

# spotlight

on research

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SEPTEMBER 2018

A CLOSER LOOK AT

# Islamic Finance

BEHIND THE RESEARCH

## Detecting HFMD: A Virologist's Race against Time

### HIGHLIGHTS

Nanotechnology in  
Harnessing Solar Energy

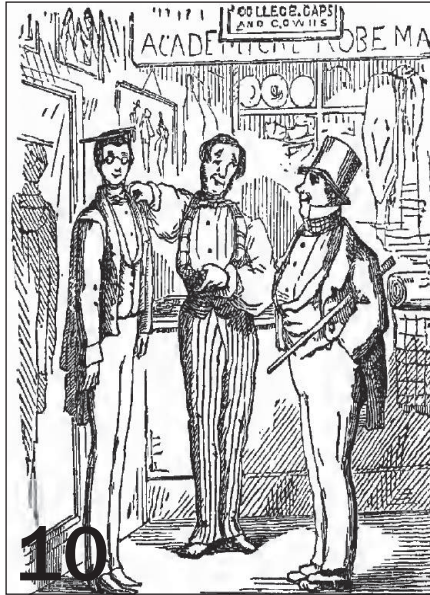
Could Low-Dose Radiation  
Be Beneficial for Us?

Finding Yourself on a  
Bench

Building Our Bridge in  
Diversity

Student Consumption and  
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An Ongoing Battle with  
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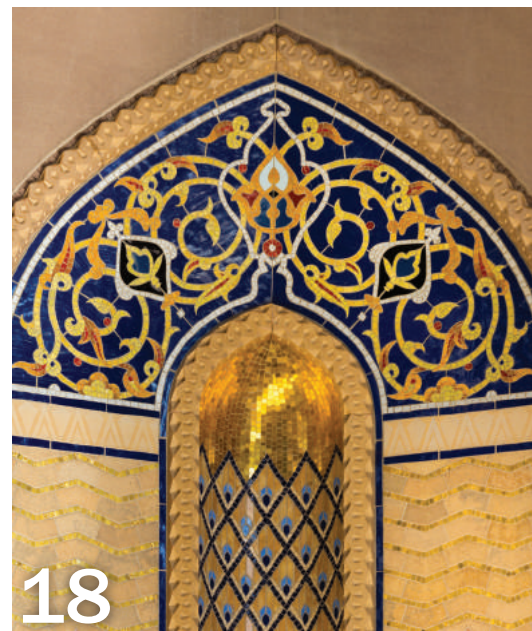
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## from the Editor-in-Chief



Welcome to *Spotlight on Research* Volume 3, the latest showcase of Sunway's diverse, multidisciplinary research.

In this volume, *A Closer Look At* features the fundamentals of Islamic finance — a concept often talked about but rarely understood. Professor Mohamed Ariff Syed Mohamed talks about what makes Islamic finance different from conventional finance and asks if it is only applicable to the Muslim community.

In the field of science and technology, *Spotlight* examines three areas — Professor Saidur Rahman's uses of nanotechnology in renewable energy; Professor David Bradley's thoughts on the potential benefits of low-dose radiation for humans; and Professor Poh Chit Laa's continued efforts in creating a suitable vaccine against dengue.

On the arts and humanities, we consider Professor Matthew Sansom's "existentialism from a bench" and discover Professor Sabine Chaouche's

"male consumption in 19th-century Oxford". We also hear from Professor Yuka Fujimoto on a new framework that has revolutionised how organisational inclusion and diversity are addressed at the contemporary workplace.

Adding to this eclectic mix is a special feature on Professor Poh, who has made vaccine and antiviral research her lifelong pursuit, and what fuels her passion for virology research.

These stories (and the many questions they ask) highlight our research expertise and reflect our continual commitment in seeking answers to real world problems. As you leaf through these pages, I hope you will enjoy reading the articles as much as we have enjoyed sharing them.

**Professor Peter Heard**  
Provost

# Nanotechnology in Harnessing Solar Energy

We use solar energy to power our heaters, electronic devices and vehicles. The idea of using solar energy is hardly new as attempts at developing solar technologies began as early as the late 19th century.

The solar energy industry however is beset with issues concerning its efficiency as a renewable energy source. The big question is, how can solar energy be harnessed more efficiently?

For Professor Saidur Rahman and his team at the Research Centre for Nano-Materials and Energy Technology, nanotechnology provides some answers.

Nanotechnology deals with structures that have a size range of 1 to 100 nanometres (nm). A nanometre is  $10^{-9}$  (a billionth) of a metre. For example, a strand of hair is approximately 100,000 nm wide and a red blood cell is approximately 10,000 nm wide.

At the nanolevel, materials begin to demonstrate entirely new properties — stronger and lighter — while systems can be made compact and more efficient.

Different types of nanomaterials such as oxide, nitride, ceramics, carbide ceramics, metals, semiconductors, carbon allotropies and magnets form the various materials used in different applications.

Size, shape and concentration of the materials are also used to control the desired properties for different applications.

Nanotechnology may be a new research field, but it is already showing tremendous potential across various industries such as medicine, engineering and even clothing. Owing to its wide range of uses and unique properties, the global nanotechnology market is expected to grow at a gross rate of approximately 17% during the forecasted period of 2017 – 2024.

In terms of renewable energy, nanotechnology is improving the efficiency, performance and life span of various solar energy applications such as flat plate, evacuated tube, concentrated collector, water heater, solar still, solar pond, solar desalination and solar thermoelectric cell.

The unique properties of various nanomaterials, particularly nanofluids, can indeed be used to increase the efficiency of renewable energy technology.

According to Professor Saidur, research shows that one gram of 5 nm nanoparticles has about the same surface area as a standard football field.

Considering this unique feature, we can say that when nanomaterials of different size, shape and concentration

**By changing the arrangement of atoms, nanotechnology may be able to produce new materials and systems with new properties and better performance.**

## The solar energy industry is beset with issues concerning its efficiency as a renewable energy source. Perhaps the solution lies in the smallest of things ...

are dispersed in a base fluid — like water, therminol, silicone or transformer oil — nanofluids are formed.

Nanofluids show remarkable improved properties than before and are useful for efficient heat transfer in various applications such as the refrigeration system, as they provide unique and improved thermal, electrical, chemical and optical properties.

The high thermal conductivity of nanofluids, says Professor Saidur, is one of the key aspects that make systems more energy efficient. Systems with nanofluids instead of the usual heat transfer fluids consume less energy and hence, have reduced operating costs.

With nanofluids, thermal systems can be made smaller, lighter and more energy efficient. In vehicles, smaller systems result in lower consumption of gasoline and fewer emissions and hence, a cleaner environment. Overall, heat exchangers like radiators, solar collectors and other equipment where nanofluids can be applied become lighter, stronger, faster, smaller and more durable.

In terms of harnessing solar energy, nanofluids improve the efficiency of photovoltaic (PV) technology used in solar

panels. In 2016, PV panels worldwide produced 77.3 GW of power, with crystalline silicon solar panels accounting for about 93% of total PV market share. The PV market is expected to be worth US\$345.59 billion by 2020.

