FLASHES

A MONTHLY MAGAZINE ON KNOWLEDGE AND DEVELOPMENT BY THE
MOHAMMED BIN RASHID AL MAKTOUM KNOWLEDGE FOUNDATION

MAY 2017
ISSUE 29

#YearOfGiving

National Space Program

The UAE launches an ambitious mission

OMAR M. YAGHI
THE SCIENCE OF MOLECULES

CELEBRATING LITERATURE
WORLD BOOK AND COPYRIGHT DAY

FAKE NEWS
THE PSYCHOLOGY BEHIND IT

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FOREWORD

Dear readers,

The UAE's ambitious plans for the future were highlighted by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and His Highness Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, when they launched the UAE National Space Program last month.

The UAE Mars project aims to reach the Red Planet in 2021, there are plans to send the first Emirati astronaut to the International Space Station in the near future, and the long-term goal is to build the first settlement on the Red Planet by 2117.

The National Space Program is just one part of the UAE's concerted efforts to build a knowledge economy based on science, technology, research and innovation. Future generations will play a vital role as HH Sheikh Mohammed bin Rashid made clear in an open letter he wrote to Arab youth in the inaugural issue of *Popular Science Arabia*. "It is imperative that we evolve, adapt, and learn at the same pace as our world is transforming. My message to the people of this region," HH concluded, "is not to wait but to seize the initiative. The time is ripe for scientific discoveries."

That the world is rapidly transforming is reflected in this issue of *Flashes*.

Robots and Artificial Intelligence create many opportunities, but they are also set to disrupt the job market. Fake news is challenging our perceptions, while new forms of advertising could turn the sky into billboards. NASA has received funding with the goal of sending humans deeper into space, while China is working on a new space station. Back on Earth the Bloodhound SSC project is planning to set a Land Speed Record in excess of 1000mph, but it's also successfully inspiring the next generation to get involved in science, technology, engineering and mathematics.

The UAE National Space Program, undoubtedly, will prove just as inspiring for present and future Arab generations.

Jamal Bin Huwaireb
CEO of Mohammed bin Rashid
Al Maktoum Knowledge Foundation

National Space Program Launched

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and His Highness Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, launched the UAE National Space Program and approved its strategy on April 12. The program, which will be executed by young Emirati cadres, was announced during a visit by Sheikh Mohammed bin Rashid and Sheikh Mohammed bin Zayed to the Mohammed bin Rashid Space Center (MBRSC).

The move is part of the UAE's ambitious space program as it aims reaching Mars in 2021 and building the first settlement on the Red Planet in 2117.

The Emirates Mars Mission (EMM) is set to launch the Hope spacecraft in July 2020 on a seven-month journey to the Red Planet. The UAE National Space Program also includes a new initiative to prepare Emirati astronauts. "Our National Space Program is a solid platform to prepare Emirati cadres specialised in airspace sciences, and qualify future generations that are able to contribute to humanity's knowledge," Mohammed bin Rashid said. "We plan to send the first Emirati astronaut into space over the next few years, and starting from today, we are preparing the first Emirati and Arab astronaut to join scientists at the International Space Station."

Sheikh Mohammed said that the UAE space program is a message to the Arab world that its sons are able to compete on the global level. "Our objective is to show the world that we are able to contribute to humanity through quality knowledge and scientific discoveries," he said.

Social Media Leader

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, was listed amongst the top 10 most followed and effective world leaders on Instagram, with followers reaching 2.35 million.

A report, published by PR firm Burson-Marsteller, revealed which leaders are the most followed on Instagram. Interaction with HH Sheikh Mohammed's account surpassed 6.6 million likes and comments, putting His Highness among the top 10 official accounts of 325 world leaders and governments.

This follows earlier reports that Sheikh Mohammed was among the top world leaders on various social media platforms such as LinkedIn, Twitter, Facebook, Instagram, YouTube, Google Plus. His Highness's followers on Twitter alone exceed 7.75 million.

Sheikh Mohammed is also ranked as one of the most influential world leaders on social media with a combined total of more than 15 million followers across various platforms. Each photo or video posted on Instagram by His Highness attracts an average of 35,966 interactions.

Sheikh Mohammed is one of the few Arab leaders who have harnessed the power of social media to build bridges of communication with the youth, whom he considers the future of the nation.

Seize the Day Message

"We live in a time of rapid changes, monumental achievements, and profound knowledge and discoveries," said His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, in an open letter addressed to young Arabs in the inaugural issue of *Popular Science Arabia* – the Arabic edition of the world-renowned scientific magazine *Popular Science*.

"It is imperative that we evolve, adapt, and learn at the same pace as our world is transforming. Above all, we must learn in our own language and within our own culture," HH Sheikh Mohammed added. "Our Arabic language has always been one of learning and science; it will not fail to absorb and adapt to the sciences and discoveries of our day. It can go even further to create superior technical terms that better represent modern inventions and developments. With that in mind, we have no second thoughts whatsoever in supporting the launch of the Arabic edition of *Popular Science* magazine – the most prominent scientific publication in the world."

HH Sheikh Mohammed reiterated his great faith in the people of this region, and his confidence that with their skills and aptitudes, "our culture will thrive, embrace the knowledge revolution sweeping across the globe and contribute to it in all scientific disciplines."

Popular Science Arabia magazine is a first step that will undoubtedly be followed by further measures and initiatives from figureheads, decision makers, stakeholders, and anyone with an interest in the knowledge and scientific ambitions of our region, HH Sheikh Mohammed explained.

"My message to the people of this region," HH concluded, "is not to wait but to seize the initiative. The time is ripe for scientific discoveries. Our ancestors built one of the most prominent civilizations in history: our youth are more than capable of restoring and advancing our cultural eminence."

MBRF Participates in UAE Careers Fair 2017

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) participated for the third consecutive year in the 17th edition of Careers UAE 2017, which was held at the Dubai World Trade Center from 9-11 April. His Highness Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum, Chairman of MBRF, officially inaugurated Careers UAE 2017.

HH Sheikh Ahmed visited the MBRF stand where the Foundation provided an overview for Careers UAE 2017 visitors of its projects, knowledge initiatives, and plans and objectives to inspire Emirati nationals to be part of MBRF's work in line with the UAE's Emiratisation strategy.

Careers UAE is one of the country's leading exhibitions in the recruitment and training of Emiratis with the participation of several companies, as well as local and international institutions. The three-day event provides a platform for more than 160 companies operating in the UAE to engage with freshly graduated citizens, and highly skilled professionals in various levels of their careers.

HE Jamal bin Huwaireb, CEO of MBRF, underlined the Foundation's commitment to participate in Careers UAE on an annual basis in order to achieve its strategic objectives to support and build national capabilities and competencies. Furthermore it is committed to providing UAE nationals with training programmes, as well as effectively integrate them with the Foundation's initiatives to build a knowledge-based Emirati society.

HE added: "Careers UAE is an ideal platform for the Mohammed bin Rashid Al Maktoum Knowledge Foundation and all institutions and government entities to communicate directly with the national talent and introduce them to the latest recruitment and training opportunities."

MBRF at Abu Dhabi International Book Fair 2017

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) successfully participated in the 27th annual Abu Dhabi International Book Fair, which took place at the Abu Dhabi National Exhibition Centre from April 26 to May 2, 2017.

The Foundation took part in the Fair in an effort to strengthen cooperation with leading cultural institutions, as well as Arab and international publishing houses. Moreover, the event offered a platform for the Foundation to showcase its literary, publishing and distribution initiatives, and projects.

His Excellency Jamal bin Huwaireb, CEO of MBRF, reaffirmed that participating in the Fair reflects the Foundation's keenness to keep communication channels open with the most prominent local, regional and international publishing houses, and to stay abreast of all happenings and best practices in the publishing and translation industries, and use them to advance the UAE Government's plans for a knowledge-centric society.

HE bin Huwaireb pointed out that the Abu Dhabi International Book Fair is an important international cultural event that gathers top-tier publishing professionals and experts in related fields such as e-publishing, printing, and copyrights. This offers participants in the Fair the opportunity to develop their plans and strategies, and to collaborate with the aim to develop Arab societies and create a knowledgeable and cultured generation.

MBRF's agenda for the Fair included events and activities that fall under the Foundation's many initiatives, such as the Dubai International Program for Writing and "Esteraht

Sayedat" (Ladies Lounge). These included reading sessions for children featuring children's authors who took part in MBRF's Writing for Children workshop, as well as book-signing ceremonies for publications issued by the Foundation under the Dubai International Program for Writing.

The Foundation also organised panel discussions tackling publishing-related topics. The most prominent of these sessions was titled "The Foundations of Cultural Discourse and Engaging Readers". In addition, the Foundation honoured the winners of the "Qesaty" (My Story) competition – which it launched last year in partnership with the Ministry of Education. MBRF also hosted several Emirati columnists, children's authors, and scientific content creators.

"Translation of Books and Publications" Workshop Launched

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) announced the launching of its "Translation of Books and Publications" workshop, as well as the conclusion of its "Writing for Children" workshop.

Both workshops were part of the Foundation's initiatives for the Dubai International Program for Writing (DIPW). The "Translation of Books and Publications" workshop aims to train a generation of qualified translators by attracting young, talented individuals to undergo intensive training from prominent experts in book translation. Meanwhile, the "Writing for Children" workshop offered training for writers looking to create literary content for children, based on tried-and-tested scientific methods.

His Excellency Jamal bin Huwaireb, CEO of MBRF, attended the press conference, along with Farah Al Muhairi, who manages DIPW; Kamel Youssef, trainer at the "Translation of Books and Publications" workshop; and Dr Wafaa Al Mizghani, trainer at the "Writing for Children" workshop.

HE Bin Huwaireb said that the DIPW has sought to catalyse the intellectual and literary movement in the UAE, the region, and the world, since it was launched back in 2013 following directives from His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. The program's workshops seek to attract talented writers from various literary fields and offer them the opportunity to train with prominent experts. The program additionally operates a global writers' exchange program.

"The Dubai International Program for Writing has added to its successful track record by launching the first-ever translation workshop," HE bin Huwaireb said. "The workshop trains a generation of qualified translators and, ultimately, enriches Arab libraries with content. The initiative also ties our societies to the cultural movements taking place around the world and helps us remain aware of international new releases and industry news."

MBRF further announced that registration for the four-month "Translation of Books and Publications" workshop is open and encouraged those interested to get in touch with the Foundation – particularly those with previous translation experience. At the conclusion of the workshop, the Foundation looks forward to publishing a collection of books translated by participants.

The press conference also saw author Wafaa Al Mizghani honour participants from the "Writing for Children" workshop, stressing that writing for children is no easy task; authors must create content that whets children's appetite to read, develops their language skills, and encourages critical thinking. The workshop divided the target age groups into early childhood, mid-childhood, late childhood, and young adults, and produced 14 children's books, as well as four young adult works that remain under revision.

ARAB READING INDEX 2016

SAUDI ARABIA

Reading Rank Overall: 3rd
Total Reading Time Per Year: 43 hours
2016 Sample Size: 17,561
Number of Arab Countries Sampled: 22

The Arab Reading Index (ARI) was first released in 2016 and aims to provide an objective assessment of the state of reading in the Arab region under the wider vision of the Arab Knowledge Index. As reading is the basic tool in knowledge acquisition, exchange, and dissemination this assessment is of primary importance. The Arab Reading Index focuses mainly on reading within the more general knowledge development concept, emphasising the role of reading as a tool for enlightenment and empowerment.

63%
EXTENT OF READING

43 hrs
Average of total reading (annual)

19
Average number of books read (annual)

58%
ACCESS AND AVAILABILITY

Reading matter sourced from

60%
Family

73%
School

42%
Society

AVERAGE TOTAL READING HOURS (ANNUAL)

Made up of

24 hrs
Electronic documents

18 hrs
Printed documents

18 hrs
Work related

25 hrs
Not work related

66%
PERSONAL ATTRIBUTES

95%
Skills and abilities

64%
Motivation

71%
Attitudes

AVERAGE NUMBER OF BOOKS READ

ابت
12
In Arabic

大A
7
In foreign languages

8
Work related

11
Not work related

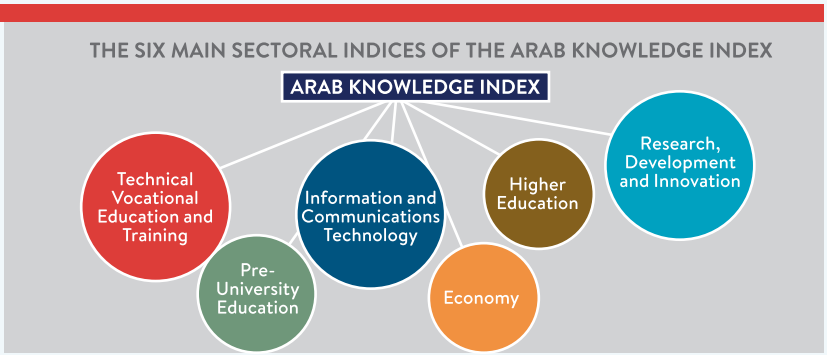
The Arab Reading Index is done in partnership by the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) and the United Nations Development Programme (UNDP).

2016 ARAB KNOWLEDGE INDEX

SAUDI ARABIA

Number of Arab Countries Sampled: 22

The Index, which was initially launched at 2015's Knowledge Summit, monitors the status of knowledge in 22 Arab countries to help decision makers, experts and researchers to implement development policies and identify knowledge gaps.



54% TECHNICAL VOCATIONAL EDUCATION AND TRAINING

Main pillars

27% Education and Training

54% Organisational Framework

73% Development context

69% PRE-UNIVERSITY EDUCATION

Main pillars

47% Enabling environments

83% Knowledge capital

73% General developmental context

69% INFORMATION AND COMMUNICATION TECHNOLOGY

Main pillars

68% Technological capabilities

71% Enabling environment

62% ECONOMY

Main pillars

57% Organisational performance and human resources

67% Competitiveness and creative development of the economic structure

71% Economy-related information technology

57% HIGHER EDUCATION

Main pillars

60% Higher education inputs

52% Higher education outputs

61% RESEARCH AND INNOVATION

Main pillars

60% Innovation

55% Research and development

70% Enabling environment and infrastructure

The Arab Knowledge Index is a joint initiative between the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) and the United Nations Development Programme (UNDP).

CELEBRATING

April 23 is UNESCO's annual World Book and Copyright Day that promotes books and literacy.

It was the idea of the Valencian writer Vicente Clavel Andrés to honour Miguel de Cervantes, the renowned Spanish author of *Don Quixote*, first on his birth date of October 7 and then on 23 April, the day he passed away. However, the literary connection to 23 April was more far reaching than that with it also marking the anniversary of the date of birth or deaths of William Shakespeare, Inca Garcilaso de la Vega, Maurice Druon, Haldor K. Laxness, Vladimir Nabokov, Josep Pla and Manuel Mejía Vallejo.

As a result in 1995, at UNESCO's General Conference held in Paris, it was a natural choice to designate April 23 as World Book and Copyright Day. Several UNESCO member states had already discovered that the establishment of a 'Book Day' – where the organization of events such as book fairs and exhibitions fell on the same day – was one of the most effective ways to promote and to disseminate books. Yet this idea had not yet been adopted on an international level.

In its Proclamation of World Book and Copyright Day, UNESCO noted that, "historically books have been the most powerful factor in the dissemination of knowledge and the most effective means of preserving it" and therefore "all moves to promote their dissemination will serve not only greatly to enlighten all those who have access to them, but also to develop fuller collective awareness of cultural traditions throughout the world and to inspire behaviour based on understanding, tolerance and dialogue."

The above factors are still central to World Book and Copyright Day. Irina Bokova, Director-General of UNESCO, says: "World Book and Copyright Day is an opportunity to highlight the power of books to promote our vision of knowledge societies that are

LITERATURE

inclusive, pluralistic, equitable, open and participatory for all citizens."

It is clear that World Book and Copyright Day has been a resounding success as it is celebrated by a growing number of partners annually. It is observed by millions of people in over 100 countries, in hundreds of voluntary organisations, schools, public bodies, professional groups and private businesses.

This success encouraged UNESCO to work on the concept of a World Book Capital City, with Madrid selected as the first Capital in 2001. This was so successful that it became an annual event. UNESCO invited the International Publishers Association, the International Federation of Library Associations and Institutions, and the International Booksellers Federation to participate in the nomination process, to ensure the three major branches of the book industry can participate in the decision.

This year's World Book Capital City is Conakry, which many regarded as an unusual choice as Guinea is one of the poorest countries in the world – it ranks 145th in the World Bank's league table for gross domestic product (GDP). However, Guinea was awarded stellar marks by health watchdogs for rolling back the 2013-16 Ebola outbreak with patient grassroots work, substituting for lack of funds and hi-tech help. UNESCO has similarly singled out community involvement and literacy programmes to explain why it made such a seemingly unusual choice for 2017 World Book Capital. Intellectuals in Conakry are hoping that Guinea's turn in the spotlight will bring desperately needed funds to boost literacy in a country where only 35 to 40 per cent of Guineans complete their education. Few people read books outside those required by school curricula.

As World Book Capital, Conakry gets the chance to showcase established and emerging literary talent, both from home and abroad, and to lure major book publishers. It is also a golden opportunity for promoting talent in other areas such as theatre, music and cinema.

