

FLASHES

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

AUGUST 2016
ISSUE 21

#2016YearOfReading

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of healthcare

DIALING IN ON OUTBREAKS

Mobile phones help predict spread
of Dengue Fever

MAKING COMPUTERS COUNT

Teaching teachers to teach
electronically

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FOREWORD

Dear readers,

The recent inauguration of the Saruq Al Hadid Museum in Dubai makes it fitting that we are running a story on how archaeologists are using satellites and drones to make new discoveries as the Saruq Al Hadid archaeological site was discovered by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, while flying over the area in a helicopter.. In 2002, Sheikh Mohammed returned with Emirati and international archaeologists who made numerous finds that established Arab tribes had inhabited the area 5,000 years ago. These artefacts can now be viewed in the Saruq Al Hadid Museum where they reflect the deep roots of Emirati culture and civilisation.

Generosity and caring is also deeply embedded in the UAE's culture as the Reading Nation campaign, which was held during the holy month of Ramadan, proved. The campaign, which was part of Mohammed bin Rashid Al Maktoum Global Initiatives, had set a target of five million books. However, it managed to secure enough funds to publish and distribute 8.2 million books to underprivileged students and refugees across the Islamic world.

One hundred thousand of these books will be distributed in Yemen as the Mohammed Bin Rashid Al Maktoum Foundation (MBRF), a member of the Mohammed bin Rashid Al Maktoum Global Initiatives, has signed a partnership with the UAE-based Galleria Saraya for Exhibitions to support the Foundation's campaign there. This initiative is central to Reading Nation campaign's aim to disseminate knowledge.

MBRF, in cooperation with the UAE Red Crescent Authority, has also launched an initiative to distribute educational bags to children aged three to 11 in refugee camps. The first stage of this campaign will distribute 5,000 bags to children in Syrian refugee camps in Jordan. Each bag contains 20 books, two learning boards, 63 educational cards and a smart pen that can read letters and words to teach children proper pronunciation.

The second phase will go further to include children around the world who are in need of education and knowledge so that they can build a better future for themselves.

Jamal Bin Huwaireb
MD of Mohammed Bin Rashid
Al Maktoum Foundation



Saruq Al Hadid Museum Inaugurated

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, inaugurated the Saruq Al Hadid Museum at Al Shindagha in Bur Dubai on 3 July.

The museum displays thousands of golden, bronze and iron pieces, discovered at the Saruq Al Hadid archaeological site in the Rub Al Khali desert. The museum also houses fossil remains of animals and fish, in addition to ancient clay pots.

Sheikh Mohammed watched a show detailing the discovery of the Saruq Al Hadid site. His Highness discovered the site while flying in a helicopter over the area. Sheikh Mohammed returned to the area in 2002, with Emirati and international archaeologists, who established that it was inhabited by Arab tribes 5,000 years ago.

At the end of his tour, Sheikh Mohammed said he was pleased with this important find and expressed pride at the UAE's rich history as a key link for different civilisations.

Sheikh Mohammed praised the efforts of Dubai Municipality and the archaeologists who explored the site. He was also delighted at the selection of the residence of Sheikh Juma bin Maktoum Al Maktoum to host the findings of Saruq Al Hadid.

"Museums reflect the culture of the nation. They symbolise the ancient and modern civilisation of a country," Sheikh Mohammed said, adding that a nation which does not have a unified past and history does not have an identity. †





Mohammed bin Rashid Meets UAE Scientific Elites

Vice President and Prime Minister and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum, met with a group of Emirati scientists, academics and holders of post-graduate degrees who work at various national institutions on 30 June at Zabeel Palace.

Sheikh Mohammed praised the dedication and loyalty of young Emiratis, saying that the country's wise leadership has spared no effort in supporting their development and specialisation in fields such as teaching, medicine, energy, technology, sports, culture and space.

"We in the UAE possess talents who are capable of making a difference and utilising the facilities to help create a bright future for our country," he said. Sheikh Mohammed also stated that the UAE, under the wise leadership of President His Highness Sheikh Khalifa bin Zayed Al Nahyan, views qualified and skilled citizens as the country's real wealth. †



Stamp Reflects Dreams Becoming Reality

His Highness Sheikh Mohammed bin Rashid al Maktoum, Vice President and Prime Minister of the United Arab Emirates and Ruler of Dubai, posted a stamp issued by his father the late Sheikh Rashid 50 years ago, that celebrated the space sciences.

The stamp was issued at the beginning of the world's space exploration phase, and at that point it was just a dream for the UAE to join this effort. Today the dream has become reality as the UAE is becoming one of the world's leaders in the space industry.

His Highness said: "Today we have a AED20 billion space sector, with a mission to Mars driven by a wholly Emirati team of scientists. Dreams begin with ideas, a word, an image or even a postage stamp. As generations work to fulfill our dreams, we develop concrete realities". †

Reading Nation Campaign Exceeded Target with 8.2 Million Books

At the end of June His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, tweeted that the Reading Nation campaign had managed to secure enough funds to publish and distribute 8.2 million books to underprivileged students and refugees across the Islamic world.

"As we enter the last days of Ramadan, our Reading Nation campaign comes to an end. Our goal was five million books. We achieved eight million," His Highness tweeted. "Eight million books will open doors of hope for millions of needy students and refugees, and shows we are truly a nation of readers."



More than 700 volunteers contributed to the campaign, with AED 41 million generated during an auction that was announced at the start of the holy month of Ramadan by Sheikh

Mohammed. "Our thanks to all who contributed, participated and supported. Ramadan is the month of goodness and our UAE is a nation of giving and care," he tweeted. †



MBRF Launches 'Esterahat Sayedat' (Ladies Book Club)

The Mohammed Bin Rashid Al Maktoum Foundation (MBRF), a member of the Mohammed Bin Rashid Al Maktoum Global Initiatives, has launched a new initiative titled 'Esterahat Sayedat' – the first book club dedicated to the women in the Arab world.

'Esterahat Sayedat' aims to promote reading on a daily basis among women of different social backgrounds. The idea is to create a reading club for women that holds regular meetings to discuss selected books in various fields, exchange the knowledge learned from these books and holding literacy workshops for participants in the UAE. Moreover, the initiative will organise meetings with authors and experts in human and personal development to discuss the books, exchange points of view regarding their topics, and work to spread them to the widest possible audience.

His Excellency Jamal bin Huwaireb, Managing Director of MBRF, said: "The goal of our efforts and projects is to develop a cultured and knowledgeable community. To that end, we launch a set of unique initiatives that focus on reading, and we support them with innovative practices, such as the 'Ladies Book Club', that catalyse the intellectual development of the female demographic in our society."

MBRF leveraged its social media outreach to spread word regarding the initiative. The 'Ladies Book Club', which will include participants from



both the UAE and Oman, is set to host 64 events and discuss 77 books. The initiative has managed to attract 1,500 members and as many as 8,900 followers on social media. †



MBRF's Initiative to Provide Books for Libraries in Yemen Gains Societal Support

The Mohammed Bin Rashid Al Maktoum Foundation (MBRF) has signed a partnership with Galleria Saraya for Exhibitions to support the Foundation's campaign to provide books for public libraries in Yemen.

The books that will be distributed in Yemen will cover a wide range of topics, from the art of management, history and heritage, to success stories and inspirational books.

His Excellency Jamal bin Huwaireb, Managing Director of MBRF, said: "This initiative follows directives from the UAE Government to support reading and knowledge locally, regionally, and globally. It serves to expand the Foundation's efforts towards disseminating knowledge on a global scale and reaching out to those in need wherever they may be, especially in societies where multiple crises are blocking people's access to knowledge, such as in Yemen and a number of countries in the region." HE added: "We are delighted to have received support from various entities, especially the Galleria Saraya

Corporation – a UAE-based SME."

Aisha Al Jasmi, general manager of Galleria Saraya, underlined the importance of this initiative, which aims to disseminate knowledge and highlight the concepts of charity and philanthropy that the Emirati people grew up with.

"As a national institution, and as part of our responsibility to society, we are keen to contribute and support humanitarian campaigns that work to spread culture," Al Jasmi said, "especially given that reading and knowledge are the most important pillars for the development and progress in any society."

The campaign to provide Yemen's libraries with books is part of the UAE's Reading Nation initiative, which was launched by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, last Ramadan, and seeks to provide five million books to students in refugee camps, as well as to establish 2,000 libraries in the Islamic world. 📖

Mohammed Abdulla Zarooni, Director of Red Crescent; Jamal bin Huwaireb, Managing Director of MBRF; and Rafat Hassan Mohammed, Vice General Consul Yemen in Dubai

Educational Bags for Refugee Children

The Mohammed Bin Rashid Al Maktoum Foundation (MBRF), in cooperation with the UAE Red Crescent Authority, has launched an initiative to distribute educational bags to children aged three to 11 years in refugee camps.

The new efforts to distribute educational bags were championed by Her Highness Al Jalila bint Mohamed bin Rashid Al Maktoum under the patronage of His Highness Sheikh Ahmed bin Mohamed bin Rashid Al Maktoum, the Chairman of the foundation.

His Excellency Jamal bin Huwairib, Managing Director of MBRF, stressed that by distributing these ‘Smart Reading Library Bags’, MBRF hopes to help refugee children everywhere and equip them with the knowledge and skills they need to build a better future for themselves and their nations.

The campaign will be carried out in stages. The first of which consists of distributing 5,000 bags – worth AED1 million in total – to children in Syrian refugee camps in the Hashemite

Kingdom of Jordan. The second phase is set to go beyond that to include children around the world who are in need of education and knowledge.

Each of these “Smart Reading Library Bags” contains 20 books, including five stories, five textbooks, two learning boards and 63 educational cards, in addition to a smart pen that can read letters and words to teach children proper Arabic pronunciation.