PV technology generates electricity via solar panels made up of solar cells. As recorded by the Fraunhofer Institute of Solar Energy, the solar cell efficiency of PV panels in a laboratory setting is 26.7% for mono-crystalline cells and 22.3% for multi-crystalline silicon wafer-based cells. High concentration multi-junction cells also reached an efficiency rate of 46%.

At high temperatures however, the efficiency and life span of PV panels are reduced. When solar radiation is directed to the panels, solar energy is converted to both electrical energy and heat energy.

About 15% – 20% of solar energy is transformed to electrical energy while the rest is converted to heat energy, which overheats the panels and reduces their efficiency by 0.5% for every increased degree in temperature. Nanotechnology is able to overcome this issue of overheating.

Nanofluids serve as heat absorption cooling systems in effectively reducing

the temperature of the panels.

Nanotechnology-based optical filtering, which only allows a desirable spectrum of solar radiation to pass through, also raises the panels' efficiency by absorbing more solar energy.

As such, Professor Saidur and his team are working on improving the usage and storage of solar energy by integrating phase change materials (i.e. nanofluids) in photovoltaic/thermal (PV/T) systems.

Overall, the field of nanotechnology has great potential in harnessing solar energy though challenges like high costs, and the settling and agglomeration of nanoparticles, will need to be addressed.

The benefits of using nanotechnology are believed to outweigh the challenges in the long run. As we move towards building a sustainable world, and for Professor Saidur, nanotechnology is the future of renewable energy.

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# Could Low-Dose **RADIATION** Be Beneficial For Us?

**There is growing research that suggests low doses of radiation may actually have positive effects on humans.**

Nuclear power plants and incidences like Chernobyl and Fukushima have resulted in radiation phobia (radiophobia) — the fear that even the smallest dose of radiation is harmful.

Ironically, radiation is everywhere. We are surrounded by naturally-occurring background radiation caused by cosmic radiation and the natural deposits of uranium ores, thorium ores and unstable potassium isotopes in the environment.

Depending on which part of the world we live in, we are exposed to an average radiation level of 2 millisievert (mSv) per

annum — twice the radiation exposure limit (in addition to natural background radiation) set by regulatory bodies for the general public.

Why then, on the basis of epidemiology, are we not more affected by such constant environmental radiation exposure? Professor David Bradley, who heads the Centre for Biomedical Physics, seeks to answer this.

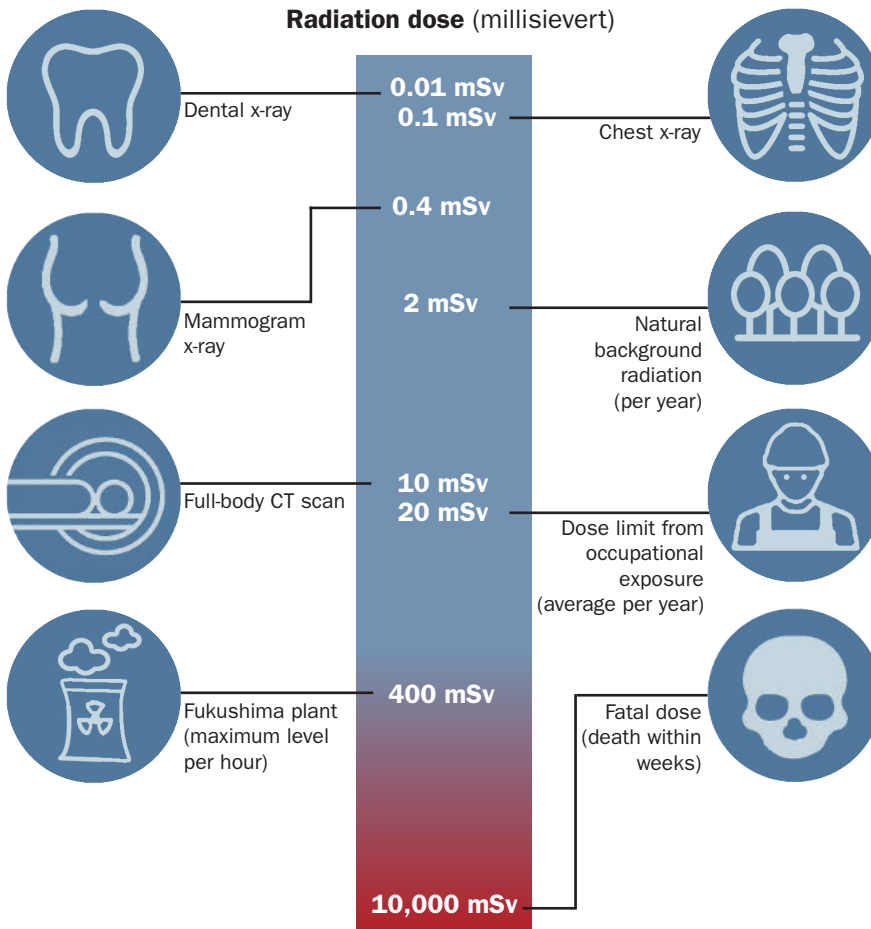
“We should relook the conventional linear no-threshold (LNT) model adopted by the International Commission on Radiological Protection which suggests

radiation exposure, no matter how small the dose, has detrimental effects and that response risk increases with higher doses.”

Professor Bradley, who has devoted 40 years of his career in radiation physics, is interested in radiation hormesis: the theory that low doses of radiation could have benefits.

“Is there perhaps some truth that we may reap beneficial effects from low levels of environmental radiation exposure such as improved health, greater immunity, stress tolerance, positive growth or longevity?”

**In fact, research has found low-dose radiation exposure to improve immune functions, foster cell production, suppress the ageing process and even slow down cancer progression.**



He cites a study in Taiwan which investigated spontaneous cancer deaths among 10,000 residents living in 1,700 apartments built using metals contaminated with cobalt-60. These residents, some of whom have been occupants for more than two decades, receive an average radiation exposure of 0.4 sievert (Sv) per year, more than 100-fold environmental levels.

The researchers expected the number of spontaneous cancer deaths over 20 years among the 10,000 residents to be 232. However, there were only seven deaths which is 3% of cancer death rate reported in the general Taiwanese public.

Additionally, of the 2,000 children living there, only three have congenital malformations which is 7% of congenital malformations rate reported in the

general Taiwanese public.

“These findings should raise some interesting questions for LNT proponents or at least, prompt them to ask *Why?*”

Air crew members are another interesting group that contradicts the LNT model. These individuals are exposed to increased doses of radiation as the higher the altitude, the lesser one is shielded from cosmic radiation exposure.

“We have not found reports about spontaneous cancer deaths among air crew members being higher than members of the general public despite the former’s exposure to greater radiation doses.”

The idea that low doses of certain toxic agents may be good for us is known as hormesis and its effect hormetic. The first clue of hormetic effects could be

traced back to King Mithridates VI, ruler of Pontus (now northern Turkey).