"Books, learning and reading are key to human life," Bokova said after the announcement. "The strong investment of the Republic of Guinea in promoting

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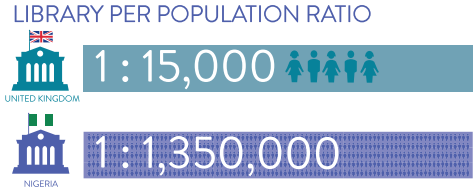
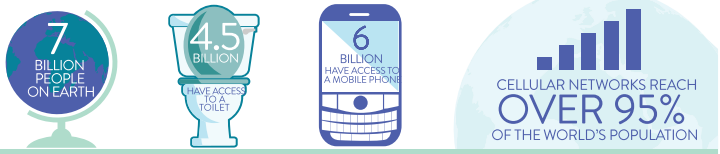
BOOKS ARE SCARCE



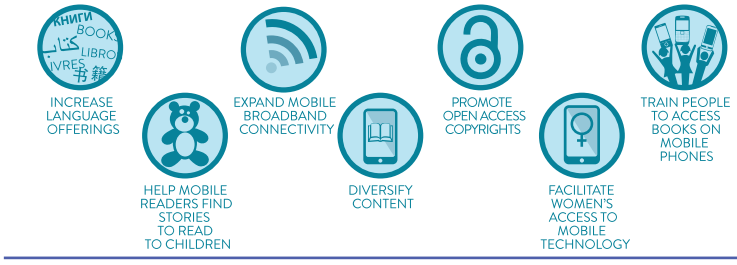
BUT MOBILE PHONES ARE EVERYWHERE

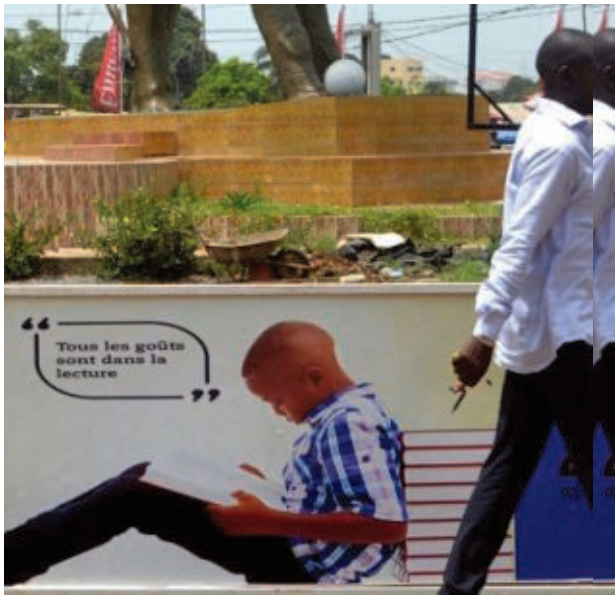


MOBILE READING IS AFFORDABLE

WHAT WE KNOW ABOUT MOBILE READING

WHAT SHOULD BE DONE?





books and literacy bears witness to a clear vision of culture and education as drivers of development and recovery." Culturally vibrant Senegal, a fellow francophone nation, is the guest of honour in Conakry.

The World Book and Copyright Day also focused on the blind and the visually impaired who have difficulty accessing books and other printed materials, constituting an obstacle to their full and effective participation in society.

According to the World Blind Union, WBU, among the millions of books published worldwide each year, less than 10 per cent are published in formats that are accessible to the blind, a rate that drops to one per cent in developing countries. Approximately one in every 200 people on Earth – 39 million – cannot see. Another 246 million have severely reduced vision.

Left: A poster in Conakry, Guinea, advertising its World Book Capital City programme.

Bottom left: The central theme of Conakry's year-long literacy push is "Initiation by Books".

Below: The World Book and Copyright Day had a special focus on blind and visually-impaired readers.

Bokova further highlighted this issue. "It is said that how a society treats its most vulnerable is a measure of its humanity. When we apply this measure to the availability of books to those with visual impairments and those with learning or physical disabilities (with different causes), we are confronted with what can only be described as a 'book famine'".

The United Nations Convention on the Rights of Persons with Disabilities and the Sustainable Development Goals marked a paradigm shift in recognising the right of disabled people to access books, knowledge and cultural life on an equal basis as others.

"This is the spirit guiding Conakry, Guinea, which has been designated World Book Capital 2017, in recognition of its programme to promote reading among youth and underprivileged sections of the population," commented Bokova.

Conakry has put in place a year-long programme, which runs under the central theme "Initiation by Books" that runs from 23 April 2017 to 22 April 2018. This theme is divided into six components – including book fairs, a focus on books and mobility, and books, youth and sport – that try to bridge the gap between books and people through community rapprochement.

WORLD BOOK CAPITAL CITY

The UNECO nomination committee welcomes programmes - presented by or endorsed by the mayor of the city making the application - that promote and foster reading. In this regard it looks at five criteria:

- The degree of participation of all levels (from the municipal to the international level)
- The programme's potential impact
- The scope and quality of the activities proposed by the candidates, and the extent to which they involve writers, publishers, booksellers and libraries
- Any other projects promoting books and reading
- The extent to which the programme respects the principles of freedom of expression, as stated by the UNESCO Constitution as well as by Articles 19 and 27 of the Universal Declaration of Human Rights and by the Agreement on the Importation of Educational, Scientific and Cultural Materials

Year	City	Country
2001	Madrid	Spain
2002	Alexandria	Egypt
2003	New Delhi	India
2004	Antwerp	Belgium
2005	Montreal	Canada
2006	Turin	Italy
2007	Bogotá	Colombia
2008	Amsterdam	Netherlands
2009	Beirut	Lebanon
2010	Ljubljana	Slovenia
2011	Buenos Aires	Argentina
2012	Yerevan	Armenia
2013	Bangkok	Thailand
2014	Port Harcourt	Nigeria
2015	Incheon	South Korea
2016	Wrocław	Poland
2017	Conakry	Republic of Guinea
2018	Athens	Greece

The phenomenon of fake news is not new but its method of propagation is. Social media has allowed information – false or otherwise – to spread around the globe in seconds and become viral in minutes. However, the good news is that decades of research has gone into why we act the way we do when it comes to processing information.

On 21 December 1955, a group of people called the Seekers gathered in a Chicago house awaiting the end of the world, believing a UFO was on its way to rescue them from Armageddon. Yet neither the end of the world nor the alien mercy mission occurred.

Unbeknownst to the Seekers, one of their members was in fact the renowned psychologist Leon Festinger, intent on studying what happens when someone's beliefs are challenged by new and overwhelming contradictory information.

He found that instead of accepting they were wrong in the face of an alternative reality, the members actually increased their recruiting efforts and scheduled another apocalypse for the next year. These were the result of an effect he termed "cognitive dissonance", dissonance that arises when facts counter your beliefs.

While certainly an extreme example, it is one psychological phenomenon that is being used to explain why people today are so willing to believe fake news. Michael Shermer, author of *The Believing Brain* and editor-in-chief of *The Skeptic*, says: "Underlying is the fact you've invested in a particular position, a political party, a religious belief or an economic ideology, something that really matters to you. These are moral foundations, something that hits to the core of who you are."

Shermer's theory is backed by hard science. In a study published last year in *Nature* it was demonstrated that challenging someone's political beliefs activates the same areas of the brain involved in personal identity and emotional response to threat.

But our susceptibility to fake news works on many levels, as the following question indicates: 'How many animals of each kind did Moses put on the ark?'

FIGHTING **FAKE NEWS**

Being flooded with information doesn't mean we have the right information, and it is not always easy to discern factually inaccurate news stories. Apart from the human tendency to accept what we read without much question or reflection, there are a number of ways in which reason fails us.

THE THREE BIGGEST FAKE POLITICAL NEWS STORIES OF 2016

1 "Pope Francis shocks world, endorses Donald Trump for president." This story was originally published by a site called WTOE 5 News before being copied by a popular fake news publisher Ending the Fed. By November 8, the story had picked up 960,000 Facebook engagements, according to Buzzfeed. During a press conference on October 2, Pope Francis spoke publicly about the US election for the first time, saying: "I never say a word about electoral campaigns."

2 "Donald Trump sent his own plane to transport stranded marines." This was published by Americanmilitarynews.com in May and racked up 893,000 engagements. A Trump-branded plane did indeed pick up the Marines, but it wasn't Donald Trump's personal jet. It was a Boeing 727 that was part of Trump Shuttle Inc, an airline owned by the president-elect from 1989-1992.

3 "Ireland is now officially accepting Trump refugees from America." Actually the piece did not even mention Ireland, it references Inishturk – a small island off the coast of Ireland, which has no say on Irish immigration policy. The article, which was published by Winning Democrats, also referenced how Canada has adopted an open door immigration policy for disgruntled Americans – which it hasn't. Nonetheless, the story generated 810,000 engagements.

Source: Buzzfeed

If you answered two, then you aren't only wrong but you've also tested positive for being susceptible to fake news. Why? It was Noah who put animals on the ark and not Moses. Questions like this are a prime example of our general confusion between two historic figures and at a deeper level illustrate our tendency to overestimate our understanding of how things work.

"It gets at the extent to which people rely on intuitive answers that pop to their mind as opposed to reflecting and checking whether the answer that comes to mind is right or wrong," says Steve Sloman, a professor of cognitive science at Brown University and editor-in-chief of the journal *Cognition*.

Human nature is characterised by its propensity to accept what we read without much question or double-checking facts. The only trick to beating fake news is knowing that you need to verify it. People who are reflective are more likely to engage in a verification process observes Sloman.

Sloman isn't the only one pointing out our lack of reasoning. In a recent article in *The New Yorker* journalist Elizabeth Kolbert reviews several studies on the human mind's limitations of reason. She points to two groundbreaking studies that took place at Stanford nearly 50 years ago.

"Coming from a group of academics in the 1970s, the contention that people can't think straight was shocking. It isn't any longer. Thousands of subsequent experiments have confirmed (and elaborated on) this finding," wrote Kolbert.

CAUSES OF THE LOGIC BREAKDOWN

There are a number of ways by which we can be left vulnerable to factually incorrect stories that infect our understanding of what's real and what isn't. One factor is 'motivated reasoning' where we are more likely

to believe stories that confirm our opinions. Adam Waytz, an associate professor of management and organisations at Northwestern's Kellogg School, explains this with the following example – "If you are motivated to believe negative things about Hillary Clinton or Donald Trump, you're more likely to trust outrageous stories about her or him that might not be true. Over time, motivated reasoning can lead to a false social consensus."

Naïve realism or the idea that our views are the only ones that are accurate is another factor contributing to a distorted perception of facts. Naïve realism leads to polarisation in discussions. Instead of disagreeing with people, we just dismiss their views as incorrect.

Sloman's research also points to the idea that knowledge is contagious and that we never think alone. Sloman, together with scientist Nathaniel Rabb, conducted a web-based experiment to prove this 'community of knowledge' hypothesis. The duo experimented with over 700 participants telling them about a fake phenomenon called helium rain. One group of volunteers was told that the scientists did not completely understand the phenomenon and could not explain it clearly. These participants were then asked to rate their own understanding of helium rain on a scale of one to seven, with one being the lowest. Most of the volunteers rated their answers at one, admitting they didn't understand the concept.

The second group of volunteers was told that the scientists understood helium rain and could fully explain how it works. When asked to rate their own understanding, this group of volunteers submitted answers that averaged around two.

Sloman says that the fact that the scientists understood the phenomenon gave the volunteers an increased sense of understanding too. "It's like understanding is contagious. If everyone around you is saying they understand why a politician is crooked, they saw a video [about that person] on YouTube... then you're going to start thinking that you understand too," he says.

In terms of fake news, these bodies of research indicate that (a) we think that we can determine the legitimacy of the news source with more objectivity than we probably can, (b) think that information that aligns with our existing beliefs – even if it is fake – is more credible than information that does not, and (c) will overestimate the extent to which other people will agree with the news, once we believe it ourselves. This latter point could play a large role in why we choose to share fake news, for example, on social media.

FIGHT THE FAKENESS

We live in a world with many "alternative facts," and despite the massive amount of research available, people continue to be susceptible to fake news. Verifying and fact-checking ourselves and those in our community is essential in determining what is real and what is fake. While it isn't possible to train every person to verify news they encounter, there is potential for communities of people to be trained to verify stories and raise the flag when things don't add up. "Develop a norm in your community that says, 'We should check things and not just take them at face value. Verify before you believe," Sloman says.

Fortunately, technology is lending a hand. Facebook has just begun to make the job easier for users by adding an "it's a fake news story" option to its reporting menu. If you use Google Chrome there are three plugins available that can detect fake news: FiB, BS Detector and Media Bias Fact Check. The BBC is busy setting up a department dedicated to flagging and correcting fake news, while Slate has created an extension that will flag stories in your Facebook newsfeed from sources known to publish fake news.

FACEBOOK ENGAGEMENT OF TOP FAKE ELECTION STORIES

POPE FRANCIS ENDORSES DONALD TRUMP

960K

CLINTON SELLING WEAPONS TO DAESH

879K

CLINTON DISQUALIFIED FROM FEDERAL OFFICE

567K

TOTAL **FACEBOOK** ENGAGEMENT FOR TOP 20 US ELECTION STORIES

FAKE NEWS

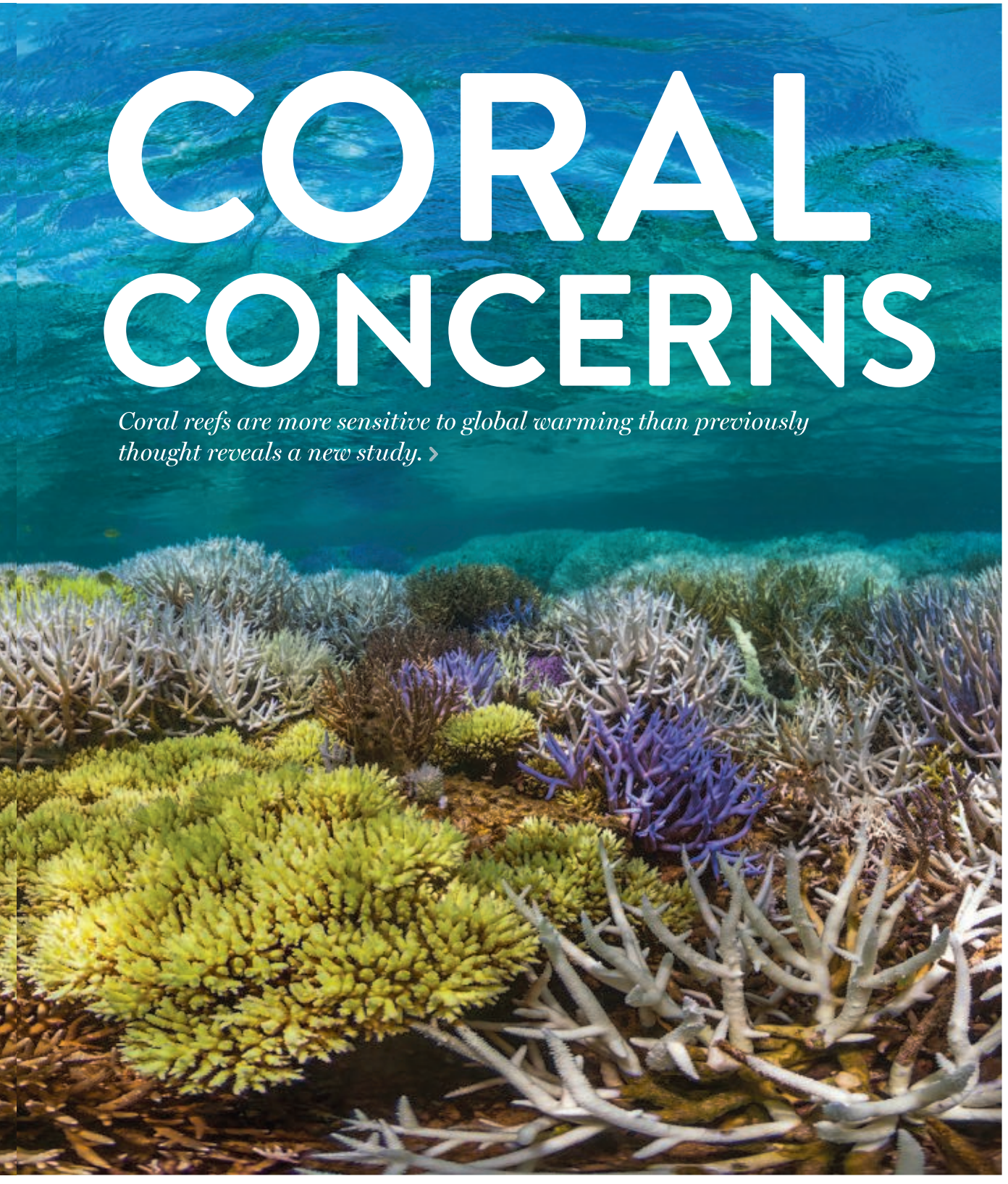
8.7m

MAINSTREAM NEWS

7.3m

CORAL CONCERNS

Coral reefs are more sensitive to global warming than previously thought reveals a new study. ›



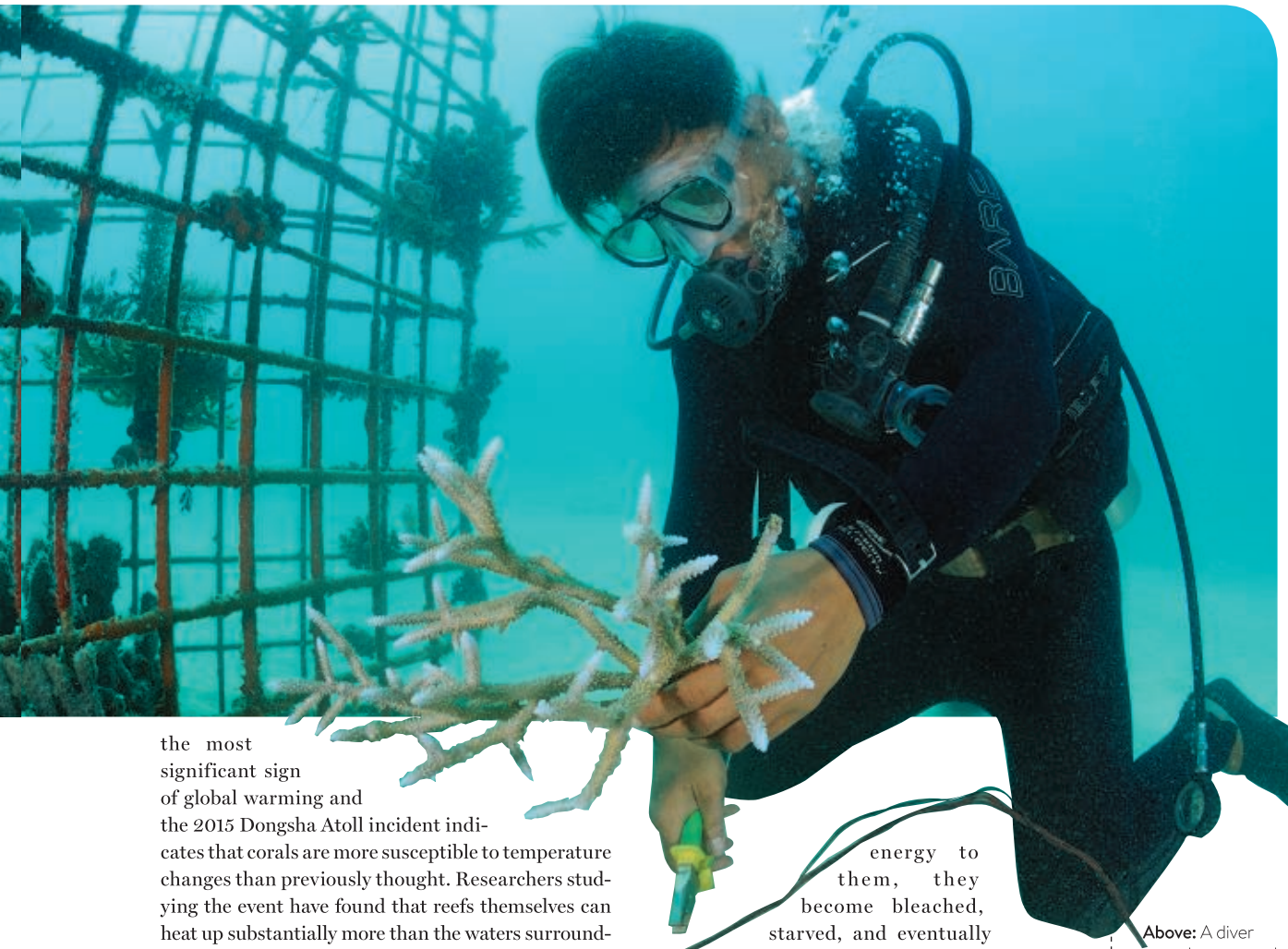
Above: A healthy coral reef is characterised by bright colours. A bleached reef is a ghostly white.