This initiative is also in-line with the “Reading Nation” initiative. 📖



SMART READING LIBRARY BAGS

20 BOOKS

5 STORIES

5 TEXTBOOKS

2 LEARNING BOARDS

63 EDUCATIONAL CARDS



SMART PENS

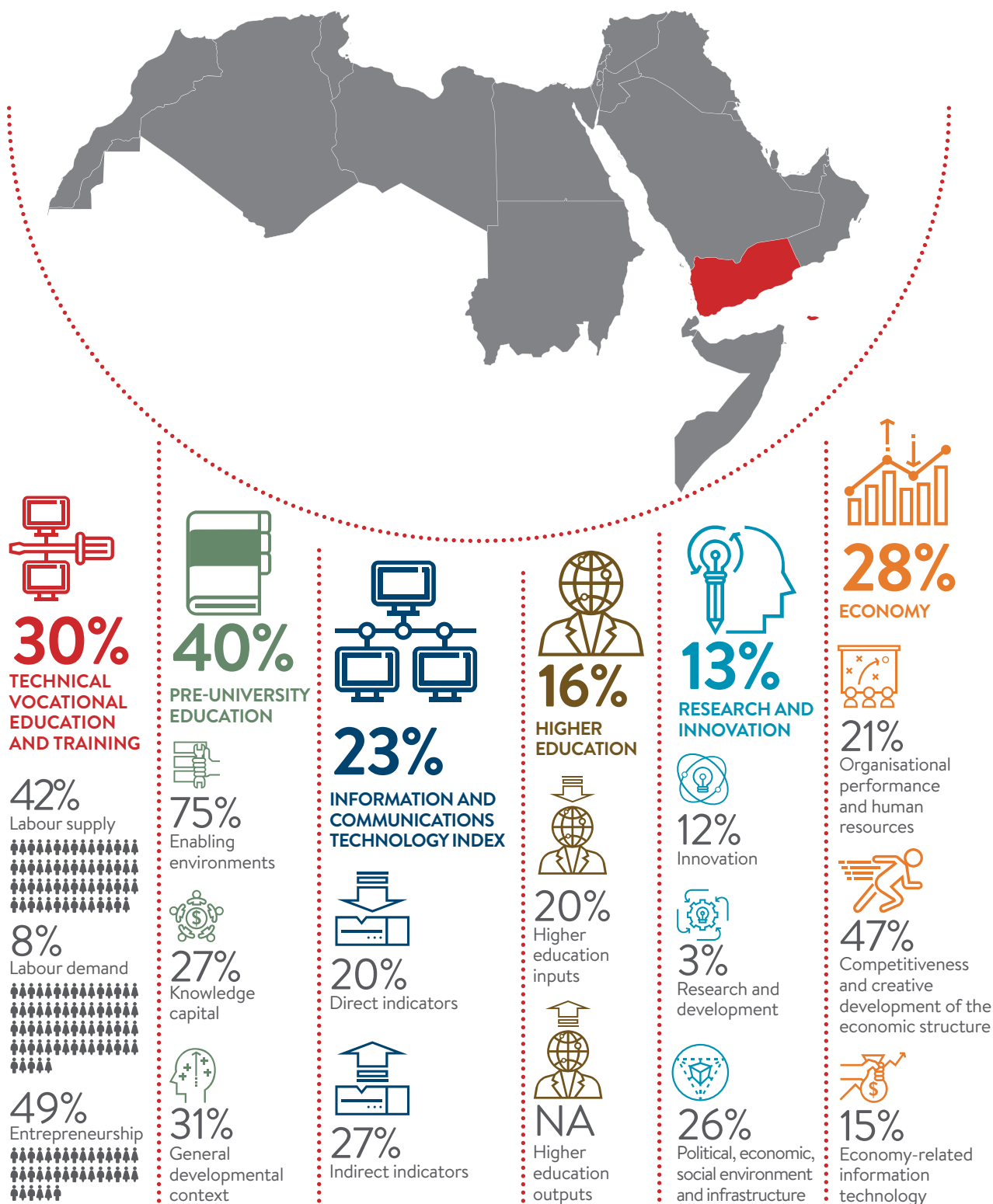
THAT CAN READ LETTERS AND WORDS TO TEACH CHILDREN PROPER ARABIC PRONUNCIATION

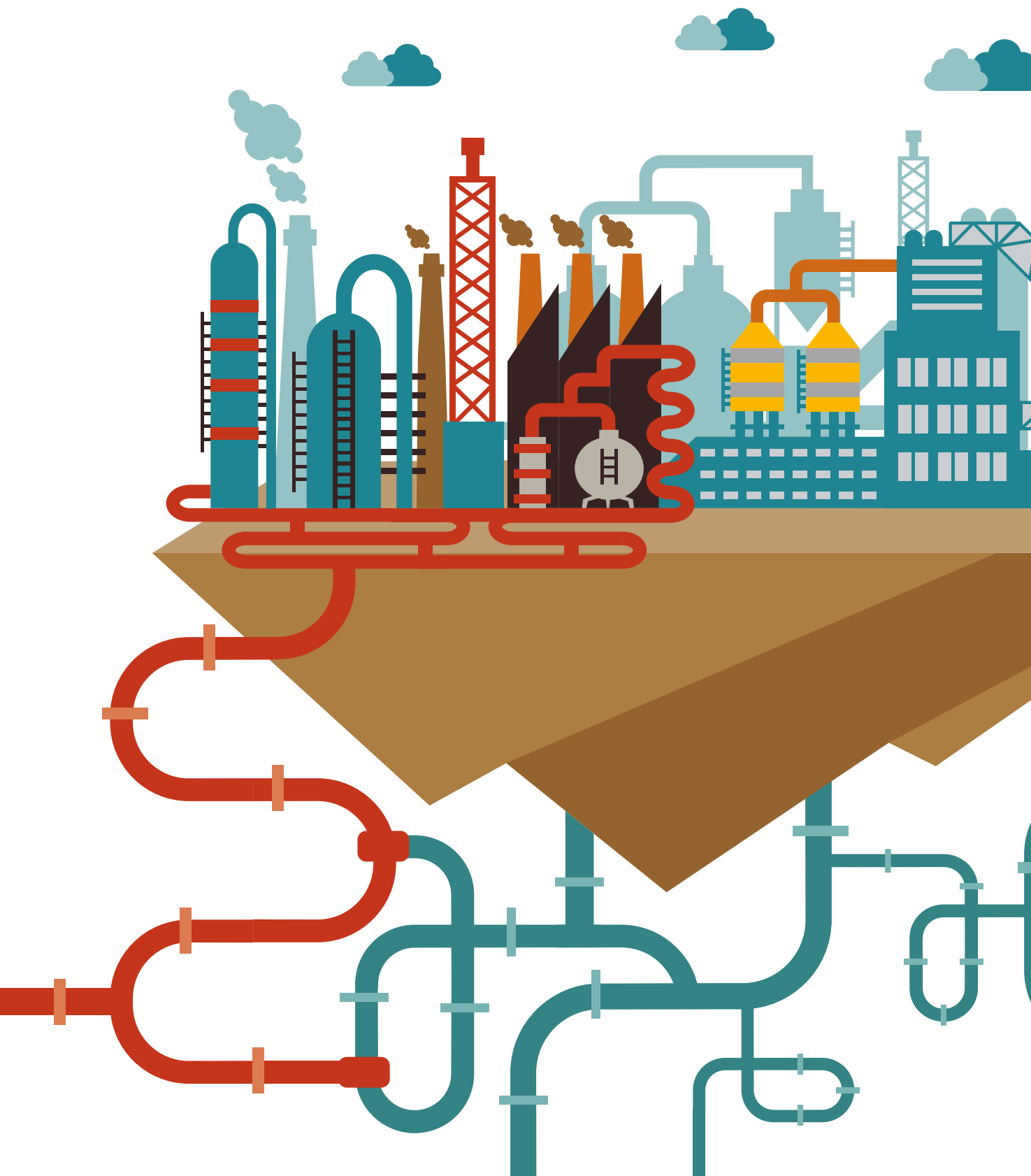
THE ARAB KNOWLEDGE INDEX

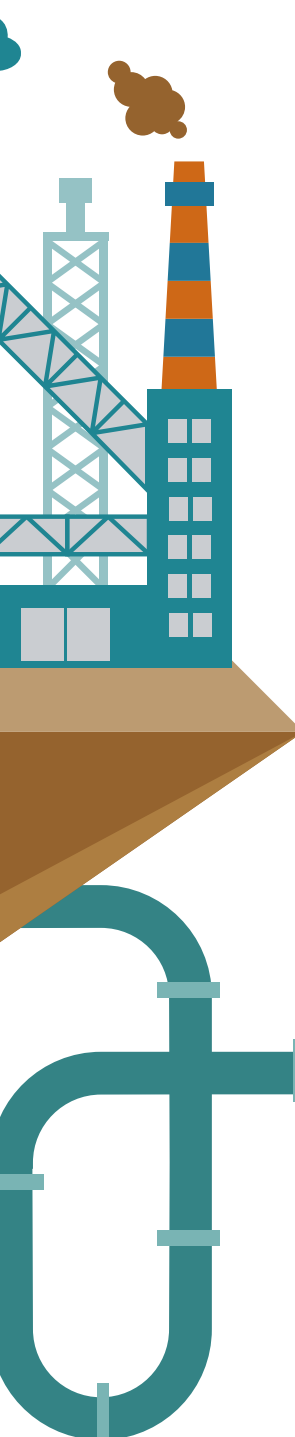
The Arab Knowledge Index, a joint initiative between the Mohammad Bin Rashid Al Maktoum Foundation (MBRF) and the United Nations Development Programme (UNDP), focuses on several critical sectors when analysing a country: Education at its Pre-University, Higher and Technical Vocational and Training levels, Research & Development and Innovation, Economy, and ICT. It employs a total of more than 300 variables across these different sectors.

The Arab Knowledge Index is distinguished by taking into consideration, and for the first time, sectors that are often not well considered in similar attempts, such as the Technical Vocational Education and Training sector, the relation between R&D and innovation, and the interaction between the different sectors.

The Index methodology was developed in consultation with top-level local, regional and international experts and academics, in addition to regional workshops across the Arab region. This issue's focus is on Yemen. ➡

ARAB KNOWLEDGE INDEX 2015: **YEMEN**





DUBAI'S NEW INDUSTRIAL STRATEGY

The industrial sector is already an important driver of Dubai and the UAE's economic success. Dubai Industrial Strategy will further aid the emirate's goal of innovation and creating a favourable environment for growth and sustainability

Weak oil prices have had a negative effect on the economic growth of all Middle Eastern oil-producing countries. However, thanks to the UAE's long-term commitment to economic diversification, the impact has been mitigated. According to the International Monetary Fund (IMF) the UAE will see overall real GDP growth of 2.4 per cent in 2016.

The UAE has successfully focused on a number of sectors in its quest for economic diversification. For example, the total contribution of the travel and tourism sector to the UAE's domestic product amounted to about AED134 billion in 2015, accounting for 8.7 per cent of GDP and is expected to grow by 4.4 per cent this year. The trade, transportation, communication and financial sectors are all faring well. Meanwhile, Expo 2020 should galvanise the economy in the next three years, once the projects related to the global exhibition start kicking in. Consultant IHS projects UAE's non-oil growth to average 4.5 per cent between next year and 2020, partly thanks to the economic boost from the Expo.

The fact that the UAE is faring well under the current adverse conditions is directly linked to its wise and forward-thinking leadership. For example Dubai's Jebel Ali Free Zone (Jafza), the Middle East's first free zone, is celebrating its 30th anniversary this year. Jafza, which started with just 19 companies in 1985, now accounts for more than 20 per cent of Dubai's GDP and more than a quarter of the emirate's non-oil trade.

On 25 June, Dubai and the UAE took another firm step into the future. His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, launched the Dubai Industrial Strategy that aims to elevate the emirate into a global platform for knowledge-based, sustainable and innovation-focused businesses. His Highness also reiterated that the UAE is on track to achieving its objectives with regard to integrating and complementing its economic sectors and optimising industrial capacity to supplement the GDP and other revenue streams to the national economy in the coming years. ➤

THE FIVE OBJECTIVES OF DUBAI INDUSTRIAL STRATEGY'S IMPORTANT PHASE ONE INCLUDE:



Increasing total output and value-addition of the manufacturing sector



Enhancing depth of knowledge and innovation



Making Dubai the preferred manufacturing platform for global businesses



Promoting environmentally-friendly and energy-efficient manufacturing systems



Making Dubai the centre for the global Islamic products market

HH Sheikh Mohammed bin Rashid Al Maktoum said: "The Dubai Industrial Strategy aims to leverage our advanced infrastructure and enabling environment to transform Dubai into a global platform for innovative industries and a destination of choice for international companies seeking an integrated and favourable environment for growth and sustainability."

He added: "With the launch of the Dubai Industrial Strategy, we are taking one more step towards the future. We have laid down a strong foundation that blends our strategic location and infrastructure with our ambition, confidence and experience. Today we have put in place the basic framework needed to compete globally in the industrial sector and develop national talents. We are one step closer to achieving the goal of making Dubai a homeland for innovators, a favourite place to live and work in, a global economic hub, and a preferred destination for visitors."

HH Sheikh Mohammed bin Rashid Al Maktoum further pointed out: "Sustainable development involves activating all pillars of the economy. A conducive environment is required to achieve our targets that focus on knowledge, science, and research, which form the foundation for the development of industries."

He added that a sound economy today means a diverse and integrated economy led by the industry and manufacturing sectors and built on pillars of innovation and creativity. The Vice President said: "Nations are recognised for what they produce and offer in products and services and the value they add to the global economy."

The Dubai Industrial Strategy is based on five key objectives that will serve as the foundation for Dubai's industrial future. The Strategy aims to increase the total output and value-addition of the manufacturing sector, enhance the depth of knowledge and innovation, make Dubai a preferred manufacturing platform for global businesses, promote environmentally-friendly and energy-efficient manufacturing, and make Dubai a centre for the global Islamic products market.

The Dubai Industrial Strategy has further identified six priority sub-sectors: Aerospace, Maritime, Aluminum and Fabricated

Metals, Pharmaceuticals and Medical Equipment, Food and Beverages, and Machinery and Equipment. These sub-sectors were chosen based on their importance to the Dubai Industrial Strategy and Dubai Plan 2021, as well as their future growth prospects, export potential and mid-term to long-term economic impact.



AEROSPACE

In the aerospace sector, Dubai will play a pivotal role through manufacturing spare parts for aircraft and providing maintenance and repair services. The crucially important aviation sector has grown substantially over the years to reach 70 million passengers in 2014. Dubai-based Emirates airline alone currently owns a fleet of 239 aircraft in service and a further 269 that have been ordered.



MARITIME INDUSTRY

Dubai is considered a front-runner in the field of maritime maintenance and repair through its Dry Docks World and Dubai Maritime City. Dubai is in a prime position to expand its activities to attract more traffic



to its facilities, especially larger ships and offshore structures. Dubai can also foray into manufacturing yachts and boats to meet the domestic demand.

ALUMINIUM AND FABRICATED METALS

The UAE is among the top global exporters of aluminium – it exports 88 per cent of the 2.4 million tons it produces annually. According to the Dubai Industrial Strategy, the emirate has the opportunity to raise its production capacity in metal fabrication through the development of its current base in aluminium production. This will be achieved by enhancing the capabilities of the downstream and finished goods manufacturing domains to increase the overall added value and maximise benefits from the existing smelters. The downstream activities will further enhance the global reach of domestic producers and attract players from the international auto and aerospace industry.

PHARMACEUTICALS

The Dubai Industrial Strategy has chosen the pharmaceutical sub-sector for its vital importance and added value. With low local and regional production capacities, the countries in the GCC region currently import 80 per cent of their pharmaceutical requirements. Lucrative opportunities exist to develop this strategic sector. The first phase of the strategy will focus on manufacturing cosmeceuticals (cosmetics that are claimed to have medicinal properties) to benefit from the growth of this niche market – particularly given the increasing demand for halal cosmeceuticals. The next phase will be manufacturing pharmaceuticals that require advanced technology, skilled human capital and strong R&D capabilities.

FOOD AND BEVERAGES

The global F&B market was valued at approximately US\$4 trillion in 2014. Dubai's exports in the same year were worth AED47.7 billion (US\$13 billion). With countries in the GCC region importing 70 per cent of their food needs and registering an annual growth of more than three per cent, Dubai can play a significant role in becoming a major hub for food products in the region. Dubai's infrastructure, airports and ports, and logistical capabilities serve as drivers for the success of the F&B sector as it relies heavily on ease of access and speed of delivering raw materials and products.

MACHINERY AND EQUIPMENT

The Machinery and Equipment sector is one of the largest industrial sub-sectors in Dubai and accounts for about 25 per cent of the industrial GDP due to the high domestic and regional demand for construction machinery and equipment. Developing this sector will add significant value to the GDP – especially given Dubai's location and reputation as a hub for machinery and equipment in the region and beyond.

By implementing the Dubai Industrial Strategy, the industrial sector is expected to grow by an additional AED 18 billion by 2030 creating 27,000 jobs. Meanwhile, investment in research and development is set to increase by an additional AED700 million by 2030.

The contribution of the industrial sector to GDP was around 14 per cent in 2014. Thanks to the far-reaching Dubai Industrial Strategy, this number is set to increase and continue both the UAE and Dubai's economic success.†

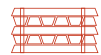
DUBAI INDUSTRIAL STRATEGY'S PRIORITY SUBSECTORS



AEROSPACE



MARITIME



ALUMINIUM AND FABRICATED METALS



PHARMACEUTICALS AND MEDICAL EQUIPMENT



FOOD AND BEVERAGES



MACHINERY AND EQUIPMENT



THE TANGY, SWEET TASTE OF ENTREPRENEURS

Lemonade Day is stoking the entrepreneurial spirit in children – one lemonade stand at a time



Left: Generations of Americans earned their first money through a lemonade stand.

For millions of Americans, the lemonade stand has long symbolised youthful entrepreneurship. In this timeless tradition, children make the drink at home and sell it to passers-by. The Lemonade Day initiative was launched to harness this opportunity to develop their business acumen.

Held on the first Sunday of May, Lemonade Day is the brainchild of Texas-based entrepreneur and philanthropist Michael Holthouse. Back in 2007, when Holthouse refused to buy his daughter a turtle, little did he know it would spawn an entrepreneurship movement involving thousands of children across the United States of America, Canada and South Africa. Undeterred by her

father's refusal, 10-year-old Lissa simply decided to earn the money for the turtle herself by selling lemonade. Holthouse, a successful businessman, stepped in to mentor Lissa and she soon set up a lemonade stall at their street corner thereby sowing the seeds of a brilliant entrepreneurial programme for kids.