Fearing that his mother might poison him, Mithridates took small amounts of various poison to build his immunity against them. He eventually attempted suicide by ingesting poison but found it ineffective. Grigori Rasputin, the 19<sup>th</sup> century self-proclaimed Russian “holy man”, also adopted the same method to build immunity against poison.

In modern-day medical research, radiation hormesis is a novel attempt at boosting patients’ immune system and stress tolerance with the hopes of promoting positive growth and longevity. It may be a long way before radiation hormesis forms the basis for the invention of new disease-treating tools, but Professor Bradley is confident that his study will further the understanding of low-dose radiation.

He works alongside researchers of diverse disciplines in harnessing the hormetic effects of low-dose radiation to produce a new form of radiation medicine, among other avenues.

“Silo mentality is a thing of the past. We need to share our knowledge and collaborate with researchers from diverse backgrounds. For example, we need to see how low doses of radiation can help in the treatment of cancer or HIV. This is where and why we need the required expertise to conduct these investigations.”

Radiation hormesis is an area of great potential yet to be fully explored. Professor Bradley believes that his research could help the general public be better informed about radiation and diffuse radiophobia.

**Professor David Bradley**

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Park benches are an everyday feature in most parts of the world.

Typically, they offer respite for tired legs, a momentary break from the office or a moment's rest while the children burn-off excess energy. You might not think of them as the basis for art but for Professor Matthew Sansom, they have become just that.

*Park Bench Sojourn* is a multimodal research project which foregrounds artwork as a central part of its methodology. In the academic context, this is known as practice-based and practice-led research. It is an approach which recognises that in addition to science-based forms of empirical knowledge, there are other categories of knowledge and understanding accessible and expressed through arts practice.

For Professor Sansom, these kinds of knowledge emphasise notions of meaning and purpose, which he argues make this type of research, and the arts in general, essential to academic enquiry and university life.

This project is built around the activity of taking some time-out or a sojourn (i.e. a temporary visit) on a bench. The website [parkbenchsojourn.org](http://parkbenchsojourn.org), home to this digital media project, states that "Park bench sojourns are experiential and require participants to find a bench to sit on for the purposes of the sojourn. [...] You are invited to participate in the project through the selection of sojourns available, any number and type, as appropriate, per outing."

Professor Sansom describes how this project explores the ways in which our sense of "who we are" is shaped by the

digital technologies that determine so much of our everyday experiences.

It questions what it means to be human; surrounded, as we now are, by computer technologies and digital media, living lives which are perpetually "connected" and dispersed through the cloud. In particular, it reflects on how our technologically determined lives and lifestyles conspire against us to find opportunities to stop, reflect and be witnesses to lived experience.

The sojourns themselves vary in nature (the website lists 10 types), with each one emphasising a particular sense and kind of experience. For example, "audio sojourns" comprise listening to audio recordings made from other benches while "sight sojourns" require you to watch video recordings which silently replay views from other benches.

Choosing a "voice sojourn" allows you to listen to a disembodied narrator describing what they see, hear and experience from yet another bench. The various kinds of content are all available on your mobile phone through downloading or streaming.

Other iterations of the project, distinct in that a bench is provided for you, have included a multimedia gallery installation juxtaposing content from a variety of sojourns and a therapeutic VR version. Regardless of the format, context or specific content, all sojourns serve the same end — to provide a bench-based aesthetically reflexive moment-in-time.

At its simplest, the project is about awareness. In detail, each of the sojourns augments experience in a way that combines and contrasts the present and

embodied, with the absent and virtual.

The idea for *Park Bench Sojourn* arose from Professor Sansom's practice as a phonographer and sound recordist around 2011. Looking for ways to present audio recordings that included a contextual and conceptual element, he had the idea to curate audio recordings made from park benches. He did not act on this idea immediately though.

Between 2012 and 2015, he worked on an ecological-arts research project, *Landscape Quartet*, which explored the creative and theoretical possibilities of artistically interacting with the environment. Funded by the UK Arts and Humanities Research Council, this practice-based project resulted in a wide range of creative works including installations and performances (in galleries and in the environment itself including a Vietnamese rice field and a Swedish forest), as well as audiovisual works and journal articles.

The key aspect of this project was that he, alongside fellow researchers Bennett Hogg, Sabine Vogel and Stefan Östersjö, made sound art and music that were participative with the environment. It was this element that complemented and extended Professor Sansom's earlier ideas for what was to become *Park Bench Sojourn*.

In part, *Park Bench Sojourn* is a response to a tension in the *Landscape Quartet's* work related to a cautiousness towards field recording due to the ways recorded sound can become objectified and fetishised. Whilst sharing this concern, Professor Sansom's focus in *Park Bench Sojourn* is less about



intervening with the environment through art and more about participating with nature through everyday activities such as walking, stillness, watching, listening, feeling and reflecting.

*Park Bench Sojourn* moves away from the overt participation of *Landscape Quartet* as the means to recover our connection with the environment, and towards a simpler contemplative witnessing of our place within nature (not as something separate from us) and our experience of the world as it unfolds around us.

The final area of interest, a consistent focus in Professor Sansom's work, is in the links between aesthetic experiences

and changes in consciousness where we feel a "loss of self". Such experiences are well documented across a number of areas, in particular those related to creativity, arts and musical practices. Over a number of years his research has drawn on a wide range of ideas and in *Park Bench Sojourn*, the scope widens to include 13th century Islamic scholar and mystic Ibn'Arabi.

Complementing the idea that sojourns are simultaneously one thing and another (present and embodied, absent and virtual), Ibn'Arabi's esoteric thought on the metaphysics of unity explains that the mystic's view of True Reality, from which all things arise, comprises two different

angles — (1) as the Essence of all phenomena, and (2) as the manifestation of that Essence.

The idea that two subjective aspects of one reality can co-exist mirrors the heightened qualities of aesthetic experience as well as, argues Professor Sansom, moments when we retreat into more contemplative states which park benches, and park bench sojourns, both represent and enable.

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# Finding Yourself on a Bench

Sitting on a bench offers more than rest. It offers time to contemplate, reflect and experience.



# Building Our BRIDGE in DIVERSITY

Professor Yuka Fujimoto lived in Japan until she was 12, and then continued her schooling in Malaysia. By age 16, she moved to Australia and found herself as one of the few Asian students in her grade at a high school in the countryside of Toowoomba. “People didn’t understand why I ate rice,”

she laughs at the memory. “And black hair was something new to them.”

This memory, among other instances of being simultaneously surrounded and challenged by diverse cultural backgrounds, spurred her to conduct research in the field of workplace diversity and inclusion. Her goal?

Helping organisations understand their roles in creating a more inclusive workplace — and by extension society — for everyone regardless of identity and demographic background.

Diversity is more than being physically different from your peers. It is knowing that your perspectives and needs can be different from that of mainstream workplace and society. This is especially so for members

of the underprivileged or marginalised community who might not subscribe to a mainstream lifestyle.

Being on the lower echelon of the corporate ladder, it is easy for these members to find themselves in a *low power status*. When broken down, *Power* refers to one’s access to and control over resources whereas *Status* refers to relationships of deference or honour between groups. Receiving less honour, respect and access to valuable resources or even fair employment practices, they might be treated as just another cog for business.

