good health, social class, or appearance. Problems arise when the binary emerges, seeing deviations from the norm rejected as ugly, dirty, immoral, and 'sick'.

Working with various international research institutions across Europe and the US, Professor John Chircop (Department of History, Faculty of Arts, University of Malta) is delving into how our understanding of what is beautiful is used within the social, political, and medical spheres of our society to mould perceptions and construct ways of control over how we see and treat ourselves and others.

Our perceptions of what is beautiful or ugly shapes constructions of the 'Other', and makes easier the control of sectors of society that are considered to be a threat to public health and the social order—the destitute, prostitutes, and criminals—dirty, diseased, amoral, and ugly. There are striking examples in history of medical institutions isolating those that did not fit the norm. To this day the idea of 'beauty' still segregates society.

Historically, disease was thought to be contagious and transmitted through physical contact, or even inhalation. In Europe, even up until the early 20th century people were encouraged to keep a safe distance between themselves and anyone who might be considered

'dirty' and even contagious. Racial discrimination against Arab Muslim pilgrims upon returning from their annual Hajj saw them detained in quarantine for fear they might be carriers of disease from these 'dirty' places. Before being granted re-entry to southern Europe, they had to endure physical examination and fumigation to cleanse them. While this selective segregation based on ethnicity may seem ridiculous now, are things really so different today?

Chircop suggests not. 'These same concepts are shown today by the way we treat migrants from war-torn countries.' In general, non-European and, especially, irregular migrants are segregated, kept away from society, and treated as second-class citizens. In place of quarantine 'fumigation', we now use biometrics, with routine physical tests, and vaccination. We can try and justify this by highlighting the developments in technology, justifying our actions by emphasising the scientific or 'medical' benefit of these examinations. But really the ideas behind this are the same; by treating a population as different, necessary for testing, we automatically create a distinction between 'us' and 'them'. This segregation is then reinforced in art, political cartoons, popular films, television, and wider social media.


Although much progress has been made in human rights and fair treatment of individuals, prejudice is insidious and subtle. It has melded itself into the fabric of society, and we need to be aware of it to change it. Chircop states, 'to go about changing this, we must start from the present, and go back in history.' By learning from our past, we can expand the concept of beautiful in today's society. **T**

DESIGN

Sylo

Function, form, safety, and environment. SYLO is a family of hybrid cycle rickshaws that fulfills all four design pillars to deliver good performance and a smooth ride.

SYLO is designed for short distances, catering to commuters and delivery services. What sets it apart from its counterparts is its mixed-propulsion technology, using both photovoltaic panels and pedal power. Adding to its 'green' points is the fact that recyclable plastics have been used for the body. This helped from an engineering perspective because it kept the vehicle light, allowing it to serve its function despite the difficult terrain it must operate in.

Form was an especially important factor in the design process. As the aim was to use this vehicle both within the historical context of the capital city, Valletta, and in cosmopolitan spaces such as Paçeville and Bugibba, it was essential for the vehicle to complement its built environment, be it classical or contemporary. Towards this end, bold lines were used, making the vehicle look distinct without looking alien. 

SYLO was the product of 10 mechanical engineering students supervised by academics from the Department of Industrial and Manufacturing Engineering, Faculty of Engineering, University of Malta as part of a third-year engineering design project.





What sets it apart from its counterparts is its mixed propulsion technology, using both photovoltaic panels and pedal power.



Nurturing language development through interaction

Dr Sarah Grech

Language is at the core of what makes us human. From birth, we interact through language, making our way through gurgling and babbling to words, and, eventually, telling (tall) stories. It is important to nurture this linguistic development as early as possible, and in Malta, this involves exposure and sensitivity to the forms and dialects of at least two languages: Maltese and English.

Such growth can be nurtured by setting a good example so that children have a solid language basis to build upon. Here, it all boils down to one key point: interaction. Language is a two-way process, so for a child to truly benefit, they need to interact with others from birth—TV cartoons just do not cut it.

At the earliest stages, language is all about sounds and bonds, not about learning letters or reciting a poem. However, even then a child is sensitive to differences and variation in language. Children know that home language is different from what they hear outside in the wider community. For Maltese children it is useless to place early focus on lamenting the

distinction between ‘*Trid* ice cream?’ instead of ‘*Trid ġelat?*’ as both are equally well understood in Malta. What is more important is that a child has enough exposure to become sensitive to which version or dialect to use in which context. In English, we have no problem singing the nursery rhyme ‘Horsey, horsey don’t you stop...’ despite knowing that the established word is of course ‘horse’ because experience shows us that children happily grow out of their ‘baby’ language. The same is true of the different forms of languages and dialects typical in a multilingual society. As we grow older, we can become sensitive to which forms of a dialect or language are best understood in the home, amongst friends, or at work.

Apart from parents, children spend most of their time in school. If schooling is meant to be about encouraging children to reach their full potential, then this should also hold true linguistically. Just as a sporty or musical child is identified and encouraged to work on their natural talent, a child whose linguistic skill is recognisable should get the same treatment. That talent should be

nurtured—they might be the country’s best lawyer in a few years’ time.

Equally, it is important to leave no child behind. A truly holistic education recognises that physical activity is vital, perhaps even more so, for the less sporty child. The same applies in languages. We must ensure that every child has the opportunity to express themselves both in speech and writing, even if they seem to struggle. After all, we don’t teach an unsteady runner how to run by making them sit and watch while we run a race for them. Similarly, children learn how to speak and write by practising the languages, not listening to (lengthy) explanations about how to use a language.

This is what nurturing skills is all about. If we want to raise confident, knowledgeable youngsters, we must allow them to constantly practise ways to get their message across. In Malta’s rich linguistic environment, this means nurturing all our dialects and forms of language in whatever shape or form available to us. It is only through this process that we can then shape rich, meaningful forms of communication amongst ourselves, and the wider world. [T](#)



Where has 'woman' gone?

Dr Marceline Naudi

Back in the old days it was assumed by most that if you had male sexual characteristics you were a MAN and as such your nature was to be macho, brave, and aggressive and bring in the money for the family; and of course, if you had female sexual characteristics, you were a WOMAN, and as such your nature was to be sensitive, emotional, nurturing, and an 'angel' in the home.

Then we discovered 'gender', i.e. not the physical/biological characteristics, but the social and cultural meanings attached to being a woman or a man, our learnt behaviour. At this stage, it became clear that having male sexual characteristics in itself did not necessarily make one incapable of holding a baby or wiping up vomit. At the same time, it was now agreed that possessing female sexual characteristics did not necessarily make one unfit for public life, employment outside the home, or leadership (political or otherwise).

And we embraced these changes with gusto! Now, we thought, women (and men, or other) could be whatever they wished to be! We were no longer held back by our sexual characteristics, by being seen as 'woman' (or 'man'). This was a big step forward for 'gender' equality.

Somewhere along the line however, 'woman' disappeared...

In the past, we spoke about women's liberation, women's rights, feminism, equality for women, women's studies, violence against women. When we talked about domestic violence, what we meant was intimate partner violence perpetrated far more by men against women.

Nowadays we speak about human rights, gender equality, gender studies, gender-based violence, family violence, and when we speak about domestic violence we get told; 'What about the men? What about the children? What about older adults?' When we speak about feminism, we are labelled passé or extremists.

Effectively, 'woman' has become invisible. The still-dominant patriarchal discourse has succeeded, with the help of all of us, in neutralising 'woman' and camouflaging this as 'progress'.

If we had indeed achieved 'gender equality', if women's rights as human rights were really being upheld, if we had eliminated violence against women, then this would be right and proper... *But have we?*

My answer to that is, of course, as you would expect, a resounding NO, we have not! And making 'woman' invisible once more will not help us achieve this! **T**

Photo by Steven Levi Vella from Artemisia: 100 Remarkable Women, a project by Network of Young Women Leaders.



Striving for Scientific Excellence

Research Support Services Directorate



Research Support Services Directorate (RSSD) team

Research is a complex endeavour. From funding, to project management, quality assurance, and so much more, any active project, whether for applied or fundamental research, needs to tick a whole list of boxes for it to achieve its full potential. This is where we, the Research Support Services Directorate (RSSD), come in.

Our goal is to provide researchers with comprehensive support towards achieving scientific excellence, from identifying and advising on funding opportunities to getting specific accreditation of their scientific methods. And our newly established directorate reflects the growing ambition of the University of Malta (UM) to develop into a world-class research institution. We are a team of nine enthusiastic individuals with very diverse backgrounds.

Having worked and studied (apart from the UM) in institutes such as the University of Cambridge, Max Planck Institute, Imperial College London, University College London, University of Nottingham, the European Institutions, as well as the private companies like GlaxoSmithKline, Teva (Actavis), Novartis and Methode Electronics, our team is excited

to bring international and private sector experience to the UM.

HOW CAN RSSD HELP YOU?

The most attractive funding opportunities for scientists at the UM nowadays are based on competitive European Union instruments. Preparation for them is intense, and only the most innovative and groundbreaking ideas hit the mark. Our team can guide you not only to identify the most suitable funding opportunity, but also on building the right team, all the while ensuring that strict EU guidelines are being followed. We also help you identify and approach collaborators in Academia, private industry, and the state—a requisite of many EU funding programmes. To this end, RSSD aims to be the interface between the academics, researchers, and the general administration, as a one-stop shop for research funding. Once the project is successful and funded, we will then link it with the range of support services available. But that is not where our contribution ends.


On the laboratory and infrastructural side of RSSD, we help the scientific, technical, and laboratory staff at

the UM to bring experimental laboratories to a world class level. The multifaceted nature of this work makes it difficult to summarise. Among other things, it involves building services, laboratory output, systems design and commissioning, followed by quality assurance, such as managing standard operating procedures (SOPs) and supporting and writing equipment tenders, creating and managing asset databases, and ensuring proper waste management. We can also contribute to managing your projects, all in the bid to improve the efficiency, productivity, and function of any laboratory.

The next step in this chain of quality assurance is obtaining accreditation for some of the techniques and methods used. To this end, accreditation and SOPs ensure reliable, repeatable, and reproducible measurements, a must for work in and with the private sector.

RSSD will give you the right support needed to achieve your vision.

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RESEARCH SUPPORT SERVICES DIRECTORATE

STUDENTS



Do you think this is a game?

John Harrington

Picture an item of furniture. Was it a table, a chair, or a wardrobe? Our ideas of furniture are not oriented around what it does, or even its essential nature, but rather around all the common examples we see around us and the cognitive web of interrelations that builds in our head.

This fictional furniture is just an analogy. Supervised by Prof. Gordon Calleja, I investigated how language affects our preconceptions of what games are and what they should do. Our ideas about games are not related to their potential or their openness but to constructions in our mind.

My research was mostly within the philosophy of language. I explored how our ideas of what a thing is are not grounded in what it does or is, but around a cognitive image, created by what we often see and label it as.

My research was mostly theoretical. It showed how other game researchers might have been misguided or had counter-intuitive results. Their research tried to define what games are and did not realise that this went

against how we used the word 'games', i.e. as a container for all the things we collectively consider game-like.

That said, I also had the opportunity to test-drive this work in a game I am currently developing with Dr Stefano Gualeni, which analyses what the word soup means (issue 20, pg 46).

Apart from answering the long-standing question of what a game actually is, this research also shows how games would benefit from being more inclusive and experimental. By creating these types of games, we can attract people whose cognitive model of a game is different from the norm. Similarly, by designing games that are more open, we can stretch the web of interconnections in people's minds, potentially showing how games are more akin to life than we realise.

Are you ready to play? [T](#)

This research was carried out as part of the Masters in Digital Games, carried out by the Institute of Digital Games at the University of Malta.



The limits of noise

Deandra Cutajar


Of the astronomical phenomena we can witness with our own eyes, a solar eclipse is one of the most spectacular. This phenomenon was used early in the 20th century to prove Einstein's new theory of gravity. As light passes around a celestial object, its path is bent exactly as predicted by Einstein's theory.

When researchers compared the amount of light that was bent by large clusters of galaxies with the observed mass of the galaxies, they found that there was a discrepancy of over a factor of 1000, giving birth to the phenomenon known today as dark matter.

The distortions of galaxy shapes by large masses, provide astronomers with a tool to construct a dark

matter map and its distribution in the universe we observe. Images captured using telescopes are analysed carefully to understand the distortions of galaxies due to the presence of dark matter lenses. However, in practice this is a very arduous task because telescopes suffer both from electronic noise as well as atmospheric distortions, so throughout my PhD, I investigated how the noise present in astronomical images could contribute to the distortion of galaxy images and also introduce errors in our maps of dark

Under the supervision of Prof Kristian Zarb Adami, I applied Bayesian inference to determine the correct measurements of galaxy shapes. However, since the variations in the shape and size of galaxies due to lensing is very small, the measurement of dark matter is extremely difficult. Only novel statistical methods developed within a consistent Bayesian framework allow us to extract the maximum amount of information in such difficult scenarios.

Unfortunately, the application of the new methods in my Ph.D. have shown results that are similar to those reported by other researchers, with the techniques failing to provide the desired accuracy. Nonetheless research goes on, unravelling more mysteries and questions that still need answers. 

Science in the House!

Researchers from the University of Malta are descending on the House of Representatives for the Science in the City festival. Here is a selection of their work, ranging from Malta's first space mission to achieving earlier breast cancer diagnoses.

1

Dr Ing. Marc Anthony Azzopardi

(Faculty of Engineering, UM)

Dr Ing. Marc Anthony Azzopardi is seeking to create new advanced electronics design industries that benefit the Maltese economy. He leads two engineering student teams designing high performance vision systems and miniaturized spacecraft in preparation for Malta's first space mission, and all with a view for commercial applications.

2

Dr Owen Falzon

(Centre for Biomedical Cybernetics, UM)

Biomedical engineer Dr Owen Falzon's work focuses on developing signal processing, image processing, and machine learning techniques for biomedical applications. He is also working on improving the performance of brain-computer interfaces and the analysis of thermographic images to extract information relevant for a range of clinical applications including diabetes.

3

Dr Elisa Seria

(Research Support Office, UM)

Dr Elisa Seria's latest work explores the potential use of stem cells to reconstitute damaged skin, tissue, or organs. Through her work, she believes cell therapy may substitute the transplantation of organs, revolutionising medicine.

4

Dr Ian P. Cassar

(Faculty of Economics, Management & Accountancy, UM)

Dr Ian P. Cassar is studying sectoral interconnectedness across the Maltese economy to aid in the formulation of industry-specific policies that will enhance Malta's competitiveness and tackle key environmental issues, such as the reduction of greenhouse gas emissions, more effectively.

5

Dr Ruben Gatt

(Faculty of Science, UM)

Dr Ruben Gatt's research interests include the investigation of counterintuitive materials such as auxetics that become fatter when stretched. Characteristics like these make them resistant to indentation, for example, meaning that they have wide-ranging applications in various industries including safety.

6

Dr Rebecca E. Dalli Gonzi

(Faculty for the Built Environment, UM)

Dr Rebecca E. Dalli Gonzi is an architect whose current research is focused on process improvement in construction technology. Her latest project is a floating structure with various applications including a performance space, dining on water, and architectural art.

7

Dr Lourdes Farrugia

(Department of Physics, Faculty of Science, UM)

Medical physicist Dr Lourdes Farrugia studied the interaction of electromagnetic fields with the human body for her doctorate and is now focused on measuring the dielectric properties of biological tissues required to design innovative microwave medical devices for new clinical applications.