South China Sea's Dongsha Atoll, regarded as one of the world's most important coral reefs, lost 40 per cent of its corals in what environmentalists are calling the most severe and massive bleaching event of its kind in the past 40 years. Notably, the decimation was not a result of any major environmental change – a spike in the water temperature by just a few degrees was sufficient to spark the devastation.

In June 2015, the South China Sea warmed up by 2°C as is usual following an El Nino weather pattern. El Ninos are naturally occurring climate cycles in the Pacific Ocean that cause drier air and warmer ocean water at the surface in equatorial Asia. The temporary rise in temperature usually does not have a serious impact on corals as the reef is regularly flushed with cooler water from the open ocean. However, in 2015, due to a lull in the region's wind patterns, there were no waves or breezes to churn the sea. Within a few days the reef lost its supply of cooler water from the open ocean. As a result temperatures surged by a full 6°C above normal summertime temperatures, causing 100 per cent of the corals to bleach, and 40 per cent to die.

"Dongsha Atoll is typically hit with tropical storms and strong winds in June, which keep the corals as cool as the open ocean," said Tom DeCarlo, lead author of the study. "But in 2015, the weather in June was exceptionally calm – at one point, there was basically no wind and no waves. This had an amplifying effect on the water temperatures, which were already feeling the heat from global warming and El Niño. The whole reef became a giant swimming pool that just sat there and baked in the sun."

For environmentalists, mass coral bleaching is



Above: A diver transplants a coral to a steel cage to form a new reef.

the most significant sign of global warming and the 2015 Dongsha Atoll incident indicates that corals are more susceptible to temperature changes than previously thought. Researchers studying the event have found that reefs themselves can heat up substantially more than the waters surrounding them. Although the temperature rose by a mere 2°C in the South China Sea, the local weather amplified its effect leading to the catastrophe. The dramatic die-off is the perfect example of what can happen to shallow-water reefs when global warming is amplified by short-term weather, the researchers warned in their recently released report on the incident.

NEED FOR IMMEDIATE ACTION

Coral reefs shelter some of the world's most diverse and valuable ecosystems on Earth. They serve as buffers for our coastlines protecting them from tropical storms, wave action and erosion. They are also vital to the livelihoods of half-a-billion people around the world who benefit from the tourism, fishing and protection opportunities they generate.

Climate change is already making the Earth's waters warm. When ocean water warms, corals expel the symbiotic algae living in their tissue. Once they lose the algae that normally photosynthesize and provide energy to them, they become bleached, starved, and eventually die. Irregularities in local weather, such as reduced wind, drive the temperatures higher compounding the risk reefs face.

Corals are declining or dying at an alarming rate around the world and the Dongsha Atoll incident shows that the current targets set for reducing greenhouse emissions are not enough to save the world's coral reefs. Earlier in January, Japan reported the death of 70 per cent of its largest coral reef due to sea temperatures being one and two degrees Celsius higher than normal. Australia's Great Barrier Reef lost almost two-thirds of its shallow water corals due to El Nino last year. An unprecedented second year of bleaching is underway now and bleached coral takes nearly two decades to recover depending on the type of species. It is estimated that roughly one-quarter of coral reefs worldwide are already damaged beyond repair, with another two-thirds under serious threat.

Another problem facing corals is ocean acidification as much of the carbon dioxide that enters the

THE UAE'S CORALS

The Arabian Gulf is already one of the most heat-stressed and saline marine environments in the world due to desalination plants and decades of pollution. Moreover, due to the naturally high temperatures in summer, the Gulf's corals are living on the temperature threshold for their species.

The El Nino Southern Oscillation, a cyclical periodic shift in the Pacific Ocean that affects weather around the world, killed 90 per cent of Gulf coral between 1996 and 1998. Coral bleaching in 2010 led to the loss of more than half of the acropora corals in Ras Ghanada, Abu Dhabi, a place famous for its reefs. This was important because that species of coral excretes a calcium skeleton, which is the basic building block for reefs.

Due to the fact that the Arabian Gulf's corals live in such a high temperature environment has made them the focus of studies. One finding has been that local corals have adapted genetically to warmer temperatures. This was indicated by there being genetic differences between corals living off Abu Dhabi's Saadiyat Island (in the very warm Arabian Gulf) and corals off Fujairah (in the slightly milder Gulf of Oman).

In 2015 a new coral reef, in pristine condition, was discovered off Abu Dhabi's Dalma Island in the Western region. The discovery was made within a larger study using satellite data to explore the health of coral colonies in Abu Dhabi, tracking changes from 2013 to 2016.

Policies are now in place to reverse some of the damage done by rapid urban modernisation, but the shift in sea temperature and increasing ocean acidity have already taken their toll on coral reef habitats and the almost Dhs100 billion they bring in annually.

The Environment Agency Abu Dhabi announced in March that it planned to increase the percentage of protected marine areas to 14 per cent by 2019, stating that it will benefit coral reefs and boost tourism in making the UAE a more popular diving destination.

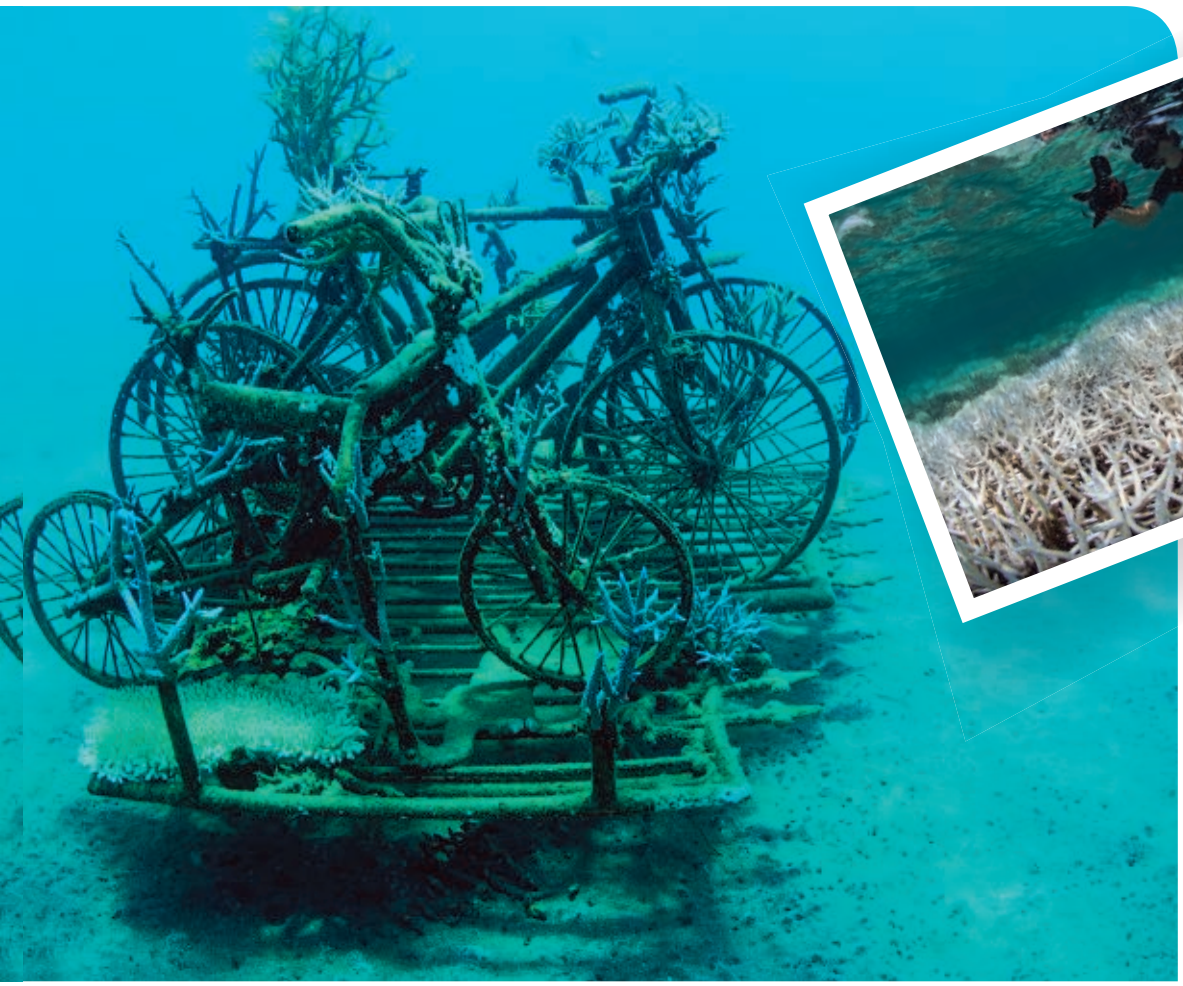
atmosphere dissolves into the ocean. With ocean acidification, corals cannot absorb the calcium carbonate they need to maintain their skeletons and the stony skeletons that support corals and reefs will dissolve. Already, ocean acidification has lowered the pH of the ocean by about 0.11 units, which means the ocean is about 30 per cent more acidic now than it was in 1751.

The Paris Climate Change agreement obliges its signatory countries to work towards limiting global climate change to a rise of 2°C, but this may not be enough to prevent catastrophic loss of coral. Current projections of how reefs will fare over the next century are based on data of the open ocean, but the Dongsha Atoll incident shows that reefs don't behave like the open ocean. A relatively small change in the open ocean temperature can translate into disaster for coral reefs.

Researchers say that local weather conditions need to be incorporated into the global climate model in an organised way to be able to accurately gauge the situation. Such studies are already underway at the Dongsha Atoll with researchers building models based on how the water flows around the atoll and the energy that comes from the sun. They are confident that once completed, the local model can be adapted to a larger-scale climate model. Although the large-scale model will not be able to pinpoint the exact occurrence of a bleaching effect, it will certainly help determine areas of high risk.

"We really need to work hard to reduce carbon emissions and slow ocean warming and eventually reverse ocean warming if possible. But there's also an urgency to identify coral reef systems that can survive ocean warming," says Anne Cohen, scientist at Woods Hole Oceanographic Institution.

Cohen's team is also working towards finding coral reefs that are more tolerant to warming and show a better chance of surviving. If such reefs are found, governments need to work harder to protect them from depletion by other activities. "All reefs need help, but we can't protect everybody, because it's not going to be practical to protect every single reef," she says. "One way to think about this is as the ocean warms, reefs that can deal with the warming have a better chance of surviving, so we should help them as much as we can."



Above: The contrast between a living reef and a dead one is staggering.

Left: Old bicycles serve as an attachment point for corals.

IMPORTANCE OF CORAL REEF ECOSYSTEMS

- Coral reef ecosystems support a variety of human needs. They are important for subsistence, fisheries, tourism, shoreline protection, and yield compounds that are important in the development of new medicines.
- At least 500 million people rely on coral reefs for food, coastal protection, and livelihoods.
- Over 275 million people worldwide live in the direct vicinity of coral reefs (within 30km of reefs and less than 10 km from the coast), and approximately 850 million people live within 100km of coral reefs.
- In developing countries, coral reefs contribute about one-quarter of the total fish catch, providing food to an estimated one billion people in Asia alone.
- Coral reefs form natural barriers that protect nearby shorelines from the eroding forces of the sea, thereby protecting coastal dwellings, agricultural land and beaches. More than 150,000km of shoreline in 100 countries and territories receive some protection from reefs.
- Coral reefs are the medicine chests of the 21st century, with more than half of all new cancer drug research focusing on marine organisms. Coral reefs have been used in the treatment of cancer, HIV, cardiovascular diseases, ulcers, and other ailments.

THE OBE EPIDEMIC

A global proliferation of cheap mass produced vegetable oils has contributed to a standardised diet that is heavy in calories and low in nutrients. What role does globalization and our changing lifestyles play in the sharp rise of obesity?

The world is getting heavier. Not to the point where gravitational forces are invoked and the Earth is altered on its axis... but the world's population certainly weighs more than ever before. Over the last 35 years, global obesity has more than doubled.

According to a series of recent reports, over 50 per cent of the world's population is not of a "healthy weight" and almost 30 per cent of the global population – some 2.1 billion people – are obese or seriously overweight.

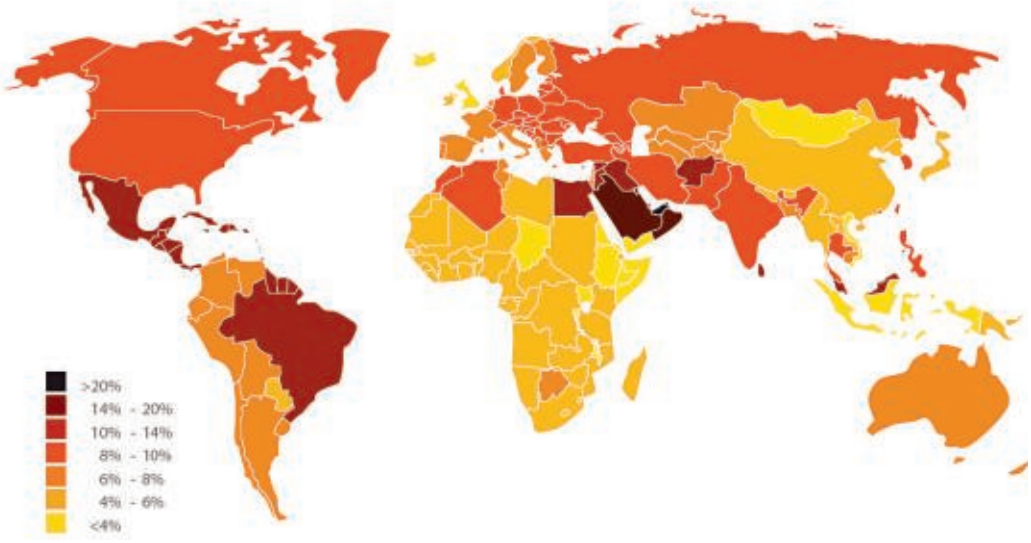
Whilst much of the media cacophony surrounding obesity is vanity-driven and focuses on our perceptions of beauty, the more substantial effect of this worldwide weight increase is exacted upon our collective health.

The global epidemic of obesity impacts the incidence of non-communicable diseases (NCDs) such as heart disease, diabetes and cancer. According to the World Health Organization, NCDs are the leading cause of death globally, accounting for 63 per cent of the annual mortality rate. Jack Fisher is the Global Coordinator, Europe and Africa, for NCDFREE, a global non-profit and social movement established nearly five years ago, which aims to spread NCD awareness in the world community. Fisher cites modern food production and consumption as a core driver for the rapid growth in NCDs.

"Firstly, many parts of the world are undergoing rapid changes in their diets, moving from local, seasonal, traditional diets, to urban 'westernised' diets that are high in sugar, salt, and fat. We know that having an energy dense, nutrient-deficient diet leads to an increased risk of developing chronic diseases such as obesity, diabetes, heart disease, and some cancers," Fisher says.

SITY

PREVALENCE ESTIMATES OF DIABETICS **2025**



Above: Diabetes is increasing globally, with the Middle East being particularly hard hit.

"At the same time, he continues, "to meet the ever-growing demands of the largest global urban population in human history, our food systems are changing to meet the growing needs of this refined diet. As food systems become more centralised, whilst moving further away from local production and consumption, our carbon footprint increases from field to fork."

As global agricultural methods have constantly sought to increase yields for greater profits, often in spite of grave environmental degradation – as evidenced in the rampant destruction of the natural landscape in Indonesia for palm oil production – the prevalence of soy bean oil and palm oil has contributed to a global standardisation of diet.

Alongside the staple produce of sugar, barley, potato, wheat, rice and maize, these cheap ubiquitous vegetable oils, commonly found in processed foods, make up an estimated 85 per cent of the global calorie count. Our diet is becoming low in nutrients and high in calories, regardless of which country we live in.

The environmentally catastrophic mass production of soybean and palm oil in Indonesia and Malaysia is incentivised by government policies and foreign trade agreements that make the export and import of oil easier and cheaper. To maintain a competitive position in the global market, highly efficient production processes are implemented – meaning huge production scales in order to lower prices – resulting in a food system based on cheap calories.

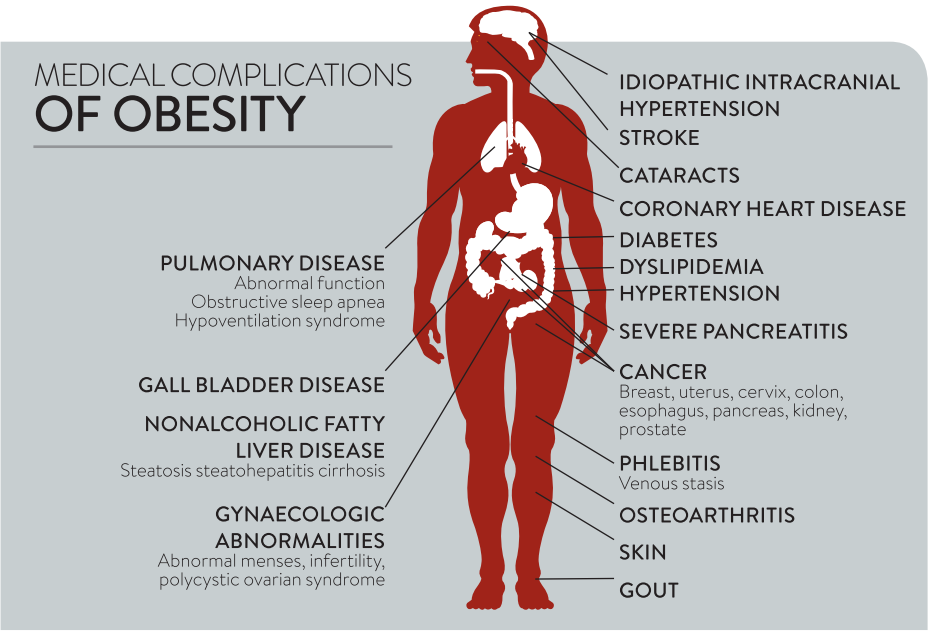
Whilst food trade in the era of globalisation has contributed to famine reduction and access to cheap calories for the world's poorest demographic, it has also affected the eating habits of the wider global population, allowing people to consume non-local/seasonal food produce and exacerbating unhealthy eating habits and adding to global obesity.