Today, nearly a million children between the ages of eight and 13 make their first foray into the world of business through Lemonade Day. The programme aims to equip kids from all socio-economic backgrounds with the skills, knowledge and opportunity required to start their own business and earn from it. ➤

> PRACTICAL, HANDS-ON KNOWLEDGE

Participants who register on the Lemonade Day website (lemonadeday.org) receive an interactive Entrepreneur Workbook and Caring Adult Guide where they are introduced to concepts such as setting goals, developing a business plan, budgeting, securing investment, creating a unique product and managing profits. It takes kids and their adult mentors around a month to cover the 14 principles of the Lemonade Day curriculum. Once this is done, they put their knowledge into action by operating their own lemonade stand business on Lemonade Day.

“It is important that we teach future generations the importance of responsible business practices and instill the entrepreneurial spirit at a young age – an age that allows them to have hope and vision to excel in the future,” says Holthouse, the founder. “Our goal is to reach kids at a critical stage in their lives – that time when they are at a crossroads between a very good or bad path.”

What do children do with the money? Once the kids have paid back their investors and covered their expenses, the Lemonade Day curriculum encourages them to open their own savings

account and then “spend a little, save a little and share a little”. From buying new toys and pets; donating to charities to saving for a bigger, better stand the coming year, Lemonade Day doesn’t only teach but also empowers children to have a dream and then go on to achieve it.

ADVANTAGES OF EARLY ENTREPRENEURSHIP

Designing eye-catching stands, creating a tasty drink and advertising it are not the only things children learn from Lemonade Day. The creators of Lemonade Day, Prepared 4 Life (a part of The Holthouse Foundation for Kids), designed the initiative’s curriculum to focus on a few but significant benefits of early entrepreneurial training.

Setting up their own stand exposes children to basics of accounting, inventory management and even revenue tracking. This serves as a novel way for them to deal with numbers, boosting their confidence with math concepts.

Children who are able to run their stand successfully realise that the outcome of their actions is in their control. They learn to take responsibility for their decisions, understand the value



Designing eye-catching stands is just one of the skills young entrepreneurs learn.

of being self reliant and that all obstacles can be overcome with proper planning and preparation.

As the children describe their products, listen to compliments or complaints from customers or simply say 'hello' – each of these improves their social skills. In fact, Lemonade Day serves as a great confidence booster for children on the autism and other learning difficulties spectrum. As no distinction is made between any child's skill and knowledge, children with learning disabilities are able to participate in the event doing the same activities as other kids, putting them at par with their peers. The fun, experiential programme is also a part of the Google for Entrepreneurs initiative, making it accessible to more children.

The GW School of Business in Washington D.C. has taken the Lemonade Day initiative a step further and included it in the business school's service-learning project. GW sends its first-year students to primary classrooms across D.C.'s public schools to mentor fourth to seventh graders. Here, it's not just the younger children learning entrepreneurial skills but also the business students. "Many times you're asked in a business meeting to sell yourself, to sell your brand, to convince someone that you need them to buy whatever it is that you have or to make a trade," says GW's Assistant Director of Undergraduate Programs David Ruda. "Part of what Lemonade Day is what we are teaching our students in the First Year Development Program. They have to go into schools and 'sell' Lemonade Day to these children."

SWEET SUCCESS

There are many, many success stories that come off the Lemonade Day experience. One such is Lily-Ann's stand from the Canadian province of Saskatchewan. Participating in the initiative for the past three years, Lily-Ann is independent of outside investors and finances her own stand. Her product line has expanded from classic lemonade to a full range of fizzy lemonades in a variety of flavours. Last year, Lily-Ann was named the Lemonade Day Ambassador, she won the Best Stand Contest, was interviewed on television and radio, won a partial sponsorship from Soda Stream – makers of flavoured sparkling water, and was also awarded a cheque from investment service company Affinity Credit Union.

However, just like real-world businesses, all the stands are not a glowing success. Quite a few children go home without having made a monetary profit, but they do learn important life lessons. The best thing is that the initial failure spurs them



to do better the following year. And Lemonade Day's unique focus on education and experience rather than making a profit encourages children to return the following year with stronger plans for success. Entrepreneurial spirit, marketing prowess, practical lessons in economics and optimism (to name a few) – all flow freely at Lemonade Day. ↑

Even if Lemonade Day participants don't turn a profit, they still learn valuable lessons.

ENTREPRENEURSHIP RISING IN DUBAI

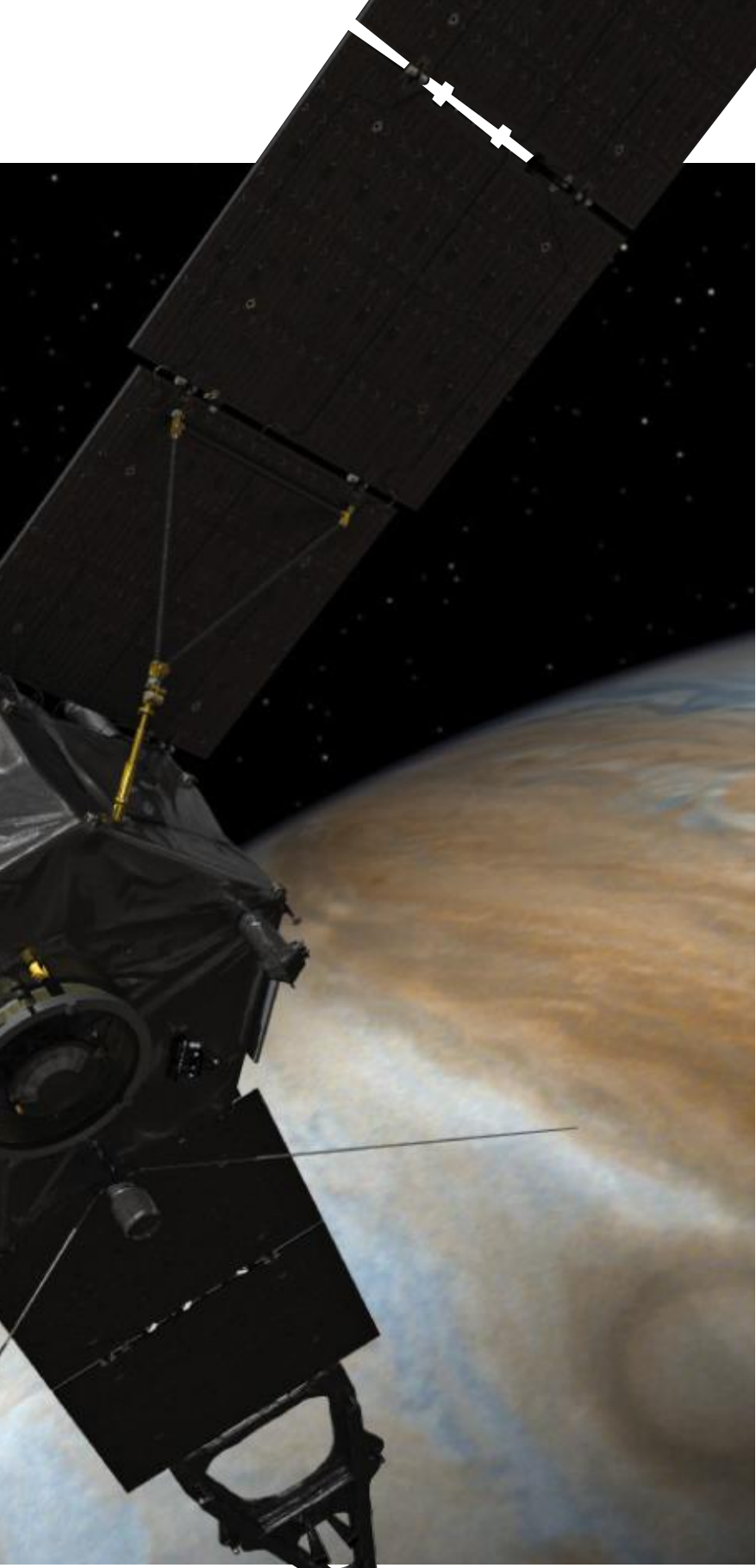
Dubai has its own share of enterprises that encourage the entrepreneurial spirit in youths. Research by the Knowledge and Human Development Authority (KHDA) in 2015 showed that over 70 per cent of Dubai's private schools include entrepreneurship in their extra-curricular activities. Apart from schools, a number of private centres focus on developing children's business acumen. Impact Hub in Downtown Dubai offers a variety of programmes from two-day boot camps to three-month workshops that cater to all stages of a business start-up. Discover Me Dubai specialises in immersive experiential workshops for teen entrepreneurs. Their workshops give teenagers the chance to work with established companies to create innovative products, and design a successful sales pitch amongst other skills.

Initiatives such as the Kids Entrepreneurship Carnival, Young Entrepreneur Competition, National Souk, and Entrepreneur Station by Dubai SME has helped many youngsters turn their business dreams into reality.

The Incredible JOURNEY

A photograph of the Juno spacecraft in space. The spacecraft is a boxy, metallic object with large solar panels extended. It is positioned in the lower right of the frame, with its solar panels extending towards the left. The background is a deep black space filled with numerous small, distant stars. The lighting on the spacecraft highlights its metallic surfaces and the structure of the solar panels.

The Juno probe travelled 2.8 billion kilometres to Jupiter before successfully entering into orbit. The data it gathers will provide critical answers to the gas giant's formation and that of our own solar system



As far as interplanetary exploration goes, Mars has received the lion's share of attention. Since the 1960s there have been 55 missions to the red planet, with a 53 per cent success rate. Another six missions are planned between now and 2020, among them the UAE's Hope probe that aims to study the Martian atmosphere and climate. If successful, it will be the first Arab, Islamic probe to reach the planet. It is scheduled to reach Mars in 2021, which coincides with the 50th anniversary of the United Arab Emirates' formation. Currently, another 21 Mars missions are at the proposal stage. The fact that nearly two-thirds of the missions have failed shows the difficulties in traversing 225 million kilometres of space (average Earth to Mars distance).

In marked contrast, there are only nine missions that have involved Jupiter in any form, with most of them being flybys or slingshots to other planets (a slingshot is when a spacecraft uses a planet's gravitational field to increase speed). Only Galileo entered Jupiter's orbit, and it managed to stay there for eight years before being deorbited by contact with the planet's atmosphere. Galileo's separate probe was operational for only 57 minutes after being launched into the planet's harsh atmosphere. At its closest, Jupiter is 588 million kilometres from earth and spacecrafts have covered that distance in anything from 13 months to six years depending on the goal of the mission, the alignment of the planets and the propulsion technique used.

As a result, science knows a lot more about Mars than Jupiter, which is the largest planet in our solar system. What we do know is that Jupiter is a gas giant, with its atmosphere approximately 75 per cent hydrogen and 24 per cent helium by mass, with the remaining one per cent of the mass consisting of other elements. Jupiter is thought to consist of a dense core with a mixture of elements, a surrounding layer of liquid metallic hydrogen with some helium, and an outer layer predominantly of molecular hydrogen. Beyond this basic outline, there is still considerable uncertainty. Jupiter's magnetic field is fourteen times as strong as that of Earth and it has at least 67 moons, including the four large Galilean moons discovered by Italian astronomer Galileo Galilei in 1610. Ganymede, the largest of these, has a diameter greater than that of the planet Mercury.

Jupiter is perpetually covered with clouds composed of ammonia crystals and possibly



▶ ammonium hydrosulfide that form a 50-kilometre deep layer. Concealed beneath this dense cloud cover, Jupiter safeguards secrets to the fundamental processes underlying the early formation of our solar system.

The primary scientific goal of the Juno mission is to significantly improve our understanding of the formation, evolution and structure of Jupiter. This is critical as present theories of the origin and early evolution of our solar system are currently at an impasse, so the information the Juno mission can provide may lead us towards a unified and correct theory. And as Jupiter is the primary example of a giant planet in our solar system, the mission can also provide critical knowledge for understanding the planetary systems being discovered around other stars.

In order to collect information, the Juno probe had to enter into a highly elliptical polar orbit that skims only 5,000 kilometres above the planet's atmosphere. Putting a probe into the relatively simpler Mars orbit has had a 50 per cent success rate so far, so it is understandable that tensions were high at the NASA Jet Propulsion Laboratory when Juno finally reached Jupiter on July 4 after a five-year, 2.8 billion kilometre voyage. Due to the communication time lag between Earth and Jupiter, Juno was on autopilot when it fired its rocket

engine for 35 minutes in a do or die moment to slow itself down and gently slip into orbit. Failure to enter orbit would have meant that Juno would have sailed past Jupiter and the \$1 billion mission would have been a failure. But as it takes 48 minutes for a radio signal to travel from Jupiter to Earth, the control room was literally in the dark while the probe executed the manoeuvre. It was an anxious wait before the control room broke into cheers after confirming Juno had successfully entered orbit.

The probe is now in an orbit that takes around 53.5 days and brings Juno within 4,300 kilometres of Jupiter. However, on October 19 this year, Juno is set to undertake another critical manoeuvre that will bring the spacecraft within 2,000 kilometres of the cloud tops, which is necessary for the key data gathering phase. At this point one orbit will take 14 days and the probe is scheduled to complete 37 of these over a 20-month period, before being deorbited and ending its life in a fiery collision with Jupiter's atmosphere in order not to risk contaminating any of the moons.

Juno's suite of instruments, which are shielded against radiation in a 180 kilogram vault made of one centimetre thick titanium metal, can sense the hidden world beneath Jupiter's clouds while

JUNO

BUILT TO WITHSTAND
INTENSE RADIATION
ENVIRONMENTS

SOURCE: National Aeronautics
and Space Administration



RADIATION CHALLENGE EARTH

Several instruments
practiced making
measurements in
Earth's magnetosphere

What protects Juno from radiation effects?

- Detectors and their electronics are to withstand radiation
- Most electronics shielded in ~1/2 -inch thick titanium vault
- On the outside of the spacecraft the star tracker's camera is about 4x heavier than even the biggest standard star trackers due to extra shielding
- Orbit is designed to avoid most intense pockets of radiation

What problems does Intense Radiation cause?