While there are efforts to promote workplace inclusiveness, research shows that current diversity training programmes lack proper communication across the corporate hierarchy and do not always result in desired changes in employees. These programmes also tend to be one-off seminars and are often not attended by employees who need diversity training the most.

To create a workplace culture that is truly inclusive, we start by listening and valuing the opinions of everyone.

According to Professor Fujimoto, true inclusion means that organisations must be more intentional in involving *low power status* employees to make joint decisions for the organisation.

“Let’s not just gather them and hear from them, but let them participate with the mainstream.”

The typical decision-making process in any organisation follows a top-down approach where only upper management members make key decisions. However, this method usually sidelines the perspectives of *low power status* employees, inhibiting healthy communication between employer and employee.

As such, she conceptualised the *Organisational Diversity Learning Framework* to create more inclusive, cross-sectional conversations and overcome the shortcomings of diversity training programmes.

Based on her framework, employees — regardless of one’s title or role — get together to discuss topics that affect the whole organisation. This way, those who are least represented in the organisation will have contributed as much as those in higher positions or who are part of the mainstream workforce.

What happens in this process is a breaking down of walls in behavioural, cognitive and attitudinal domains. Everyone gets a say in the conversation and is exposed to each other’s viewpoints, perspectives and attitudes.

Employees who do not usually interact are made to actively listen to one another, nurturing a form of behavioural learning that invites them to interact with different social groups more frequently and to be more attentive and inclusive of their colleagues’ perspectives, feelings and attitudes.

Why take everyone’s opinion into account? How does that benefit an organisation? Professor Fujimoto found that by including people from marginalised backgrounds, organisations would be exposed to new ideas and fresh perspectives on how to further develop their businesses. Quite simply, businesses thrive where diversity is present and accepted.

Employees on the lowest rung of the ladder will also develop a greater sense of belonging to the organisation, higher self-esteem and sense of importance. These positive feelings will help advance their career, which in turn contributes again to organisational improvement.

“It’s the start of a healthy cycle. A win-win situation for everyone.”

Scandinavian countries are prime examples of how inclusive practices benefit the economy. These countries adopt nationwide norms and practices in promoting social equality for refugees and those with mental illnesses and physical disabilities in particular. Organisations are supported by such norms and simultaneously act on inclusion practices.

Scandinavian countries top the list of most inclusive economies in a 2017 study by World Economic Forum. Norway in particular, is ranked number one and has a gross domestic product (GDP) per capita of US\$89,741 — well above the average GDP of US\$44,656 reported for 30 other advanced economies. Professor Fujimoto believes we can emulate the practices adopted in this small country of only five million people.

Governments can only do so much to instate policies. It is practitioners who have the power to make positive changes to their decision-making policies. They can start by emphasising workplace diversity and facilitating more inclusive learning activities.

These learning efforts represent a crucial channel for lessening intergroup discriminations and increasing workplace inclusion of minority groups by providing equal decision-making opportunities to all employees. Diversity learning research will need to continue making trajectories

to maximise employees’ learning about the perspectives of others in ways that are free from social categorisations, prejudices and stereotypes.

“Imagine having factory workers and sales managers or department directors interact with each other to solve an organisational problem together; something as pivotal as new product development.”

She believes that organisations and businesses need to deal with the pressing issue of the widening of the gap between the poor and rich. The key lies in moving away from pure capitalism to inclusive capitalism. This is not an either-or situation; organisations can be profitable while being inclusive.

**Professor Yuka Fujimoto**

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# Student Consumption and Debt in Victorian Oxford



In 1877, then student at Magdalen College, Oscar Wilde was twice summoned by the University of Oxford proctors to appear before the University Court concerning a £30 debt involving fashionable goods. Wilde had ordered a felt hat, a superior suit and silk scarves from Joseph Muir, tailor and shoemaker of 34 High Street, as well as a gold collar stud and a sword and belt from George Ormond, jeweller of 118 St Aldate's.

Unpaid debts incurred by some male undergraduates at Oxford such as Wilde's were not uncommon and in fact, increased dramatically from the 1830s onwards. Such purchases suggest a craze for possessing, consuming and shopping for goods and were related to fashion trends and social pressures that are worth investigating.

Undergraduates from Oxford represented a particular group in British society that had its own characteristics. Students were part of the elite. They were bachelors and had neither yet undertaken any patriarchal duties nor confined to exclusively masculine tasks such as ruling the household and acting as "breadwinners".

They had no employment but lived off annual allowances from their families ranging from a hundred to several hundred pounds or, in some cases, studentships. They participated fully in the economic life of the University town by becoming customers; often compulsive consumers as numerous bankruptcy court cases suggest.

Students aimed to position themselves in their community by trying

## Examining male undergraduate consumer culture and trade in the famous University town during the 19<sup>th</sup> century.



to look like their peers, displaying the signs and habits of the upper classes while also expressing their own particular tastes and extravagance. They grew into future adult roles by managing their private interests and public image as well as developing a consumer experience with majority of them becoming prudent economic agents.

Professor Chauouche's recent research looks at juvenile agency, concentrating on the minority of undergraduates who ran into debt.

She reconstructs the different paths undertaken by young men, from their first steps into consumption to spending on a routine basis. She shows how a male consumer culture developed intertwining not only with the rise of competition between tradesmen, but also with the University reforms which, in the second part of the 19<sup>th</sup> century, allowed more students to live outside college.

She illuminates the connections between student consumption, University reforms, the city's growth and the development of trade. Whereas discipline and abstinence were promulgated by the University's philosophy and rules, students' social habits and urban life inhibited thrift. The proliferation of shops over the century and the prominence of local networks made Oxford an emporium of fancy commodities for students. In this sense, Oxford's retail environment was a strong incentive for students to overspend.

She also explains how tradesmen put in place marketing strategies, aggressive sales techniques and specific services to attract new students. "Touting freshmen" was a way for tradesmen to increase impulse purchases, gain the loyalty of their young customers and channel student demand.

Some undergraduates overspent, like Edward Nappleton Jennings who had a £1,865 debt. His case represents for instance the epitome of a phenomenon

which was partly linked to commercial rivalries and reveals the tensions which arose over the years opposing tradesmen, students and colleges. Tradesmen responded to the bad publicity their practices received while colleges refrained from interfering in their students' consumption, adopting a *laissez-faire* policy.

As Professor Chauouche points out, the development of market relationships and the methods of payment offered by tradesmen to undergraduate customers were also important. In 19<sup>th</sup>-century Oxford, long-term credit, much preferred by merchants, played a major role in the local economy. Purchasing facilities impacted on demand and encouraged excesses in consumption. They were used as a facility by many students and as a result, accelerated insolvency.

Adolescents have been somewhat neglected in historians' accounts of the social construction of masculinity, despite the fact that young men were active consumers in using the world of goods to create a specific self. Professor Chauouche therefore focuses on this aspect in the

context of youthful consumption, especially with regards to what being a "fast man" meant in undergraduate culture and what the "mask of masculinity" consisted of among students.