However, the advent of globalisation in the late 80s and the aggressive expansion of oil crops is not the only factor at play. According to a study by the London School of Economics, which focused on 26 countries between 1989 and 2005 when globalisation significantly expanded, there is also a social dimension relating to the calories we consume and obesity. The report propounds a 'globesity' hypothesis and the results "suggest a robust association between globalisation and both obesity and caloric intake".

We are fatter not simply because of the easy access to the calories provided by the cheap oils and calorific food driven by global trade, but also because our lifestyles have become much more sedentary. The 'information age' and our ability to shop, work and socialise without barely moving plays a significant role in the rise of obesity.

Author of the study, Dr Joan Costa-Font, says, "Our food intake is driven towards meeting the needs of a pre-global world, where people would have to walk to places and where there would not be as many energy-saving activities as today. Individuals would have closer personal social contacts, and would cook and spend more time on daily chores". The results suggest that if people were to resume the normal levels of physical activity that were evident pre-globalisation, there should be a degree of abatement in soaring obesity levels.

Another recent report with concurring findings was conducted by the McKinsey Global Institute (MGI). The paper, entitled, *Overcoming Obesity: An Initial Economic Analysis*, offers an independent view on how to confront the challenges of the obesity epidemic.



According to the report, obesity is one of the top three social burdens created by human beings, impacting global GDP by 2 trillion dollars, closely behind the $2.1 trillion from armed violence, terrorism and war, and $2.1 trillion for smoking.

The study concludes that a "systemic, sustained portfolio of initiatives, delivered at scale, is needed to reverse the health burden." The study also stresses that, "Education and personal responsibility are critical elements of any programme aiming to reduce obesity, but they are not sufficient on their own. Other required interventions rely less on conscious choices by individuals and more on changes to the environment and societal norms. They include reducing default portion sizes, changing marketing practices, and restructuring urban and education environments to facilitate physical activities."

Whilst overarching social strategies are undoubtedly necessary, the choices of individuals and the positive effects these can generate are not to be underestimated. Anyone can contribute to a reversal of the health crisis and, to paraphrase Ghandi, be the change they wish to see in the world.

Paul Cazaux, Founder of Complete Fitness BCN, personal fitness expert and nutritionist with a portfolio of international clients says, "Today we live in an incredibly fast paced world with even faster food. When it comes to diet and nutrition many of us have no idea where to start as there is so much conflicting advice. First of all, we need to slow down. That means slowing how fast we eat and ideally not on the move, giving the body time to focus on digestion.

"Then we need to look at balance and ensuring we get our nutrition from natural sources and not heavily refined and processed foods with excessive use of oils. In a nut shell – and nut being a very appropriate word – we need to maintain a diet consisting of good fats; raw not roasted nuts, avocado, fish that's high in omega 6 and 9 and extra virgin olive oil. Coconut oil to cook with is a great healthy alternative to the proliferation of mass produced cheap vegetable oils".

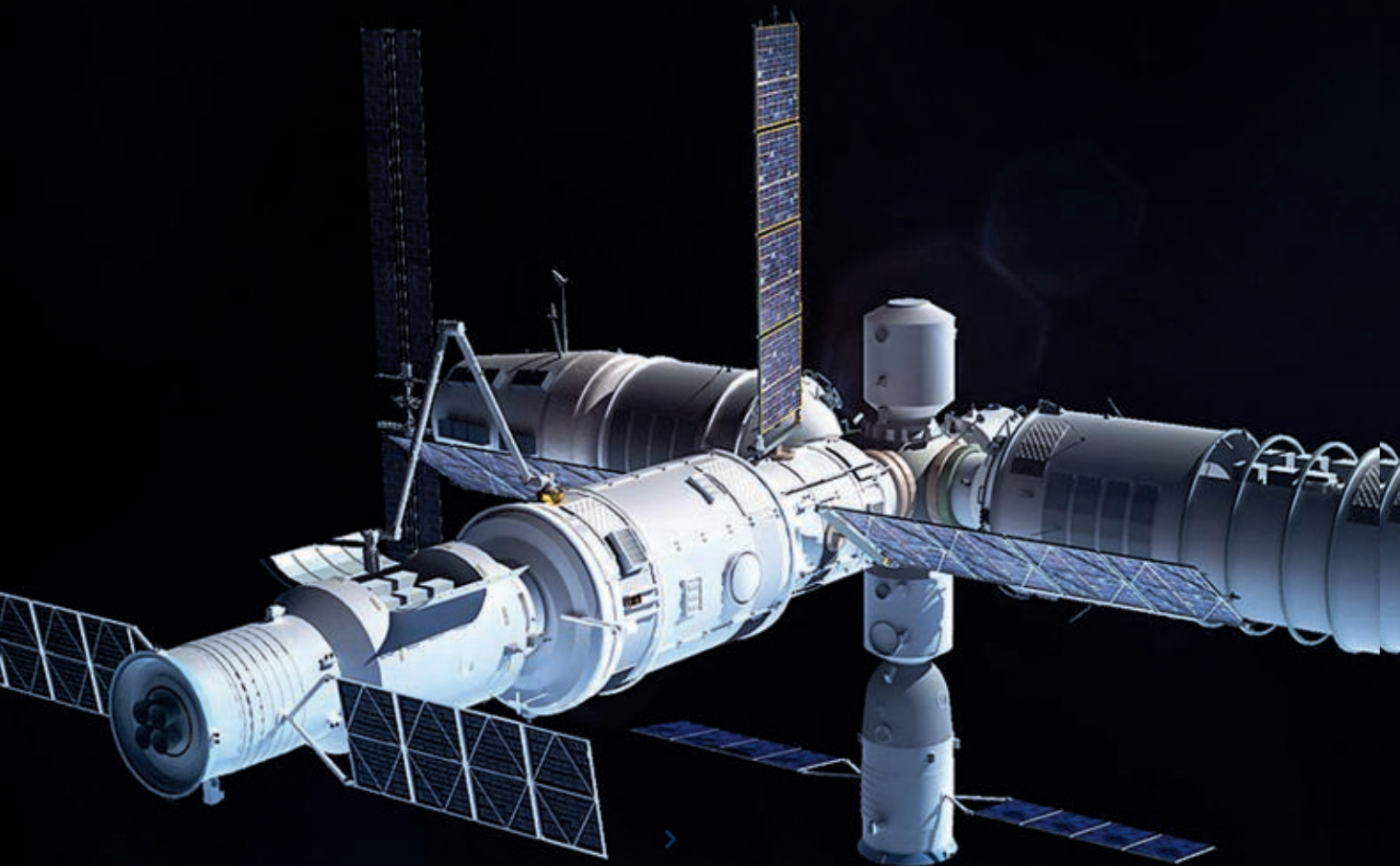
It goes without saying that this advice is highly dependent on the economic means of the individual, but the point remains that singular action can be effective. The 'Millennials' demographic has often been maligned in contemporary discourse as being complacent, privileged and with a strong sense of entitlement. Yet this broad and youthful demographic is also widely defended as being well-informed and ready to tackle the multiple crises they've inherited from previous generations.

According to Jack Fisher of NCDFREE, "Millennials matter when we talk about the urgent need to shift to a more sustainable future for humans and our planet. Millennials have now surpassed the 'baby boomers' as the largest living age group in the world. They are also the first generation to see the impacts of climate change and subsequently are aware of the urgent need for action."

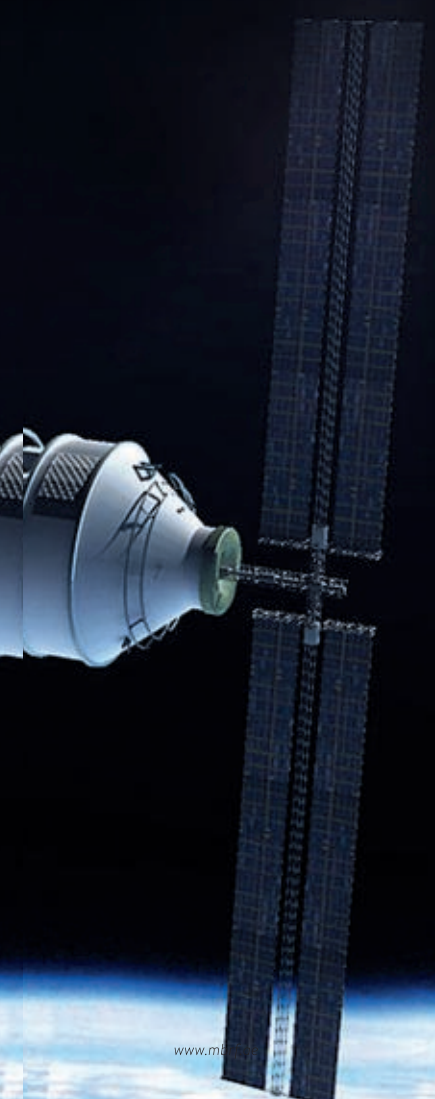
If the rate of obesity is to be slowed or even reversed it will require the combined efforts of all – governments, international and grass-roots organisations, broad social demographics and individuals. And technology will play a key role, as Fisher concludes, "The plethora of digital technologies that millennials use on a daily basis means that we have never been better connected as a global community. By harnessing these passions (including a little youthful brashness and drive) and the technological advancements that unite us, I am certain that our age group will be a central driving force for global social change in the pursuit of a healthier, more sustainable future."

Above left: The proliferation of cheap vegetable oils has led to a dramatic increase in global calorie consumption.

WHERE TO NEXT?



Space exploration is heading towards a new era, but the exact direction is yet to be determined.



On 21 March, US president Donald Trump signed a $19.5 billion NASA bill with the goal of sending humans to Mars.

It was the first such authorisation bill in seven years, with Trump stating in his speech to both houses of Congress that "American foot-prints on distant worlds are not too big a dream".

NASA, for its part, has long been committed to the idea of human travel to Mars, with the challenge of developing systems and capabilities required to explore beyond low-Earth orbit, near-Earth asteroids, and eventually Mars, all integral to the beginning of a new era in space exploration.

"We've been working hard over the past several years to develop a sustainable Mars exploration plan, which we believe is NASA's next giant leap in human space exploration," says Cheryl Warner, a spokesperson for NASA. "We know there are challenges to sending humans to Mars, from getting there to landing, living and working on the planet and safely returning home. While our long-term Mars architecture is still under development, we recently announced a concept for a deep space gateway and a deep space transport in the vicinity of the moon to support human missions to distant destinations, including the Red Planet."

Although the $19.5 billion is in line with NASA's funding in recent years, the space agency's acting administrator, Robert Lightfoot, stated that it "bolsters our ongoing work to send humans deeper into space and the technologies that will require".

By deeper he means not only Mars, but further afield, out beyond Jupiter and Saturn, where NASA's Cassini mission recently announced it had found the ingredients needed for life on Enceladus, the gas giant's icy moon.

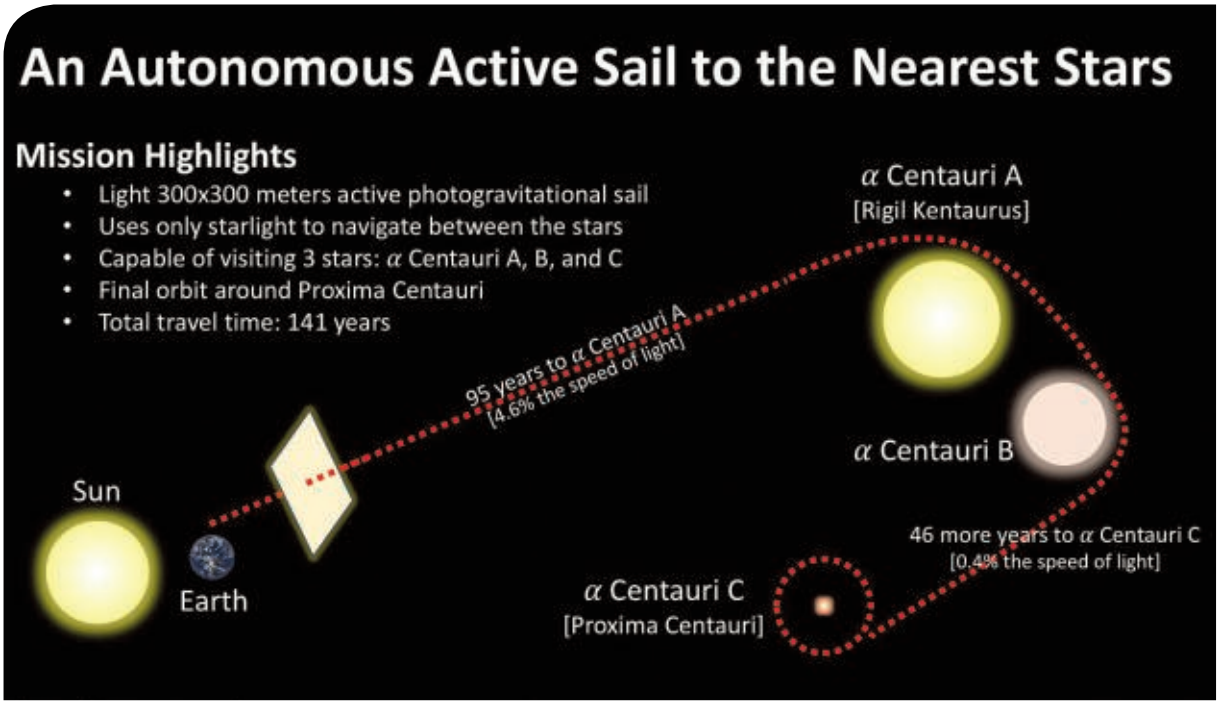
How you get to the further reaches of our solar system, however, is a matter of continued and varied discussion. Do you take incremental steps, or giant leaps? Manned or unmanned? One-way or return?

"There is a debate between those who want to take incremental steps in space exploration because of the reduced risk and costs, and those who want to tackle the long-term goals immediately," says Paul Kalas, an astronomy professor in the department of astronomy at the University of California, Berkeley. "Establishing a moon base [for ex-ample] would develop all the expertise needed to go further, such as to Mars, whereas others might want to focus all efforts and funds into the ultimate jackpot – human presence on Mars."

The European Space Agency's (ESA) director general, Jan Woerner, has discussed the possibility of creating an international 'village' on the moon as the next step towards obtaining the know-how and infrastructure needed to head into deep space. NASA, meanwhile, as Warner says, has announced concepts for a deep space gateway to support human missions further into the solar system.

"Those missions would begin with the first integrated mission of NASA's Space Launch System rocket and Orion spacecraft from the agency's Kennedy Space Centre in Florida," says Warner. "These unique capabilities will open deep space to human exploration and will provide a vital role in crewed missions to Mars."

With the International Space Station to be decommissioned within the next 10 years, the international community will be left without an outpost on which to test next-generation life-support systems, communications technologies and the physical and psychological effects of weightlessness and isolation on the



Above: The Breakthrough Initiative is proposing to send a nanocraft probe to Alpha Centauri

Above right: A section of the Chinese Tiangong space station.

human body. Which is why NASA views its deep space gateway and deep space transport as critical.

"I envision different partners, both international and commercial, contributing to the gateway and using it in a variety of ways with a system that can move to different orbits to enable a variety of missions," says William Gerstenmaier, associate administrator for human exploration and operations at NASA's headquarters in Washington. "The gateway could move to support robotic or partner missions to the surface of the moon, or to a high lunar orbit to support missions departing from the gateway to other destinations in the solar system."

The dangers of humans venturing into deep space are apparent. In October last year the ESA's Schiaparelli lander – supposed to be the first European probe to operate on Mars – crashed as it attempted, ironically, to land.

"Getting to Mars is possible, but there are risks when accelerating away from Earth, en route to Mars, and decelerating to land on Mars' surface," explains Kalas. "Without the protection of Earth's magnetic field, one problem is shielding astronauts from high energy particles that damage living tissue.

"Ongoing scientific research is testing radiation-induced diseases as well as the decline of bone density in low-gravity environments, not to mention cognitive and behavioural disorders."

But Mars is far from being the only goal in space exploration. In April next year the ESA will launch BepiColombo, Europe's first mission to Mercury, while the Chinese are planning to activate the first phase of a new space station, called Tiangong, in 2022. In the mid-2020s both China and Russia have tentative proposals to land people on the moon, while 2031 is the proposed launch date for Russia's Mercury-P spacecraft, which hopes to perform the first ever landing on Mercury, the closest planet to the sun.

It is the search for life, however, that thrills many astronomers, particularly its possibility on exoplanets – planets that orbit a star other than the sun. Those exoplanets that lie within the 'habitable zone' – the region around a star in which liquid water could exist on a planet's surface – are of particular interest.

Fresh discoveries in faraway solar systems have been emerging at a rapid rate. During the first week of April, a 26-year-old Australian mechanic named Andrew Grey contributed to the discovery of a four-planet solar system during a British television event called *Stargazers Live*. The four new planets, about 600 light years from Earth, were found to be orbiting a star about 90 per cent of the sun's mass. In total, 90 new planets were discovered during the *Stargazers* event, which had asked amateur astronomers to help in the hunt for exoplanets using data observations of more than 100,000 stars by the NASA Kepler space telescope.

"The coming decade will belong to the study of exoplanets," wrote the author Stuart Clark in *The Guardian*. "A variety of space missions and ground-based telescopes will finally move the field on from simply discovering that these planets exist to taking readings of their atmospheres to assess them for habitability. In so doing, we stand to learn a lot about exoplanets, a lot about Earth, and a lot about our place in the universe."

"I see their significance as being primarily cultural, because in this case humanity's desire to understand the context of their own existence outweighs even the scientific interest in their occurrence," adds Dr John Southworth, a lecturer in astrophysics at Keele University in the UK. "From a scientific viewpoint, the detection and characterisation of exoplanets is important in determining how stars and planets form and evolve. This in turn is critical for understanding how our own solar system occurred, and also how many of the different types of planetary systems there are in the galaxy and universe."

Helping in this understanding will be NASA's James Webb Space Telescope. With a 6.5-metre primary mirror, it will be launched on an Ariane 5 rocket from French Guiana in October 2018. It will be far more powerful than NASA's ageing Hubble telescope, and will be able to see planets in greater detail, letting scientists look for atmospheres, seasons, weather and signs of life.