- Spacecraft and instrument degradation
- Electric charging of the spacecraft
- Noise from particles hitting detectors



RADIATION CHALLENGE SPACE

Radiation from...
Solar energetic particles
Cosmic rays from
outside the solar system

other experiments investigate the external effects that world produces. Specifically, Juno's mission is to:

- ☞ Determine how much water is in Jupiter's atmosphere, which helps determine which planet formation theory is correct (or if new theories are needed).

- ☞ Look deep into Jupiter's atmosphere to measure composition, temperature, cloud motions and other properties.

- ☞ Map Jupiter's magnetic and gravity fields, revealing the planet's deep structure.

- ☞ Explore and study Jupiter's magnetosphere near the planet's poles, especially the auroras – Jupiter's northern and southern lights – providing new insights about how the planet's enormous magnetic force field affects its atmosphere.

How much information Juno collects will depend on how long the instruments last. Thanks to the radiation shielding, some instruments are expected to last at least eight orbits and others more than 11.

Juno will map Jupiter's internal structure by studying its influence on the planet's gravitational field with unprecedented accuracy. The water abundance will be determined by microwave radiometers that will detect thermal radiation from deep atmospheric layers, a completely new



approach. Water ice brought most of the heavy elements to Jupiter. Knowing the water abundance will reveal the original form of that ice and hence help define the conditions and processes in the original cloud of dust and gas that led to the origin of Jupiter. Those same conditions and processes were forming other planets as well, which will tell us much about the origin of earth and the rest of our solar system.

If all goes well, by February 2018, when Juno is set for its fiery collision with Jupiter, scientists will have a treasure trove of data that will lead to a greater understanding of our solar system and those beyond our reach. ⚡

Celebrations erupted at the NASA Jet Propulsion Laboratory after it was confirmed Juno had entered orbit around Jupiter.

■ Why does Jupiter have such Intensive Radiation Belts?

- Very strong magnetic field
- Jupiter's magnetosphere extends out 100 Jupiter radii on the sun facing side – Earth's is only 10 Earth radii
- In addition to the solar wind, Io's volcanic activity constantly releases gas into the magnetosphere, which gets ionized and energized, adding to the radiation

■ RADIATION CHALLENGE JUPITER

- Very intense radiation belts
- Particles trapped in the belts are so fast they spiral from top to bottom in only a few seconds
- These particles are moving at nearly the speed of light!





Technology can be a powerful learning tool in the classroom, but only if used efficiently and effectively

Last year, the World Education Forum declared ensuring “inclusive and equitable quality education and promoting lifelong learning opportunities for all” as its vision. It observed that information and communication technologies (ICT) will play an important role in achieving this target. Additionally, the World Summit on the Information Society listed ‘connecting all primary and secondary schools to ICT’ as one of the 10 targets in its 2015 ‘Plan of Action’.

It is obvious then that ICT is globally recognised as a powerful factor in strengthening education systems, enabling the spread of knowledge, improving access to information and creating more effective employment opportunities. However, it is naive to believe that technology alone can solve the world’s education problems. >

MAKING COMPUTERS COUNT

➤ ONE SIZE DOESN'T FIT ALL

A case in point is the initiative undertaken by New Education Highway (NEH) in Myanmar (Burma). For three years, the non-governmental organisation visited some of the country's free community learning centres handing out laptops to pupils. The devices were packed with valuable information including content relating to the entire United States school curriculum, university level courses and even copyright material gained through generous donations. A few months later, the team returned to the schools hoping to find vast improvements in students' learning levels. However, they only found barely used, dust-covered laptops being returned to them.

So, what was the disconnect between their efforts to introduce technology into educational environments and sustainable student improvement? The problem was deceptively simple: the teachers did not know how to use this material to teach.

The NEH team responded to the situation by creating lesson plans for the teachers and organising more seminars to familiarise them with the offline courses, but the problem persisted. On further probing, the NEH team learned that many of the teachers were simply unable to understand the new learning methods that required active inputs from both, the teacher and learner. Huge parts of

Pupils can only get the full benefit of information and communications technology if the teachers are properly trained.

MOBILE LESSONS FOR BURMESE SCHOOLS

An innovative programme bringing ICT to Myanmar's classrooms is 'Connect to Learn Myanmar', an initiative by technology companies Ericsson and Qualcomm; the Myanmar and UK governments; UNESCO; The Earth Institute at Columbia University; educational software developer Finja5; and EduEval, an education evaluation organisation. Thirty-one schools in marginalised areas of the country will receive tablets as well as access to cloud-based educational applications as part of this initiative. Five teachers from each school will receive technical training enabling them to use the devices in their classrooms. Further, 600 female students will be awarded scholarships to ensure completion of their secondary education.

So far the results have been positive. Teachers and students, both, have adapted to the mobile devices quickly. Teachers link their devices to the students' allowing them to monitor each child's progress and provide timely support to children facing difficulties. School authorities report that the initiative has not just given students more access to the internet, but has also enabled them to be more effective in what they are learning. Computer skills are highly valued in Myanmar and the programme promises real economic advantages for the students who have this exposure.



the lessons were omitted and learners would simply move on to the fun activities, which were rendered useless as the students had no foundation to build up on.

Another obstacle was the lack of honest feedback – none of the teachers ever told the team about their deficiencies. All the reviews were positive and there was no hint of dissatisfaction or hesitation in using the laptops.

NEED FOR A CULTURE CHANGE

The NEH team soon realised that a culture change was needed. They decided to hand out laptops only after they had assessed and developed methods to ensure that the teachers were adequately trained to use the technology to improve learning. Chloe Smith, Project Coordinator and Teacher Trainer at NEH, Myanmar started the reform by training a group of 11 teachers in a monastic school. Three months later she returned only to find that they had forgotten everything. Smith started forming smaller and smaller groups of teachers until she found one-on-one individual training as the best solution.

Teachers were picked based on their willingness to adapt to the new teaching methods and the quality of their feedback. The new system required them to be able to work independently and continue to provide honest reports after NEH left the campus. Additionally, Smith's team implemented a strict three-day teaching policy with the off days being given for the teacher to plan the next lesson. Although



difficulties persist, the NEH team reports seeing great improvement in the quality of planning and teaching.

There is no doubt that technology enhances human capabilities, but the important thing is to have adequate and effective training strategies for teachers. Simply pouring millions of computers and education materials into ICT training programmes is not enough warn experts. While technology does open up paths to cost effective education and vocational training, providing schools with just hardware is not the solution to the problem. Teachers need to be aware of the technologies' potential, have ample opportunities to apply them and need training and support. Only then can they be informed and confident in their use of new technologies and ensure long term benefits to learners. †

Chloe Smith,
Project
Coordinator and
Teacher Trainer
at NEH, checks
on students' progress.

ICT IN EDUCATION IN THE UAE

At the recent International Conference on ICT and Post-2015 Education, H.E. Hussain Al Hammadi, UAE Minister of Education, reaffirmed that the UAE's Constitution and Legislation already guarantees the principles agreed upon at the Conference to unleash the potential of information and communication technologies in education. The five principles – the right of education, equity, integration, quality education and lifelong learning – have been a part of the nation's development plan since its formation in 1971. They are

also in line with the UAE Vision 2021, UAE National Agenda and the Ministry's Education Development Plan 2015-2021.

UAE's Vision 2021 also focuses on investing in science, technology and research at all levels, especially in the educational sphere. Smart learning is now a part of every school's curriculum with a series of teaching methods, assessment and exam systems and infrastructure being developed to support e-learning. Emirati and other students are greatly benefiting from a series of unique

opportunities created by the Ministry to familiarise them with digital devices for use in specialised research and developing technical skills.

Currently, a comprehensive National Monitoring and Evaluation (M&E) System that will aid the formulation of policies and measure the use of ICT in educational systems is being developed by the UAE's Ministry of Education. The system will further ensure that current practices are in compliance with the highest standards of global educational practices and sustainability concepts.



SOLAR'S BRIGHT FUTURE

The cost of electricity generated by solar power and other renewables has fallen to the point where it can compete with power generated by fossil fuel plants

If there is one thing that isn't in short supply in the Middle East it is sunshine, and the UAE is capitalising on solar power in its move towards renewable energy. Dubai plans to invest AED 50 billion dirhams (\$14 billion) to generate a total of 5,000 megawatts of power by 2030 at the Mohammed bin Rashid Al Maktoum Solar Park, helping provide 25 per cent of the emirate's electricity from clean energy sources. By 2050, Dubai's Clean Energy Strategy is targeting 75 per cent.



Dubai currently has 13 megawatts in operation at the Solar Park and a further 200 megawatts under construction. But what is truly remarkable is that the recent bid for the 800 MW third phase of the project came in at 2.99 cents per kilowatt hour, which is 15 per cent lower than the previous record set for solar power. In Dubai's case, the 2.99 cents per kilowatt hour is 50 per cent cheaper than the 5.84 cents it paid in 2015 for phase two.

“In Dubai's case, the 2.99 cents per kilowatt hour is 50 per cent cheaper than the 5.84 cents it paid in 2015 for phase two.”

More significantly, at this cost point solar power is undercutting the cost of power generated from coal. The price of 2.99 cents a kilowatt hour is one-third cheaper than that generated by a coal plant also being built in Dubai, one that, like the third phase at the Mohammed bin Rashid Al Maktoum Solar Park, is also expected to start operations in 2020. It is also undercutting the price of natural gas – which generates 99 per cent of the UAE's electricity – that currently stands at nine cents per kilowatt hour. And that is changing the economics of energy production on a global scale. ➤

Illustration: Tarak Parekh



The third phase of Mohammed bin Rashid Al Maktoum Solar Park is expected to start operations in 2020

➤ In the past, coal has typically been the cheapest alternative for countries trying to build big central power stations. But coal has a negative effect on health, and it is also the biggest single source of carbon emissions that contribute to global warming. In other words, if there's a cheaper alternative to coal the world will use it.

The fall in the price of solar power has been precipitous. Just 40 years ago the cost of solar cells was around 200 times what it is now, and the price of US solar power has dropped by an astounding 70 per cent since 2009, even as panels became more efficient. A 2015 report by Deutsche Bank says total costs could fall another 30-40 per cent over the next several years. If that happens solar could extend its reach of "grid parity" to 80 per cent of global markets within the next two years. This means electricity generated by solar will cost the same as electricity generated from conventional sources such as coal, oil and gas. In the long term solar-power generation will increasingly dominate as it's a technology, not a fuel. As such, efficiency increases and prices fall as time goes on.

The growth in renewable energy has surprised

even the best forecasters. Since 2000, the International Energy Agency has raised its long-term solar forecast 14 times and its wind forecast five times. Every time global wind power doubles, there's a 19 per cent drop in cost, according to Bloomberg New Energy Finance (BNEF), and every time solar power doubles, costs fall 24 per cent.

A report compiled by BNEF, the Frankfurt School of Finance and Management, and the United Nations Environment Programme sheds some interesting facts on *Global Trends in Renewable Energy Investment 2016*. Among its key findings was that:

⇒ 2015 produced a new record for global investment in renewable energy. The amount of money committed to renewables excluding large hydro-electric projects rose five per cent to \$285.9 billion, exceeding the previous record of \$278.5 billion achieved in 2011. This record was achieved despite sharp falls in oil, coal and gas prices that protected the competitive position of fossil fuel generation.

⇒ The amount of generating capacity added in wind and solar photovoltaics last year came to

SOLAR GOES PRIVATE

In 2014 the Dubai Executive Council issued resolution number 46 to put in place a comprehensive framework at a legislative level to connect electricity produced from solar power to the distribution system. This has cleared the way for companies, landlords and residents to install solar panels on the roofs of buildings. The electricity generated by the panels helps to power the relevant building, and any excess generated is fed back into the emirate's electricity grid. This 'green' energy will then be offset against the amount of conventional energy purchased from DEWA and can lead to savings of between 20 to 50 per cent. DEWA is not placing any restrictions on the number of solar roofs that can join the scheme, as Dubai's electricity grid can currently accommodate an extra 2,600MW.

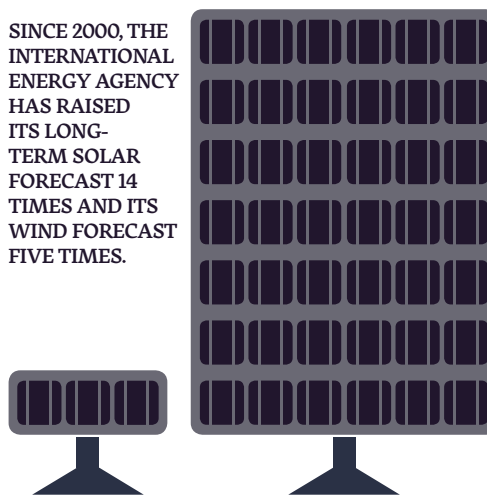
118GW, far above the next highest annual figure, 2014's 94GW. Overall, renewables excluding large hydro made up 53.6 per cent of the gigawatt capacity of all technologies installed in 2015, the first time it has represented a majority

⇒ Global investment in renewable power capacity, at \$265.8 billion, was more than double the dollar allocations to new coal and gas generation, which was an estimated \$130 billion in 2015. However, the huge weight of conventional generation capacity already built meant that new, clean technologies only accounted for just over 10 per cent of world electricity last year. However, this did prevent the emission of some 1.5 gigatonnes of CO₂ in 2015.

⇒ Last year was also notable as the first in which investment in renewables excluding large hydro in developing countries outweighed that in developed economies. The developing world including China, India and Brazil committed a total of \$156 billion, up 19 per cent on 2014, while developed countries invested \$130 billion, down eight per cent. A large element in this turnaround was China, which lifted its investment by 17 per cent to \$102.9 billion, or 36 per cent of the world total.