8

Dr Melissa Formosa

(Department of Applied Biomedical Science, Faculty of Health Sciences, UM)

Molecular biologist Dr Melissa Formosa leads the Malta Osteoporotic Fracture Study, part of an international consortium investigating the genetics of osteoporosis and fracture susceptibility. She is currently using the zebrafish model to study novel genetic factors implicated in bone physiology.

9

Dr Shawn Baldacchino

(Faculty of Medicine & Surgery, UM)

After discovering a new type of breast cancer in his doctorate, Dr Shawn Baldacchino is now reading for his post-doctorate. The project, 'Accurate Cancer Screening Tests' aims to determine breast cancer types more accurately, potentially leading to earlier diagnoses, with possible classification from body fluids.



Photos by Sebio Aquilina

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EARTH

At a time when all of humanity's differences are taking centre stage, there is one thing that unites us all: Earth. Lady Bird Johnson once said that 'the environment is where we all meet.' We all have a mutual interest

in not only protecting it, but enriching it. In this EARTH focus, we have a selection of the University of Malta's best contributions to that discussion, from innovative energy grids to the freshwater under our seas and so much more.



Bloomin' roofs go green

Rooftop gardens as insulation, flooding prevention, and much more

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Making buildings better

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Underwater groundwater

A potential solution for Malta's eroding water table

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A green future for electrical networks

A new approach to incorporate green energy production

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*Weather in Malta can be extreme. Summer is scorching. Winter brings storms. Some might blame nature and leave it at that, but there are solutions to these problems. **Nigel Borg** talks to **Antoine Gatt** about one of them.*

Many tourists visit Malta for its sunny days, but as most locals know, the summer heat can be debilitating, draining everyone's energy by early afternoon. Winter is mild and relatively pleasant; however, the occasional downpour nods towards Noah's trials. People are quick to complain about the inconvenience this weather causes, but the consequences run much deeper, affecting our economy, our environment, but most of all, our quality of life.

High summer temperatures quickly drive up electricity bills due to air conditioner use, but it can also damage buildings. In summer, roof slab temperatures can vary from 25°C to over 60°C each day. These temperature fluctuations can be problematic, as the expansion and contraction of the roof slab and damp proofing (membrane) leads to hairline cracks. Exacerbating the situation is the 'urban heat island phenomenon'. Towns and cities

can be up to 6°C hotter than rural areas due to heat being absorbed by buildings during the day and reflected into the atmosphere at night.

And while the temperature is not much of a problem in winter, flooding can be. Even moderate downpours can slow traffic down in key areas and dole out serious damage to people's property. Extensive hard surfaces like roads and concrete mean that rainwater is not absorbed. The lack of green spaces just makes it all worse. Road closures and even deaths are common when storms strike.

In one of the world's smallest nations, space will always be a problem. How can we have more gardens when we barely have room for everything else on this tiny island? The answer is green roof technology. This technology is already used successfully in northern Europe; however, considering the Maltese climate, there was some question on whether it could be adapted for local use. These questions are precisely what the LifeMedGreenRoof project, managed by Antoine Gatt of the Faculty for the

Built Environment, set out to answer.

The project was a baseline study on green roofs in Malta and spanned a total of four years, starting in November 2013 and finished in July 2017. Partly funded by the EU through the LIFE+ funding body, one of the main findings of the project was that green roofs act as a temperature buffer, particularly during summer months. 'The demonstration green roof at the University of Malta was found to tame the temperature shifts, keeping it at a steady 27°C on a daily cycle', says Gatt, 'reducing air conditioner use and the formation of hairline cracks in the building itself'. Overall, this would make the building more energy efficient and reduce maintenance costs on things like membrane replacement. On a national level, green roofs also help Malta reach one of the EU's Europe 2020 Strategy targets, which include reducing energy requirements by 20%, particularly as buildings have been identified as having the greatest energy-saving potential.

The most important benefit happens over the winter months ➔



In reality, relative to Malta's size, we actually have more flowering plants than England!

by reducing localised flooding. In the study, the green roof absorbed up to 90% of the rainfall in 2016. While it is true that the winter was relatively dry and bouts of rainfall were not too close together that year, it is still an impressive number. If implemented widely enough, they could plug the flooding problem.

THE PROJECT AND ITS TRIALS...

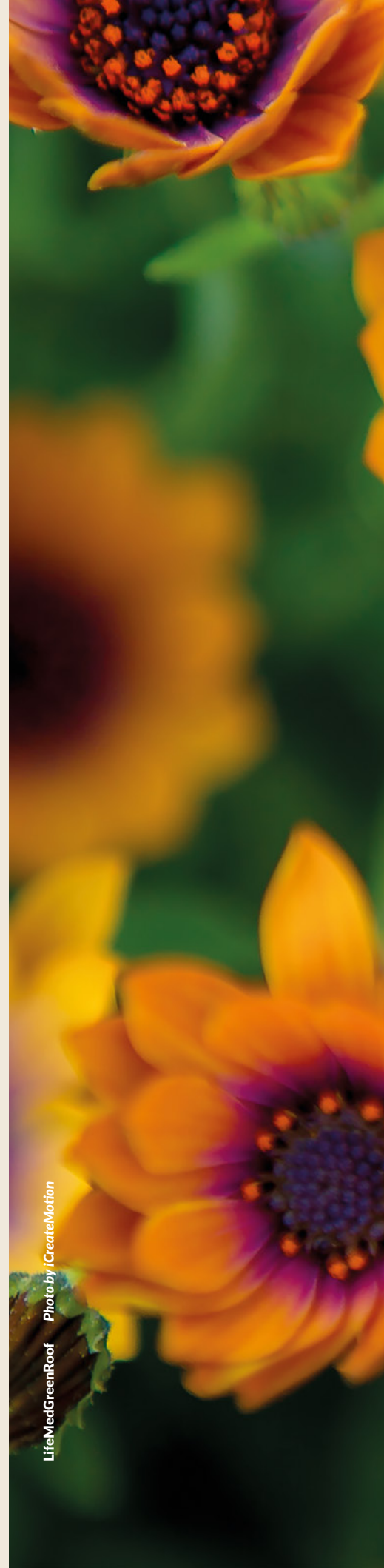
There were a number of challenges which the LifeMedGreenRoof project set out to overcome. One major problem was adapting northern European technology to a Mediterranean climate and ecosystem. Apart from practical considerations, 'a big challenge was the perception that 'nothing grows in Malta,' ' says Gatt, particularly due to our harsh summers. 'In reality, relative to Malta's size, we actually have more flowering plants than England!' he added.

Also, green roofs need the right plants and growing medium. They also need other layers to help with drainage and to protect the building. A typical green roof system would consist of a total of five layers. From top to bottom these would be: the plants, the substrate or growing medium, filter fabric, the drainage module, and the root barrier. All

this is laid over the damp proofing membrane and roof slab. Soil cannot be used as a growing medium for green roofs because it is too heavy. It can also contain plant seeds which would increase maintenance time.

'Ideally, local materials would be used for the growing medium but the materials available were not appropriate,' Gatt says. 'We tried using crushed concrete and stone, among others, but found that the chemical composition of our rocks wasn't good for plants to grow in.' Other materials trialled included crushed olive stone and locally made compost. Sadly, the olive stone requires more study due to the presence of oils, and the compost was found to contain heavy metals. Substrate materials were instead imported from Italy. They included pumice, lapillus, coconut fibres, and biochar, a type of charcoal used for agricultural purposes.

Another challenge was selecting plants which can withstand the sweltering conditions on Maltese roofs. Apart from the heat, summer brings intense sunlight and high winds that can prove deadly to exposed areas. However, these conditions do not only affect roofs. Local garrigue habitats are characterised by shallow soil and very little shade, meaning that the plants found there are exposed to intense sun and wind—very much like plants on a roof would be.



LifeMedGreenRoof Photo by iCreateMotion






The plants chosen for the trial green roof were successfully grown in this study. These included species such as *Antirrhinum tortuosum* (Greater Snapdragon or *Papoċċi Ħomor*), *Hypericum aegypticum* (St John's Wort or *Fexfex tal-irdum*), *Cheirolophus crassifolius* (Maltese Rock-Centaury or *Widnet il-Baħar*), and *Thymbra capitata* (Mediterranean Thyme or *Sagħtar*). Considering how some of the plants found locally are endangered and scarce, such as *Anacamptis pyramidalis* subsp. *urvilleana* (Maltese Pyramidal Orchid or *Orkida Piramidali ta' Malta*), green roofs could also act as conservation beds. The diverse plant selection would also provide spaces for rare animal species. 'One time we went up to the roof to see a swallowtail butterfly,' Gatt says, 'and that's one of the rarest butterflies to see.' The Maltese honey bee, currently thought to be facing extinction, could also find reprieve in green roofs.

MASSIVE BENEFITS TO BE REAPED

The potential benefits of having green roofs are not limited to acting as a temperature buffer in summer and as flood mitigation in winter. Green roofs will add green spaces where none were previously thought possible.

Given Malta's rapid increase in construction, the aesthetic impact in many areas would be more 

than welcome. Implementing green roofs would soften the harshness of buildings and lend a more vibrant, varied aesthetic. Each building would have its own unique roof garden to show off.

Aside from beautification, many studies have shown that green infrastructure improves people's well-being. Correlations were found between being around the natural

environment and a healthier lifestyle, increased activity, and higher attention levels in school children. Green roofs can also serve as recreational spaces, especially in office blocks, allowing colleagues to use them as a space to socialise during breaks, much like parks abroad. They could even be used for events provided there is sufficient space. Depending on the growth medium's depth, they can also act as noise buffers and reduce glare.

From a landlord's perspective, all of the above increases the property's appeal and value, while also increasing jobs in the construction industry directly related to the implementation of green roof technology. The economic benefits are huge,

ripe for the picking for a startup business to turn this academic research into a new economy.

Yet another potential benefit of green roof technology is that they work very well with photovoltaic (PV) panels, whose efficiency of energy production peaks at around 25°C. Given that summer temperatures in Malta are often well above that, lowering the PV panels' temperature would boost energy production. Luckily, green roofs help in cooling the air above them through evapotranspiration. Experiments in Hong Kong showed that combining green roofs with PV panels resulted in a 4% increase in power production. The advantages seem endless.

A big challenge was the perception that 'nothing grows in Malta.'



THE BIGGEST CHALLENGE: POLICY

Given all they have to offer, green roofs could contribute towards solving Malta's greatest issues. It is worth keeping in mind that many of these benefits would result only if green roofs are implemented on a national scale. This brings us to the third and biggest challenge faced by the project: policy.

Following the project and its very positive results, a policy proposal has been submitted. Feedback from the the government, MEPA, and the ERA have been positive.

If green roofs are to be implemented nation-wide, the right incentives

and regulations are needed. The policy would need consultations with stakeholders. Financial incentives are vital to kickstart the implementation of a new technology. Incentives could take the form of something similar to what was done for PV panels, such as a tax rebate from the government based on the surface area of the green roof installed. Regulations could be put in place for certain buildings to have a green roof, such as public and commercial buildings. Something similar exists in France where commercial buildings are required to have a green roof.

A less direct form of financial incentive would be the introduction of a tax based on soil sealing, or

the destruction or covering of soil by buildings. Reducing the area of exposed soil has a negative effect on flooding and ambient temperatures since it reduces soil that is available to retain rainwater. This contributes to flooding and the government's costs in terms of flood relief. As a tax, this would be reduced based on the area of green roof installed and also on any garden present on the plot since this would help reduce flooding.

Only time will tell what will happen in terms of green roofs, but one can hope that we can look forward to a greener future; not only for our own sake but for also for our beloved islands and for the sake of those who will follow after us. **T**



East Wing of demonstration Green Roof (left)
West Wing of demonstration Green Roof
Photos by iCreateMotion



CONCRETE FOR SUSTAINABILITY

Concrete is the most used building material supporting the construction boom.

Hans-Joachim Sonntag talks to **Dr Ruben Paul Borg** about advances in cement bound materials that can lead towards sustainable development, more durable buildings, and a lower carbon footprint.

In the compacted floors of the Maltese Islands' Neolithic temples lies a precursor of concrete. Its modern reinvention surrounds us today in buildings, civil engineering works, and infrastructure. The rapid growth of Malta's construction industry and infrastructure (currently pushing above 5% GDP rate of growth) has led to a reliance on concrete's versatility and adaptability. Construction materials expert Dr Ruben Paul Borg says that while concrete usually evokes negative connotations—think 'concrete jungle'—it is absolutely essential to modern life and holds many interesting secrets.

At its core, concrete is a mixture of gravel, sand, and cement acting

as a binder which reacts with water, ultimately producing a hardened material. This basic recipe leaves the door open for a diverse range of cement bound materials which can be engineered to suit a wide variety of applications from artworks to towering skyscrapers. But how does it really impact us?

Asked why he first became interested in working with concrete, Borg lists three main reasons: innovation, cultural heritage, and sustainability. 'It is hard to overstate the importance of sustainability,' he says. 'Cement production alone accounts for over 5% of the man-made contribution to CO₂ emissions,



Degradation of concrete - corrosion of reinforcement

simply because we use so much of it,' and that statistic will only increase with the current growth rate. Sustainable construction can only be achieved through innovative approaches intended to reduce concrete's carbon footprint. This can be achieved in different ways: through the use of alternative low impact materials and industrial by-products, development of advanced materials, and more durable concrete structures. For all this, Borg says, 'we can take inspiration from history.'

Researchers in the field turn to the ancient Romans because they were the first to use concrete on a large scale. Roman concrete, *opus caementicium*, is

made with basic ingredients, including volcanic ash acting as a binder, resulting in an improved microstructure and enhanced durability. *Opus caementicium* was used in the Pantheon in Rome, the world's largest unreinforced concrete dome, which still stands today, 2,000 years on. 'The use of local material, including waste materials, to improve the material's design and durability is the perfect example of how we should think about sustainable concrete,' says Borg.

Reinforced concrete was developed in Europe over 100 years ago. Made out of concrete with embedded steel bars, it can withstand huge compressive and flexural stresses. As

a result, its use increased dramatically, ultimately becoming the most widely used construction material. However, there are downsides. Embedded reinforcing bars can corrode and lead to cracking, degrading structures. Borg refers to the historic 1930s reinforced concrete water tower at the Civil Abattoir, a unique structure in Malta which he and his team are currently restoring, reverting to advanced cement-based materials, composites, and innovative techniques. 'We need to pay more attention to the preservation of industrial heritage and concrete British military structures in Malta,' Borg says. 'These structures present a challenge in appreciating first and ▶



then restoring our 19th and 20th century heritage. But they also present an opportunity in understanding how early concrete and reinforced concrete structures performed over time and the mechanisms involved in their degradation.' 'This,' he adds, 'enables us to design durable infrastructure for a sustainable future.'

Non-corroding materials could be one solution to the problems facing reinforced concrete. During his past research, Borg focused on the potential of high-performance fibre-reinforced concrete structures and the exploitation of industrial by-products and waste materials such as limestone. In another recent study, fibres produced from recycled waste plastic polyethylene terephthalate bottles helped in controlling early stage cracking of concrete.