Further help will arrive in 2023 in the shape of the Giant Magellan Telescope. Apart from being able to view exoplanets in far greater detail, it is hoped that the telescope's unprecedented light gathering ability and resolution will help answer many other astronomical questions. How did the first galaxies form? What are the dark matter and dark energy that comprise most of our universe? What is the fate of the universe?

Yet, as Michaël Gillon, an astrophysicist at the University of Liège in Belgium, has previously stated in response to questions regarding the possibility of atmospheres around the seven planets of Trappist-1, there is only so much that can be done from afar. The likelihood of travel to any of the known exoplanets within our lifetime, however, is extremely remote. All current planned missions – manned or unmanned – are limited to our solar system. The only exception is Breakthrough Starshot, a $100 million research and engineering programme seeking to develop the technology needed to send a probe to Alpha Centauri, the closest star system to our own and home to Proxima Centauri b.

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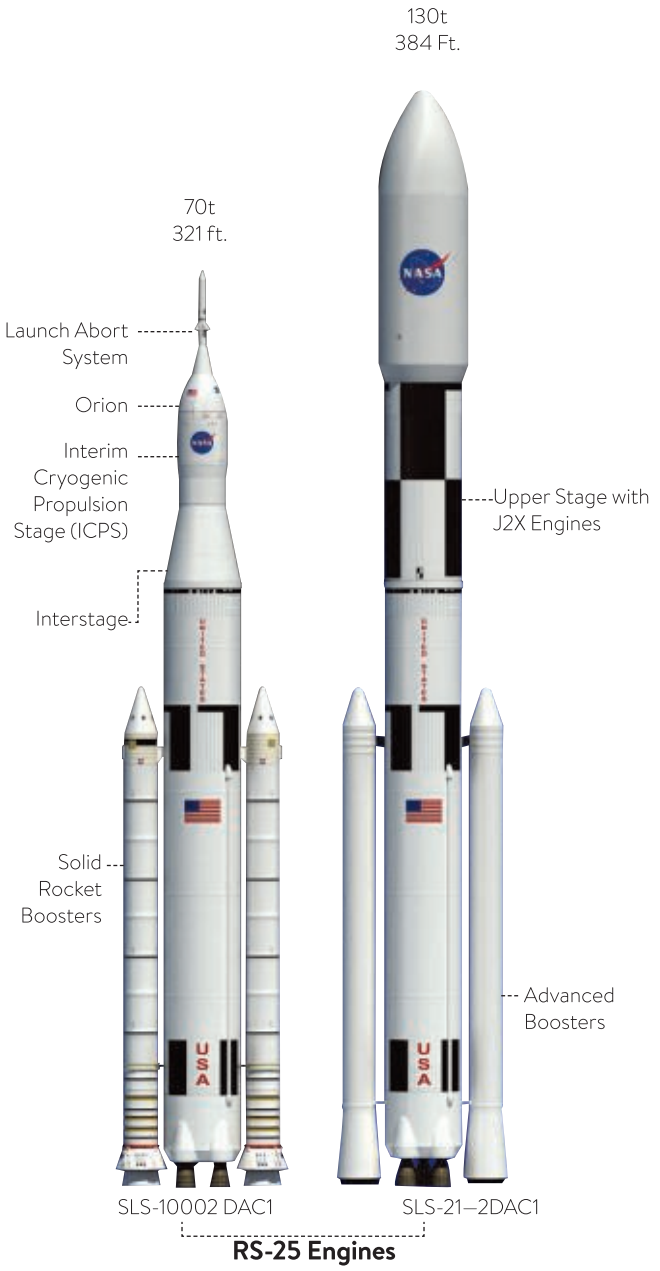


THE UAE'S SPACE AMBITIONS

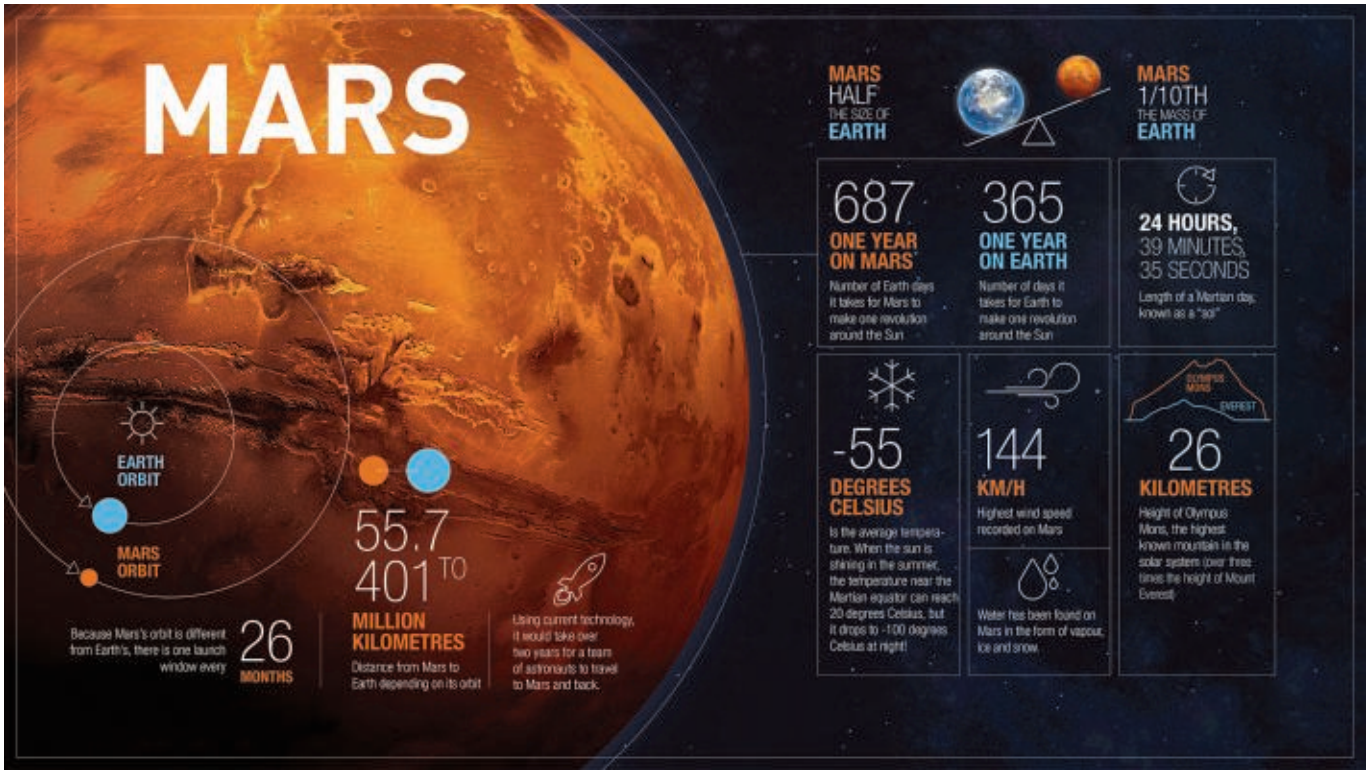
The national space programme was launched in April 2017 by His Highness Sheikh Mohammad Bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, and His Highness Sheikh Mohammad Bin Zayed Al Nahyan, Abu Dhabi Crown Prince and Deputy Supreme Commander of the UAE Armed Forces. As part of the 100-year national programme, the UAE will set a long-term plan to prepare Emirati astronauts and set up the first human inhabited city on the Red Planet by 2117, as well as the Mars Probe landing on the planet over the next four years.

UAE investments touched Dhs20 billion in the space industry, an annual growth of eight per cent, which positions the UAE among the top ten countries with the largest investments in the space industry. Global investments in the industry are valued at $300 billion.

The brainchild of Russian entrepreneur Yuri Milner and his Breakthrough Initiatives, the programme aims to use light beams to propel gram-scale nano-craft through space at one-fifth of the speed of light. It is estimated that a possible fly-by mission could reach Alpha Centauri within about 20 years of its launch. The programme is supported by English theoretical physicist and cosmologist Stephen Hawking and Facebook founder Mark Zuckerberg.

It is new and as-yet-unknown technologies that will propel future space exploration. Advances in microelectronics, nanotechnology, laser engineering, electromagnetic propulsion and quantum mechanics over the course of the next 50 years will most likely change the way we look at space.

"We need to figure out how to travel astronomical distances quickly," says Southworth. "The limitation here is the speed of light, which appears to be a hard physical limit."



"I don't think we will be travelling into the rest of the universe in spaceships, which are depicted as the next step in a line of travel evolution after aviation and rocketry," adds Kalas. "Space is too huge. I believe that in 1,000 years humans will gain knowledge and experience of very distant locations through yet-to-be-discovered phenomena that stem from poorly understood fields such as quantum mechanics."

For now, a better understanding of the many bodies in our own solar system (including Mars), plus a few unmanned craft journeying to the nearest stars are the priority, says Southworth.

"There are four 'terrestrial planets' or rocky planets in our solar system, and Mars is the most hospitable relative to Mercury and Venus," says Kalas. "Thus Mars has a role for our possible future, yet it is also critical for understanding our origins. How and when did chemistry become biology? Some say it only took 800 million years after the formation of the Earth. Could that have happened on Mars too? Mars is extremely significant in our quest to understand the origin of life."

As we move further into the solar system it is believed that space exploration will improve life on Earth by advancing scientific knowledge and discovery, driving technological development, and providing economic opportunities across numerous industries.

"One might note that all animals display a behaviour which is to explore their environment," adds Kalas. "Humans might call this curiosity, but this is also a very critical behaviour related to survival of a species."

Emirati engineers working on the Hope spacecraft that is scheduled to reach March in 2021.


Can Do It! We Can Do It! !

THE FUTURE OF ADVERTISING

The digital media business Lightvert Ltd. sees the sky as not only the limit, but the actual canvas on which to project advertisements. Will the moon and stars soon be joined by logos and branded content?

The untrammelled growth of consumerism and the ceaseless proliferation and reproduction of visual images and text by modern media technologies provides the means by which we negotiate society and find our place in it.

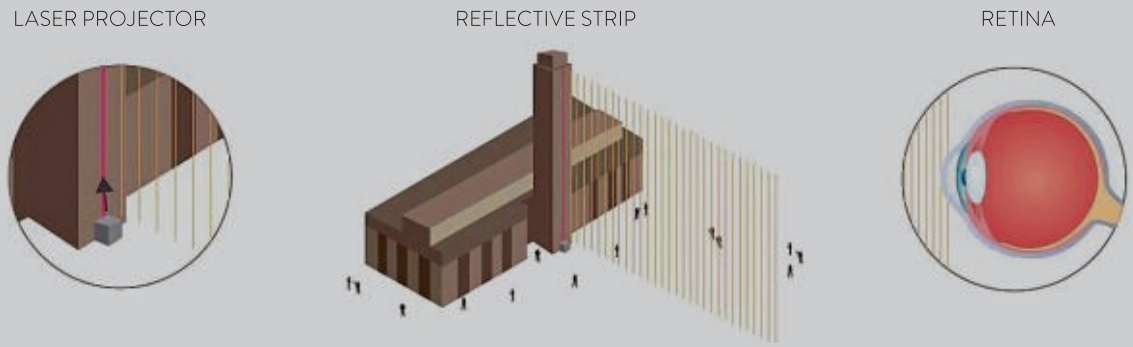
"We are surrounded by emptiness but it is an emptiness filled with signs," wrote the French philosopher and sociologist Henri Lefebvre, renowned for his incisive critique of everyday life. One wonders how he might respond to the potential commandeering and commodification of the sky?

We could soon see the rolling out of a new form of advertising consisting of 200-metre-high images projected off skyscrapers into the night sky and beamed directly into the retinas of the general public. British adtech startup Lightvert Ltd. has developed a new augmented reality solution called ECHO. This patented technology works using the 'persistence of vision' effect, which occurs when a light source leaves an imprint on your vision after you've looked away.

ECHO operates via a 20cm strip of reflective material mounted on the side of a building. A high-power projector then beams light off the reflector directly into the viewer's eye. In reality the giant

HOW THE TECHNOLOGY WORKS

ECHO is a revolutionary one-dimensional display system that creates two-dimensional images using the 'Persistence of Vision' effect. The images exist only in the eye of the viewer and not reality.



1 A laser projector reflects light off a reflective strip attached to a building.

2 The vertical strip of light that passers-by see changes rapidly. with each successive strip making up one part of the picture.

3 The vertical strip of light that passers-by see changes rapidly. with each successive strip making up one part of the picture.

Above: Lightvert's technology will project 200-metre-high images into the night sky.

image is not visible in the air but exists in the eye of the onlooker for a fraction of a second, just long enough to avoid classification as subliminal advertising, which is illegal.

With ECHO, advertisers can display the world's largest digital outdoor images without the need for the world's largest billboard. "Effectively, ECHO images are hiding in plain sight, as big as the city skyline and right in front of you!" says Daniel Siden, Founder and CEO of Lightvert.

Siden is an engineer, designer and entrepreneur specialising in lighting products and technologies. Describing his invention Siden says, "Think of the strip of light coming off the reflector as like a single vertical row of pixels in a digital image. This strip of light changes so that all of the rows of pixels are displayed in rapid succession. Your eye catches all of these rows as it moves across them and your brain puts together the complete image, which you 'see' fleetingly – although technically speaking it's never there."

Lightvert operates in the digital-out-of-home market (DOOH) and the start-up used a crowdfunding campaign on Crowdcube to finalise the development of the technology and help with bringing ECHO to market. Speaking to Flashes from the UK Siden says, "As a pre-revenue, hardware technology infrastructure company, we're operating in a very niche space within tech funding. Crowdfunding not only helped to generate real equity funding for Lightvert but also helped us to find the right strategic investors. Without crowdfunding it would have taken us significantly longer to raise the funds. We're now about to close our seed round and we will be looking to begin raising our series A round in approximately nine months, which will fund the build out of a larger network of displays."

Along with the £670,000 target from the crowdfund, Lightvert has benefitted from £250,000 of funding from UK government organisation Innovate UK, alongside an exclusivity agreement with multinational advertising giant WPP's startup incubator, KineticX. Rosh Singh, Director of Digital Innovation at KineticX says, "We believe that Lightvert and their ECHO product has the potential to be transformative within the DOOH market. The first phase will disrupt, opening up a new innovative advertising medium to the market, which will then scale to become a new channel in itself."

We are living in times of rapid development with many new technologies such as artificial intelligence, geolocation, projections and holograms, and the internet of things all set to compete with and possibly supersede our familiar advertising mediums. Considering the cusp of change in his industry Siden says, "Up until now the world has been very focused on print and screen based media, with screens being owned, managed and operated until recently in a manner very similar to its print predecessors. It really took the innovations of non-linear and random access media to blaze the trail we are currently on. Media such as compact discs and the worldwide web allowed people to begin to think about media outside of the paradigm of print and create a higher value media proposition".

Timing is an essential element of the uptake and enduring success of a new technology. Responding to the question of why the present is the time

to launch, Siden explains, "Now, with innovations in mobile media from companies like Twitter and Snapchat, the world has realised that we're open to consuming and managing content not only in a non-linear manner but also in a non-archival and more experience-based form. The last two generations have seen more new media than all generations before it combined and this accelerated pace is not slowing down. It is this quick and very recent evolution in how we appreciate and utilise old and new media that makes now the right time to introduce our ECHO technology. We may still be ahead of our time though!"

In terms of the countries where the company predicts a positive response, Siden reveals, "We see the UAE and Asia as being the most likely early adopters. The markets in these regions are very open and accepting of innovation. DOOH is a rapidly growing industry with a global CAGR in excess of 16 per cent forecast through 2020. This growth for the time being is predominantly driven by the conversion of print displays to digital displays and the increased sales revenues that come from advances in programmatic advertising. But soon the developed markets will have achieved significant conversion from print to digital and the growth will be wholly limited by the planning permission limitations".

With respect to health and safety issues, Lightvert has passed preliminary examinations but these tests are likely to expand when the technology is introduced into the public realm. ECHO media may not in itself be hazardous, but what is potentially dangerous is people's behaviour around new mediums. "Driver and cyclist distractions can lead to accidents and of course we do not want to do anything that would endanger the general public," Siden says. "For this reason, we intend to roll out the media in a controlled manner within each city, starting with temporary installations in pedestrianised locations and expanding outward from there."

Reflecting on the question of the challenges his company faces, Siden answers with swift conviction, "Human behaviour. It's like that well-worn Henry Ford quote: 'If I had asked people what they wanted, they would have said faster horses.' Despite the accelerated changes and rapid introduction of new media, people still think intrinsically in terms of post- ers and screens. Our biggest challenge is acceptance in the industry we're disrupting. The brands get it, the people on the street who see it enjoy it, but the industry is still trying to understand it, which is to be expected at this stage of development in our business".

The question of whether people on the street will welcome the technology or find it insidious and invasive remains to be seen.

Public comments seen online prove that the technology is certain to be divisive. One person in the UK asked, "Can there be a more outrageous and indefensible form of light pollution than this? Any and every means must be found to ban this revolting form of advertising before it starts to torment us".

Speaking about torment, Burger King has developed an in-house ad that will intentionally trigger the artificial intelligence technology of Google Home devices to search "Whopper Sandwich." It consists of a 15 second TV ad that ends with the words "Okay Google, what is the Whopper burger?" The Google Home device near your TV will then respond by extolling the virtues of a Whopper burger by using the entry on Wikipedia. This is an indication that more non-traditional advertising could extend to the home via both Google and Amazon's in-home smart speaker Echo (which is powered by Alexa).

Augmented reality is another new advertising trend that works on the real-world Pokemon Go principle. A user can aim his phone down a street and sponsored special offers from shops within the picture will appear on screen based on your search history, location and interests. This is the brave, new world of advertising.

Below: Augmented reality is an advertising trend that is growing rapidly.

NEED FOR SPEED

The Bloodhound Supersonic Car Project is set on achieving an incredible 1000 miles per hour, smashing the current Land Speed Record and putting it beyond reach for many years to come. Driving the desire is not the glory, but education.

The ultimate triumph and a beacon for humankind's desire and ability to push the boundaries of possibility, the Land Speed Record has covered a lot of ground since it was first established in Paris, France, at the end of the 19th Century. The Comte de Chasseloup-Laubat set the first official Land Speed Record in 1898 when he took his Jeantaud 36-horsepower electric motor to 39 miles per hour (mph). Leap forward 120 years and the new target is 1000mph.

The mantle for making this happen is held by the redoubtable British race driver and entrepreneur, Richard Noble. In 1983, Noble broke the Land Speed Record when he drove the Thrust2 car at 633mph. The record stood for 14 years until Noble himself led the team that broke his record. Driven by Andy Green, the Thrust SSC (Supersonic Car) reached 763mph in 1997, in the Black Rock Desert, Nevada, USA.