Although the above facts make for positive reading, it should not be forgotten that global demand for electricity is still growing. It is projected that power sector emissions will grow more

SINCE 2000, THE INTERNATIONAL ENERGY AGENCY HAS RAISED ITS LONG-TERM SOLAR FORECAST 14 TIMES AND ITS WIND FORECAST FIVE TIMES.



than 10 per cent between now and 2040, with no prospect of a peak being reached until the late 2020s at the earliest. As a result the CO₂ content of the atmosphere looks set to rise sharply beyond the 2015 average of 401 parts per million. However, one factor that could affect both emissions and electricity demand over the next 25 years is the growth of electric vehicle (EV) sales. These jumped 60 per cent in 2015 to a new record of 462,000. EVs, via the recharging of their batteries, could also offer new opportunities for balancing renewables output.

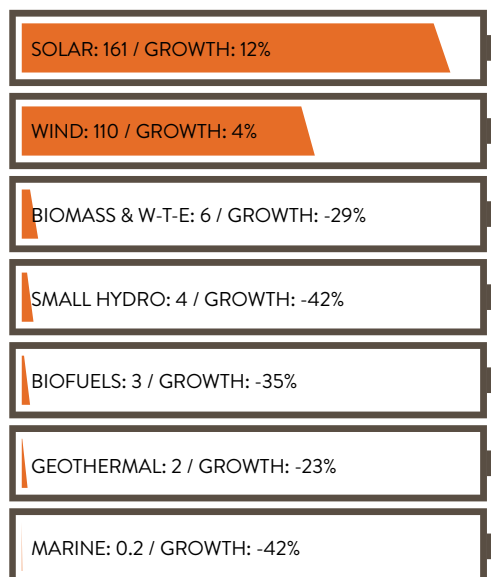
As far as investment in renewable energy goes, solar saw a 12 per cent increase to \$161 billion last year, and wind a four per cent boost to \$109.6 billion. Will this trend continue over the long term? The answer appears to be yes as costs for renewables keep falling and the technology keeps improving. Moreover, renewable energy production through wind and sun has one big advantage in that the only cost is installing the infrastructure as there are no fuel costs – in sharp contrast to conventional fossil-fuelled electricity generation, which is subject to the cyclical nature of the energy markets.

Renewables also have the advantage that wind farms can be built in nine months or so, and solar parks in three-to-six months. Coal and gas plants take several years, and nuclear even longer. So developing countries in a hurry for new capacity may opt for speed.

The installation growth trend for renewable energy is heading in the right direction. As long as individual countries, such as the UAE, keep installing more capacity, the growth of carbon emissions will decrease and hopefully turn negative in the near future. ↑

GLOBAL NEW INVESTMENT IN RENEWABLE ENERGY BY SECTOR, 2015, AND GROWTH ON 2014, \$BN

Source: UNEP, Bloomberg New Energy Finance





DRIVEN TO SAFETY

UAE's school kids are learning road safety essentials in a unique simulated environment

It's never too early to learn safety rules and that's what thousands of school children across the UAE were doing earlier in May and June this year. Children between the ages of six and nine took to the driving seat in a unique initiative by Dubai's Roads and Traffic Authority (RTA), the Knowledge and Human Development Authority (KHDA), Abu Dhabi Police and the BMW Group Middle East. The awareness drive called *My First License - I Know My Road Rules* saw 3,000 children from schools in Abu Dhabi, Dubai and Sharjah take to the wheels of miniature cars to learn good driving habits and the fundamentals of road safety.

Miniature road travel scenes – complete with road signs, roundabouts, traffic signals and zebra crossings – were recreated at schools to give the children a feel of real life driving. First, the children attended a theory session with instructors who teach them road safety rules and reading different traffic signs. Once the basics were taught, the little drivers had to navigate the circuit safely

under the guidance of police officers and teachers. At the end of the drive, safe drivers were awarded their very own 'license card' endorsed by the relevant emirate's police force, RTA and KHDA.

The World Health Organisation (WHO) lists car accidents as the second biggest cause of death in the UAE. The capital city, Abu Dhabi, recorded over 100,000 serious traffic offences in just the first four months of 2016. Dubai Police responded to nearly 2,500 emergency calls and 250 accidents – all within the first five hours of the first day of Ramadan this year! These statistics show that initiatives such as *My First License - I Know My Road Rules* are needed and may go a long way in teaching road safety rules to children – the drivers of tomorrow.

Deema Hussein, Traffic Awareness Manager for the RTA, strongly supports the campaign. "Statistics show that the education of children as future road users needs to be an ongoing priority, and as such, forms part of our broader efforts to



At the end of My First License – I Know My Road Rules, safe drivers are awarded their very own 'license card'. After a theory session, the children take to miniature road travel scenes that depict real life traffic driving conditions under the watchful eye of instructors.



making the UAE's roads safer." Ciel Events first launched the initiative in the UAE in 2011. Since then almost 23,000 children from 46 schools have taken part in a bid to create a generation of safer drivers. Last year, leading car manufacturer BMW joined the campaign as part of its own 'Stay Alert, Stay Alive' campaign.

Osman Abdelmoneim, General Manager of AGMC (importers of BMW), said: "A split-second is all it takes. Just a lapse in concentration for a second can result in a terrifying collision. Regardless of whose fault it is, we all have the responsibility to protect ourselves and our families. One way of doing this is to ensure our children and next generation of drivers understand and respect the rules of the road; getting all the important safety messages engrained into their behaviour from an early age will not only help keep them safe but will be key to ensuring safer roads for the future."

Major General Mohammed Saif Al Zafeen, Director General of Dubai Police's Traffic Department, agreed with this sentiment: "This campaign, coupled with regular driving programmes, helps contribute towards a long term solution to traffic accidents in the UAE as these children will have a better understanding of the rules of the road."

Since its inception, the campaign has branched out to Qatar, Bahrain, Kuwait, Saudi Arabia, Oman and Jordan and comprises of activities such as e-learning courses, public surveys on road safety, awareness events in nurseries, automobile showrooms and other public places. 📌



MEDITECH'S STARTUP BOOST

Medical technology is growing in leaps and bounds, but it is often startups that come up with innovative and consumer-friendly ideas

The medical technology field (MedTech) is making an increasing impact around the world. In Middle East and North Africa (Mena) it is growing at a pace of five per cent annually and is set to play an important role in improving healthcare facilities in the region by offering the latest devices to diagnose, monitor and treat almost every disease today. Rami Rajab, chairman, Middle East Medical Devices and Diagnostics Trade Association (Mecomed), said the annual value of the Mena MedTech market is currently worth \$7 billion and is expected to grow to \$11 billion by 2021.

MedTech takes many forms, from imaging and diagnostics such as Xray and ultrasound to cardiovascular devices such as stents, pacemakers and heart valves. 3D technology is opening up a new world for medical device designers, while robotic-assisted surgery can reduce the length of operations and speed up the patient's recovery time. But also at the consumer level technology is doing its best to look after our health. For example, most smartphones now come equipped with motion sensors that measure steps, distance travelled and even stairs climbed. Apple's Medical ID turns any iPhone 4s or newer model into a mobile medical alert bracelet. Setting up the phone's medical ID allows doctors or emergency workers to tap and hold the Emergency button on your home screen — even when it's locked — to access medical conditions, allergies, emergency contacts, blood type and

other potentially lifesaving information.

The technology sector has been transformed by startups, although multi-national corporations naturally also played an important role. The same can be said of the MedTech sector, where startups are coming up with innovative ideas. According to the StartUp Health Insights Annual Report, MedTech startups received about \$6.6 billion of investment in 2015, compared to about \$1.1 billion in 2010. By the middle of this year, funding had already reached \$3.9 billion.

Among these startups is US-based Breath Diagnostics, which has patented its OneBreath technology for early lung cancer detection using the patient's breath. A patient simply breathes into a bag and then the cancer signature compounds are concentrated onto a microchip before being washed off and measured using mass spectrometry.

Diabetes is a growing problem, and the Middle East region has the world's highest prevalence. According to the World Health Organisation diabetes has increased regionally from 5.9 per cent in 1980 to affecting 13.7 per cent of the total population in 2014. This marks a total increase of around 37 million people. The disease has many negative health effects, among them being that it is the number one cause of blindness among people between the ages of 30 and 69. DreamUp Vision, a Paris company, is devoted to preventing blindness in diabetes ➤



➤
Above: Teddy the Guardian measures children's temperature through a sensor in its paw.
Below: WellDoc is an app with a data-driven approach to managing diabetes.

sufferers. The company's software focuses on diabetic retinopathy, which can be diagnosed using retina analysis before symptoms begin to show in the later stage of the disease.

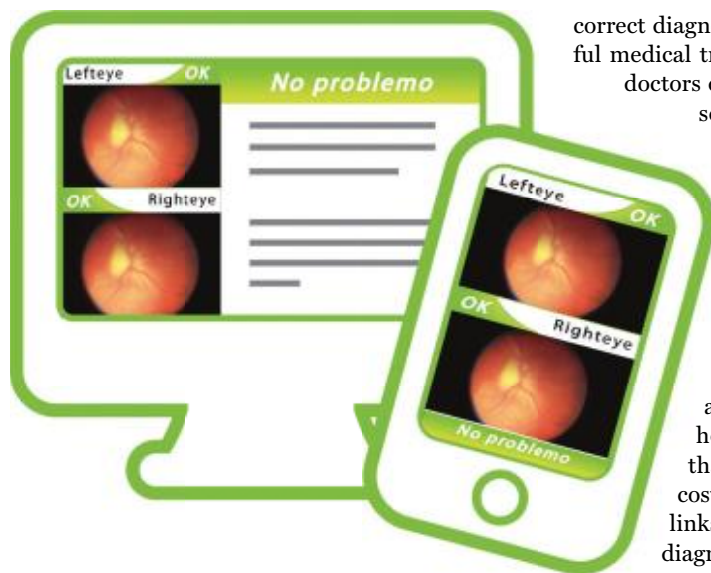
WellDoc, which is the first mobile prescription therapy approved by the US Food and Drug Administration for Type 2 diabetes, aims

to change the way chronic disease is managed by placing a data-driven focus on patient outcomes. The app helps patients manage their diabetes effectively between medical office visits by analysing data input by the patient to deliver personalised guidance.

Another diabetes technology, that is still being tested, is MedicSen. This app is designed to work with a non-invasive patch that simulates the behaviour of the human pancreas. The app's learning algorithm will monitor blood glucose and insulin levels, taking into account factors such as exercise and diet, and come up with advice on how best to manage the condition.

Baby monitors have been around for ages, but the one designed by Wearless Tech may well become a parent's best friend. The Cocoon Cam can give parents information about their infant's skin temperature and breathing patterns, as well as other behaviour like crying and sleeping position, without any wearable components. The technology also sends an alert via the mobile app to parents if anything out of the ordinary is identified. Best of all the technology's performance improves as it learns more about each baby.





correct diagnosis is the foundation for successful medical treatment. But just like the series, doctors don't always diagnose correctly or sometimes they are simply baffled.

That's where CrowdMed comes into the equation. Crowdsourcing a diagnosis may sound risky at first – unless the crowd you query is made up of physicians. Jared Heyman, founder and CEO of CrowdMed, found this to be true after his sister had the rare opportunity to meet with a large team of medical experts who helped solve a mystery condition that had plagued her for years and cost more than \$100,000. CrowdMed links patients whose conditions elude diagnosis with a team of medical detectives who seek answers from experts. The

DreamUp Vision compares retina scans to detect symptoms of diabetic retinopathy.

Another technology aimed at children is the Guardian series from ID Guardian that captures data through sensors embedded in child-friendly devices. For example, Teddy the Guardian – a cuddly teddy bear – has a sensor in its paw that measures a child's temperature within seconds, while The Brave Lion checks heart rate and oxygen saturation. Data from the sensors is transmitted in real time to a mobile app where it can be viewed, analysed and saved. *Time Magazine* listed ID Guardian's sensors among its top 10 game changing innovations in the connected home.

The Thermibody bodysuit works on a similar principle. The temperature-measuring bodysuit for babies begins working as soon as it is put on and stops automatically the moment it is taken off, so there's no danger of forgetting to switch it on. The suit sends data to the parent or clinician's phone, which can be programmed to trigger alerts if the body temperature rises to dangerous levels.

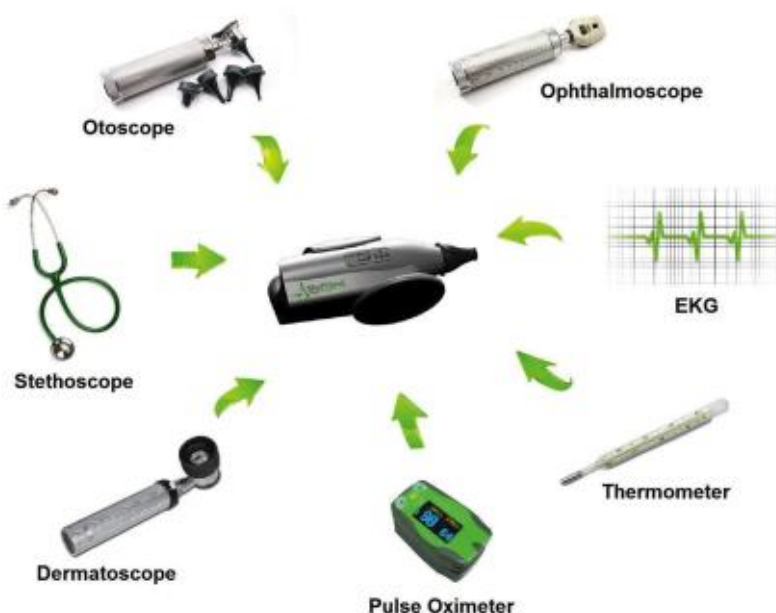
The MedWand brings us closer to the fabled 'tricorder' that is used in the sci-fi series *Star Trek* to diagnose patients. Resembling an ear thermometer, the MedWand combines the functionality of several conventional diagnostic tools, including an otoscope, ophthalmoscope, EKG and pulse oximeter. It has built-in connectivity, so readings can be uploaded directly to the cloud where they can be accessed by care providers. The MedWand is also compatible with a variety of Bluetooth-enabled peripherals, like glucometers.

Any fan of the TV series *House* knows that a

patients submit their cases through CrowdMed for a flat fee – \$149 for a 'standard' package, \$249 for 'premium' and \$349 for 'priority' – and receive their money back if the company can't deliver an accurate result. Experts earn points for cases they help solve, which translate to improved ranking, recognition and in some instances financial compensation.