She provides an insight into the material world of underage students and analyses forms and modes of male consumerism. The study of the goods which were purchased leads her to argue that the concept of "gendered consumption" should be nuanced as students had indeed "masculine" and "feminine" tastes.

In conclusion, Professor Chauouche's study shows how some boys of the Victorian era who were to become adults and married men, became within a few years materialistic and consumerist and thus experienced — long before their wives — the pleasure and in some cases, the "addiction" of shopping.

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Credit: All images. Cuthbert Bede in *The Adventures of Mr Verdant Green*

# An Ongoing Battle With Dengue

To develop an effective vaccine against dengue, we need to first understand the limitations of existing vaccines and how to overcome them.

Dengue is a viral disease many of us, particularly in Asia, are familiar with. After all, more than 40% of the world's population live in endemic areas.

Statistics show that dengue cases have multiplied eight folds within the past 20 years, causing up to 390 million infections per year globally. Malaysia alone recorded more than 82,000 dengue cases and 171 dengue-related deaths in 2017.

Despite the prevalence of dengue, there is still no effective vaccine against it. This is mostly because the dengue virus has four serotypes — DEN-1, DEN-2, DEN-3 and DEN-4.

In Malaysia, the highest number of dengue cases involve DEN-1 and DEN-2, while DEN-4 has the lowest figures. In 2016 however, there was a sudden increase in dengue cases involving DEN-3.

According to Professor Poh Chit Laa who heads the Centre for Virus and Vaccine Research, an effective vaccine must be able to prevent all dengue serotypes from infecting the body.

“If you have been infected by one serotype and subsequently get infected by another, the pre-existing antibodies in the body from the first infection are not

able to recognise and neutralise the new serotype.”

The antibodies could instead increase the severity of dengue and may result in severe haemorrhagic fever, possibly leading to dengue shock syndrome and death. This is known as the antibody enhancement effect.



There is also the issue of T-cell immunity or “antigenic sin theory”. In this instance, the body’s T-cells respond to the first infection but are unable to effectively recognise and act on the second infection from a different serotype.

Dengvaxia (CYD-TDV), the world’s first licensed vaccine, is only partially effective against dengue. A tetravalent hybrid vaccine comprising yellow fever backbone, it mainly protects against DEN-3 and DEN-4. Research shows that it only has a 35% efficacy against DEN-2 and a 50% efficacy against DEN-1 in Asia.

In addition, Dengvaxia is effective only for patients aged 9 to 45. The Philippines government vaccinated children below nine years of age when they first administered the vaccine in the country. As a result, 14 children died and the vaccine was subsequently suspended in the country.

“Any novel vaccine must be effective for different groups of people.”

Professor Poh commented that two live-attenuated vaccines currently undergoing clinical trials — DENVax by Takeda and TV003 by the US National Institutes of Health — demonstrated good seroconversion (the time rate for antibodies against dengue to become detectable in the body).

“However, their good seroconversion is only for certain serotypes or particular groups of people. Their vaccine efficacy and genetic stability have also not been tested yet in the Asian population.”

At the Centre for Virus and Vaccine Research, there is a beehive of research activities to develop live-attenuated and synthetic peptide as well as vaccines antiviral and antiviral peptides.

For the development of a novel live-attenuated vaccine, Professor Poh says that the molecular determinants (or genes) of virulence in a virus genome need to be identified so that they can be replaced with more beneficial mutations through site-directed mutagenesis.

In this manner, the viral load of the mutated virus can be kept at low levels that are no longer harmful to the body. Instead, they serve as antigens to elicit antibodies against the virus itself and stimulate cellular immunity to produce cytotoxic CD8+ T-cells.

In addition to preventing dengue, Professor Poh and her team are also researching on ways to treat dengue more

effectively. They are attempting to produce an antiviral peptide that is chemically stable to protease (or gastric) digestion. If successful, the antiviral peptide can then be administered orally. The next phase is to look at how the peptide can enter into our cells with the help of nanoparticles or cell-penetrating peptides.

The team is also concerned with production costs as the higher the number of amino acids in the peptide, the higher the cost. Since the peptide comprises several amino acids, they are working on producing a truncated peptide with fewer amino acids just to see if it could still be as active as the parent antiviral peptide.

“By reducing the number of amino acids in the peptide, the cost of manufacturing will also be reduced when the product is eventually commercialised.”

Professor Poh hopes to collaborate with more local biotechnology companies to jointly evaluate and manufacture antiviral peptides and vaccines. In the long run, it might even be possible to make peptide drinks that patients can consume to treat dengue infections.

“We want to produce vaccines and antiviral peptides that can be consumed orally and are also commercially viable.”

“Not only that, the team aims to one day produce the first synthetic peptide vaccine or live-attenuated vaccine against dengue. Research has been promising so far.”

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# Detecting HFMD

## A Virologist's Race Against Time

The year was 2000 when an unprecedented outbreak of hand, foot and mouth disease (HFMD) in Singapore claimed the lives of five children. Professor Poh Chit Loo, then a researcher at National University of Singapore, felt herself grieving with a mother who lost two children to the disease. She decided to channel her research focus towards HFMD and its deadly enterovirus 71 (EV-A71). She has never looked back.





**I wanted my research to make an impact on lives.** After graduating from Monash University (Australia) in 1980 with a PhD in Environmental Bacteriology, I returned to Malaysia and Singapore to pursue my academic career. However, after seeing the massive HFMD outbreaks, I became interested in medical virology research particularly in developing antivirals and vaccines.

**HFMD had taken the lives of many young children in Asia since the 1970s.** In 1997, HFMD claimed the lives of 59 children in East Malaysia. In 1998, at least 78 children died in Taiwan. In China, statistics showed that HFMD claimed at least a few hundred lives and infected 1.6 – 2.1 million children each year. As a scientist, I could look at these figures as mere statistics but what I really wanted to do was help save young lives.

**I witnessed a family losing two children within a week.** I was a researcher in Singapore when the outbreak happened. I met a mother who lost two of her three children to HFMD within a week. They were only aged five and seven. The sight of her grief was heartbreaking. I knew then that I wanted to focus on the virus causing HFMD.

**Every second counts when it comes to saving lives.** In medical science, we have this maxim: Time is precious. We have to decide quickly on whether to admit a child in an outbreak. In those days, virologists abided by the gold standard of performing a tissue culture to detect the culprit virus, EV-A71. In the two to three weeks it takes for the tissue culture to be ready, and another one to two weeks to serotype the virus via neutralisation test, about 29 days would have passed. By then, it would have been too late for the patient.

**My main focus was to develop a quicker way to detect the virus strain.** In an outbreak, time is of the essence. I wanted to develop a rapid diagnostic test for the EV-A71 virus. I worked closely with paediatricians at the National University Hospital (NUH) and Singapore General Hospital. They were very supportive towards my work, knowing that I was trying to find a quicker way to detect the presence of EV-A71 strain in clinical specimens.