That record has stood for two decades but Noble and Green are back and its days are numbered. Together with a team of around 80 science and engineering experts, the Bloodhound Project is laser-focused on raising the benchmark once more.

The plan was to reach 800mph this year and 1000mph the following year, but the new attempt has been pushed back to 2018 due to budget issues. The Bloodhound team are unfazed by the postponement and are actually glad of the extra time so that they can factor in potential vehicle weight fluctuations, ensuring that the vital thrust margin is uncompromised.

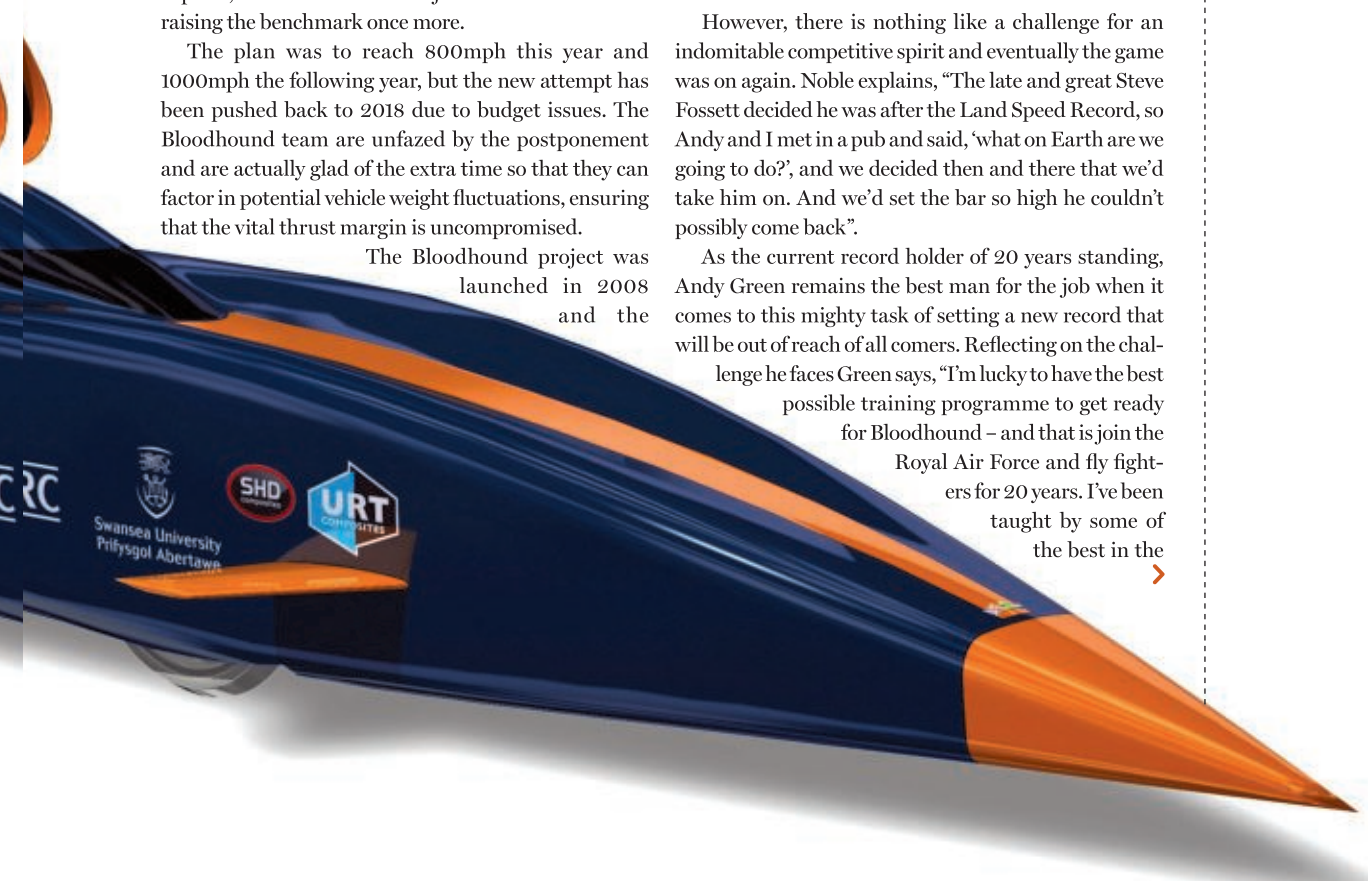
The Bloodhound project was launched in 2008 and the plans for a new record bid were slated for 2011. But the scale of this land speed attempt is unprecedented and has resulted in the time extensions. The difference between achieving over 700mph and 1000mph is a gaping chasm. One that needs a rocket to cross it.

The Thrust SSC had the same Rolls-Royce Spey turbofan jet engines as an F-4 Phantom II jet fighter. It produced 22 tonnes of thrust and broke the sound barrier when it clocked up 763mph. To beat this, the Bloodhound SSC must combine both a jet engine and a rocket engine, which in unison are designed to reach 1,050 miles per hour.

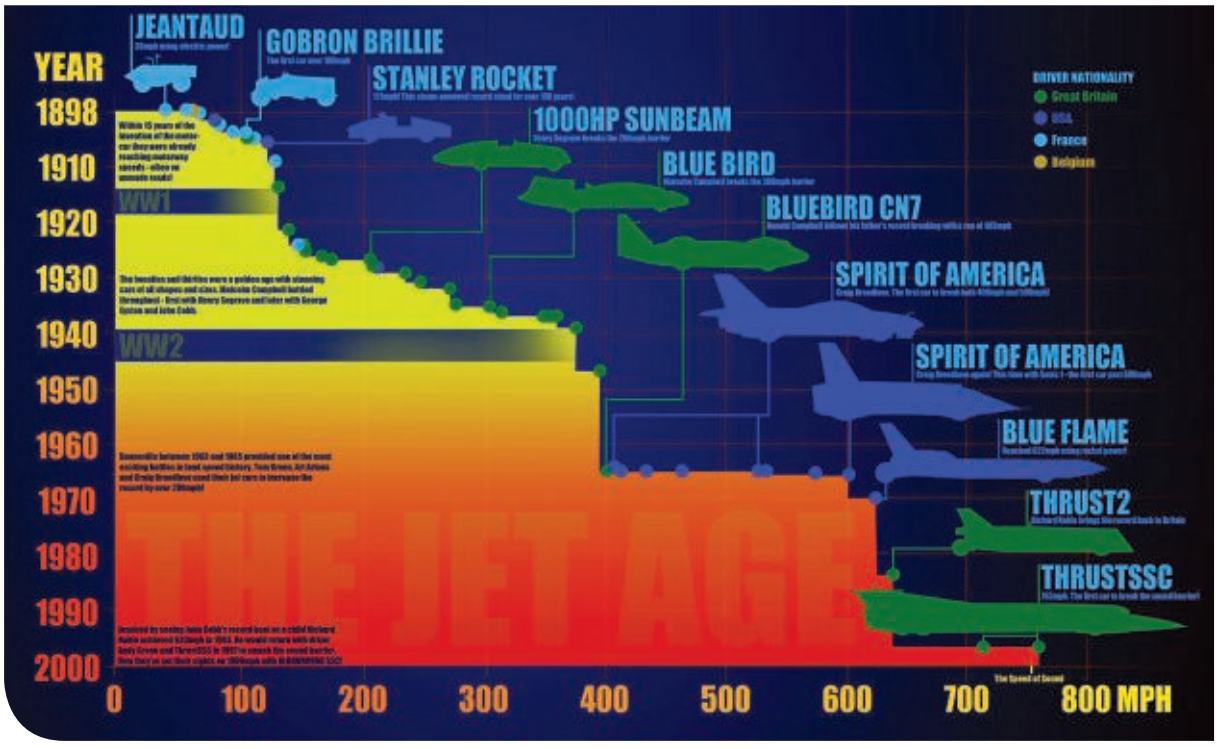
Noble led the team when Andy Green drove the Thrust SSC into the record books in 1997 and he says the budget was nearly £2.5 million. In contrast, the figure needed for Bloodhound SSC is expected to be in the region of £60 million. "We all swore we'd never ever do this again," Noble says with a laugh, adding, "the financial, mechanical and engineering trauma on a thing like this is absolutely massive. We were exhausted when we finished."

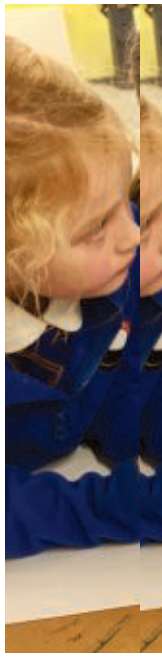
However, there is nothing like a challenge for an indomitable competitive spirit and eventually the game was on again. Noble explains, "The late and great Steve Fossett decided he was after the Land Speed Record, so Andy and I met in a pub and said, 'what on Earth are we going to do?', and we decided then and there that we'd take him on. And we'd set the bar so high he couldn't possibly come back".

As the current record holder of 20 years standing, Andy Green remains the best man for the job when it comes to this mighty task of setting a new record that will be out of reach of all comers. Reflecting on the challenge he faces Green says, "I'm lucky to have the best possible training programme to get ready for Bloodhound – and that is join the Royal Air Force and fly fighters for 20 years. I've been taught by some of the best in the ›



THE LAND SPEED RECORDS





Above: A graphic illustration of how the Land Speed Record has improved over time.

world to deal with jet engines and supersonic precision control. Plus, I have a background in mathematics so I understand the numbers and technology behind what we're trying to achieve."

But the Bloodhound is a car and not an aircraft – and there are clearly big differences. As Green says, "the first time you get into four wheel drift at 100mph it's a terrifying feeling. Multiply that by four or five times and it's exactly the way Bloodhound will behave in the dessert. I've just had a chance to practice it, relatively slowly, to get a sense for what the car is doing and how to control it... and of course, I've got the background of having done this before in Thrust SSC".

When the time is right, the destination for the next record attempt will be a mud and salt pan in the Kalahari Desert called the Hakskeen Pan. The Bloodhound project's partners in South Africa have spent five years preparing the most extraordinary racing surface in Land Speed Record history. Staggeringly, they have hand-cleared and water-levelled 20 million square metres.

"When you look at a track with no traffic, obstacles or bumps and nothing else out there, and 12 miles of perfectly clear track, you only have to do two things to keep the car safe," Green says. "Number one – keep all the wheels on the ground all the time. And number two – stop before you get to the end of the track".

As the Bloodhound SSC is the first car in the digital age, when the time comes for this spectacular record attempt, it will be live streamed to reach a global audience. This is of crucial importance to the whole team because, as Green explains, "In doing that we're not just about showcasing great British technology, it's much more than that, it's about inspiring that next generation globally... the kids who are going to build that high technology, low carbon, energy efficient world of the future. That, in very simple terms, is what Bloodhound is going to achieve".

The wow factor of a car that will travel faster than a bullet leaving the muzzle of a handgun, Mach 1.4, or 1000mph, is obvious, but it's also clear that the strategic objective underpinning the whole project is "inspiring the next generation" – tackling the dearth of scientists and engineers in the UK and worldwide and getting young people to engage in science, technology, engineering and mathematics (STEM).

This has been at the core of the project from the beginning, as Noble explains. "We had a meeting with the Minister Lord Grayson, who was responsible for buying aircraft and ships for the UK Ministry of Defence, and he came up with the idea of running the education programme, because many advanced countries have a shortage of engineers and scientists. In Britain, it's really severe and so Grayson had this idea of using the project as an education programme, as an education stimulant, and we have around 6,000 schools working on it now".

The Bloodhound project's global STEM programme recruits ambassadors to inform, advise and enthuse teachers, students and the general public about the Bloodhound project, both in the UK and abroad.

A similar approach is being taken in the UAE. STEM activities in the UAE have resulted in new vocations and job positions, such as Aerostructure Technician and Semiconductor Process Engineer, that 10 years ago didn't exist in the country. Abu Dhabi's state-owned Development Company, Mubadala, has been especially active in helping to promote STEM skills and highlight how they can be a foundation for long-term careers in new industries. Nadine Hassan, Head of Integrated Marketing and Outreach at Mubadala says, "By raising awareness about STEM skills and how they form the basis for meaningful careers in Abu Dhabi's new industries, we are helping develop a skilled local workforce to support continued economic growth."

To date, hundreds of thousands of children have welcomed Bloodhound Ambassadors to their schools. As Noble explains, "They've built model rocket cars, they've had the full scale interactive Bloodhound parked in their school halls, they've used 3-D Printers and they've seen rocket combustion engines in action. All of those children were taught by our team of educators and ambassadors".

In the UK, where Noble believes the number of scientists and engineers needs to be tripled, the Bloodhound team are succeeding in inspiring the younger generations. This is borne out by the "Bloodhound effect", where companies and universities connected with the project have seen direct positive responses. Swansea and the West of England Universities, both of which contributed to designing the Bloodhound SSC, confirm a big rise in applications for their aerospace and engineering courses. The Castle engineering company in Glasgow, which made the Bloodhound's aluminium wheels, says that attracting apprentice applications is now much easier.

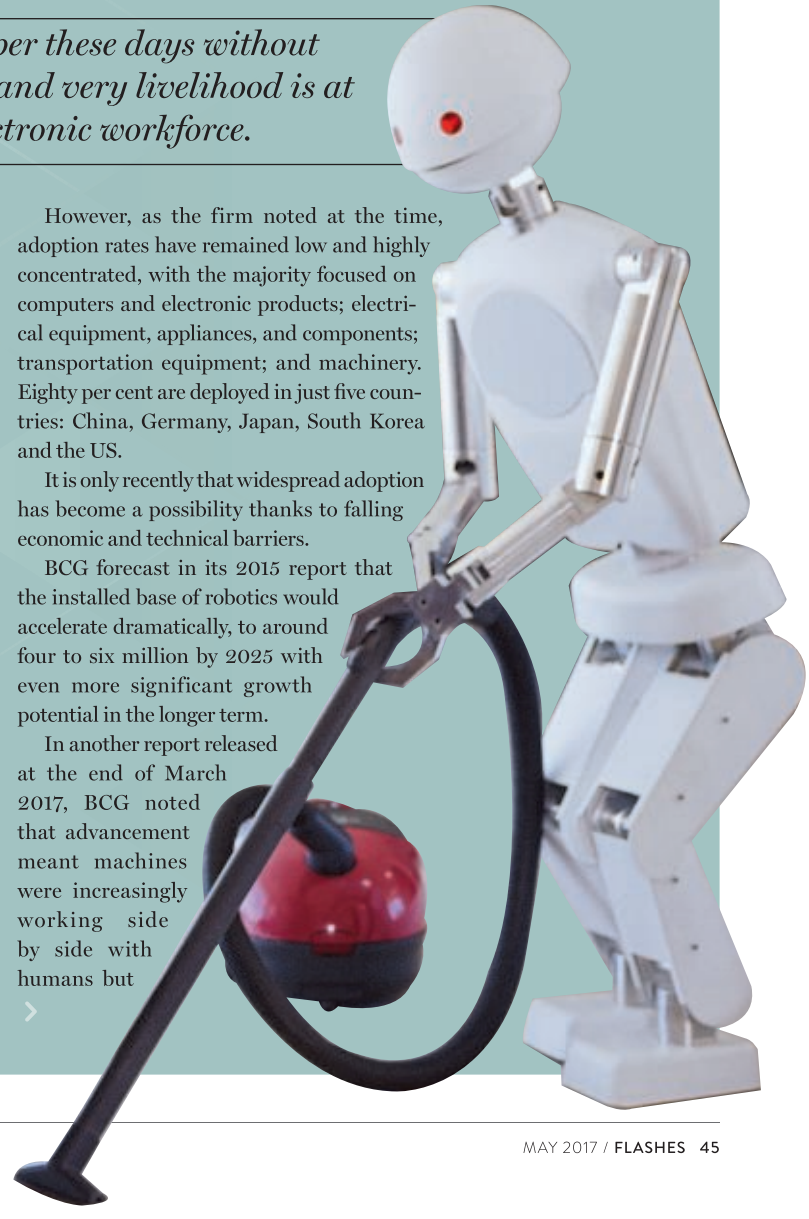
So, whilst the Land Speed Record is a real badge of honour and an awesome achievement, the real drive towards clinching the 1000mph milestone is not the glory but the desire to inspire others to push for the same. As Green concludes, "This is not just about another Land Speed Record – we could almost just get Thrust SSC out of the museum and give it a good polish and go slightly faster. This is about a genuine step change to go as fast as it's possible to go with modern technology. We're hitting the limitations of aerodynamic design as we understand it. The Bloodhound team will be telling the story of the world's first 1000mph World Land Speed Record attempt for a long time to come and hopefully inspiring other people to have a go at breaking it".

Above: The Bloodhound team hopes to smash the 1000mph barrier.

Above left: The Bloodhound education programme is active in 6,000 schools.

THE ROBOTIC REVOLUTION

You can barely open a newspaper these days without articles warning that your job and very livelihood is at risk due to the rise of a new electronic workforce.



These machines don't need to sleep, can often be more productive and are rapidly decreasing in cost placing a direct threat to assembly line and office workers as more technology develops.

A study released by the World Economic Forum last year forecast that disruptive labour market changes including the rise of robotics and artificial intelligence would result in a loss of 5.1 million jobs in 15 leading economies by 2020, with two thirds of the losses coming in the office and administrative sectors.

And these predictions are proving more real than you might think. In January, Japan's Fukoku Mutual Life Insurance attracted headlines when it announced it was laying off 34 employees and replacing them with an artificial intelligence system to calculate insurance payouts.

The company said it expected to increase productivity by 30 per cent and saving around $1.2 million a year in salaries after the AI system is installed.

Reports of robots taking jobs are by no means new. Industrial robots for manufacturing purposes have been in use in Europe, Japan and the US since the 1960s, with Boston Consulting Group (BCG) estimating there were about 1.4 million in use in 2015.

However, as the firm noted at the time, adoption rates have remained low and highly concentrated, with the majority focused on computers and electronic products; electrical equipment, appliances, and components; transportation equipment; and machinery. Eighty per cent are deployed in just five countries: China, Germany, Japan, South Korea and the US.

It is only recently that widespread adoption has become a possibility thanks to falling economic and technical barriers.

BCG forecast in its 2015 report that the installed base of robotics would accelerate dramatically, to around four to six million by 2025 with even more significant growth potential in the longer term.