From the above it becomes clear that MedTech startups are coming up with innovative approaches that not only help us to lead healthier lives, but also to diagnose and manage medical conditions. [▶](#)

The MedWand is a multi-function diagnostic instrument with inbuilt connectivity.



GREEN HOMECOMING

Last month, Solar Impulse 2, became the first solar-powered plane to circumnavigate the globe without using a drop of fuel after completing its historic final leg from Cairo to Abu Dhabi

In 2014, Swiss pilots Bertrand Piccard and André Borschberg chose Abu Dhabi both as the departure point and the final destination for their landmark journey around the world in a solar-powered plane, the Solar Impulse 2 (Si2). The desert city's climate, commitment to clean technologies and avant-garde infrastructure made it a natural choice for this revolutionary flight. The partnership between Solar Impulse 2 and Masdar (Abu Dhabi's renewable energy company) and the subsequent successful completion of the journey not only positioned Abu Dhabi as the global centre of expertise for renewable energy but also demonstrated the potential of green energy.

It was the first time that solar had taken flight on such an epic scale, and it was fitting that the Solar Impulse 2 landed in Abu Dhabi one day after the birthday of Amelia Earhart, who became the first woman to fly alone across the Atlantic in 1932. Piccard and Borschberg's historic flights join earlier ones by Earhart, Charles Lindbergh, and other pioneers – but Solar Impulse was always more about energy than aviation. As the Solar Impulse 2's website acknowledges: "Behind Solar Impulse's achievements, there is always the same goal: show that if an airplane can fly several days and nights in a row with no fuel, then clean technologies can be used on the ground to reduce our energy consumption, and create profit and jobs." In that regard the Solar Impulse 2's epic flight was an aviation and a marketing success.

WHAT ARE THE IMPLICATIONS OF SI2'S EPIC JOURNEY?

Solar power and renewable energy have made impressive strides in the past decade, but it will be a long time before solar powered commercial flights take off. The Solar Impulse 2's wings are approximately the size of a 747, but the whole plane only weighs as much as a car. During the course of its journey, which entailed over 500 hours of flight spread across 17 months, the Si2 collected and consumed electrical energy equivalent to a little over 300 gallons of kerosene-based jet fuel. ➤







Bertrand Piccard and Andre Borschberg broke numerous records during their epic flight.

➤ By comparison, a Boeing 777, which is capable of carrying up to 400 people, burns an average of around 2,000 gallons of jet fuel per hour. In other words, current solar technology can't create the energy density required for commercial aviation.

However, technologies moves at a rapid pace, and what is cutting edge today is very likely to become the norm tomorrow. Aircraft designers

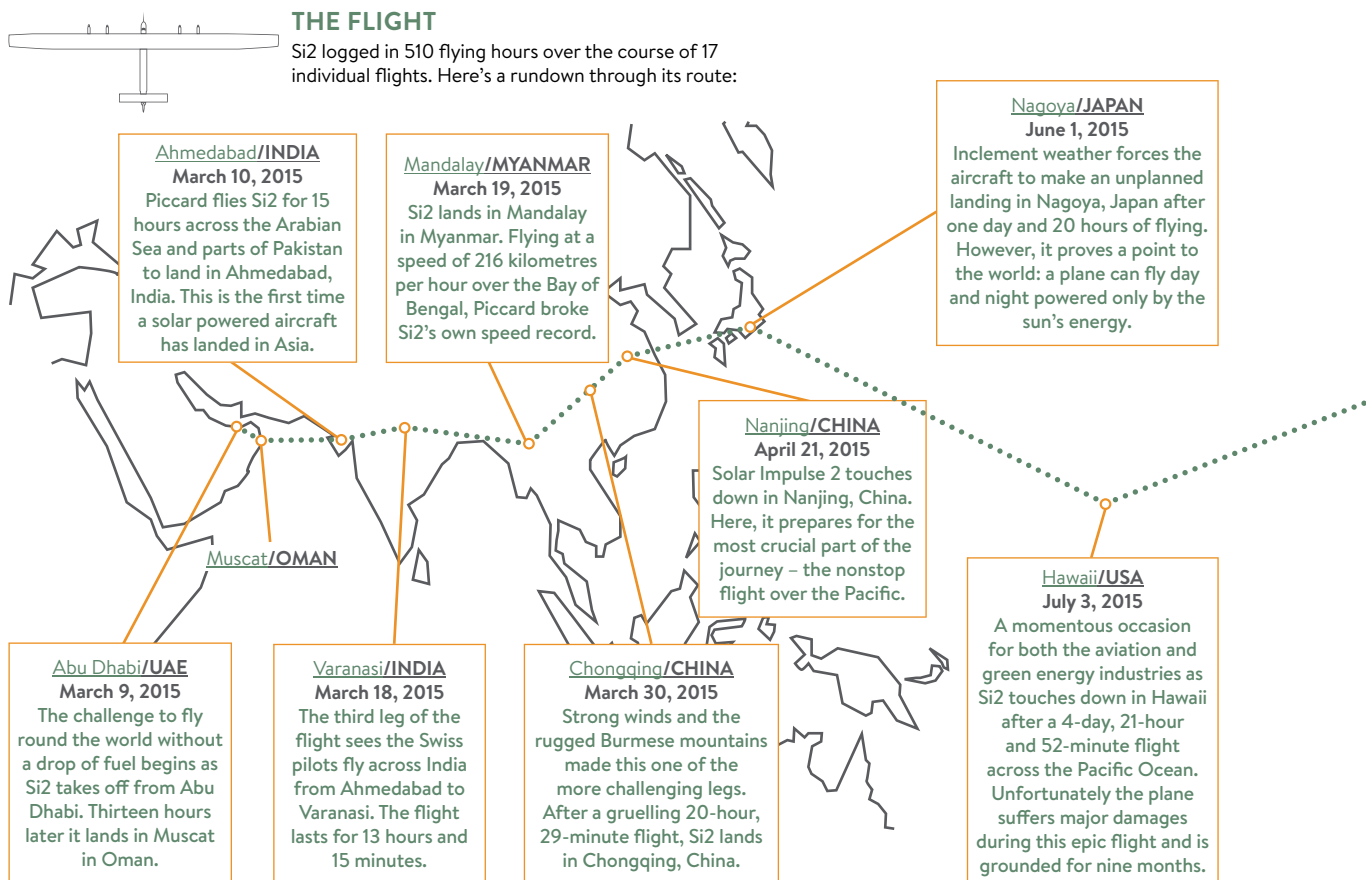
are already looking seriously at using photovoltaic solar cells on the wings of conventionally-powered jets, with solar energy being used to run onboard electrical systems, thus boosting the fuel efficiency of their jet engines. The Boeing Dreamliner, for example, currently uses batteries to power its auxiliary (non-motive) systems.

According to Bernard Piccard the Si2's success highlights the significant gains in efficiency and weight-saving that solar cells have made in recent years. Indeed, the plane's lightweight materials and other components could be used on the road and the power grid. Its super-efficient engines, which can serve as a model for other motors, ran on electricity generated from 17,248 solar cells, while special, energy-dense batteries stored sun power so the plane could fly at night. The plane's cells are also nearly 50 per cent more efficient than regular ones.

According to Masdar CEO Mohamed Jameel Al Ramahi the plane's 118-hour flight over the Pacific Ocean "shattered the myth that solar energy captured by PV panels can't be stored and utilised at night."

THE FLIGHT

Si2 logged in 510 flying hours over the course of 17 individual flights. Here's a rundown through its route:



The Solar Impulse team notes that the plane's lightweight, extra potent LED lighting and insulation can be used in housing. Its sensors and data-collecting tools, meanwhile, could help inform other types of energy management systems.

CREATING WORLD RECORDS

The Solar Impulse 2 aircraft ushered in a new era of green flying. It is the first solar powered aircraft to fly around the world using zero fossil fuel and emitting no CO₂. The 2,300kg aircraft was powered by more than 17,240 solar cells fitted on its massive wings. Over the course of 17 individual flights covering a distance of 26,098 miles in 510 hours, Si2 went on to set many world records.

The first record the Si2 set was its 15-hour, 20-minute flight from Muscat to Ahmedabad, which at that point was the longest duration any solar-powered plane had flown. The green plane went on to break its own record many times in the remainder of its flight around the globe.

When Borschberg piloted the 117-hour, 52-minute flight between Nagoya in Japan and

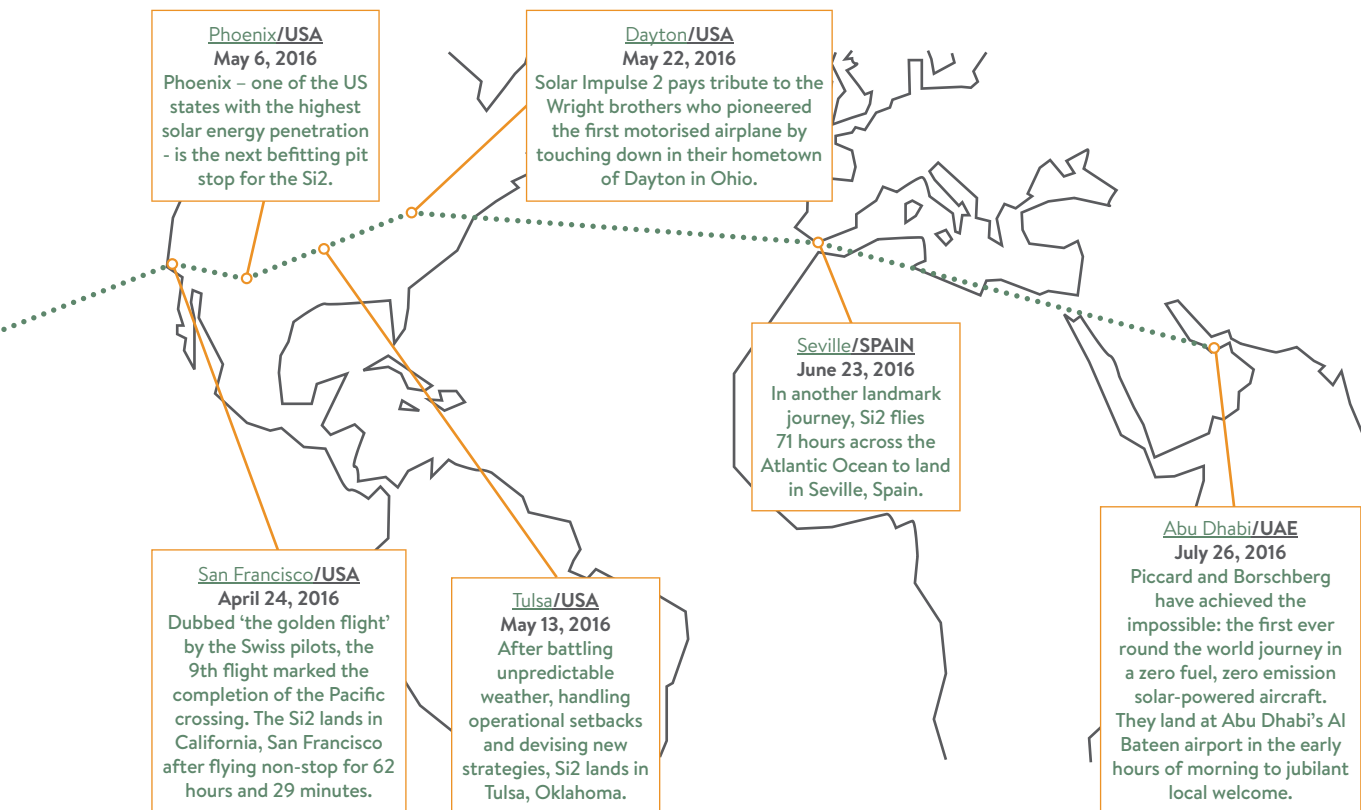


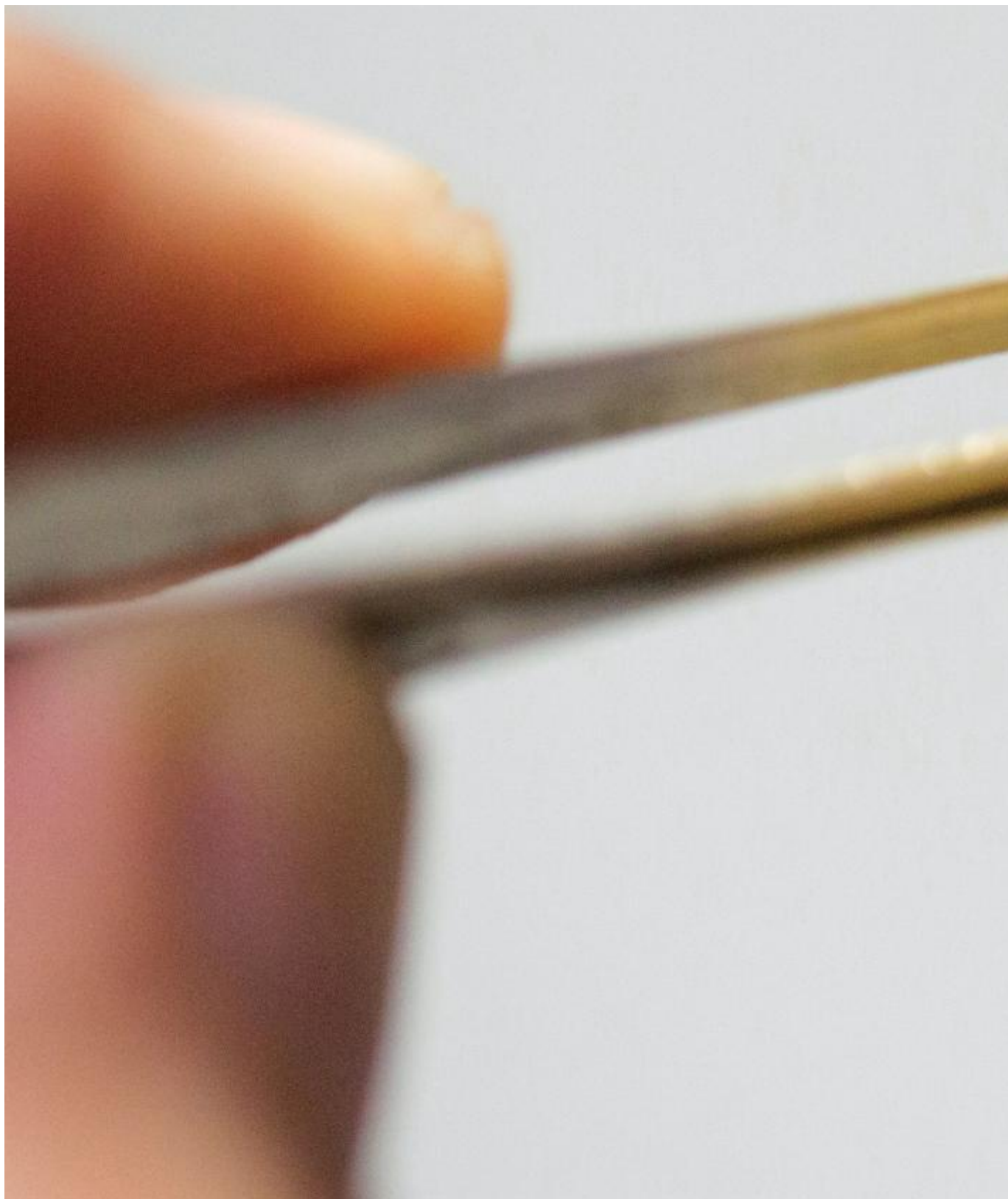
Oahu in Hawaii, he created two more world records: the longest continuous flight by a solar plane and the longest non-stop solo flight in aviation history.