Such approaches fit into the concept of the 'circular economy' which is strongly promoted by the European Union by addressing the life cycle impact of materials and structures. In line with this principle, Borg has been successfully using quarry limestone and excavation waste as alternatives to cement and aggregate to produce strong and durable cement bound materials. In addition, construction and demolition waste, which accounts for the largest portion of waste generated in Malta, has been used to produce concrete with improved lifecycle performance, effectively resulting

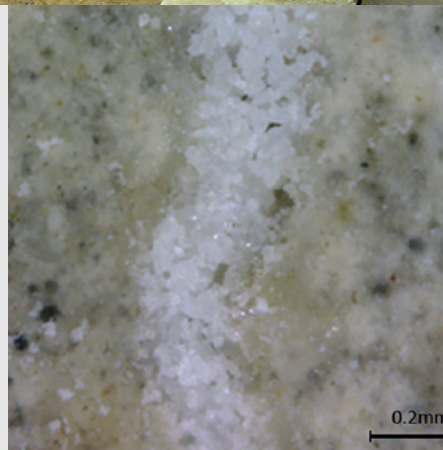
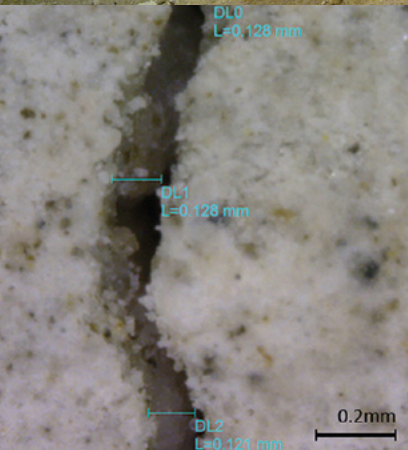
Academia should be a driving force in the process by staying one step ahead and by inspiring industry



Civil Abattoir historic reinforced concrete water tower
Photo by Dr Ruben Paul Borg



Recycling of concrete



Top: Recycling of quarry waste from the extraction of limestone
Bottom: Healing of cracks in concrete: before (left) and after (right) treatment.
Right: Ruben Paul Borg (Background: Concrete benches based on industrial by-products, produced by students in materials engineering)
Photos by Ruben Paul Borg

in reductions in raw material being extracted and in waste produced.

Cement's high contribution to carbon emissions is another major problem. The production of cement is highly energy intensive, therefore different binders based on industrial by-products and waste materials can help reduce the environmental impact. Together with his students, Borg has been developing a geopolymer concrete that should help reduce concrete's carbon footprint.

'Notwithstanding these advances,' says Borg, 'the best way to tackle the carbon footprint of concrete is to use materials efficiently for an intended application and ensure structures perform throughout their lifetime.' This brings us neatly back to the issue of durability in concrete structures. Using a technique called Structural Health Monitoring, sensors inside the concrete can detect materials and structural performance and lead to improved safety through early

detection of damages, as well as a better understanding of what makes certain structures more durable. Cracks occurring in concrete structures may lead to degradation and loss in integrity with time. In recent studies Borg is conducting with his students and collaborators, he is also looking at 'self-healing' concrete using specific concrete additives, as well as particular strains of bacteria to heal cracks in concrete. Showing microscopy images from these studies, Borg explains that the technology holds great potential for the future.

Industry interest and new European-funded projects mean Borg is confident that the findings will be applied. 'Academia should be a driving force in the process by staying one step ahead and by inspiring industry,' he states. Besides the interest from the private sector in these advances, he also nods to the government which has also acknowledged the importance of concrete sustainability. To develop

new standards for construction waste recycling when demolishing or dismantling buildings, University of Malta researchers are collaborating with the MCCA (Malta Competition and Consumer Affairs Authority) and the BICC (Building Industry Consultative Council, Government of Malta). The work promises to solve a key waste problem as more than 80% of waste by weight generated is from construction, and it should lead to a better quality of the built environment for everyone.

There are endless opportunities for innovation in concrete and as many issues. Concrete may not be appreciated, especially given the problems Malta is facing with development and the countless cranes that come with it. The importance of sustainability is key given concrete's impact and use within society, which offers significant challenges. It is only with research like Borg's that we can hope to transform these challenges into opportunities. **T**



SUSTAINING SUSTAINABILITY

*Changing our attitudes and behaviour is not easy, especially when the results of the effort may only be seen years from now. Issues like sustainability require action at different levels within individual, community, and international spheres. Local NGO **Kopin** provides a hybrid approach, and suggests ways of breaking this down into bite-sized action.*

August 2nd 2017 marked the day humans used up the natural resources our planet is able to generate in one year. Over the past few years, this date has moved earlier into the year at an alarming rate.

Environmental sustainability has become a pressing topic the world over. In December 2015 world leaders gathered in Paris for the Conference of the Parties, where they signed an agreement on the carbon emission reduction. Despite criticism about its lack of concrete mechanisms binding stakeholders to uphold targets, over 150 countries have signed up and presented their plans to keep global temperature change below a two-degree Celsius rise, a rise that would devastate our ecosystem and put life on earth in jeopardy.

Malta is involved in the Paris Agreement. Despite this process, the country's environmental issues

seem to be piling up: severe water scarcity, denser urbanisation, overfishing, unexpected shifts in temperatures, and extreme weather episodes. A dichotomy has emerged on the islands. While on the one hand, people are increasingly concerned with the effect that climate change might have on their health and quality of life, many also still believe that the well-being of a society is measured by short-term economic income.

Many organisations are acting on this viewpoint. All of them are advocating for more sustainable development of the Maltese Islands: from the promotion of land and marine conservation, to the active opposition of green area development. The reappropriation of Manoel Island's open spaces and shore was a recent success thanks to the fruitful collaboration of activists such as Kamp Emergenza Ambjent amongst others, citizens, and the Gzira Local Council.



1. Kopin's stall at the WorldFest 2017
 2. Children visiting Vincent Eco Farm
 3. Children working on their school garden at Saint Michael School
 Photos by Michelle Calleja Chehab

Each one of us has the duty to improve our quality of life. For the last decade, Kopin has been working in Malta to raise awareness about the different issues linked to sustainable development, not only from an environmental point of view, but also by highlighting the impact that an unsustainable world has on citizens' rights.

Education is a key area for Kopin. Through EAThink—eat local, think global! we are reaching out to students and teachers in schools, to promote the idea that achieving sustainable development starts from the early years of education. The provision of teaching materials, promotion of organic school gardens, and organisation of educational visits to smallholder farmers should bring a better understanding of the effects that everyday food choices have on life on earth. Children involved in the project activities are now aware of the amount of energy needed to produce food or to import certain products from abroad, and they are also aware of

the amount of food and water wasted every year in Malta and Europe.

But while schools are an excellent portal into young people's lives, Kopin also strives to connect with older members of the community and empower them to drive change. Over the past two years Kopin has been promoting an economy that shifts profits from one's pockets to the promotion of social causes. Susy—Sustainable and Solidarity Economy has mapped sustainable businesses in Malta and put them in touch with each other, enabling them to work together and better advocate their causes. The project is also promoting these initiatives through film thanks to a collaboration with the Valletta Film Festival. With these stories, we can show that the status quo can evolve and things can be done differently. Later this year, in October, we are inviting all socially-conscious enterprises in Malta to a public event in Birgu to meet citizens, share their ideas about

alternatives to mainstream consumerism, and inspire new entrepreneurs.

Much of what needs to be done to alter the path we are on requires a collective effort that includes the private sector. Changing light bulbs and buying local is not enough. Individuals cannot compensate for politicians' and the corporate sector's responsibilities. It is through a legal framework that the necessary green policies, such as a shift in fossil fuels and the provision of working wages, can be implemented. The exploitative system that places the burden on the individual has to be dismantled and replaced with an economic system that provides viable, environmental options for everyone.

We need to stop thinking exclusively like individuals and develop social collaboration that delivers true solidarity **T**

👉 www.kopin.org
 🐦 @KOPINmalta
 📍 Kopin Malta

Underwater Groundwater

*Under the sea is a whole new world with its own geology. **Dr Aaron Micallef** writes about the MARCAN project, shedding light on the freshwater reserves sitting beneath the sea's saltwater and how they can be used to alleviate the groundwater problem plaguing The Maltese Islands.*

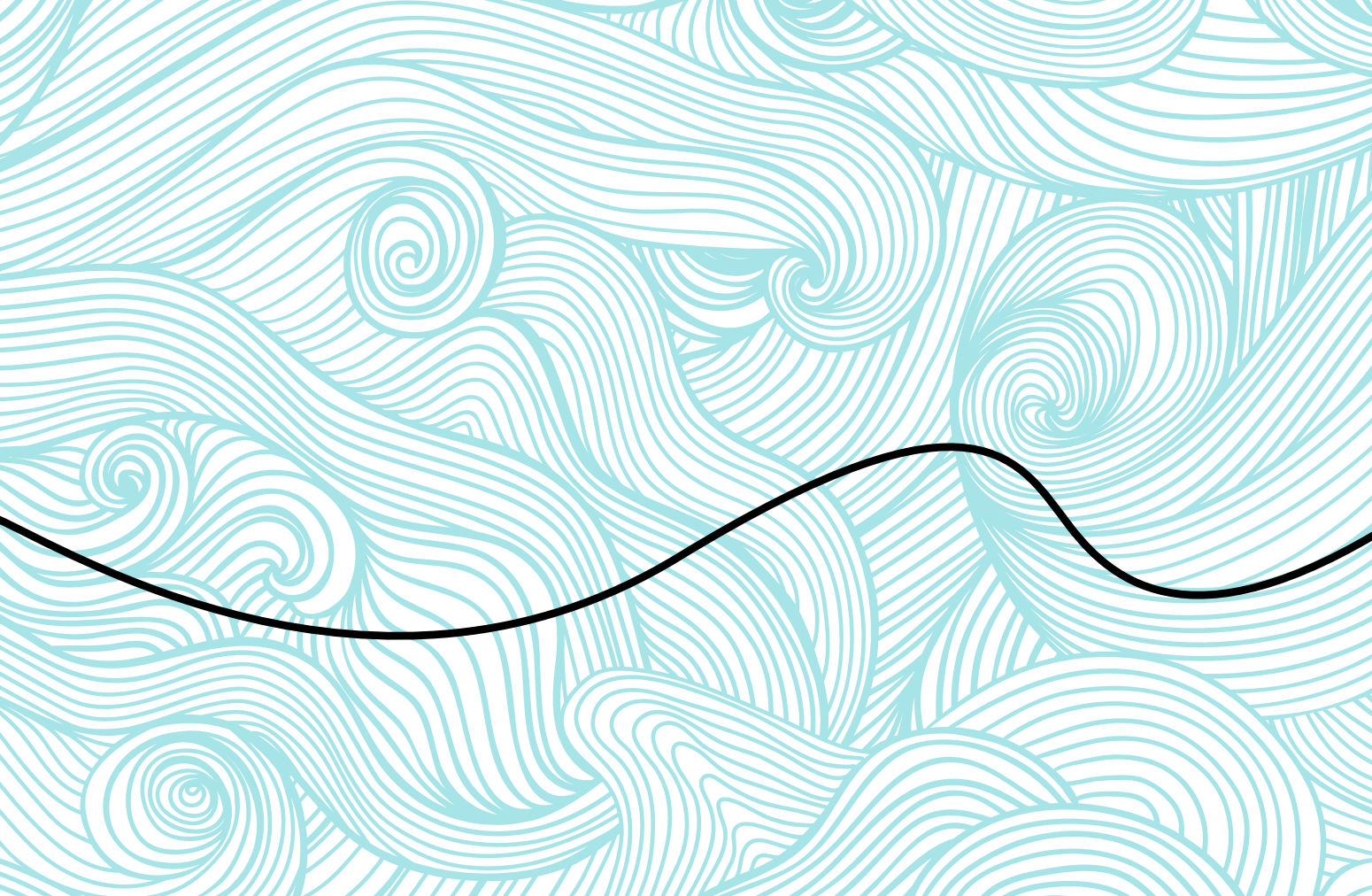
We have a water problem. By 2020 shrinking freshwater resources and growing demand will lead to 40% of the global population experiencing problems of water scarcity. When it comes to water resources per inhabitant, Malta is one of the ten poorest countries in the world. Water shortages in other countries have led to food shortages, economic slowdowns, and even increased global conflict. Addressing local and global freshwater shortages is a matter of urgent concern.

Solutions? There are a few. Many call for water recycling and better controls over its use. But the world is not always as straightforward as we would like it to be, and these ideas are not always feasible. Groundwater resources may be compromised by contamination, sea level rise, or conflicts with neighbouring states, as in the case of Pakistan and the Maldives. So, we need to think out of the box.

One solution may be found at the bottom of the ocean. In the past few decades a number of serendipitous discoveries of freshwater, down to hundreds of metres depth below the seafloor,

have been made during oil exploration campaigns. Freshwater reservoirs can form underwater in two ways: either the sediment/rock layer that hosts the groundwater extends from the coastline to the seafloor, or the groundwater is 'fossilised', a remnant of when sea levels were significantly lower than today and part of the seafloor was exposed. Recent estimates put the volume of freshwater hosted in sediment and rock offshore at half a million cubic kilometres of freshwater: equivalent to four times the volume of water used by humans in the past 200 years.

Offshore groundwater has recently raised the interest of geoscientists at the Marine Geology & Seafloor Surveying (MGSS) group of the Department of Geosciences (Faculty of Science, University of Malta), and not just for its potential use as a source of freshwater in the future. During the last 100 years, groundwater has been proposed as an important player in shaping onshore and offshore landscapes; however a definitive link remains to be made. For the majority of the last 2.5 million years, the sea level was up to 130 metres below present levels, creating suitable conditions for the development of extensive groundwater systems >

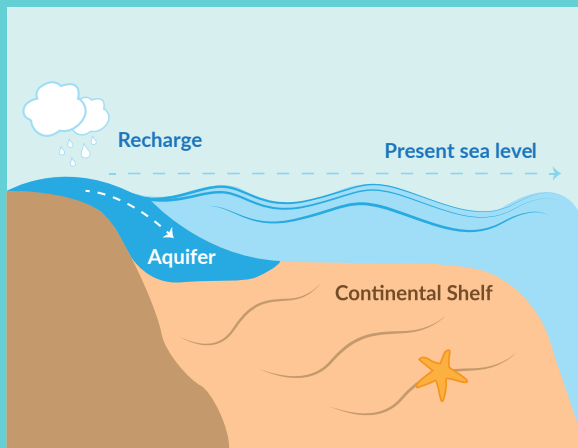


Electromagnetic induction survey along Ashberton coast

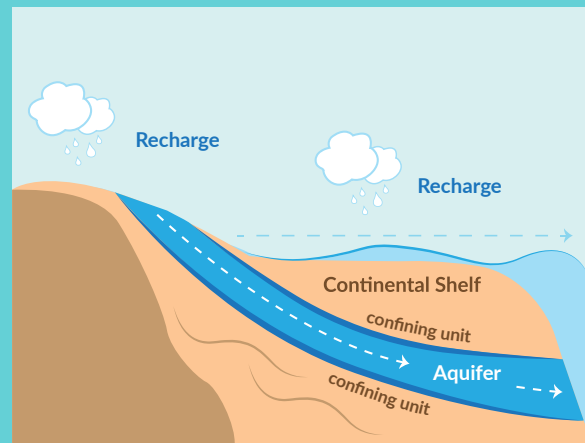


Box Canyon

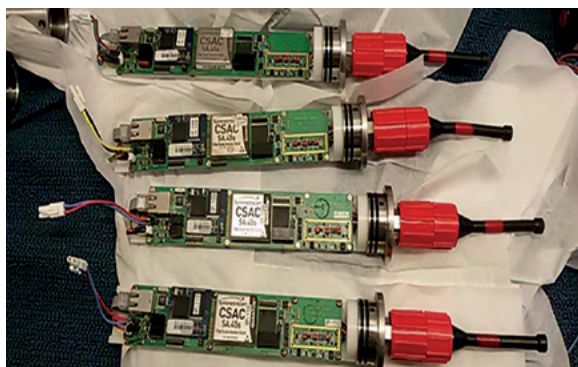




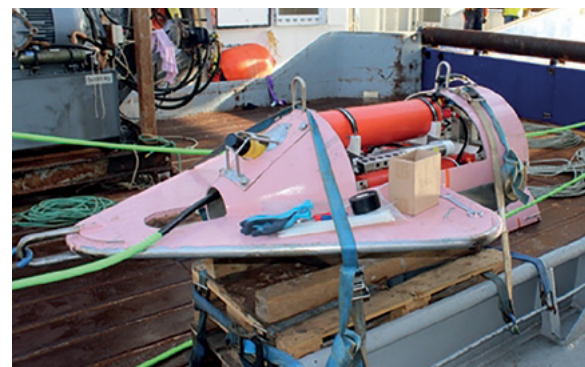
Offshore groundwater reservoirs during high sea level