In another report released at the end of March 2017, BCG noted that advancement meant machines were increasingly working side by side with humans but

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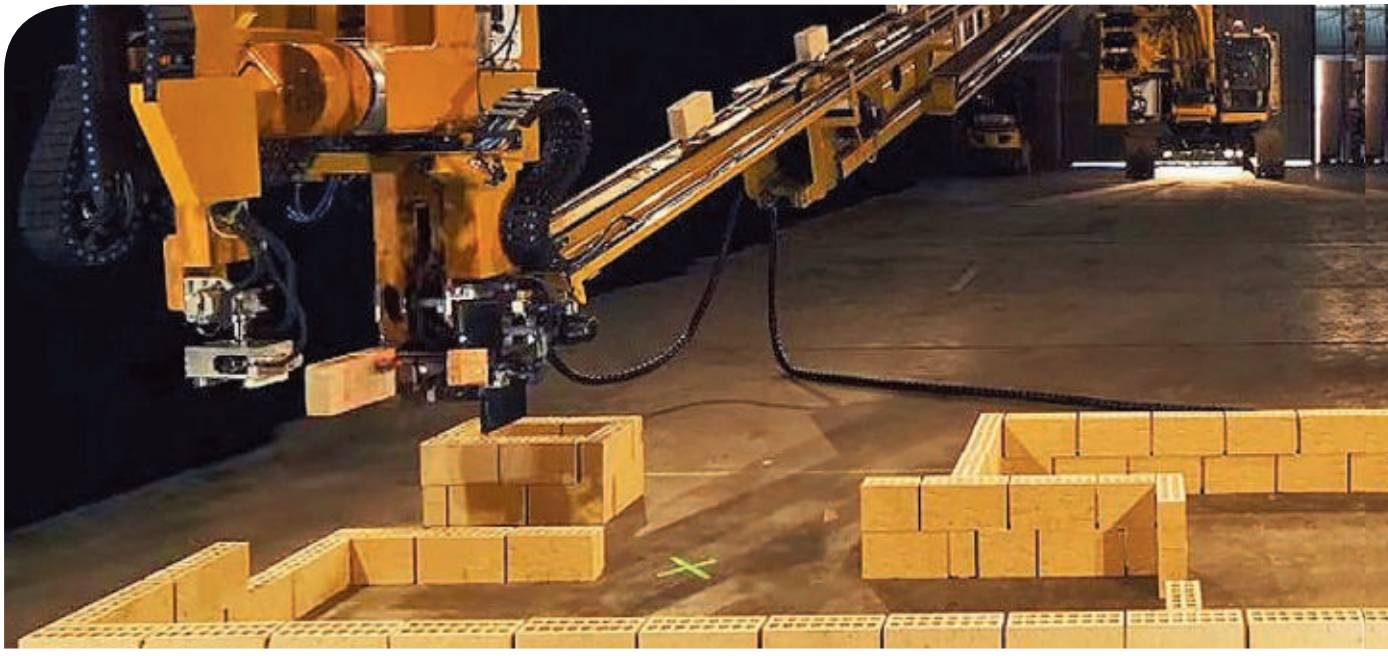


Above: A bricklaying robot called Hadrian is claimed to lay 1,000 bricks in an hour.

also replacing them, even in fairly sophisticated roles. Examples include Amelia, a cognitive agent developed by IPsoft that can perform roles as varied as technical support, customer care and procurement processing.

In the traditional home of robotics, the manufacturing sector, today's robots are becoming cheaper and more sophisticated, with products like Rethink Robotic's Baxter costing just $22,000 for a basic model compared to $500,000 for industrial robots in the past, according to the firm.

"Automation will replace assembly line and office workers even as companies require increasing numbers of programmers and other highly skilled digital talent, along with an enormous upgrade in the skills and capabilities of these workers," BCG noted. "As machines assume a greater role in the workplace – turning virtual reality into the new reality of the working world – humans will clearly have to adapt."

The impact of robotics in the workplace is further emphasised by the *Robots and Jobs: Evidence from US Labour Markets* report released in March by Economics researchers Daron Acemoglu, from the Massachusetts Institute of Technology, and Pascual Restrepo, from Boston University.

In the study, the two look at the increase in industrial robot usage between 1990 and 2007 on US labour markets through a model in which robots compete against human labour in the production of different tasks.

"Using this approach, we estimate large and robust negative effects of robots on employment and wages across commuting zones," they said.

Based on their findings, the authors calculate one robot per thousand workers reduces the employment to population ratio by about 0.18-0.34 per cent and wages by 0.25-0.5 per cent.

As a result, they estimated 360,000 to 670,000 jobs had been lost to robots in the US alone during the study period – although it should be noted that the impact varied largely depending on the sector.

Among the most affected were manufacturing jobs in heavily-robotised industries, which include automobile manufacturing, electronics, metal products, chemicals, pharmaceuticals, plastics, food, glass and ceramics. Smaller negative effects were seen in construction, business services, wholesale and retail.

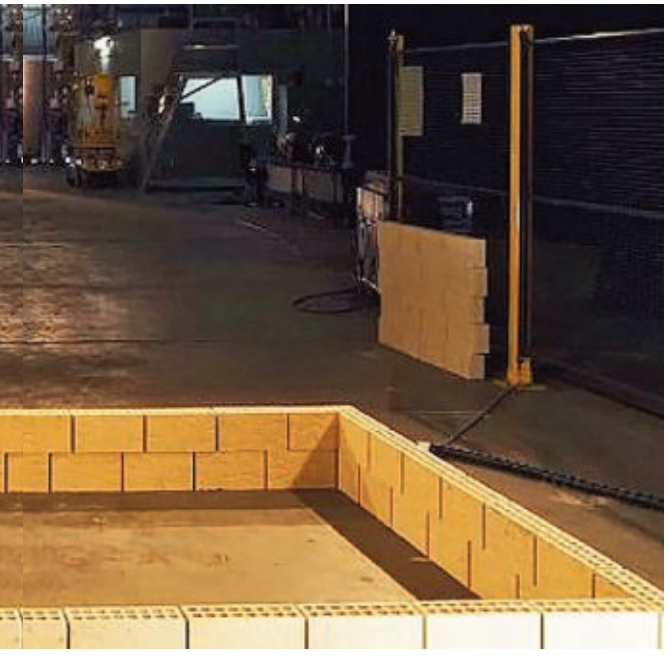
In other sectors too, the impact of robotics is yet to be felt. Some predictions suggest up to one in six public sector jobs could be automated by 2030 with the police force among the departments affected.

Dubai Police said last year it planned to use robots and artificial intelligence in its policing of the city by 2020, with plans for robot officers that perform basic functions expected to be up and running this year.

Innovations seen at the 2016 GITEX tradeshow included a robot patrolman that on top of simple functionality like shaking hands allowed members of the public to report crimes, pay for traffic violations and submit paperwork using a touchscreen.

Dubai Police is working with IBM's Watson artificial intelligence system – the same one used by Fukoku Mutual Life Insurance – to integrate a virtual assistant system allowing voice commands and other functionality.

A more mobile bot with wheels also seen at the event could carry out actual street patrols, using its cameras and sensors to detect people and objects



and automatically alert human officers if it sees anything suspicious.

Consultancy firm Frost & Sullivan said in a study last year that there would be a six-fold increase in mobile robotics in the Middle East by 2020, with shipments expected to rise from four million units in 2012 to 25.4 million in 2020.

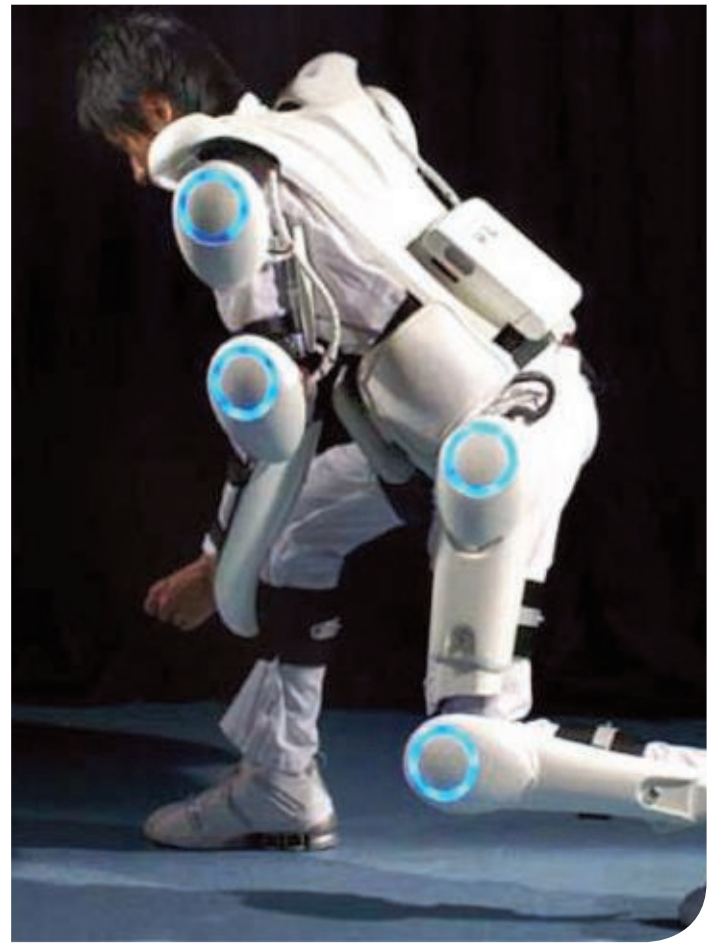
Among the most affected sectors will be logistics, with related robotics increasing from 1,400 in 2012 to 95,000 in 2020. Meanwhile the largest absolute growth is expected in personal and household robotics from four million in 2012 to 25 million in 2020.

Others sectors are expected to be impacted by larger machines. In 2015, Australia's Fastbrick Robotics unveiled a bricklaying robot named Hadrian, which it claims will be able to lay 1,000 bricks an hour once commercially available. This would allow it to build the entire shell of a building in just two days, compared to four to six weeks for human labour.

Closer to home, Dubai-based KEF Holdings is expecting to roll out the Middle East's first robot-manufactured homes from a UAE plant commissioned for 2018. This follows the success of the concept in European markets like Sweden and Denmark and KEF's rolling out to India.

The Dhs360 million KEF Infra Dubai home-production plant will feature state of the art robotics used by car manufacturers and have the capacity to fabricate eight villas and townhouses each day.

Everything from interior finishing to mechanical, engineering and plumbing work and external structure will be completed in the factory before being transported to its location.



But not every advancement is necessarily bad news for human workers. As the UAE AI/Robotics for Good competition showed in February, robots can also improve quality of life and complement human efforts in areas like emergency rescue.

Entrants for the competition included thought controlled wheelchair B-Motion, a project produced by Ajman University graduates Noor Fakhr, Mohammad Noor, Omar Mohammadi, and Abdullah Fakhrfor for quadriplegic patients who have paralysed limbs.

Others like the In-Pipe Inspection Robot developed by American University of Sharjah's Dr Mamoun Abdul Hafez, Dr Shayok, Dr Mohammad Jaradat, Wassim Al Masri, and Daniel Walid can be used to navigate oil pipelines to detect leaks. UK-based Open Bionics' 3D scanned and printed bionic hands could cut the cost of bionics for amputees from $100,000 per hand to just $5,000.

These and other technologies show that while robotics may change the workforce as we know it, they can also provide valuable benefits to improve quality of life. The challenge in the coming decades will be making sure human stay relevant as the robot revolution takes hold.

Above: Robotics are are being used to help people with disabilities achieve more mobility.

HOW TETRIS COULD HEAL THE MIND

From reducing stress disorders to controlling cravings, Tetris isn't just great for whiling away time but may also be a powerful therapeutic tool according to new research.

Lining up blocks to form perfect rows in cyber space could be more than a cure for boredom say scientists. A new study by Professor Emily Holmes from the University of Karolinska shows that Tetris' immersive simplicity makes it a powerful therapeutic tool. Holmes has spent many years studying the game's medical benefits and is now convinced that Tetris therapy helps lessen the impact of traumatic events.

Flashbacks or memories of traumatic incidents are considered to be the central hub of symptoms associated with post traumatic stress disorders (PTSD). They can trigger and even intensify symptoms such as irritability, anger, poor concentration and sleep disorders. Researchers believe that if the occurrence of flashbacks can be controlled, PTSD can be significantly reduced.

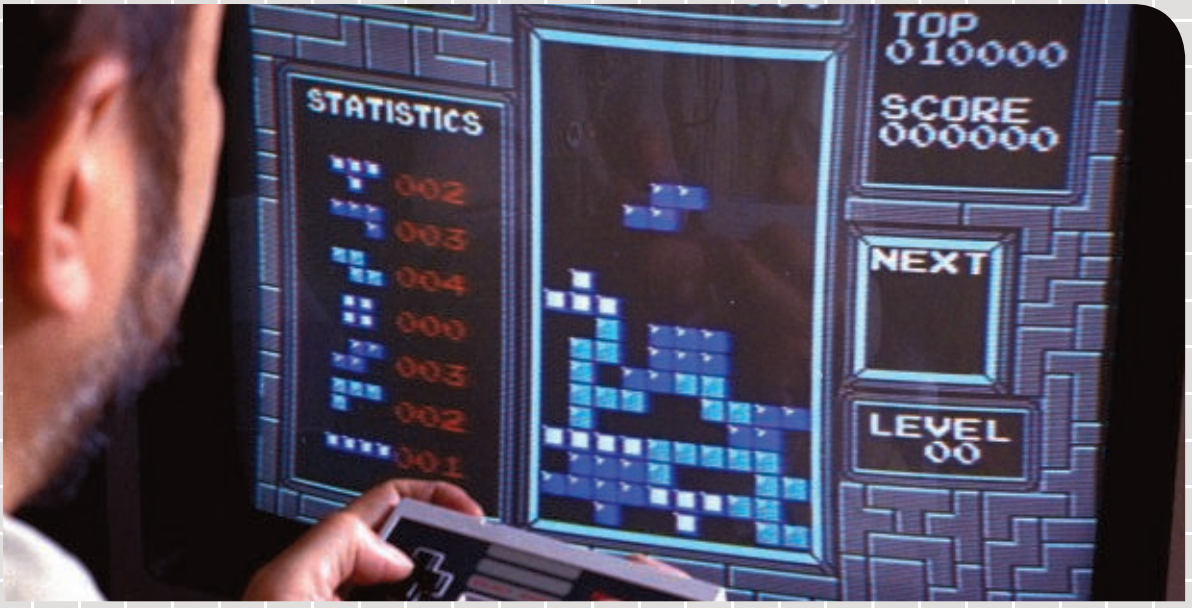
Holmes' research team administered Tetris therapy to victims of road traffic accidents admitted to the emergency department at a large UK hospital. The patients, who were in a state of shock, were asked to visualise the crash they had just encountered and then begin playing Tetris on a Nintendo console. Patients who played the highly engaging visual-spatial game experienced significantly fewer flashbacks. Only 20 minutes of play seemed to be sufficient in preventing disturbing memories of the accident being formed. The patients who did not receive the Tetris therapy reported experiencing more flashbacks than those who had played the game.

"The Tetris game had a protective effect," said Holmes." Our findings suggest that if you engage in very visually demanding tasks soon after a trauma, this can help block or disrupt the memory being stored in an overly vivid way."

However, doctors only have a six-hour window of opportunity after a traumatic event to intervene and prevent the onset of PTSD. Holmes now wants to conduct bigger trials to provide concrete proof of her theory, as the initial trial group involved only 71 patients. If the experiment proves to be successful for larger groups as well, she is hopeful Tetris could be a treatment all hospitals could start using.

A BLOCK FOR CRAVINGS

Across the world, Australian scientists from Plymouth University and Queensland University of Technology claim playing Tetris can block cravings for coffee, cigarettes and alcohol.



Thirty-one students participated in an experiment where they were asked to rate their current level of cravings for cigarettes, food and drink. Fifteen of the students were given iPods to play short games of Tetris to see if the game would have any effect on their cravings. Surprisingly, cravings decreased in the Tetris group.

"We think the Tetris effect happens because craving involves imagining the experience of consuming a particular substance or indulging in a particular activity. Playing a visually interesting game like Tetris occupies the mental processes that support that imagery; it is hard to imagine something vividly and play Tetris at the same time," said Professor Jackie Andrade, a member of the research team.

ACTIVATE YOUR EYES

The healing powers of Tetris are not entirely a new find. A study by Dr Robert Hess from McGill University in Canada, conducted a few years ago, showed that an adapted version of the game helped treat amblyopia or lazy eye.

Traditionally, treatment for lazy eye involves covering the "good" eye with a patch, forcing the "lazy" one to work more. Tetris challenges this conventional cure by training both eyes to work together.

In Dr Hess' study, patients were asked to wear head-mounted video goggles, which displayed the game dichoptically. This means, one eye could only see the falling objects while the other eye only saw the objects on the ground. To play the game, both eyes had to work together.

Eighteen adults participated in the test where half the patients' eyes were covered with the conventional eye patch, while the other half played the modified game with the goggles. At the end of the two-week test period, the group which used both eyes showed more improvement in their vision. When the patched group was moved to the Tetris training, they too reported dramatic improvement in their vision.

To some, the suggestion that a video game can help counter serious psychological diseases and addictions may seem like trivializing the condition of the patient. Researchers themselves are asking for more tests with a wider number of test subjects. However, the preliminary findings are encouraging and cannot be disregarded. It is possible that simple visual-spatial exercises, as exemplified by Tetris, could have a significant impact on some psychological disorders.

Above: Tetris can help patients deal with traumatic incidents and cravings.

MOLECULAR ALCHEMY

Omar M. Yaghi created his own branch of physical science known as Reticular Chemistry. It is now an established part of the thinking of all scientists and has the ability to create unprecedented advances.

"Science delivers solutions. Whether these solutions are deployed to address a societal problem is a societal choice rather than a scientific one," says Omar M. Yaghi to *Flashes* from his office at the University of California, Berkeley.

A lauded scientist and one of the world's most acclaimed chemists, Yaghi has made an enormous contribution to science through exploring new possibilities in the world of atoms and molecules, creating molecular frameworks that can have far-reaching applications.

Born in Amman, Jordan, Yaghi was struck at a young age by the invisible building blocks of all things. What began as the natural fascination of a whip-smart schoolboy grew into a stellar career in chemistry. "When I was in primary school at the age of 10 I found molecular drawings in a book and they captured my attention," he explains. "I always felt that these drawings, which are often used to represent the molecular world, reveal the inter-workings of living and synthetic materials. They hold the secrets of matter!"

Above: Yaghi is working on molecular structures that can draw moisture from the air resulting in water.

At the age of 15, although he spoke almost no English, his father encouraged him to go to the United States to study. He attended the Universities of Albany and Illinois and eventually became a postgraduate fellow at Harvard. Now, at 52, Yaghi has far too many roles and titles to list. Just some of his designations include Co-Director, Kavli Energy NanoSciences Institute and the California Research Alliance by BASF; Director, The Molecular Foundry; James and Neeltje Tretter Chair Professor of Chemistry, University of California, Berkeley; and Founding Director of the Berkeley Global Science Institute.