Si2 is also going down in the history books as the first clean-energy aircraft to fly across both the Atlantic and Pacific Oceans.

But as Piccard made clear: "The most important thing isn't to make world records. It's to show what we can do with clean technologies."†

Solar Impulse 2 and crew received a joyous reception after landing at Al Bateen Airport in Abu Dhabi to complete their round the world flight.







CALLING OUT DENGUE

Health officials can now accurately forecast dengue outbreaks thanks to an innovative phone tracking system

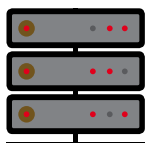
Tracking phone calls to combat dengue fever is the latest technology-based weapon in the war against this prevalent and sometimes deadly disease. The US-based New York University and the University of Washington teamed up with Pakistan's Information Technology University and the Punjab Information Technology Board to develop a public-health hotline that can forecast outbreaks of dengue almost a fortnight in advance.

Although the hotline system has been in use in Pakistan since 2011, it is gaining global attention only now due to the massive dengue outbreaks taking place around the world. Dengue is the world's fastest-spreading tropical disease and is endemic in at least 100 countries in Asia, the Pacific, the Americas, Africa, and the Caribbean. According to the World Health Organisation (WHO) an estimated 390 million dengue infections occur worldwide each year, with about 96 million resulting in illness and 22,000 deaths, mostly among children.

There are four distinct, but closely related serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3 and DEN-4), which are transmitted by female mosquitoes mainly of the species *Aedes aegypti*. Recovery from infection by one virus provides lifelong immunity against that particular type. Severe dengue (also known as Dengue Haemorrhagic Fever) was first recognised in the 1950s during dengue epidemics in the Philippines and Thailand. Today, severe dengue affects most Asian



TRACKING OF THE OUTBREAK



Data from the Pakistan Punjab Government's Toll Free Health Service Hotline is used



300,000 calls plus weather conditions are analysed by the team



The predictions were matched with the actual number of cases registered in public hospitals



86%

accuracy in predicting outbreaks



Spraying for mosquitoes is successful in containing dengue outbreaks

➤ and Latin American countries and has become a leading cause of hospitalisation and death among children in these regions. Although there is a dengue vaccine, its effectiveness hasn't been established yet as it was only released last year and cannot be given to children under the age of nine. Early detection of dengue outbreaks and access to proper medical care therefore remain central to combating the disease and keeping the death rate below one per cent of infections.

HOW DENGUE OUTBREAKS ARE TRACKED

The research team used data from the Pakistan Punjab government's toll free health service hotline to make predictions about when and where the disease would appear next in Lahore. 300,000 calls, weather conditions and even health hotline awareness trends from across 10 districts in Lahore were analysed by the team to forecast the number of dengue incidences.

The predictions were then matched with the actual number of cases registered in public hospitals. The findings were eye opening: the statistics showed 86 per cent accuracy in flagging an outbreak as well as determining the number of patients and their locations, 15 to 20 days ahead of time.

"To the best of our knowledge, this system is the first to demonstrate, with significant empirical evidence, that an accurate, locality-specific disease forecasting system can be built using call volume data from a public health hotline," said Lakshminarayanan Subramanian, a professor at New York University's Courant Institute of Mathematical Sciences and part of the research team.

Researchers further point out that their system is not static. The model continuously refreshes itself on the basis of new incoming data. The real-time predictions – which health officials can keep track of via an app – mean necessary action is taken at the right time, each time. The app also

GLOBAL BURDEN OF DENGUE

Prior to 1970, only nine countries had reported severe dengue epidemics. Today, the disease is rife in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific.

With large dengue outbreaks in almost every country, 2015 will be remembered as perhaps one of the grimmest years in the world's medical history. The Philippines reported more than 169,000 cases, Malaysia logged in excess of 111,000 cases and Brazil reported over 1.5 million. Death occurs only when the disease develops into a more complicated form called severe dengue. According to the World Health Organisation, severe dengue is the leading killer among Asian and Latin American children. Apart from the loss of life, dengue also adds to the world's economic burden (in terms of lost productivity and increased medical care costs), with studies estimating the total annual global cost of dengue at \$8 billion. However, the exact reach of the disease cannot be estimated as many cases go unreported or are misclassified.

allows health workers to record the measures they undertake to contain the disease.

The system marks an important breakthrough in tackling dengue, where early intervention is critically important. In Pakistan, when callers logged in with symptoms indicative of dengue, health workers not only guided them to the nearest hospital but also dispatched a team to the affected area to spray for mosquitoes in order to contain the disease. The hotline's effectiveness can be gauged by the fact that health officials were able to bring down the number of dengue cases in Lahore from 21,000 in 2011 to just 1,600 in 2013.

Although the process sounds deceptively simple, obtaining exact locations and symptoms was a major challenge for the research team. Callers gave vastly different levels of details, leaving it to the team to fill in the blanks.

SCALE OF ECONOMY AIDS SUCCESS

"Thousands of lives are lost every year in developing countries for failing to detect epidemics early because of the lack of real-time data on reported cases," points out Subramanian. "We think our technique can be of use to public-health officials in their fight against the spread of crippling diseases."

Compiling disease surveillance data is usually a cumbersome process. Most systems demand massive infrastructure and can monitor only on a state or city level making both prevention and control difficult. Needless to say, health authorities do not gain much success from them.

This is where the new system stands apart – it lets officials determine the exact location within a city where disease activity has increased, and that without the need for an expensive system. This enables governments to spend money on the targeted containment of the virus through vector control measures such as getting rid of the carrier mosquitoes through spraying insecticide, clearing stagnant water, mosquito nets and public awareness.

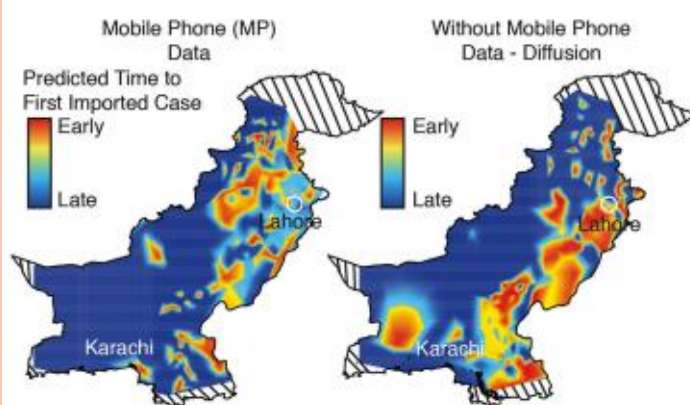
"Instead of allocating a large work force to collect block-by-block level data on disease incidences, we crowdsource the data using citizen inquiries and feedbacks," says Umar Saif, the Vice Chancellor of Pakistan's Information Technology University and Chairman of the Punjab Information Technology Board, which implemented the system in Pakistan.

WHAT'S NEXT

While the research team used dengue in Pakistan as a model, the health hotline approach is not limited to just one disease. The system can be

used in other countries to track other epidemics, such as Ebola and Zika, and can even be adapted to other formats such as emails or text messages. Researchers are now using the information logged in via the app to zero-in on the most effective control measures.

"To the best of our knowledge, this system is the first to demonstrate, with significant empirical evidence, that an accurate, locality-specific disease forecasting system can be built using call volume data from a public health hotline," Subramanian says. "This simple technology can save thousands of lives in the developing world." ↑



MOBILES MAP OUT DENGUE OUTBREAKS

Prior to 1970, only nine countries had reported severe dengue epidemics. Today, the disease is rife in more than 100 countries in Africa, the Americas, the Eastern Mediterranean, South-East Asia and the Western Pacific.

Analysing health hotlines is not the first time telephone technology has been used to trace the spread of dengue. Human travel is known to be one of the causes of dengue transmission – and people rarely travel without their cell phones. Researchers decided to use mobile phone data to capture people's movements in Pakistan and eventually predict when and where a dengue epidemic may break out.

Back in 2013, researchers from the Harvard T. H. Chan School of Public Health in the United States teamed up with Telenor, a Norwegian mobile provider operating in Pakistan to analyse call records from 40 million subscriber SIM cards. This data was used to create a mathematical model of travel patterns. Then clinical and climate data were added in to help epidemiologists predict the possible locations and timings of breakouts across the country. Initially, the model was applied to study past occurrences of the disease – and the results were statistically accurate. The patterns of the first dengue outbreaks in the north eastern areas of Pakistan matched the travel patterns obtained from mobile call data of that period.

THE FUTURE OF

HISTORY

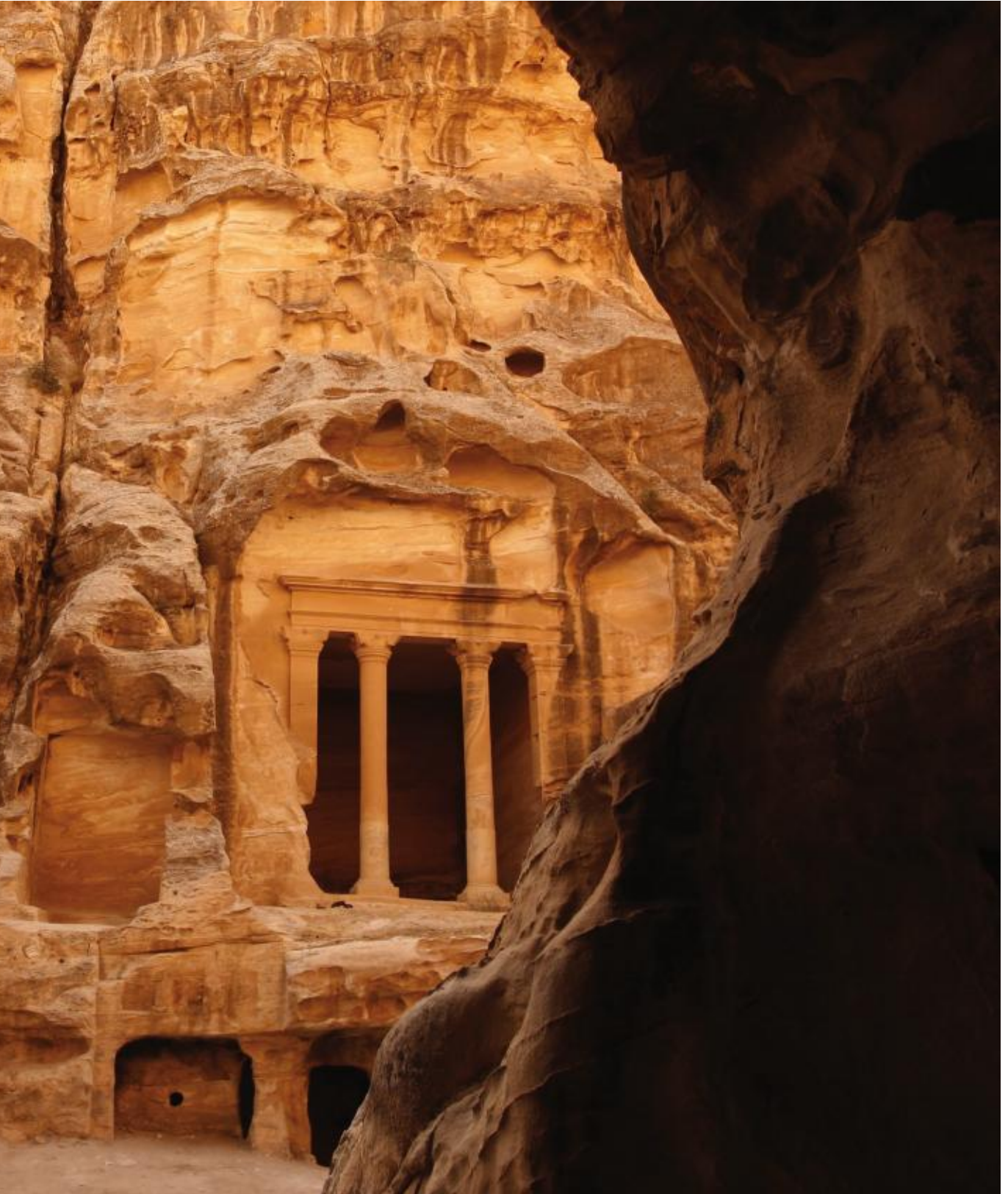
Tedious trial and error excavations may soon be a thing of the past as archaeologists use satellites and drones to probe – accurately – into the past

Last month archaeologists discovered a new monument in the historical city of Petra. The find is a surprise given the facts that the monument lies less than one kilometre away from the main city and the archaeological community has been exploring the UNESCO World Heritage site for the past 200 years. Yet it hadn't stumbled upon the massive 56 metre by 49 metre platform till now. Chances are the monument may have gone unnoticed for another few decades if it hadn't been

for modern satellite imagery, aerial drone photography and ground surveys that were used to locate the structure.