**Reducing detection time from 29 days to an hour.** My research resulted in the development of a rapid molecular diagnostic assay based on the real-time reverse transcription polymerase chain reaction (RT-PCR). Now, we are able to positively identify the presence of EV-A71 in clinical specimens within an hour, which can quickly guide clinicians in admitting children who need immediate clinical attention.


**Detecting the virus strain quickly is only half the battle.** There is still no FDA-approved antiviral or vaccine against EV-A71. At Sunway, I am supervising the development of live-attenuated and synthetic peptide vaccines as well as antiviral peptides for the prevention and treatment of EV-A71 infections. The wild form of EV-A71 virus is potentially very virulent, producing a high amount of viral particles that cause HFMD. By changing amino acids through mutagenesis, my team and I are trying to produce live-attenuated vaccines that are less virulent.

**Research should be about giving back to society.** I have always held on to the belief that in any research, it must positively impact lives. Scientists should ideally develop interests in research that can contribute to society and help bring the country's healthcare to the next level.

**Passing the baton to young researchers.** In ensuring continuity of best practices, I focus on sharing knowledge, skills and lessons learned with young researchers. I hope their hard work comes to fruition in the near future, and that someday their research findings will impact society in a meaningful way. After devoting four decades to medical bacteriology and virology research, this will be my greatest satisfaction.



*In 2014, Professor Poh was appointed Distinguished Professor in recognition of her work. She currently heads the Centre for Virus and Vaccine Research at Sunway University.*



# Islamic Finance

## The Way Forward

The principles of Islamic finance have been around for centuries but modern-day finance sectors still do not fully understand the advantages of Islamic finance.

Islamic finance, in its simplest terms, can be defined as finance with ethical considerations in the way financial transactions are conducted. Although the ethical principles embedded in Islamic finance are rooted in theological beliefs, Islamic finance is in fact a modern-day concept that only came about in the last 60 years.

The first few research papers on Islamic finance were published in the mid-70s. Today, such research is widely accepted as part of mainstream economics and finance, with many research papers published within the last decade in top scholarly journals such as *Journal of Banking and Finance* and *Journal of Financial Economics*.

“We have indeed come a long way. It is currently a small sector but the sector is expanding,” says Professor Mohamed Ariff Syed Mohamed from Sunway University Business School. With over 240 papers and books to his credit, Professor Ariff is a prominent researcher in the areas of accounting, economics, banking and finance, as well as Islamic finance.

His interest in Islamic finance started in 1989 out of mere curiosity but has since developed into a passion that fuelled his career. For the past 30 years, his research revolved around Islamic banking, capital market investments, *sukuk* (debt), money markets and *waqf* (endowments).

“Since my major works are in mainstream economics and finance, I am interested to see how mainstream theories in economics and finance can be applied to Islamic banking and finance. More specifically, I look into the impact of Islamic financial instruments on bonds, stocks and others found in financial markets.”

Islamic finance is rapidly growing worldwide but Professor Ariff believes that there is still a need to understand Islamic finance better in academia and across the industry.

Quoting the example of mainstream mortgage finance, he says that banks are just mere financiers with no risk sharing. This is different in Islamic finance whereby borrowers share in the risk of this financing. This leads to different meanings on how a contract is established and risk is shared.

“Sadly, this has not been fully recognised in practice by banks, as many do not yet understand the full precepts of Islamic banking.”

If the contract is based on the principle of risk-sharing between borrowers and lenders, then collecting a contract fee from the borrowers becomes an anomaly. Professor Ariff argues that fee for mortgage is a historical relic.

“Whenever a customer makes purchases, he or she is not required to pay a fee to purchase that item. Why then should a financier charge a fee in addition to benefitting from the difference between the sum paid with interest and the sum borrowed?”

Professor Ariff believes that modifications and reforms of modern finance practices in mainstream banking, finance and insurance sectors are required to make the financial system more stable and for borrowers to feel safer.

“We also need simpler solutions to financing without additional costs such as legal costs and auction fees imposed on borrowers. Lenders would also be protected under strict ethical lending via asset-backed lending, where money is

borrowed for a specific production purpose as opposed to consumption purposes.”

Asset backing as a principle helps to ensure that borrowers do not borrow far too much — a common issue that causes many indebted companies as well as governments to go under during financial crises (i.e. 1997 Asian financial crisis). For the Islamic mortgage model to be fully compliant as asset-backed, borrowers should not borrow more than the value of the assets in place, which acts as a natural limit on borrowing.

“The amount borrowed needs to be backed by the assets of the borrowers, not as a collateral because the assets are transferred to a company that is jointly-owned by the borrowers until the borrowed fund is returned. Risk is therefore, equally shared between the lenders and the borrowers.”

When borrowers default in payment, mainstream banks normally seize assets in joint-stock company via court approval. Under asset-backing principle however, lenders are protected as they are already joint owners of assets held outside the control of the borrower. Professor Ariff believes that this practice, if adopted by all parties, will make the financial system more stable.

Despite such equitable principles, he notes that the industry as a whole is still not giving needed attention to fully refining its practices.

“Most sectors, including the banks, have not come to a stage of fully understanding the principles and practices of Islamic finance. In fact, they are likely to consider Islamic finance as a work-in-progress with more to be learned, which augurs well for the future.”

# Islamic Finance in Brief

## The Six Major Areas

**Islamic Banking** The first Islamic bank was established in Egypt in 1963. It was later shut down due to political upheavals but the seed of the idea was planted. In the 1980s, Islamic banks began to grow across 76 countries mostly due to demand from 56 Muslim-majority countries. Today, there are over 60,000 mainstream banks offering financial products, with the more prominent ones being members of the Basel-based association. There are also some 250 to 300 Islamic financial institutions that are similar to banks. Collectively, these banks and financial institutions have developed close to 60 banking products and own total assets estimated to be worth between US\$2 and US\$3.3 trillion.

**Capital Market** The Islamic capital market grew later from applying several criteria to identify which of the approximately 400,000 stocks traded in some 125 stock markets are acceptable under Islamic doctrines of fair financial transactions. This began in the 1990s when the Dow Jones Group was approached by investors who

wanted a list of companies that conducted business in accordance with financial and production principles under Islamic legal requirements. This led to the birth of the Dow Jones Islamic Index, which lists companies that are compliant with Islamic ethical standards. Subsequently, 24 other countries including Malaysia followed suit in developing such market indices. Furthermore, mutual funds subscribing to the same principles started to sprout in several countries. As of 2018, there are some 388 socially responsible investment funds adhering to the same principles.

**Insurance Market** Mutual insurance, which has been carried out by joint-stock companies for centuries, is a new field in Islamic finance. Under the mutual insurance principle as introduced by the Puritans in the United States some 200 years ago, an insurance company is owned by policy holders and thus, all net profits are accrued to the insured. This stimulated the growth of mutual insurance in other parts of the world such as Japan

Professor Ariff's passion has driven him to collaborate with kindred scholars in producing a series of books that have made an impact on the formal study of Islamic finance worldwide.

"We received a seed funding of A\$306,000 from the Australian Research Council in 2006 as well as three Australian financial institutions with the express aim to publish authentic literature in the emerging field of Islamic

finance as a sub-discipline of finance."