Offshore groundwater reservoirs during low sea level



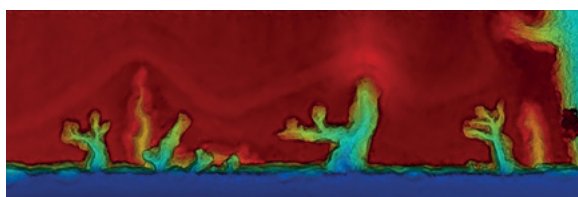
CSEM - Receivers
Photo by Brad Weymer



CSEM - Transmitter
Photo by Brad Weymer



R/V Tangaroa
Photo by Dr Aaron Micallef



Digital elevation model of Ashburton coastline compiled using drone



Dr Aaron Micallef



MARCAN RV Tangaroa Cruise Team
Photo by Dr Aaron Micallef

across large areas of the global seafloor. It is thought that these systems may have controlled dangerous processes such as submarine landsliding, transporting sediment across continental shelves and into the deep ocean, effectively creating underwater avalanches that destroy seafloor infrastructure. They also play a role in generating tsunamis and contribute to canyon formation. Should this theory be correct, our understanding of groundwater systems needs swift revision; however, data around the subject is sparse, and this is why the MGSS geoscientists developed the MARCAN project.

Funded by a European Research Council Starting grant, MARCAN is a five-year project that will define the characteristics and dynamics of offshore groundwater in unprecedented detail, and determine whether it plays an important role in marine geology. Led by myself, Aaron Micallef, the MGSS team brings together geologists, geomorphologists, geophysicists, geochemists, hydrogeologists, and engineers from the University of Malta, GEOMAR in Germany, NIWA in New Zealand, and the New Mexico Institute of Mining and Technology in the USA.

The first phase of the MARCAN project involved an expedition to the

South Island of New Zealand, one of the project's two study areas. In April 2017 the project team sailed from Wellington on board the research vessel Tangaroa and spent four weeks surveying the seafloor offshore Timaru, which hosts one of the shallowest offshore groundwater systems in the world. The scientists used advanced technologies such as marine controlled-source electromagnetism to map sub-seafloor salinity, as well as a suite of geophysical and chemical data to generate a 3D groundwater model of the region. The expedition also involved a terrestrial component, whereby the coastline close to Ashburton was surveyed with drone and electromagnetic induction to characterise the onshore-offshore interface. Similar expeditions are planned for the Maltese Islands in late 2017. Much of the data sets acquired during the expedition are being processed, but there are good indications that an extensive reservoir occurs offshore. We also found widespread evidence of gas seepage (methane), which could complicate our investigation.

During the next five years, experiments and numerical modelling will be carried out. This will later allow us to use that data to run simulations

of groundwater erosion in the laboratory and determine whether it is an effective process in shaping the terrestrial and submarine landscapes.

The project presents a unique opportunity to address long-standing questions in terrestrial and marine geology and bring about a great leap forward in our understanding of some of the most widespread and significant landforms on Earth, but not just that. Groundwater seepage has also been proposed as an important factor shaping landforms on Mars. The project also has important applications. MARCAN will contribute essential environmental baseline data, scientific knowledge, and observational tools to make the Maltese Islands and the EU a leader in the assessment and environmentally-sustainable exploitation of valuable offshore groundwater resources. This could be the beginning of a revolution in the groundwater problem. **T**

MARCAN is funded by the European Research Council under the European Union's Horizon 2020 Programme (grant agreement n° 677898).

The MARCAN project can be followed on: www.marcan.eu

A Green Future for Electrical Networks



Malta can lead EU countries to become the first green island in the Mediterranean with 100% renewable energy. **Dr Alexander Micallef, Prof. Ing. Cyril Spiteri Staines and Prof. Maurice Apap** tell us more about how Malta could do it.

Malta's size and location have shaped the island's fate since time immemorial.

Wars were waged for control over Malta; wars were won thanks to its aid. Centuries later, Malta's geography continues to hold just as much importance, if for different reasons altogether.

When testing new ideas, it is wise to start small. Malta's minuscule size, combined with its population and vehicle density, makes it the perfect petri dish for cutting-edge development and implementation of widespread renewable energy solutions. In fact, Malta could lead other EU countries, making it the first green island in the Mediterranean, with 100% renewable energy penetration.

However, our current national targets are much less ambitious.

All EU countries are legally bound to produce at least 20% of their total energy through renewable energy sources by 2020. Some countries like Sweden are also working under their own steam, setting the bar high and aiming for 49%. Malta's goals, however, fall disappointingly short, with a target of just 10%. And if that wasn't enough, doubt is also being shed on whether we can even reach that. Change has to happen.

THE MALTESE ELECTRICAL ENERGY SCENARIO

Malta faces unique energy challenges with its dependency on fossil fuels for both electricity and transportation. And while the potential of solar and offshore wind energy is huge for the

Maltese islands, identifying how to integrate a variety of renewables and energy storage systems into its energy mix is difficult.

At its peak in August 2017 Malta's electrical energy demand hit 460 MW. Presently this demand is met through three different sources: the gas power station in Delimara, the recently completed Malta-Sicily Interconnector, and a selection of renewables. The presence of the interconnector improves the security and reliability of the local grid; however, it also means that the necessary diversification of the energy supply is being outsourced to Italy. In 2016 renewable energy production accounted for a mere 5% of the total energy generation, mostly from small-scale domestic and industrial PV installations, though it should be noted that the government is now building its first solar energy farm. ➔



Prof. Ing. Cyril Spiteri Staines



Dr Alexander Micallef



Prof. Maurice Apap

UNLOCKING THE FULL POTENTIAL OF SMART GRIDS

The stability of an electrical grid is maintained through a delicate balance between supply and demand, between energy generation and the electrical loads connected to it. A large renewable energy supply could compromise stability due to the intermittency of the energy generated—there is no solar power at night! Simply increasing the number of renewable energy sources without an overhaul of the whole grid, known as the

The presence of the interconnector improves the security and reliability of the local grid; however, it also means that the necessary diversification of the energy supply is being outsourced to Italy.

'fit and forget' approach, can have a slew of problems.

The electrical grid needs to be modernised using 'smart' tech. This technology communicates between its different points, allowing for more efficient delivery and reliability. It not only reduces common problems like power cuts, but also allows people to better manage their own energy consumption and costs because they have easier access to their own data. Utilities benefit from a modernised grid through improved security, reduced peak loads, increased integration of renewables, and lower operational costs.

Malta has already taken a step in the right direction by introducing smart meters to its grid, helping match electricity generation and demand. They provide an important link with an information and communications technology infrastructure. However, we are still a long way from unlocking a real 'smart grid's' true potential. Technologies such as the Internet of Things (IoT) have the potential to revolutionise our lives through efficient management of connected appliances through the use of online portals, smart plugs, and smart meters.

Microgrids are the next step in the green journey. They work as a self-contained small-scale power grid that can operate independently while linked to the main power grid. These microgrids contain their own renewable energy source, storage systems, and loads all working cooperatively. Microgrids can operate autonomously

in standalone (islanded) mode if required, or they can be integrated into the larger distribution network allowing for effective use of many decentralised sources of electricity generation. Multiple microgrids can then be interconnected together to form a larger distribution network. This interconnection enables the transformation of the electrical grid into a true smart grid, offering better supply reliability for customers.

THE FACULTY MICROGRID RESEARCH TEAM

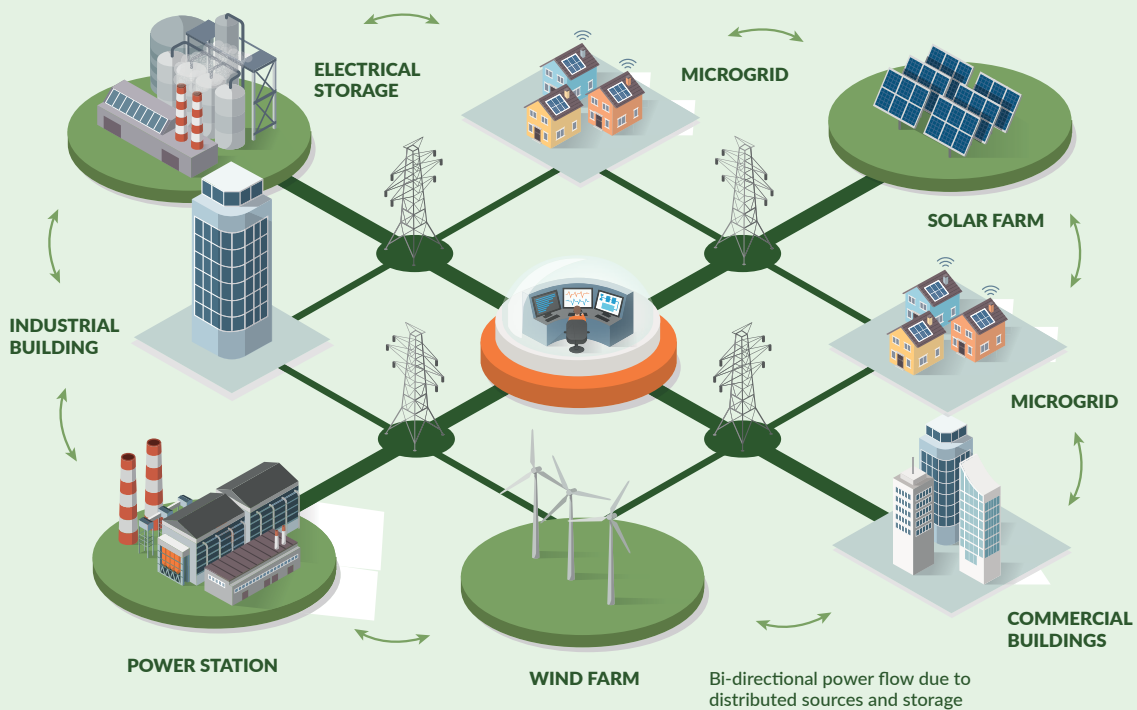
At the Faculty of Engineering, we (Dr Alexander Micallef, Prof. Ing. Cyril Spiteri Staines, Prof. Maurice Apap) have been working in the field of microgrids in close collaboration with the Department of Energy Technology at Aalborg University for the past six years.

The work started with investigations into single phase microgrids where electric power is distributed through alternating current (AC) using a system in which all the voltages of the supply vary in unison. We modelled a group of neighboring households in a residential area with local electricity generation. With this, it was essential to ensure that the voltage and frequency were within acceptable levels for the appliances connected. Failure to do so would have resulted in considerable damages. Considering that the energy sources also had inverters that change direct current (DC) to alternating current,

SMART GRID

ELECTRICITY SUPPLY NETWORK

Illustration of smart electrical networks shaped by microgrid clusters



specialised control techniques needed to be developed and implemented through this project to ensure reliable operation. These control algorithms for the inverters enabled both islanded and grid-connected operation, while being coordinated by a local microgrid central controller to manage and optimise the operation of the microgrid. This coordination can also be improved through decentralised control by applying additional IoT concepts. The next step shall be to scale up the laboratory setup and possibly integrate it into a community project, where the potential benefits of such systems could become more evident.

The team is now also investigating DC microgrids for electrical networks in buildings. While electricity is usually provided in the form of AC, there are various consumer electronics powered by DC, such as LED lighting, laptops, and smartphones.

Therefore, DC microgrids have potential advantages over their AC counterpart: lower conversion losses due to fewer stages (DC to AC and vice versa); no requirement for grid synchronisation; and elimination of voltage phase or frequency issues that occur on AC grids. Now we are working on determining the best network architecture and energy management strategies for a residential building with the possibility to extend this to a group of buildings.

The team is exploring the application of microgrids and IoT in smart grids for marine and land transportation systems. Sustainable transport is a priority in developed countries and efforts are being made towards greener transport at European and national levels. The European Commission is pushing a 'Smart, Green, and Integrated Transport' initiative, which aims to boost the competitiveness of

the European transport industry and achieve a European transport system that is resource efficient, environmentally friendly, safe, and seamless for the benefit of the economy and society at large.

THE ROAD AHEAD

The research areas of smart grids and microgrids are rapidly growing, and the potential benefits on the local and global scale are enormous. By allowing for a deeper integration of renewable energy sources, we would like to strengthen the Maltese position as a green island through more projects in these areas.

This change needs to happen through collaboration with local and foreign industry, electrical network operators, as well as policy makers that are open to moving beyond traditional energy generation and distribution schemes to create the backbone for an innovative Maltese Islands. 






Growing Up

in the



Digital Age





*With the rise of digital technology and its impact on early childhood development, young children and parents alike are stepping into uncharted territory. **Hans-Joachim Sonntag** talks to **Prof. Charles L. Mifsud** and **Rositsa Petrova** about their latest study in collaboration with the European Commission's Joint Research Centre.*

It is no secret that modern technology has reshaped family life. Screens are part of virtually every household, meaning that interaction with them begins early. Parents trying to pacify their children by placing a smartphone or tablet in their hands is a common sight nowadays. The problem is that most research conducted so far has focused on kids between the ages of nine and sixteen, leaving many unanswered questions about the exposure to digital technologies in early childhood.

To answer these questions, the European Commission's Joint Research Centre initiated a Europe-wide study. As part of this project, the Centre for Literacy (University of Malta) carried out in-depth interviews with 10 local families. Leading the endeavour were Prof. Charles L Mifsud and researcher Rositsa Petrova.

'The increasing technologisation of childhood is not very well studied', Prof. Mifsud confirmed, 'and there are many conflicting views about the potential benefits and dangers.' Petrova said that the interviews would help garner insight

on 'how the families use digital technologies and how these are impacting their lives.' She was aware, however, that 'when you talk to young children in front of their parents, they may aim to please,' so interviewing them separately allowed for the added benefit of highlighting discrepancies between children's views on their use of digital technologies and the way their parents perceived things.

DIGITAL DEVICES AND TRADITIONAL TOYS

One of the biggest concerns for parents when it comes to digital technologies is the possibility of children becoming over-reliant on them. However, the general consensus during the interviews was that digital devices may be beneficial when used in a balanced way, together with traditional toys. A few recent studies have highlighted that activities such as physical painting or crafts can complement technology, as they involve a more sensory experience. ➔



Prof. Charles L. Mifsud



Rositsa Petrova

One of the biggest concerns for parents when it comes to digital technologies is the possibility of children becoming over-reliant on them.