In recent years, Yaghi was awarded both the King Faisal International Prize in Chemistry and the Mustafa Prize in Nanoscience and Nanotechnology and he is presently the second most cited chemist in the world. This level of expertise and worldwide pre-eminence is borne out of his enduring passion and dedication to science. Chemistry is about atoms and how they are connected in space. Much of what we see around us is made of atoms, which make molecules, that come together to form larger objects. Chemists like Yaghi burrow deep down into these hidden worlds to uncover what is behind certain phenomena. Why and how do things behave the way they do and how can they be made better?

Chemistry is not only about atoms and how they are connected but also about how they can transform things. A capable chemist could tweak some atoms and molecules in such a way that it could transform a lethal poison into a medicinal cure. That's the type of control that can be exacted on the hidden world, allowing science to be an essential benefactor.

"I am interested in the beauty of molecular structures: how atoms are linked together to make molecules and form great materials such as polymers and pharmaceuticals. The questions that interest me are mainly concerned with making beautiful chemical structures as a way to address intellectual problems, especially basic science problems," Yaghi says, adding, "I'm driven by the focus of figuring out how to control matter on the atomic and molecular levels in order to precisely build chemical structures such as metal-organic frameworks (MOFs) and covalent organic frameworks (COFs). These materials are now very useful in clean energy storage and generation, clean water, electronics and catalysis, to mention a few."

The potential impact of developing science is limitless and chemistry has flourished as the skills to control matter on the atomic and molecular level have advanced. In the present context, the progression from atoms and molecules to assemblies and, more recently, to these MOF and COF frameworks, is setting the stage for bold advances in new materials and uses – including everything from the storage and separation of gases through to the elimination of harmful elements in our atmosphere.

Yaghi has targeted chemical structures and architectures and honed his skills to design them in unprecedented ways, and in the process founded his own branch of chemistry called Reticular Chemistry, which is concerned with the linking of molecular building blocks into predetermined structures.

Reticular Chemistry is an inherently complex and

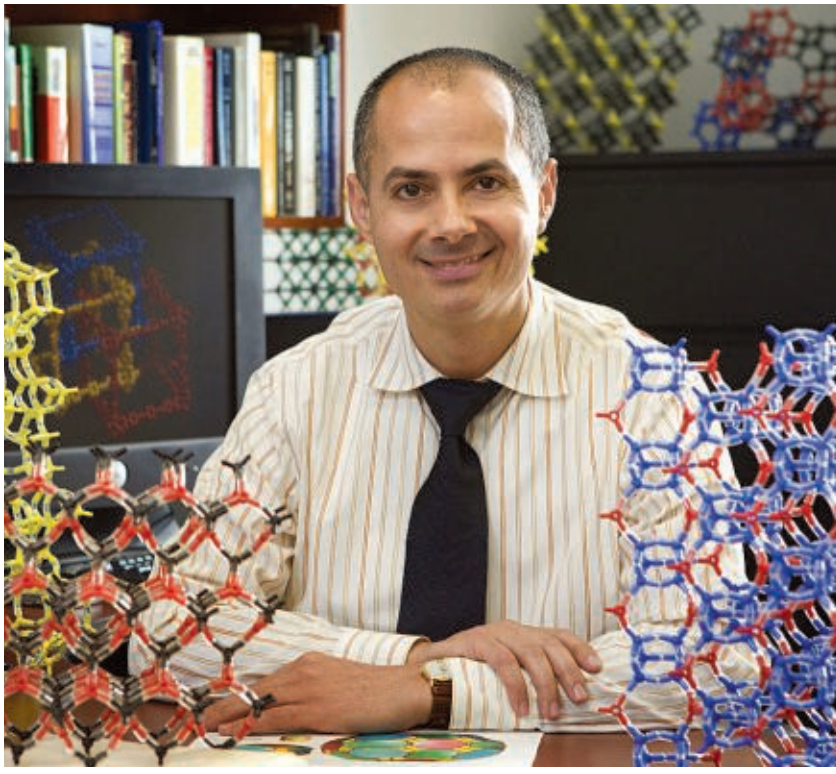
expansive subject but Yaghi is able to clearly explain it. "It is a field where one is able to stitch molecules together using strong bonds to make robust porous frameworks within which gases such as hydrogen, methane and carbon dioxide can be stored, or harmful molecules can be transformed into useful renewable fuels. Reticular Chemistry has changed the way we think about making new materials and it has led to the largest class of materials ever made. The power of this chemistry also lies in our ability to vary framework structures and craft their interiors to make them suitable for specific functions, such as capturing water from air to deliver drinking water for arid climates."

This is the "chemistry of the framework," where atoms and molecules can be controlled and manipulated. Imagine a material that can seek out and capture carbon dioxide molecules from within a universe of other molecules. The potential as a solution to ubiquitous environmental degradation is cause for optimism in an age of grave uncertainty.

"Once we have developed the means of controlling matter precisely at the atomic and molecular levels, the sky is the limit in terms of applications," Yaghi says. "The materials we are making in this way are completely new and are finding applications in the food and agriculture industry, clean energy, clean water, clean air, renewable fuels, catalysis, supercapacitors and as electronic materials, drug delivery, and bio-imaging."

Specific examples of the application of these include the use of MOFs for the slow release of pesticides and for keeping food fresh; for the capture of carbon dioxide before it is emitted into the atmosphere and conversion of carbon dioxide inside the MOF through catalysis to fuels; hydrogen storage for fuel cell and automobile fuelling and methane storage in MOFs for automobiles.

Yaghi has won many awards for his groundbreaking achievements and he is held in the highest esteem in the scientific community. Reflecting on what inspires and drives him on to accomplish more he says, "The excitement and thrill of discovery. I am blessed because I wake up every day looking forward to the next discovery, the next exploration into the molecular world. Humans are driven by searching for knowledge and understanding the world around us. The accumulation of knowledge in itself is a waste if it is not directed to the improvement of the mind. Thus, a major part of my motivation is to use the exploration into the unknown to challenge others, especially students, to go beyond their comfort zone and achieve their true potential, thereby elevating their minds and their thinking."



Above: Yaghi is the father of Reticular Chemistry, which has led to the creation of new materials.

Alongside the compelling leaps being made in Reticular Chemistry it is equally exciting to consider the potential for it to deliver solutions to the various problems posed by climate change and other grave environmental crises. Yaghi is confident about this and says, "I believe some of the discoveries we make will address many climate challenges and more. If indeed we as a society recognise these problems and make them a priority, then I'm hopeful that in future we can build a global science culture, where facts and reason are paramount."

It should come as great comfort to those within and outside the scientific community that great minds like Yaghi's are hard at work trying to resolve and improve the challenges humanity faces in the 21st Century. Yaghi's Reticular Chemistry is not just about new materials, it's about a transformation in the way we think about building chemical architectures.

Yaghi himself is buoyed by the knowledge that his discoveries will be developed further by those who will look into how nature works and subsequently translate the findings into these new materials in order to carry out new functions. Yaghi concludes, "My thinking is to create functions to help in sustainability, health, energy and water. I can't say what others might come up with. I suspect more great things."

BOTANY AND MEDICINE

Arab physicians during the Islamic Golden Age relied heavily on an expertise in botany, which resulted in many important treatises.

"One takes ten dirhams each of Indian and Kabul myrobalan without the stones, five dirhams each of common polypody, Meccan senna, Cretan cuscuta, lavender and Syrian borage, twelve dirhams each of dry, red raisins without the pips, three dirhams each of seed of endive, pulverised seed of fumitory and stripped liquorice root, a dirham of cuscuta seed, a mithqal of roses without stems, and a dirham of fennel seeds," wrote the 10th century physician Sahlan ibn Kaysan.

All were to be cooked in 400 dirhams of pure water until reduced to a quarter, according to instructions in his medical formulary *Mukhtasar al-adwiyah al-murakkabah* (A Brief Account of the Mixed Medicines Used in Most Illnesses). The mixture was then to be sieved, seven dirhams each of cassia and manna softened within it, filtered again, and finally a dirham of sieved agaric, a quarter of a dirham of salt, a spoonful of almond oil, and ten dirhams of sugar thrown upon it. It would ›

Above: A pharmacist prepares medicines to treat a patient suffering from smallpox.

Below: Fruit tree illustration from *Ajaib al-makhlukat wa gharaib al-maujudat.*

then be ready for use as a decoction (a concentrated liquid resulting from the heating or boiling of substances).

Very little is known about Ibn Kaysan other than he served the Fatimid caliphs of Egypt and reached the peak of his fame under the reign of al-'Aziz (975-996). He was, however, one of many physicians during the Islamic Golden Age who relied heavily on an expertise in botany.

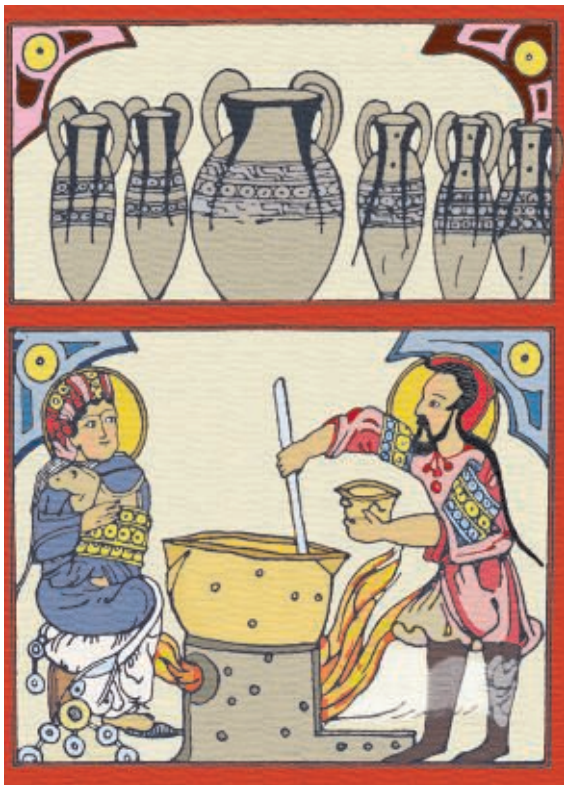
Botany was important in the Islamic world for a number of reasons, but fundamentally because of Islam itself. Various plants were named in the Quran and are seen as signs of God's power and majesty, amongst them the mustard tree, acacia, pomegranate, euphorbia, sweet basil, gourd, ginger and cedar.

In a theological context, plants served as proof of God's wisdom. The Quran, therefore, provided an impetus for the study of herbs and plants by Islamic scholars and – as Islam spread geographically – led to the emergence of a rich botanical literature.

The botanists of the time studied with diligence. They knew how to produce new fruits by grafting, and combined the rose bush and the almond tree to generate rare and beautiful flowers. The botanical gardens of Baghdad and Samarra, even those of the Fatimid caliphs of Egypt, contained an endless variety of plants cultivated for their foliage, fragrance or culinary and medicinal virtues. It was the latter, however, that became the most important aspect of all botanic studies and literature.

Plants were studied for their curative and healing properties and authors sought to determine the true significance of every species they encountered. In many ways, botany became an ancillary branch of medicine or – more precisely – pharmacology; that is, the branch of medicine concerned with the uses, effects and modes of action of drugs. And nearly all drugs were derived from plants.

"I had great desire to know precisely *Materia Medica*, which is the basic study of composed drugs, and I have furthered the study of this subject with much care," wrote the Andalusian physician and pharmacologist Abu Dawud Sulayman ibn Hassan Ibn Juljul, better known simply as Ibn Juljul. "God, most kind, has given me the means to accomplish my wish, which was to bring to life what I feared whose knowledge could be lost, a loss of something that is of great advantage for the health of humans. It is, indeed, God who has created the cure, and has spread it amongst plants thriving on the soil, and amongst the animal kingdom, that move on the land, or swim in the waters, and in minerals under the ground, for all this is witness of the power for healing, a gift and a bounty from God the Almighty."



We know of Ibn Juljul's words largely thanks to Ibn Abi Usaybi'ah, a 13th century physician who lived and worked in Syria and Egypt and is best known as the author of the biographical dictionary *Uyun al-anba'e fi tabaqat al-atibba'e* (Sources of Information on the Classes of Physicians).

The dictionary included the biographies of physicians from ancient Greece through to the author's contemporaries, reflecting the debt owed by Arab and Persian botanists and physicians to the Greeks. Just as the Arabic translation movement had begun the transference of Greek knowledge in astronomy, philosophy, chemistry, biology and mathematics to scholars in Baghdad from the 8th century onwards, so too it led to the arrival of the works of Greek physicians such as Hippocrates and Galen, and the physician and botanist Dioscorides.

It is Dioscorides who is perhaps the most important. It was a translation of his *De Materia Medica* that constituted the original source of knowledge and inspiration for medical and pharmacological writers. Dioscorides described approximately 600 plants, mainly of the Mediterranean area, providing for every item equivalent names in some other languages, its provenience, a short morphological description, and then a statement of its medicinal properties and uses.

"The Muslims elaborated on Greek classification and originated new major types of pharmacological literary models," wrote Martin Levey in *Early Arabic Pharmacology*. "These new approaches to pharmacological knowledge became not only more numerous and diversified but also, on the other hand, more flexible literary media. Since this literature flowered into works which considered the subject from a great variety of new directions, there resulted new ways of looking at pharmacology and new lines opened up for exploration and more detailed investigation."

While the natural philosophers were preoccupied with any given plant's place on the scale of living things – what were the functions of its different parts, how they reproduced, and whether a species was fixed or variable – botanists, pharmacists and physicians were more interested in pharmaceutical encyclopaedia, medical formularies, and the philology of plants.

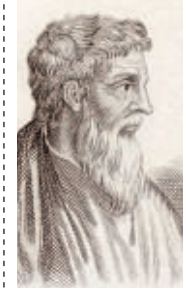
Indeed, the man considered to be the founder of Islamic botany, Abu Hanifa Dinawari, a polymath born in Dinawar in what is now modern-day western Iran, wrote the most comprehensive and methodical early philological work on herbs. The *Kitab al-Nabat* (Book of Plants), which consisted of six volumes (only the third and fifth volumes have survived complete), was written in the 9th century and includes an alphabetical inventory of 637 plants, with descriptions of the phases of plant growth and the production of flowers and fruit.

Similarly, although much later, Ibn al-Awwam, an Arab agriculturist from Seville in southern Spain, wrote *Kitab Al-Filaha* (Book of Agriculture) towards the end

Above: An illustration from the Arabic version of *De Materia Medica.*

Above left: Thirteenth century Arabic artwork entitled 'The Preparation of Medicine from Honey'.

Below: The famed Greek botanist Diodcorides.



Above: Arabic scholars greatly contributed to our knowledge of medicinal plants.

of the 12th century. Although primarily a comprehensive agricultural treatise, it mentions 585 different plants, explains the cultivation of more than 50 fruit trees, and includes many valuable observations on soils, manures and plant disease. It also includes advice on the cultivation of aromatic and scented plants such as gillyflower, lily, water lily, narcissus, violet, mint, lavender, basil and mallow, and the cultivation of plants used for seasoning and medicaments, including cumin, aniseed, fennel, mustard and coriander.

It is with the pharmacist, botanist, physician and scientist Ibn al-Baitar, however, that the apogee of botanical writing in Arabic was reached. His pharmaceutical encyclopaedia *Kitab al-Ǧami' li mufradat al-adwiya wa al-aghdhiya* (Compendium on Simple Medicaments and Foods), written sometime in the 13th century, listed 1,400 plants (more than 300 hitherto unclassified or unknown), foods, drugs and their uses.

Although the bulk of the compendium's information is compiled from earlier authors, it is the most comprehensive encyclopaedic work on simple drugs and is considered a fundamental work on botany, describing 3,000 samples, all listed in alphabetical order.

It is these simple remedies that are often the most fascinating to read. For example, *The Management of the (pharmacist's) Shop and the Rule for the Notables on the Preparation and Composition of Medicines Beneficial to Man,* a manual for pharmacists composed in Cairo in 1260 by the otherwise unknown Abu 'l-Muna Dawud, highlighted the main uses for individual plants and herbs. Aloe-wood syrup heated the stomach and was deemed beneficial for palpitations caused by damp black bile; aniseed was a laxative or cordial; basil, an ingredient in eye ointments; berberry, an astringent; dodder strengthened the liver; jujube helped with indigestion and skin diseases; while behen was believed to work as an aphrodisiac.

Syrups were the most palatable form of medicine and their recipes were described at length in the works of many of the major botanists and physicians, including Ibn Kaysan and Najib al-Din al-Samarqandi, of whom little is known other than he was killed during the pillage of Herat by the Mongols in 1222.

Ibn Kaysan gave detailed accounts of the preparation of syrups made with flowers such as rose, nenuphar and violet, with the flowers to be immersed in very hot water, covered and left until macerated. A ratl (unit of measurement) of dissolved, concentrated, and frothy sugar was to be added for every four ounces of flowers, then the pure juice of the flowers of the orange tree added and cooked on a gentle fire until concentrated.

As with other areas of learning and science, Muslim botanists, physicians and pharmacists acted as a bridge of knowledge between Ancient Greece and the European Renaissance, passing on a thoroughly examined knowledge and writings in a literary form that suited each scholar and their work.

Interestingly, however, some of the decoctions, syrups, lincti, simple remedies, poultices, medicines, oils and lotions from the Islamic Golden Age have survived almost as far as the modern day.

Discussing Abu 'l-Muna Dawud's manual for pharmacists in *Syrups From the Apothecary's Shop*, Leigh Chipman and Efraim Lev noted that: "This was a very popular book, which survives in about 30 manuscripts, and according to Goitein [a German ethnographer, historian and Arabist], continued to be in use by 'traditional druggists' in Cairo until the twentieth century, and according to Levey, writing in the 1960s, 'is still very popular mainly outside the large cities'. Despite this, to the best of our knowledge no in-depth studies of it have yet been undertaken."[3]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Leonie Matta has more than 25 years of experience in Marketing in the Middle East Region. During her experience that varies accross different industries on a regional and international level, Leonie had led, managed, implemented and developed diverse small, medium and large projects as well as teams. In addition to her PMP certification, 7 years ago, Leonie is a certified "Authorized Training Provider" on delivering RMC and TSI methodologies in project management. Both PMI Rep and well renowned USA companies in the field of project management training and PMP® certification exam preparation.

Today, she holds a Masters in Digital Marketing in Italian language and is one of the first 50 worldwide certified to Train & Coach on CQ (Change Intelligence), the latest concept in Change Management Leadership. The latter being an important component in maintaining the PMP certification, and CQ has become recently a PMI Rep.

Leonie provides Virtual & In Person Training & Coaching in PM, Marketing and Leadership in Arabic, English, French and Italian.

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