Professor Ariff believes that the Islamic finance market, which is based on strong ethically-approved financial standards derived from Islamic religious doctrines, is slated to grow further. In the last 18 years or so, mutual funds are regrouping under the umbrella of "socially responsible funds" with principles that are broadly similar to the ethics advocated in Islamic finance.

Professor Ariff comments that focus should be placed on in-depth research to refine the practices that have been around for centuries and are now being examined in the light of modern-day methods.

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**Professor Mohamed Ariff Syed Mohamed**  
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and Taiwan. In the same manner, the Islamic equivalent of mutual insurance is the Takaful insurance, also known as Islamic insurance, which came about in the mid-1990s.

**Sukuk Bond** The mainstream bond market in some 120 countries around the world is worth a total of US\$150 trillion, doubling in size of the share market. Bonds help firms and governments raise funds for investments and are issued by various organisations while investors are the public lending to these organisations. The late 1990s saw the growth of the *sukuk* market, also known as the Islamic debt market, which is based on a risk-sharing principle with asset-backing by lender-cum-borrower to reduce the risk of default. Financial and tax laws in 18 countries have been amended to create a level playing field for this new market to grow under Islamic principles. It is estimated that US\$1.2 trillion worth of issues have been made to date. This is a market with big potential and is expected to grow rapidly in the coming years.

**Money Market** The base interest rates in an economy are determined by investors' demand for short-

term money market instruments widely known as Treasury bills. For 20 years, such instruments which are compliant with Islamic principles have been issued mainly for interbank transactions in the overnight and short-term end of borrowing. Malaysia and Turkey became the first two countries to issue Islamic money market instruments. The size of the money market is normally three times the size of the capital market of a country.

**Waqf and Zakat** *Waqf*, pronounced as *Waqaf*, is an endowment made by an individual (sometimes a group) to provide charitable assistance to the needy and the poor. *Waqf* contributions can be either monetary or non-monetary (i.e. land) and are used for social causes. In addition to *waqf* is the concept of *zakat*, which is money voluntarily given each year by the faithful — usually 2.5% of individual wealth — to the needy and the poor. Both *waqf* and *zakat* have been around for centuries as sources of welfare and it is only within the last decade that there is a growing attempt to manage these sources as potential assets that can better serve the community.



# Professorial Lecture Series

## The Business of Theatre in Eighteenth-Century Paris

by Professor Sabine Chaouche  
29 March 2018

In her professorial lecture, Professor Chaouche looked at strategies developed by the Comédie-Française to break down the commercialisation of Parisian performances of the 'Théâtres de boulevard' led by unofficial companies. The Comédie-Française was a playhouse with royal privileges and a hybrid administration. On one hand, it was under the control of the monarchy and the authority of managers from the

aristocracy as well as administrators. The playhouse was included in the House of the King and depended on its directives and policies; actors had to pay duties to the King by participating in Court entertainments in Fontainebleau or Versailles any time they were required or called. In this respect, the playhouse was involved in a form of "public business service" while also ensuring daily performances in Paris. On the other hand, the Comédie-Française was a private company involving self-management and self-maintenance — a family business even. Its main objective was to make profit. Actors had to reimburse their debts and the playhouse had to pay

their employees, suppliers and taxes to charities and the poor. It had to not only produce revivals but also new plays. It had ordinary but also extraordinary expenses (costumes, machines, etc.). Actors had to therefore attract as many customers as possible to make money, with their salary depending on the success of their seasonal programme and the crowd of the audience. Professor Chaouche showed how the management of the repertoire was correlated with policies aiming to increase the company's income. Actors tried to attract audiences by performing more new plays but "old" plays proved to be pivotal to the smooth day-to-day running of the playhouse, keeping it afloat.

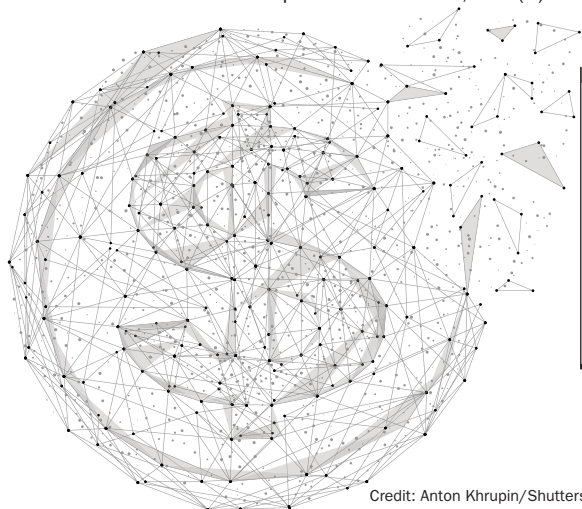
## Banks, Firms and Financial Markets: Connecting the Dots ...

by Professor Chaiporn Vithessonthi  
3 May 2018

The professorial lecture briefly touched upon issues related to whether or not (1) capital control policies are beneficial to the economy, (2) monetary policy and bank risk-taking affect financial markets and drive corporate investment, and (3)

a firm's investment decisions affect its performance. For example, taking the view of a monetary authority, one may argue that the imposition of capital controls should lead to more stabilised exchange rates, which hopefully in turn stimulate economic activities (e.g. outputs and employment). In his research, Professor Vithessonthi found that the tightening of capital controls has a short-run negative effect on stock prices and more importantly, increases exchange rate

volatility. After removing capital controls, the firms' cost of capital tends to fall. There is evidence to support the notion that monetary policy changes affect commercial banks' lending rate fairly quickly. The amount of bank loans moves inversely with the lending rate, which would have an influence on corporate investment. As bank systemic risk increases, corporate investment tends to be higher.



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## Notable Mentions

**Dr Jane Gew Lai Ti** was awarded Outstanding Woman in Science (Chemistry) 2018 at the Venus International Women Awards (VIWA).



The series showcases original research by Sunway's academics devoted to forging new grounds in their areas of expertise.

## Personality?

by Professor Hew Gill  
28 September 2017

All humans have a personality, but is personality the same across the world? Has human personality been the same throughout history? And is your personality the same throughout life? Using archaeological evidence, Professor Gill showed that the core of human personality has been historically consistent to the extent that we share aspects of personality with the

Neanderthals and other early hominids. However, the current dominant paradigm in personality research, the so-called Big Five Model (BFM) traits of Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness, does not explain some key areas of human behaviour and needs to be re-examined. Despite evidence that individuals inherit personality from their parents, it is also clear that personality changes across the lifespan and may be different across the world. Comparing the words used to describe personality in multiple languages

shows that there are more than five traits and suggests that human personality may have evolved as human societies have developed. The relationship between language and personality may make it possible for individuals to cultivate their own personality. We may also be able to design new techniques with a range of applications such as improving education, matching people to jobs better and even treating some mental illnesses more effectively.