Interestingly, the study showed that a lot of joint family activities involved the use of digital technologies. Parents read ebooks to their children and played games together, emphasising the overall positive attitude to changing lifestyles. One mother even pointed out how '[her son] learns when he is playing [videogames] with his father. This involves the skill of teamwork.'

Asked about the different devices, it became clear that the children in the study were particularly fascinated by the touchscreen capabilities of smartphones and tablets. In the words of a seven-year-old: 'On the phone, all you need to do is with your fingers and on the computer you have to type... and sometimes I find it difficult.' Young

children are inclined towards them too because the device's response to their stimulus is instant, just like if they were to knock over their toys in real life and watch them fall.

For many children, the appeal of interactivity is what gives smartphones and tablets a leg over traditional toys. One girl preferred the phone to her dolls because it could talk back to her. Interactivity and personalisation are great benefits of many technological applications, but even without taking into account interactive media, the benefits of digital devices are known. By the age of two, children are cognitively active when watching TV, showing less interest when the programme has been scrambled to remove the narrative.



PROMOTING EMERGENT LITERACY

The concept of emergent literacy refers to the child's growing awareness of what reading and writing are, before actually being able to engage in them. Studies have shown that literacy activities involving the use of digital technology, such as writing on tablets, has a positive association with print awareness and knowledge, but further research is required to fully understand the effects on traditional literacy development.

Another concern is that of digital literacy. Children are increasingly expected to be multimedia savvy and to switch between interpreting text, audio, and flash on a tablet or

smartphone. In recognition of this, personal tablets have been given to eight year olds in schools in a project spearheaded by Malta's Ministry of Education. Using these technologies from an even younger age can allow children to become digital natives and master these skills early on.

DIFFERENT PERCEPTIONS OF CHILDREN AND PARENTS

Parents in the study generally claimed to supervise the interaction of their children with digital technology very closely. This feeling of control is partly due to the so-called Pass-Back Effect which involves parents passing on their devices to their young children who were deemed to be too young to

have their own. However, the children developed a sense of ownership regardless and started acting very independently. 'Sometimes I ask mum and sometimes I don't—it's still OK,' one seven-year-old said.

Many children also admitted to using the devices without their parents' knowledge. This was particularly true for when they were sent to bed to sleep. Exercising complete control over their children's use of technology was rarely a possibility, except in the case of one family in the study. The youngest child had developed an addiction when the technology had been used as a 'babysitter' and was therefore strictly prohibited from any further access. He had also ➤



been referred to a speech therapist as he had difficulties communicating with other family members. However, even the father of this family acknowledged that technology could be a positive force in child development as long as it was controlled. But to what extent can exposure to digital technology be reasonable?

GUIDELINES FOR TECHNOLOGY USE

The American Paediatric Association has the following guidelines for technology use by children. Parents whose children are younger than 18 months should avoid having their children using screen media other than video chatting. Parents of children between 18 and 24 months of age who want to introduce their

Parents clearly feel the need to become more engaged in their children's online activities, while also making sure that there is a focus on educational apps to balance playing with learning.

children to digital media should choose high-quality programmes and guide the children to understand what they are doing. For children aged two to five years, a limit of one hour per day is recommended.

While these are useful guidelines, according to Mifsud's study, the most important thing is to have meaningful communication with children, all the while setting clear limits. 'Children are very capable and resourceful, so parents should be more open about digital technologies and allow them to explore,' recommends Petrova. 'If they are used mindfully and not just as a babysitter, there shouldn't be any problems.'

NEED TO EDUCATE PARENTS

Another great concern parents referred to was young people's online behaviour. One parent decried that 'nowhere on the internet is safe!' Parents clearly feel the need to become more engaged in their children's online activities, while also making sure that there is a focus on educational apps to balance playing with learning.

One way to address such concerns, says Mifsud, is for the parents to engage in meaningful talk with their children about what they are doing with the digital technology. Only two of the families used parental controls, illustrating a wider problem in the area—parental engagement.

It was evident that children were sometimes more technologically proficient than their parents. 'I found it amazing to discover how good and

independent even six year olds were with the technology, downloading apps by themselves,' recalls Petrova. One boy said that he helped his mother to go into the setting of the family's tablet to uninstall apps when more storage space was required for an update. This lack of parental engagement was reinforced again when some parents were not able to tell the interviewer which websites their children use regularly.

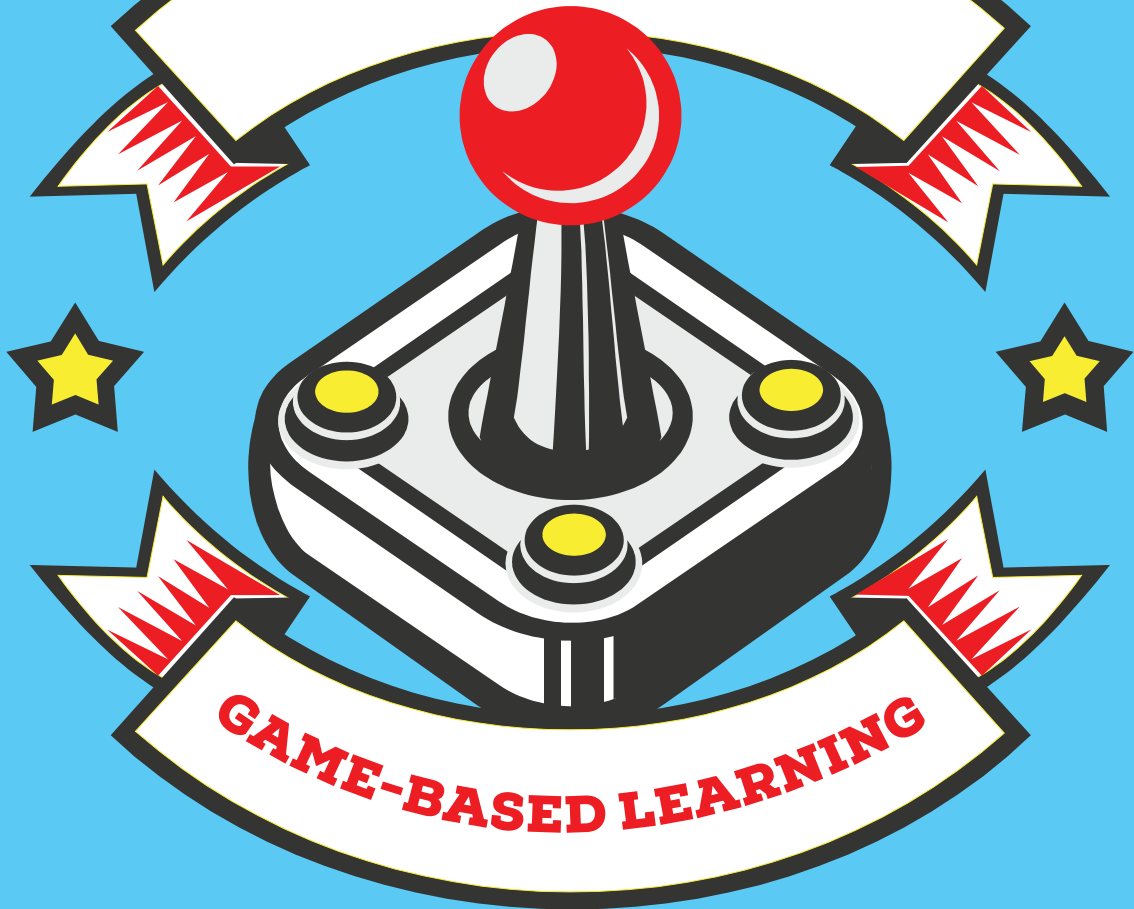
Many lessons can be learnt from the findings in Malta, but one of the most pressing is the need to help parents understand how to reap the most benefits from digital technologies. A follow-up project is now underway, and it is looking at how the technology use in the same families is changing as the children grow older. The Centre for Literacy, in conjunction with other European partners, is putting together information for parents, as well as teachers, to boost their multimedia literacy, emphasising the integration of digital and nondigital practices.

The inescapable reality is that smartphones and tablets are part of young children's lives. As a result, they are developing intuition and competence that can quickly leave parents outmatched. Rather than using a smartphone as a pacifier, parents need to embrace the possibilities and take a proactive approach to guiding the process of technologisation for their benefit. As six-year-old Rosie put it: 'I just like to figure out new stuff.' And so she should. **T**

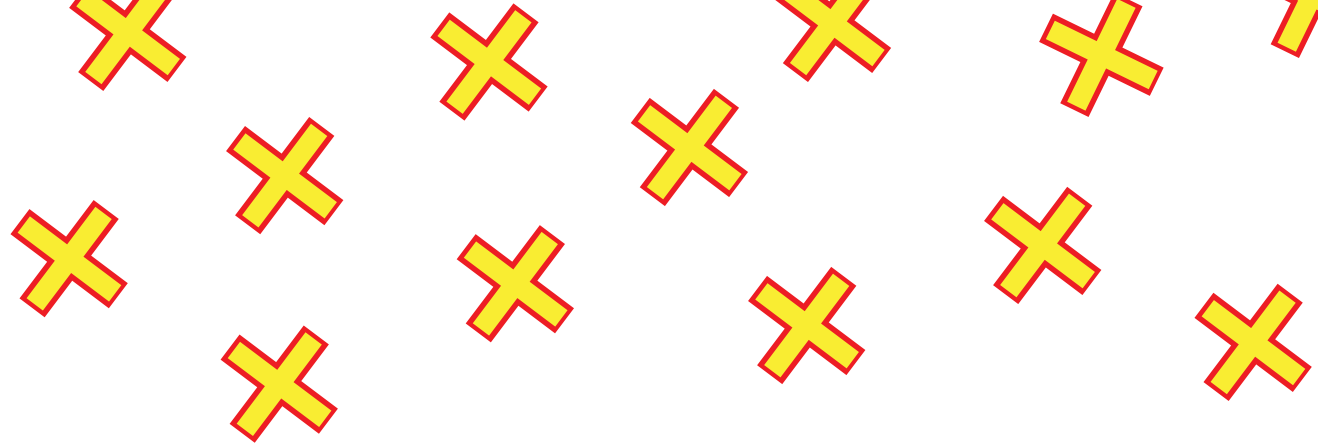
The online version of this study can be accessed from: <http://bit.ly/2eYx2Pq>

LEVEL UP!

UPGRADING



GAME-BASED LEARNING



Suggesting a teacher might start the lesson by telling students to launch Pokémon-Go on their tablets might sound crazy, but this could be the new way to engage a generation of technophiles. Dr Vanessa Camilleri writes about the potential impact of gaming in the classroom.

If I say the words 'digital' and 'video game', what's the first thing that pops into your head? *Bioshock*, *Call of Duty*... maybe *World of Warcraft*? High quality, Triple A games with millions of players around the world fuelling a billion-dollar industry.

Gamers immerse themselves in these worlds for hours on end, exploring them like true travellers. They learn the lore, complete missions, hone skills, becoming evangelists of their favourite worlds. And with good reason! Games tap into their need for adventure and excitement, providing a safe space for them to live out their wildest dreams.

This very visceral reaction to games might cause some to roll their eyes in exasperation and dismiss it as a waste of time. But they would be wrong. In a country where more than one in five students (20.9%) leave school because they feel demotivated, unengaged, and bored, there is something to be learnt from games.

The project Game-based Learning to Alleviate Early School Leaving (GBL4ESL) seeks to use games and incorporate them into classrooms effectively to reduce the rate of early school leavers (ESLs) to no more than

10% of the population by 2020, in line with European Union goals.

WHAT IS GAME-BASED LEARNING?


Although the use of games at school has been common practice for some decades now, many were limited to basic drill and practice 'edutainment'. But this thinly veiled attempt of masking education within a 'game' was about as popular as chocolate-covered broccoli, failing to stimulate any high-level cognitive activity, leaving students as disengaged and bored as they ever were. The challenge we still face is the lack of enthusiasm with education-related gaming. There is a need for more engaging games in the classroom which offer the student the chance to learn without really realising it.


Over the years the boundaries of game-based learning (GBL) have widened. The concept now includes meaningful play: serious games such as Pulse, Duolingo, and Food Force. This said, the most essential features of a game have remained constant. A game must set out a problem that needs to be solved. The solution

should be found within the framework of a set of rules which may or may not be explicitly stated during game play. It also has to offer an environment that is conducive to promoting shared accomplishments. Whatever the game, research has shown that the potential for engagement is much higher when the game design is focused more on the application of strategy, communication, analysis, and other higher-order cognitive skills.

Although students who are at risk of early school leaving (ESL) tend to fare rather poorly in academic subjects, this does not necessarily reflect their ability to grasp these more complex games and skill sets. There is a high potential for developing complex skills when playing specifically designed educational games. The importance of implementing GBL in the classroom is clear, and steps need to be made towards it being fully acknowledged within the educational community.

EDUGAMING MALTA

In 2013 Malta's Information Technology Agency (MITA) approached the Department of Artificial 



Intelligence with a proposal to team up as partners in a project designed to introduce the use of video games in the classroom to stimulate learning in young people. The suggestion was accepted immediately, and a new collaboration was formed—GBL4ESL.

The project GBL4ESL was formed as an Erasmus+ strategic partnership



Dr Vanessa Camilleri
Photo by Jean Claude Vancell

The challenge we still face is the lack of enthusiasm with education-related gaming.

between five institutions in Europe: MITA, University of Malta (UM) and St Margaret's College in Malta, Donau University in Vienna, and Nystromska School in Sweden. Two years later UM took the lead on the design of a guidebook while MITA and Donau worked on sourcing suitable games and bringing the project together. Challenges arose in the form of time constraints and simple geographical barriers; however, the mission was accomplished, resulting in a toolkit of digital games which can easily be translated into any lesson plan.

The toolkit provides teachers with the material needed to run the games confidently in the classroom, reintroducing an element of fun in learning. Its partner is a guidebook that explains how these games can be used most efficiently. Suggestions include allocating specific time for gaming in the school day and highlighting the importance of feedback and brainstorming to determine how to target different groups of students with each game. Among the most successful lesson plans are those focused on literacy and numeracy, which have been implemented with great success. The game's aim is to bring the player up to the highest standard in both of these skills, setting a strong foundation for further learning. This project also takes into consideration the learning kids do at home, and so advice is also available for parents, showcasing the theory behind the games and evidence of their success to persuade even

the diehard video game skeptic.

The use of the toolkit and guidebook together will also help to change policy on a much larger scale. Because no current policies exist to advise on or regulate the use of gaming in the classroom, everything that has been done in the area has relied on teachers' initiative. GBL4ESL hopes to change this by standardising implementation of such games.

EDUCATORS SPEAK OUT

Before official release of the toolkit, school teachers and academics from the institutions involved were invited to workshops and seminars across Malta, Sweden, and Austria to receive training on how to use the games effectively and offer their feedback. The results were immensely positive.

Marion Evelyn Cassar, a Personal, Social and Career Development teacher, found the toolkit to be particularly useful while introducing the large variety of topics covered in her wide subject area. 'I can safely say that with my students, game-based learning has increased the participation and engagement,' she says. Others were most inspired by the flexibility GBL provides, allowing the students to work to their own potential. Computing and ICT teacher Eleanor Mifsud said that 'Students could be creative, innovative and reach their own level of attainment. GBL4ESL is designed to encourage a willingness to learn, which makes this independent learning such an important factor.'



More positive feedback included praise for how many diverse applications the toolkit had. 'We have used GBL to introduce topics, consolidate objectives, revise a single learning outcome or a whole topic, and explore mathematical facts during lessons,' Rose Grixti and Victoria Brincat reported, having tested the toolkit in classes with their mathematics students.

Some teachers took this even further with their students, allowing them to be in control of the objectives, rules, and outcomes of their educational game. Marlene Galea and Doriene Grech run maths and computing extracurricular clubs in St Margaret's College in Malta for students with a large range of abilities. Students of the maths club were encouraged to write pleasantly-challenging puzzles for their peers, developing numeracy but also communication and design skills. 'Problem-solving presented in a gamification approach

is intriguing for all students, irrespective of their academic achievement or their motivation towards learning.' These comments highlight the success of the game with both ESLs and high-achievers.

Perhaps most important are the students' reactions to gaming in the classroom. Jose Molina Avella at Nystromska School found that introducing an element of fun in a lesson with the use of digital or board games proved to have a huge impact on both teachers and students. He also said the evaluation that followed each game was a positive experience, allowing them to communicate their ideas on what worked well for them and what they would change.

By involving both students and teachers in the testing process, the project became much more of a collaboration rather than a question of dictating what would work best in the classroom. Although the main scope of the project was the development

of the toolkit and the practical guide for educators, there were a number of additional conclusions which emerged from the project and which are essential for the success of game-based learning. Having proper feedback, evaluation, and input from students and teachers alike resulted in a project that they felt they could take ownership of, especially important in the case of disengaged early school leavers.

Ultimately, the project highlighted the need to bring back fun to the classroom. Old style game-based learning has no place in the learning environment anymore, but by changing our misconceptions about new digital and more interactive games, we open up a whole new world of potential learning resources more likely to attract a technology-loving generation. **T**

The toolkit and guidebook can be accessed from: <https://toolkit-gbl.com>
Project info can be accessed from: www.mita.gov.mt/gbl

MALTA'S BRIGHTEST EXPORTS:

TRAVELLING TO THE EU'S JRC

*A group of Maltese researchers travel to the European Commission's Joint Research Centre site in Ispra to share their work in the fields of climate change, environment, and medicine. **Cassi Camilleri** writes.*

Communities are built around shared goals and policies. Since its inception the European Union (EU) has worked to do just that: bring countries together under an umbrella of prudent principles that guide decisions and achieve rational outcomes benefitting all involved.

But the world is not a utopia; systems stumble. Shifting ideologies and political leanings lead to disagreements. Mitigating such discord is the great equaliser—science—stripping away agendas and beliefs and replacing them with facts.

The Joint Research Centre (JRC) is the European Commission's science and knowledge service, a sprawling hive packed with brilliant minds from all four corners of the continent. Its mission is to provide independent, evidence-based scientific and technical support to see European policies through from inception to implementation. 'The work we do here is not research for research's sake,' says Elke Anklam, Director of the Health, Consumers and Reference Materials Directorate at the JRC. 'Here, the research has a direct impact on people's lives.'

This summation could not be more accurate. As I write this, US President Donald Trump's administration is ploughing on with devastating reversals of climate policies. At the same time, environmentally conscious social media users are sharing a slew of articles citing a new study by the JRC which says that if global warming continues to go unchecked, 'a new super heat wave of 55°C can regularly hit many parts of the world, including Europe and the United States.' After the heatwave 'Lucifer's' rampage this

summer, these words ring truer than ever.

With work like this going viral, the JRC's role and responsibility is starkly clear. When I was invited to visit the Ispra site by the Malta Council for Science and Technology (MCST), Dr Melchior Cini explained how five inspiring Maltese scientists would be given the unique opportunity to not only get an inside look into its functions, but to present their own research to their European colleagues. I could not get on that plane fast enough.

THE CHOSEN ONES

With the support of the Executive Chairman of the Malta Council for Science and Technology (MCST) Dr. Jeffrey Pullicino Orlando, the Malta Young Scientist Award was set up to encourage exchange and to share Maltese research with our European counterparts, contributing to the JRC's mission. The application process consisted of an initial screening and an interview, following which five winners were handpicked for a study visit to the JRC's site in Ispra, Italy. And so the team was assembled: Dr James Ciarlò, Sephora Sammut, Joanna Vella, Dr Shawn Baldacchino, and Dr Vanessa Petroni. 'They all work in different areas—climate, rare diseases, geology—which will make things very interesting,' Cini said. And he was right.

Talking to Ciarlò about his work on climate projections, he honed in on a specific problem we have in the simulation of the atmosphere. At the moment, significant assumptions are being made to simplify the task. 'There are so many organic chemicals, all going through so many changes in

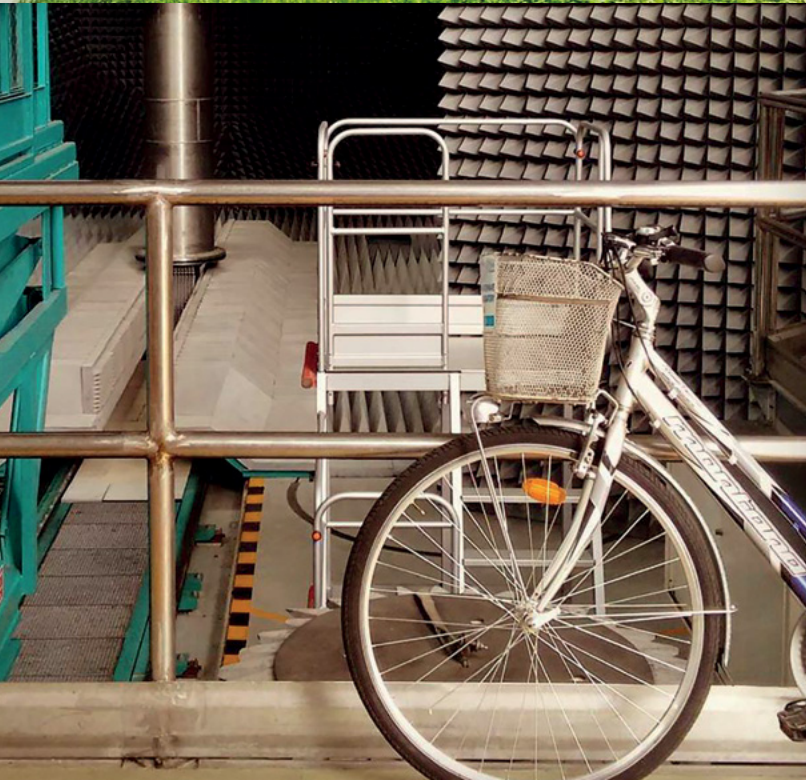




Detail of the state-of-the-art anechoic chamber at the European Microwave Signature Laboratory at the Ispra site

The grounds at the Joint Research Centre's site in Ispra (left)

Photos by Cassi Camilleri



Reaction Wall at the European Laboratory for Structural Assessment

Entrance to the anechoic chamber at the European Microwave Signature Laboratory at the Ispra site (left)

Photos by Cassi Camilleri



their atmospheric lifetime, and all of them influence weather—it's almost impossible to monitor. Most of the time they complicate studies, so they are put aside,' he said. However this creates a problem with accuracy in predictions, so Ciarlò developed a state-of-the-art Regional Climate Model that introduces the organic chemical processes as well as the physical properties that cause these particles to affect our climate.

Sammut picks up the environmental baton with the first study on Maltese pocket beaches, a very important part of our landscape. Her paper shed light on beach sediment dynamics and how beaches change over time. Wave exposure, geological background, and coastal configuration were found to be important components,

It would be great if we could have some more Maltese minds in some of our sites

but more investigations need to be made in this field to fully understand the ramifications of changes to our coastline and how to protect them.

The rest of the team, Petroni, Baldacchino, and Vella, are dedicated to medicine. Petroni and Baldacchino both made research advances in cancer. Through genetic profiling on cancer strains, Petroni discovered novel therapeutic approaches to improve the targeting of breast cancer cells and improve response to therapy. By combining different drugs and treatments, she found that less of each would be needed, thus reducing side-effects associated with each and improving patients' quality of life. Baldacchino, on the other hand, used biomarkers, features specific to a particular cancer cell that are measured to define different cancer strains, to identify and better diagnose lesser-known cancer strains. Finally, Vella is tracking mitochondrial disorders through time and tracking their prevalence in the Maltese population, all this with the intent of generating a genetic profile for Maltese citizens.

SHARING IS CARING...

Upon arrival at the JRC, we were welcomed by tall trees, a carpet of green grass, and a bold red Maltese cross. The visit coincided with the last few weeks of the Maltese semester, during which Iain Formosa and Romilda Manicolo organised events to share Maltese culture and traditions with colleagues. It was quickly pointed out how the pair were the only Maltese people in the 3,000-strong workforce in Ispra. 'It would be great if we could have some more Maltese minds in some of our sites,' Formosa said, expressing his great support for our researchers' visit and the work they were presenting.

Indeed, this feeling was shared by most everyone we met at the JRC. As part of the visit, Ciarlò, Sammut, Vella, Baldacchino and Petroni had the opportunity to shadow leading scientists in their respective areas. From the JRC's Air & Climate Unit, Dr Luca Pozzoli and Dr Srdan Dobricic, whose work involves monitoring pollution, emissions, and air quality for the benefit of EU citizens, said that 'while we do not run atmosphere





@EuropeanUnion, 2017

simulations ourselves, we collect outputs from different models and different countries, and try to compare these outputs with observations to validate or make estimates.' In fact, he added that 'that is one activity we are going to present to James. It could be interesting for him to contribute to in future.' The aim is for this data to inform policy and country responses.

Similarly, Sammut found plenty of common ground at the Water & Marine Resources Unit where, as Dr Diego Macías explained, numerical modeling tools are developed that allow them to simulate the conditions in European seas under different scenarios. 'This can be applied to climate change and political scenarios. We try to understand how different options in the marine environment will affect the service and the ecosystem.' They were a vital part in the development of the EU's Common Fisheries Policy, which outlines member states' quotas for the amount of fish they are allowed to catch. Through various market interventions, the EU is encouraging the fishing industry while making sure that their activity remains viable for the fishermen of tomorrow.

Lab visits followed, capturing the interest of Vella, Petroni, and

Baldacchino. Guided by Dr Pascal Calpo, they were introduced to the facilities that enable the understanding of nanomaterial properties and their interactions with biological systems. The equipment is needed to support the safe and sustainable development of nanotechnology in today's society. Other labs I saw were the European Microwave Signature Laboratory, home to a state-of-the-art anechoic chamber used mainly to test wireless communication systems, and the European Laboratory for Structural Assessment, which works on the harmonisation and risk mitigation in construction.

What is impressive here is that the labs at the JRC are being opened to researchers all over the continent. Access to the laboratory is being offered to researchers from academic, public, and industrial laboratories based within EU Member States and Horizon 2020 associated countries. The prospect is brilliant—many Maltese researchers expressed interest.

CLIMAXES AND OTHER MATTERS

The highlight of the visit was the Maltese scientists' presentations. As

the crowd was gathering, among them JRC's board of governors, Director General Vladimir Sucha opened the floor for Malta's researchers. He stated that this was an excellent opportunity for Malta's voice to be heard through their research. Following his thanks, the five chosen ones took centre stage and shared their work to much applause.

The Malta Young Scientist Award was a great opportunity for the UM's researchers, both to bring their valuable work to light and to create links with European colleagues. The ultimate result will be these young researchers joining the team at the JRC in future, representing Malta as they contribute directly to the effort to inform policy at the local and European level.

The human race has an insatiable hunger for knowledge. As centuries roll on, it shows no sign of abating, with new discoveries bringing forth more questions than they answer. What is certain is that facilities like the JRC and the bright minds of the researchers housed within are certain to help us work through them one by one. Time could not be more pressing. **T**

Read more:
<http://bit.ly/2i0ToDF>

START UP

Foody Indulgence:

• THERE'S AN APP FOR THAT! •



*Cooking for others has become increasingly complex these days thanks to ever more diverse dietary requirements. **Monique Chambers** talks to **Jessica Edwards** about her perfect solution.*

Dinner parties can be daunting. The new people, the small talk, the etiquette. It is a social dance many find challenging. Me? I'm a shy vegetarian who also happens to be lactose intolerant.

Being invited to a dinner party is not something I particularly look forward to. I have to beg for options with no meat, no fish, and no cheese and then watch the host's face drop, instantly regretting their invite. I usually end up being served a lettuce salad with a side of resentment. But now... there is a solution.

Monique Chambers is the mind behind an application called Indulge Me FOOD. The app allows hosts not only to send out invites to their dinner guests and receive their RSVPs, but also stores their food preferences and intolerances ahead of time, meaning the host can cater for all 'picky' eaters present. The app cleverly provides recipes that account and accommodate for everyone's intolerances.

Monique has been working in marketing and PR for 25 years, technology marketing in particular. It was during this time that she developed an appreciation for all things 'lovely and nice'. And that was where the Indulge brand started. The philosophy behind it is one of self-appreciation, the idea of treating yourself and enjoying the 'nice' things in life. The brand includes books, a magazine, property, and apps.

The first app is based on the idea of having a wish list that can be seen by others. The inspiration? 'So you know when your boyfriend buys you

something and it's the wrong size, the wrong colour. I had had enough of that and decided to go down the route of creating an app around it,' Monique says. And thus the Indulge Me GIFT app was born. Since then, it has been downloaded thousands of times and travelled to 110 countries.

After the success of the Indulge Me GIFT app, Monique was ruminating over new concepts. At this point she was working as part of the marketing team at the Knowledge Transfer Office (KTO) at the University of Malta (UM), helping start-ups get their message across correctly 'from tech to human'. It was then that her thought to merge algorithms and hosting elaborate dinners emerged. How great would it be if you could have an easy way to invite all your friends, gather their RSVPs and their food intolerances, and find the right recipes that would cater to all those dietary needs at once? This train of thought set the ball in motion.

Looking to focus on her new app idea, Monique left her position at the KTO and dedicated herself fully. A year later, in 2016, Monique's plan was set, and she sent in her application for the UM's TAKEOFF Seed Fund Award. Hard work paid off: she was awarded the funds and became an incubatee. With this came the opportunity to read for a Masters in Entrepreneurship at the Centre for Entrepreneurship and Business Innovation, with the Indulge Me FOOD app as her major project.

The venture began with research. 'You have to research, research, research. The first app I made ▶



1. Monique Chambers

2. User Interface Design for Indulge Me FOOD. From left to right: Sending invitations - Grocery List - Suggested Recipes

[Indulge Me GIFT] did okay, but I didn't do any research. You need to make sure no one is doing the same thing and that you're getting the most out of the app,' she says. 'I just thought it was a good idea and that was it. That approach was a missed opportunity. Although it did well, I could have done so much more with it.' With that lesson learnt, she joined forces with British Panel Research agency FLY to find out more about people's entertaining habits and how they felt about this new level of nutritional diversity in today's social circles. The results confirmed some key points. 94% of hosts do not know what brands to buy for certain intolerances or diet restrictions. 54.4% of hosts are unhappy to create a separate meal for friends with dietary restrictions. They also found out that 40% of hosts use messaging services to invite guests, which makes it more difficult to keep track.