## The Creative Process of Music Composition and Performance

by Professor Don Bowyer  
18 January 2018

When a composer sits down with a blank sheet of paper, or a blank computer screen, what is the process that leads to a completed piece of music? Further, how does that completed work become a performance? While this process most certainly differs from one composition to another (not to mention one composer to another), Professor

Bowyer discussed his own processes related to seven of his recent classical and jazz compositions — four of which were produced on commission. Originally composed between 2002 and 2016, all seven of these works were conceived for specific performances although each has been performed subsequently. Four of the compositions were in a modern western classical tradition, although each included jazz elements to one degree or another. The final three were jazz compositions. All had evolved over time from their premiere performances. Cumulatively, these performances involved the trombone, bass trombone, violins, viola, cello, bass,

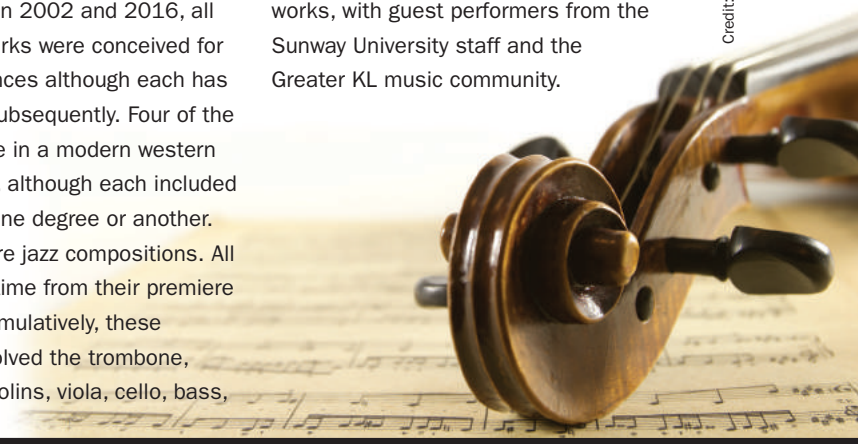
piano, soprano, jazz guitar, jazz bass, drum set and audience participation via mobile phone. The professorial lecture included live performances of these works, with guest performers from the Sunway University staff and the Greater KL music community.

Credit: senticus/Shutterstock.com

**Professor Saidur Rahman** received the Highly Cited Researcher Award 2017 by Clarivate Analytics, and Lifetime Achievement – Awards for Publication Citation at the 2017 i-Proclaim Annual Research Awards (ARA).

**Professor Mayeen Uddin Khandaker** received the Certificate of Excellence in Reviewing 2017 for *Nuclear Instruments and Methods in Physics Research Section B* journal by Elsevier.

**Associate Professor Dr Alvin Ng** received the National Outstanding Educator Award for Psychology at the Private Education Excellence Awards 2017.



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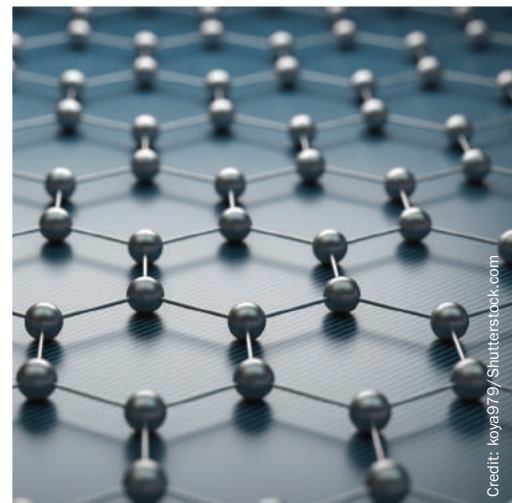
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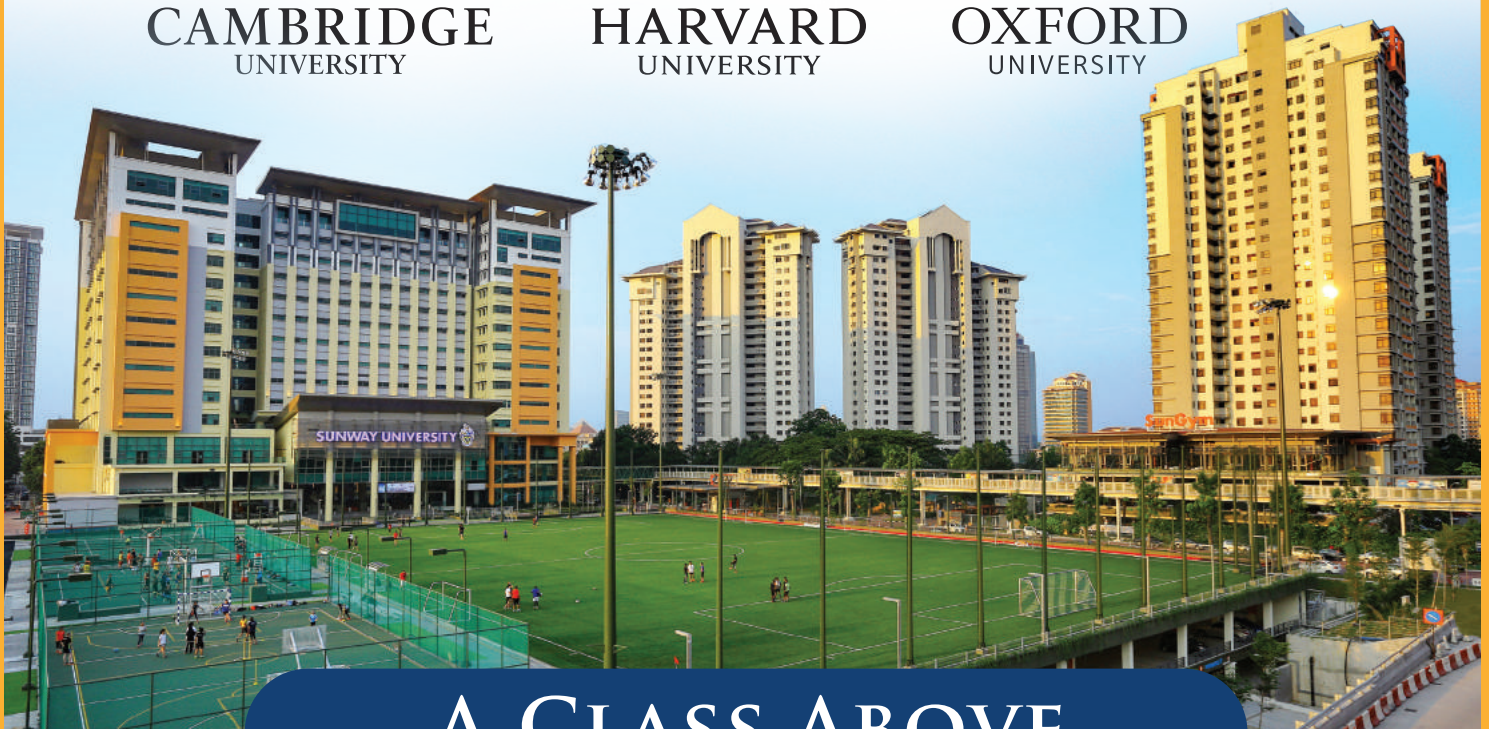
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