54.4% of hosts are unhappy to create a separate meal for 'intolerant' friends


Following that, Monique sat down and considered her skillset. 'I always want to avoid being a jack of all trades,' she says. Despite the budget restrictions, she brought a number of experts on board who could handle different areas in app development. UK-based lead generation agency Buying Time took on the role of finding an audience. She also hired development studio JustSomeCoding to build the app with assistance from SWITCH for branding. 'I worked with both for the Indulge Me GIFT app and a couple of other projects,' she says. 'Relationships started in 2011 when I worked with them on adverts from their clients which were included in Indulge magazine,' Monique states, highlighting the importance of keeping connections close and networks growing.

The app came together and is now receiving its final touches. The way it works is that hosts send

off their invites. Once guests receive the invitation, they fill in their profiles, unless they have done so already, along with their eating restrictions. Once everyone has accepted the invitation, the host gets a list of everyone that's accepted and a list of their intolerances. From there, they would be presented with menu suggestions that cater for all of the intolerances at once. 'Recipes usually only cater for one particular eating restriction, these would cater for all of them,' Monique says, eliminating the need to make multiple dishes.

Indulge Me FOOD is not only appealing to hosts. Monique is currently in talks with retailers to find partners who would like to offer the app to their customers exclusively. This means that these business partners would be able to build a repository of their own products which clients could refer to, related to their recipe of choice. This way, the app would also be able to provide clients not just with a set of recipes, but with an easy-to-follow shopping list tailored to the retailer and the items it stocks. For the time being, the app is being offered to foreign companies because Maltese retailers are not big enough. That said, it will be available in app stores for local consumers to use. 'Often people go to more than one shop to get what they need, unlike abroad, where you can usually find all you need in one shop, including homeware,' says Monique.

Through this journey, Monique has done away with some outdated anxieties. She says she is now happy to talk about her ideas openly, doing away with 'paranoia'. 'Having an idea is one thing, making it happen is another entirely,' she says. Not to mention how people can sometimes point out things you overlooked. 'A friend mentioned religious diets and the restrictions that come with those. It was an area I hadn't even considered. And I should have,' she says, 'The world is a very small place.'

Besides making it easier for the host to organise dinner parties, this app will definitely help in making all the guests feel included. I look forward to the day I can enjoy a dinner party and stay late because I no longer need to nosedive into the fridge at home. 

LAB TO LIFE





Running with ideas

Prof. Joseph N. Grima's work on auxetic metamaterials has been lauded the world over. Now that NIKE has released a shoe with an auxetic sole, he talks to **Clemens Uhl** about his thoughts on sharing knowledge.

Many innovators look to nature for inspiration. When Swiss electrical engineer George de Mestral was on a walk with his dog in 1941, he noticed how cockleburs in the woods clung to his companion's fur. This inspired him to develop the fabric hook-and-loop fastener we now know as Velcro.

However, there are also times when researchers sit in their lab and manipulate existing structures and materials for so long that they eventually end up with something that has properties rarely seen... even in nature.

Most materials in nature stretch and narrow when pulled; cloth, rubber bands, plastics all of them behave this way. Auxetic materials don't. They have what's called a negative poisson's ratio. When stretched along an axis, they grow fatter in a direction perpendicular to the direction of the force; when they are pulled they grow wider.

Leading the way in auxetics in Malta is Prof. Joseph N. Grima, whose interest in interdisciplinary research directed him to work in that field years ago, at the time unaware of how important it would become. When reading for his Ph.D. at the University of Exeter, Grima was introduced to the principle of auxetics by Prof. Kenneth E. Evans, who coined the term.

THUS THE JOURNEY BEGAN...

The counterintuitive nature of auxetics appealed to Grima's creative mind. 'Imagine sitting bored in a restaurant waiting for your food. You take three toothpicks, arrange them like an arrow and connect them at the tip. If you start pulling the shaft, the outer legs extend horizontally, creating a design which expands in each direction. It becomes auxetic.'

By arranging several connected arrows next to each other, he created a lattice of star shapes. ➔

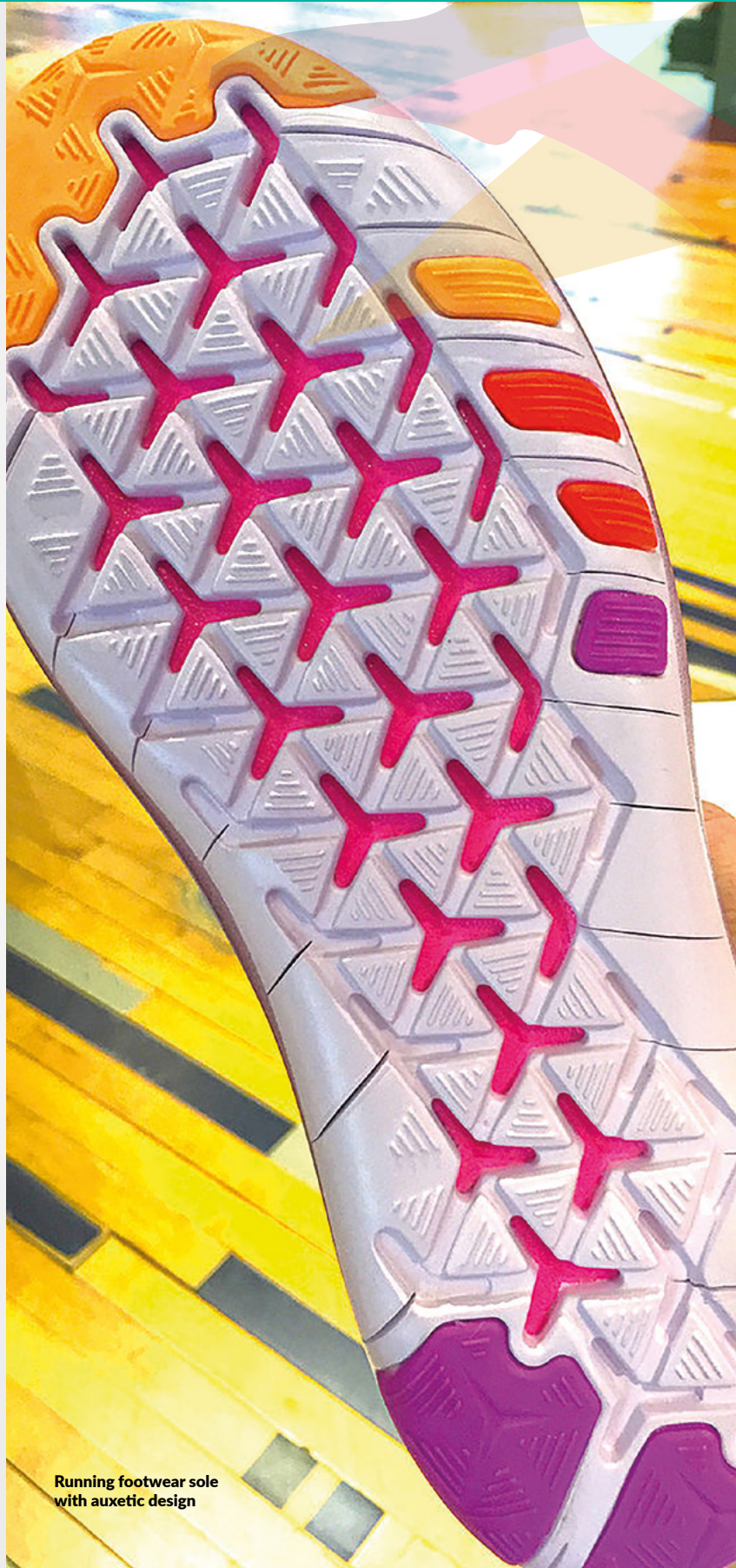
Within those stars, in the negative space, he identified the basic forms underpinning them—triangles and polygons. It was then that Grima moved away from working with sticks and came up with the idea of having intervened rigid units. This became the basic concept for all his future research.

‘Once I found a working model, I started generalising,’ explains Grima. ‘The next obvious step was to use squares.’ Grima used all sorts of materials to bring those models to life, from rubber carpets to metal, but the resulting structures proved unwieldy. They needed a better solution. And that came in the form of a mathematical model.

Translating what he was seeing in front of him into a set of equations would be Grima’s next task. With an optimised model, other researchers no longer need to wade through the endless jungle of possible shapes and patterns in order to find the golden solution for their specific problem. It was at this point that modern innovation brought with it the last piece of the puzzle—3D printing.

Testing an idea is always essential. The mathematical model was born out of the need to make fewer real-life metal and rubber models, but it did not replace actual testing. 3D printing now provides a very quick and efficient way to prove that a design actually works in real life. Using synthetic materials, objects get printed layer by layer, eventually creating a physical representation of the object. ‘When you see and feel a physical model, you can easily play with it and see how it works. It is basically the same when trying to understand certain mechanisms in science.

Developing such a shoe wouldn't have been possible without the open mindset of sharing knowledge.



Running footwear sole with auxetic design



Listening to facts preached by a teacher and doing sample calculations using cryptic formulas sometimes won't do the deal. Once performing a hands-on experiment, you really start to grasp the matter,' says Grima. 'Mathematical models and rapid prototyping now permit researchers to significantly optimise their designs like never before. You can just keep on tweaking, adapting, and printing it until you are satisfied.'

TRAVELLING BEYOND

Oftentimes, research stays in the lab; new technologies don't surpass the phase of prototyping. But that is not the case with Grima's work in auxetics. Taking advantage of the unique way auxetic materials react to pressure, NIKE just recently presented a running shoe with an auxetic sole that seems to be incorporating Grima's approach with rotating triangles. They promise a better fit, smoother movement, and a sleeker feeling proving that Grima's design works. 'When I first tried these shoes I was very happy to see that one of our first models developed got translated into an actual product, which feels great.'

Developing such a shoe wouldn't have been possible without the open mindset of sharing knowledge. For Grima, the University of Malta, or indeed any university, should be an open, innovative institution providing recent knowledge and sharing research for future use. Companies should be able to put together different bits of research and add their own ideas in order to produce new products, creating something bigger. 'If every little bit of research of the University were to be protected to the extent that practically nobody else could use it, then you would create a society where nothing could develop further.' This said, it also goes to show how relevant research at universities is to private industry, and how they would do well to support such work.

The next step for Grima is pretty straightforward. 'What I would like to see is more researchers contributing to building blocks to develop innovative products, which are then used by the people to improve the quality of their lives.' Shoes are but one concrete application for auxetic materials. Because of their ability to adapt to irregular shapes, there is a lot of potential for the use of auxetics in mattresses, car seats, and even safety hats. The higher resistance to impacts make auxetics very useful in production of protective gear which could save lives.

An important factor in all this, for Grima, is affordability. The products made should still be affordable for everyone, he says. 'What is the point in spending hundreds of thousands of euros on research which will be only be made accessible to a limited number of people such as the high-end sport professionals?' he questions.

When Grima started out, research in auxetics was still in its early days. After dedicating decades to this field his contribution has seen it make huge leaps, proving that research can travel beyond lab walls and have a very real impact on people's lives. With this sense of community in mind, Grima will continue to strive forward. **T**

THE MALTA COMMUNITY CHEST FUND

invests in medical research

Research Innovation & Development Trust (RIDT)



From its very inception, the University of Malta Research Innovation and Development Trust (RIDT) aimed to catalyse a societal culture change—to see funding for research and innovation receiving broad-based and sustained support, as well as donations from large corporate donors. Indeed, a few productive years later, a silent revolution is gaining momentum as Maltese society embraces this concept.

To underline this shift, there couldn't have been a more significant donor than the Malta Community Chest Fund (MCCF). The MCCF, under the patronage of the President of the Republic, is considered by many to be the people's philanthropic saving pot, the national piggy bank for good causes. It raises funds through its relentless campaigning and public generosity. Following in the steps of her predecessors, the current President, H.E. Marie-Louise Coleiro Preca, has taken this endeavour to new heights with L-Istrina, the yearly telethon fundraiser which hit the €5.5 million mark in 2016.

In December 2014, following an invitation by RIDT's CEO Wilfred Kenely, The President visited the University of Malta's research facilities and was shown some of the world-class research projects in areas such as breast cancer, brain-computer interfacing, and kidney disorders. Following that visit, the RIDT engaged with the Office of the President to identify research projects that would be supported by the Malta Community Chest Fund.

The first project to be funded was a study in the genetics of osteoporosis. Dr Melissa Formosa (Faculty of Health Sciences) is leading this project which, having conducted studies on animal models, is looking at Maltese families with members affected with osteoporosis in a bid to determine whether genetic factors also increase susceptibility to this bone disease.

The President's commitment has been re-endorsed with the signing of an agreement to finance a three-year National Eye Study to the tune of €132,000. The project investigates the incidence of eye disorders such as glaucoma and cataracts across the Maltese population. To date there is no reliable data available on blindness and common eye diseases. Led by ophthalmic surgeon and visiting senior lecturer Francis Carbonaro (Faculty of Medicine and Surgery), the project will be gathering data from 1% of the Maltese population aged between 40 and 80. The goal is to determine both age and sex-specific prevalence, and the cause of blindness and visual impairment in adults.

[It is a] 'distinct honour and great privilege to offer the full support of the Republic of Malta to the Research Trust'

PRESIDENT, H.E. MARIE-LOUISE COLEIRO PRECA

In her message to the RIDT, the President of the Republic spoke of her 'distinct honour and great privilege to offer the full support of the Republic of Malta to the Research Trust. My office is committed to help achieve the aspiration and values we share with the Research Trust to create sustainable economic growth as a means to social development and prosperity.'

The Malta Community Chest Fund has chosen to invest in medical research conducted within the University of Malta. In doing so, it is not only supporting the quest for research-based solutions to our daily challenges, but also sending a clear message to the Maltese community—investment in research pays. **T**



URBAN UTOPIA

Valletta 2018 Foundation

Valletta is living proof that major cultural and artistic events can breathe new life into the city. When Malta's capital

was granted the title of European Capital of Culture for 2018, all hands were on deck to prune and preen, reversing decades of decay to make it 'worthy' of such a prestigious title. Now, after years of intense effort, the hard work has paid off. City Gate now provides an appropriately magnificent entryway into Valletta. Dingy, long-shuttered venues have been restored and reinvigorated. The once sleepy city has roared back to life with the wealth of events being organised. Valletta is no longer a stop on the hop-on hop-off bus; it is a bustling melting pot of old and new with an inescapable siren song.

This shift has created positive momentum in the arts scene. But not all outcomes have been positive. Valletta's overhaul can look very different for the ones who call the city home. The burst of activities may have disrupted some people's day-to-day

business, while also contributing to the congestion and noise. The solution is in identifying ways to effectively balance the discomfort brought about by social change and the valued benefits that same change brings.

Finnish social activist, Jaakko Blomberg knows the struggle. He founded the NGO Yhteismaa (Common Ground) in Helsinki in 2012. Yhteismaa specialises in new participatory city culture, co-creation, and social movements. 'In the beginning, many municipal officers in Helsinki were against our events and projects; they just didn't have any procedure for handling them, so we kind of had to find a new way to do things.' Leaving room for people to share their ideas and expressing themselves is also essential, he says. 'There should be different kinds of roles and tasks for people to take on; all changes are scary, so it's important to inform people and make them feel like they're part of the process. For example, many people are prejudiced against street art, but when you explain more about it and give people the chance

to take part in the process, their attitude becomes much more positive. Organisers have to provide enough information and make participation easy. It's important that it's not just about a small circle of activists, but about the whole community.'

Closer to home, project leader of the *Gewwa Barra* initiative, Victor Jacono, tells us how Valletta residents often felt 'helpless and disowned of their spaces.' *Gewwa Barra* was created to address precisely that issue: to empower residents and give them ownership of their community, using artistic tools to get a glimpse at the cultures affecting their lives and help them express the needs and dreams that shape their experience in the capital city.

'We seek to encourage creativity, but also responsibility. We hold creative

Residents often felt 'helpless and disowned of their spaces.'



Gewwa Barra was created to [...] empower residents and give them ownership of their community, using artistic tools to get a glimpse at the cultures affecting their lives and help them express the needs and dreams that shape their experience in the capital city.




Victor Jacono



Jaakko Blomberg

workshops conducted by different facilitators and artists to give people the chance to look at themselves through the aesthetic lens of the artworks. Currently we are engaging the residents of Duwi Balli in a process of creative place regeneration, through a collaboration between architects Maria Cerreta and Franco Lancio, the Valletta Local Council, and the Valletta Services Directorate. It is not simply a matter of approaching the residents and asking them what nice things they would like us to do for them. It is a matter of asking them what they wish to express with our support, of providing them with tools and opportunities to respond creatively to the changes affecting their lived spaces,' Victor says. In 2017 and 2018 *Ġewwa Barra* is going to extend its reach even further in order to involve residents from across the capital city, with different artists conducting a series of creative workshops that will culminate in an exceptional performing arts event.

While Victor is realistic about the forward march of change, he believes it is unjust and unacceptable that changes are engineered by a handful of stakeholders, whose decisions everyone else simply has to accept—especially when such changes are going to affect Valletta's residents' lives dramatically. Much like Jaakko with *Yhteismaa*, he believes that the fear of change can be lessened if people are informed and included in the process. 'The voices of those stakeholders with lesser means need to be amplified and given the importance they deserve. The arts can contribute greatly towards this. *Ġewwa Barra* is not so much about single events, but the mainly bottom-up processes engaging the residents creatively. I believe it is the experiences brought about by such processes that will leave an important and long-lasting legacy with the inhabitants of Valletta.' 

Jaakko Blomberg and Victor Jacono are keynote speakers at the Valletta 2018 conference titled *Living Cities, Liveable Spaces: Placemaking & Identity*. More information on this conference can be accessed at conference.valletta2018.org. Registration ends on 12th November. Discounted rates are available for students.

LIGHTS, CAMERA ...AND KEN



Maria (Marieclare Camilleri)
from *The Isle*
Photo by David Pisani

Filmmaker **Kenneth Scicluna** originally wanted to work in computer animation but finally found his calling in film. **Veronica Stivala** joins him on his journey so far, which despite being rather distressing at times, is also one that brings with it some rewards.

Columbia University is one of the best film schools in the world. Number five on the *Hollywood Reporter's* rankings and with an acceptance rate of just 7% according to the *Columbia Spectator*, getting in is no mean feat. Filmmaker Kenneth Scicluna did, twice. Times were different then and, arts scholarships were non-existent. As a result, Kenneth had to renounce both times because he could not afford the substantial fees. Instead he turned to practical filmmaking, and so his journey began. Since then, he has become a member of the European Film Academy, had his films screened at some 70 festivals around the world, and has been named Best Local Director at the 2011 Malta Short Film Festival for *Daqqet ix-Xita*, a film which also received the Best Cinematography Award.

So what attracted him to film in the first place? 'The glamour,' deadpans Kenneth. He is indeed a witty man. He is also the only person—so far—to answer my emails with quotes from poetry, lightening the tone of what could easily become run of the mill exchanges. 'I think it's the length of the process, perversely,' he confides on a more serious note. 'As much as it can be a pain, there's attraction in the method of conceiving a thought and turning it into a story, and breaking it

down again, and then building all the happenings and voices in a script, and then re-shaping them when filming, and yet again when editing, and stringing all the pieces together, and finding that it somehow works. It is a very painful process that is so rewarding in the long run, that it somehow justifies the means, ruinous at times, to get there.'

Interestingly Kenneth, now 42, originally wished to work in computer animation. Having studied computer science at sixth form, he moved on to the only related course offered at the University of Malta (UM) at the time: computer science and mathematics. A year later, he dropped out and switched to communication studies and archaeology, finally settling on communication studies and sociology some time after. There were several catalysts for this change, one of them being the discovery of two books

at the library: *On Directing Film*, by David Mamet, and *Cinematography*, by Kris Malkiewicz. He reflects how 'although knowledge of sociology has served me well in my work, to an extent, in hindsight, English would have been a much better option'. Even with these 'missteps', through UM lecturer Louise Vassallo, he signed on as a production assistant on *Dust* (1996), produced by the late Sonny Monte and directed by his son Gratian. Looking back, Kenneth remembers how the experience was 'formative and informative. A few friendships formed on it have also lasted.'

From there, Kenneth started working on foreign films, all the while developing his own. He has a long list of credits to his name: *Genesis* (2000—written by Jean Pierre Magro), a film about a group of young people finding their way in the world, was the first Maltese feature film in decades to be invited to festivals abroad. *Central Express* (2003) saw him directing two short documentaries for Rai 3, one focusing on Caravaggio's sojourn in Malta, the other a meandering journey into the Gozitan genius loci. *The Isle* (2004—co-written with Jean Pierre Magro) for Zentropa's *Visions of Europe* tells the story of a foreigner who takes pictures of dilapidated buildings, inspired by Böcklin's cycle of paintings on the Isle of the Dead. With Marie Briguglio, he joined forces with ten other

Film can leave a mark, even if small, on the way people think, feel, and see the world. It is a risk, hopefully a calculated one.

Tafxnaf workshop
Photo by Matthew
Muscat-Drago

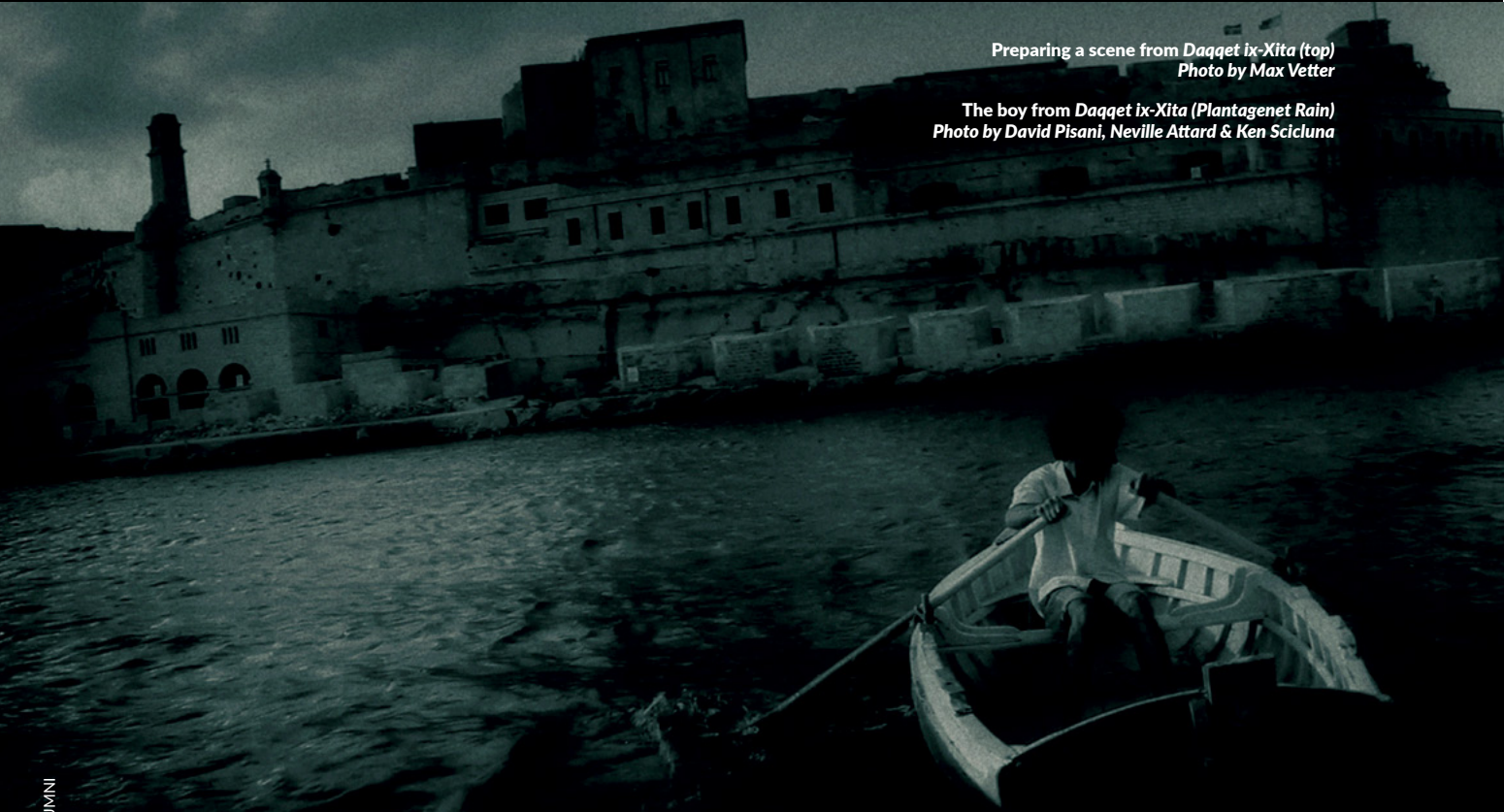


At the launch of Visions of Europe



Preparing a scene from *Daqqet ix-Xita* (top)
Photo by Max Vetter

The boy from *Daqqet ix-Xita* (Plantagenet Rain)
Photo by David Pisani, Neville Attard & Ken Scicluna



European directors for *Europe's Old New Faces*, a project supported by Looks Film+TV for Arte, where together they drew a picture of their country on the basis of national monuments. Then came *Daqqet ix-Xita* (2011), the first film co-funded by the Malta Film Fund, a disturbing yet oddly moving account of a young man's futile attempts to escape his mundane life. Finally, there's *Eleġġija* (2014), the first in a series of films inspired by Maltese poetry for Inizjamed in conjunction with the Valletta 2018 Foundation, which drew inspiration from Doreen Micallef's writings.

Speaking about what he thinks his strong points are, Kenneth finds he lives 'best in dark corners,' admitting his least successful attempt was in colour. 'I don't think I can do comedy,' he declares, noting how he likes narratives built around 'gaps, holes.' Elaborating further on this, he explains: 'I relish

Kenneth warns that anyone wanting to get into a similar career in film ought not to, 'unless you're prepared to face pain. A lot of pain. And financial misery.'

moments of ellipsis. My only issue,' he contemplates, 'is that sometimes the gaps in my films can be a bit too wide.'

Kenneth does not mince his words when asked what filmmaking means to him: 'A lot of uncertainty, and a lot of effort for little return. That is the stark truth. It's going out on a rough sea in a small boat.' But, he continues, 'what keeps you rowing, sometimes, is the belief that beyond the next crest lies something important: a concept, a happening, a face. And sometimes, you do find that face, that fleeting thought, that glimpse of a truth, and when you do, the seas calm down for a while, and it all seems worthwhile, and worth pursuing again. But there's also a lot of aimlessly rowing about, and getting wet.'


Indeed, a career in film is not an easy one. And a successful career in the industry means you must be ready to take risks and to believe in yourself. To this comment, humble Kenneth answers that, 'more than a staunch belief in myself—although there were a few surprising moments, like winning a mentorship award of late with a German-Iranian producer, and other such moments along the years, which suggested I just might have interesting goods to sell—it's a belief in film itself. A belief that a film can leave a mark, even if small, on the way people think, feel, and see the world. It is a risk, hopefully a calculated one.'

Did Kenneth ever have any down moments, any times when he felt like giving up? 'Yes,' he says, surprisingly adding how he tries to give up daily. But, thankfully, what keeps him from pulling the plug all the way out is a comment from his wife, feedback from a friend, and 'the dogged stubbornness that

somehow, someone, somewhere will find [his] work interesting'. For those thinking of starting a career in film, Kenneth warns them not to, 'unless you're prepared to face pain. A lot of pain. And financial misery.' For those stubborn ones out there still reading, Kenneth advocates to start with a solid education. 'Get a first degree in Communication Studies with a secondary area having a strong literary component. Further your theoretical studies in film at MA level—the MA in Film Studies at the UM is excellent in this respect, and then move on to a practical film school abroad.' Currently, Kenneth is reading for the MA in Film Studies himself.

To keep the wheels turning, Kenneth also lectures part-time with the Faculty of Media and Knowledge Sciences (UM) on the Development of Film Language with his mentor, Prof. Saviour Catania, as well as on Applied Media Aesthetics and Film Analysis. Beyond the bread and butter, Kenneth is also working on a wonderful project called *Tafxnaf* where he shares his film-making experience with 12 and 13-year-olds. 'It has certainly been very hard work and the cause for many a sleepless night, but seeing the children take an active role in turning stories, which they themselves have written, into short films is a very rewarding process,' he confides.

His latest project is a film adaptation he is working on with award-winning writer Clare Azzopardi—a process he is greatly enjoying, not least because of the sheer pleasure of working with Azzopardi.

Kenneth leads a busy life, but I end our interview by asking what he does when not working. To this, his reply is: 'Parenting. Or trying to, haplessly.' 

TO-DO LIST

MOVIE



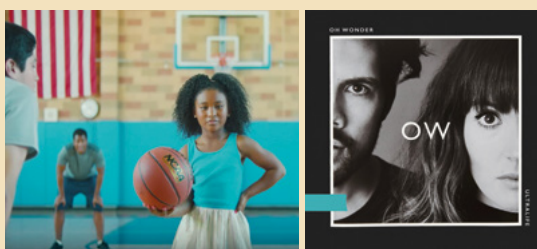
Praised for its scientific realism, **Moon** (2009) follows Sam Bell (Sam Rockwell) as he works through his own personal hell, just as he's nearing the end of a three-year, painfully solitary mission mining helium-3 on the far side of the Moon.

BOOK



A spectacular series of graphic novels written by Brian K. Vaughan and illustrated by Fiona Staples. Badass Romeo and Juliet in space—that is **Saga**.

MUSIC



The uplifting **Ultralife** by Oh Wonder celebrates love and life, beautifully capturing the 'ultra' feeling when someone or something turns life upside down.

TV



Ever wondered what the world would be like if the Nazis had won the second World War? Watch **The Man in the High Castle**.

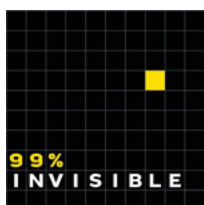
YOUTUBE CHANNEL

Everyone loves **Kurzgesagt**, and so do we. The animation is on point, and topics range from economics, to biology, philosophy, and more.



PODCAST

Design lovers, this one is for you. **99% invisible** handles a wide range of topics that tend to stay under the radar. The origin of revolving doors is a good one.



INSTAGRAM

Sam Spratt's client list includes Variety, Rolling Stone, Der Spiegel, Smithsonian, Gawker, Wall Street Journal, National Geographic, Angry Birds, Netflix, and Childish Gambino. This guy is special.





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Malta's Science & Arts Festival

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6PM TILL MIDNIGHT

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