Sarah Parcak, an associate professor of anthropology at the University of Alabama-Birmingham and Christopher Tuttle, executive director of the Council of American Overseas Research Centers (CAORC) made the discovery in June this year. In a joint project supported by the BBC and Digital Globe (satellite imagery





and geospatial content provider) Parcak and Tuttle made the find with the help of Google Earth, WorldView-1 and WorldView 2, and drones.

SEEING THROUGH SATELLITES

Google Earth was used to focus on Petra and then high-resolution images and remote sensing techniques from the WorldView satellites were used to study the site in detail. This step revealed four groups of possible historic sites. The team went on to create maps containing details of the GPS coordinates of the central point and four corners of each location. Then drones were deployed to capture images with unprecedented resolution levels of up to one centimetre. Amongst the several smaller sites, the researchers identified the huge platform, which is almost the size of an Olympic pool. The research team then undertook site visits to confirm the find. On site they found broken pottery, which places the platform's construction to around 150BC – which is near the time Petra was founded.

Tuttle is hugely impressed by the effectiveness of satellite imagery and drones in locating the monument. “I’m sure that over the course of two centuries of research [in Petra], someone had to know [this monument] was there, but it’s never been systematically studied or written up. I’ve worked in Petra for 20 years and I knew that something was there, but it’s certainly legitimate to call this a discovery,” he said in a statement.

Petra is one of the most well-surveyed historical sites in the world, yet the discovery of the ceremonial

REVEALED IN PETRA

A massive ceremonial platform dating back to 150BC was discovered in Petra in June. Located 800 metres south of the city, archaeologists think the elevated platform may be the ancient city’s second-largest dedicated display area. The main platform measuring 56 metres by 49 metres encloses a flagstone-paved smaller platform. A small building, with traces of a row of columns, stands atop the smaller platform. The pottery shards found around the site indicate that it was built nearly 2,150 years ago.

Petra, located in southern Jordan, was the capital city of the Arab Nabatean tribe. Established in the 2nd century BC, the city is a World Heritage site. UNESCO calls it “one of the most precious cultural properties of man’s cultural heritage”. In 2014, the city was named as one of the “28 Places to See Before You Die” by *Smithsonian Magazine*.

platform indicates that more lies beneath the red sandstone city. Although excavations will remain the deciding factor of the authenticity of a find, archaeologists are welcoming the use of satellite and drone imagery in their line of work. Drone mounted sensors and aerial perspectives are revolutionising their work, helping them identify the faintest traces of historical buildings and then relate them to other monuments across the landscape.

Parcak’s use of satellite pictures and other

Below:
Archaeologists
are using drones
to map sites
and take high-
resolution
images.

Below right: A
Muon particle
scanner revealed
a hidden room
inside the Bent
pyramid.





Sarah Parcak's use of satellite imagery has earned her the nickname 'space archaeologist'.

Below: The Bent pyramid is the only structure of its kind. The top may have a different angle for structural stability.

technology to identify historically significant sites has earned her the nickname 'space archaeologist'. She is confident many other discoveries will be made over the next few years using satellites and other advanced technology. "This technology is not about what you find – but how you can think about things like settlement scale and ancient human-environment interactions more broadly," she added. "What happens when you can truly map the near-surface buried features for an entire site? I'm excited, but we need to think about the implications of having all this technology at our fingertips so we can use it responsibly."

NEW LIGHT ON OLD SPOTS

This is not the first time historians have used technology to shine a light on the well hidden secrets of human history. In April this year, researchers found a hidden chamber in Egypt's Bent Pyramid with the help of a Muon particle scanner that works much like an airport luggage scanner. The non-invasive scanner lets scientists see through the structure of a building. Hidden chambers or other structural peculiarities are revealed due to the temperature differences picked up by infrared scans. At the same time, on the other side of the globe in North America, a Viking site was found by 'space archaeologist' Sarah Parcak using satellite data.

In 2012, documentary filmmakers used a Lidar scanner to map a remote valley in La Mosquitia in Honduras, South America. Peering through the dense rainforest canopy and an intricate network of swamps, rivers and mountains, the powerful scanner found the building foundations and mounds of what could be Ciudad Blanca, a legendary metropolis. Lidar, or light detection and ranging, comprises of slow-flying planes that image the landscape by emitting constant laser pulses towards the ground as they glide over it. ↑



THE MIDDLE EAST'S HIDDEN HISTORY

Making use of Google Earth's satellite imagery, archaeologists in 2011 discovered that Saudi Arabia holds a wealth of archaeological remains that pre-date Islam and may be several thousand years old. The researchers discovered nearly 2,000 tombs by peering through one high-resolution 'window' at a rocky lava field east of the city of Jeddah – all without having to set foot in the Saudi desert. Judging by the sheer number of stone ruins identified in Saudi Arabia, as well as in other research in Jordan, there may well be a million such sites scattered throughout the Arabian Peninsula, according to David Kennedy, an archaeologist at the University of Western Australia who led the study.

Google Earth was also used to discover the Middle East's own version of the Nazca lines (large geoglyphs carved into the surface of the vast, empty desert plain that lies between the Peruvian towns of Nazca and Palpa). Stretching from Syria to Saudi Arabia, thousands of stone structures with a wide variety of designs have been found, with a common design being a circle with wheels. Researchers believe that they date back to antiquity, at least 2,000 years ago. They are often found on lava fields and range from 25 metres to 70 metres across.

Last year saw the launch of the Endangered Archaeology project by researchers at Oxford and Leicester universities, which records the archaeological heritage of sites across the Middle East and North Africa using satellite and aerial photography. The areas being studied are some of the most significant in the world in terms of its archaeological remains. The team says there could be as many as 3.5 million sites, many of which are under immediate threat from war, agricultural development and expanding populations. Endangered Archaeology leaders work with local authorities and departments of antiquities to create a network of 'wardens' who can manage and preserve the sites.



Sofana Dahlan

THE DESIRE TO HELP OTHERS

Sofana Dahlan is a lawyer, entrepreneur, angel investor, public speaker and a mother. But what really motivates her is to help other women reach their goals.

Sofana Dahlan believes in overcoming obstacles and giving back to society. She is one of the first 10 Saudi women to be given permission to practice law in the Kingdom after completing a Bachelors degree in Law (LL.B.) and a Masters degree in Islamic Law at the Faculty of Law at Cairo University, as well as an MBA degree from the American University of Technology. She was also the first Saudi to serve as fellow for the United Nations Alliance of Civilizations (UNAOC) on a tour of Europe and the United States. On the business front she is the CEO and founder of Tashkeil – a Saudi Arabia-based social enterprise that incubates and promotes creative entrepreneurs, organises events and undertakes various initiatives. On top of that she founded the Kayan space and studio – a membership based co-working office for creatives, entrepreneurs and freelancers.

As a result she has become an icon of female empowerment and is feted for being a social entrepreneur, angel investor and a popular public speaker. However you describe Dahlan, there is a common thread running through all her achievements: The desire to help others.

This is evident from her career choice as law was not her first calling: She had wanted to become an architect when she was a little girl. However, her passion for helping others changed her career trajectory. “When I noticed that my country did not have any women in the judicial realm to stand up for women specifically, I decided to change my career course

and become a lawyer instead,” explains Dahlan. “It was more a destiny than a planned career path. I was inspired by the story of an orphan girl who married a wealthy man but was denied rights to inheritance by her stepchildren when her husband passed away. The plight of the widow, and women in general, made me realise how much our country needed a female lawyer to not only represent women, but to educate them about their rights and support them to obtain them.”

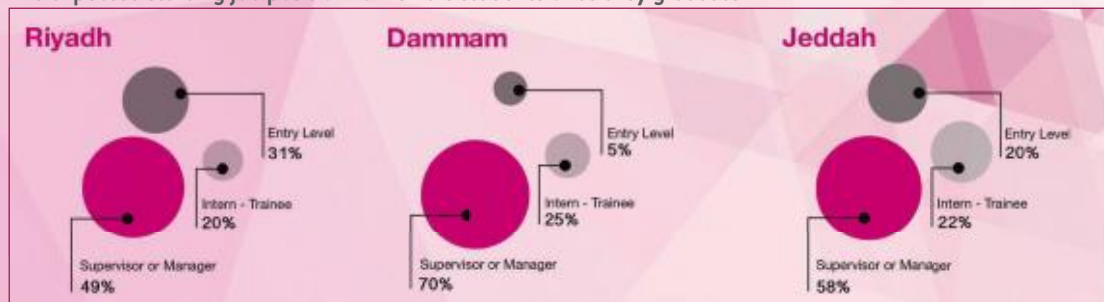
After starting Tashkeil, Dahlan made the move to entrepreneur without quite planning to do so. “When I started Tashkeil, my goal was to empower creative innovators in dealing with obstacles in their careers,” she says. “I was then considered an entrepreneur, but I didn’t know what it was because it was a relatively new concept. I considered my work to be a sort of social responsibility”. But there’s no argument that she’s a respected entrepreneur. Last year, for example, she was selected as an ambassador for Women Entrepreneurship Day (WED). Her message to her fellow entrepreneurs was a simple one: “I consider all of us to be entrepreneurs because we all aim to participate in nation-building and to promote change.”

In Saudi Arabia, the gender gap in economic participation is about 27 per cent with a female-male ratio of 21 to 80, according to an official report by the World Economic Forum. However, recent studies also show that women entrepreneurs in Saudi Arabia are now establishing and managing more SMEs

ARAB CONTRIBUTION

GLOWORK, AN EMPLOYMENT AGENCY FOR SAUDI WOMEN, CONDUCTED A SURVEY WITH 10 FEMALE UNIVERSITIES KINGDOM WIDE WITH OVER 2000 RESPONDENTS. BELOW ARE SOME OF THE RESULTS.

The expected starting job position for female students once they graduate



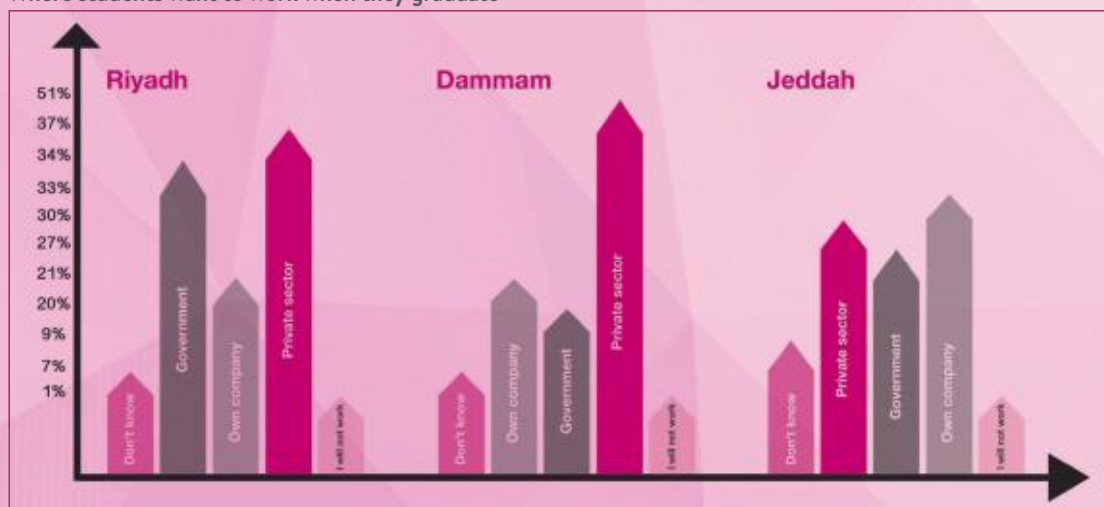
The most factors that influence the student's educational choices



The most factors that influence the student's career choices



Where students want to work when they graduate



SOURCE: GLOWORK

than at any time in history and are increasing. This comes in line with the national plan to diversify the economy by creating jobs and inviting more women into the labour force.

"In my opinion, in the entrepreneurial world, men and women face the same set of challenges and barriers, regardless of gender," says Dahlan when asked what are of the biggest barriers are for female entrepreneurs. "But women are women, whether they are in this part of the world or another. They face the same struggles and constraints. And they have the same goals, whether it is to advocate for women's rights or break the shackles of a stereotypical and cultural mindset. Of course it varies from one country to another in its intensity."

Dahlan knows what it takes to break down barriers and create a more even playing field for women. "It's only with perseverance and persistence that we can break into the old boys network. I was the first woman in Saudi Arabia to be granted permission to study law by the Ministry of Education, and was among a handful of women who received the licence to practice law in the Kingdom. I got my licence accredited after 13 years and that's because I persisted until I got it."

Although Dahlan firmly believes in female empowerment, she is not a proponent of affirmative action to create diversity but rather that companies should hire the best person for the job. And in some fields, she believes, women are better than men.

"I think gender should not be taken into consideration as long as an organisation knows which gender is capable of handling the task efficiently. If they are qualified and capable then they should earn the position regardless of being a man or woman, but with equal support and monetary benefits for both. My workplace comprises 70 per cent of women because I think they are better for that particular post."

"It is important for companies to utilise all available human resources and capitalise on their competence," continues Dahlan. "A study by *Psychology Today* reported that women do have an edge over men when it comes to emotional intelligence that comprises self-awareness, managing emotions, empathy and social skills. These are key leadership skills. Research by Catalyst also indicates that companies with more women leaders outperform companies with fewer or no women. Harvard University has also reported that companies with more women have a higher net profit margin. Hence, companies that invest in women do benefit in the long run."



Dahlan credits her life experiences for making her the person she is today. "Oprah Winfrey said: 'Where there is no struggle there is no strength'. I too found my own strength amid my struggles. Struggles open doors and prompt one to take decisions that are bold and fruitful. I have faced numerous struggles in my life and each one of them has been a life-altering experience for me, whether it was becoming a lawyer, setting up a business and running it solely, or being a mother."

These life experiences have shaped her personal leadership style and philosophy for success. "My leadership style stems from the characteristics of water. Water has strength, it has the quality to take any shape, find new ways around things and withstand pressure, but even then it doesn't lose its subtlety or softness."

As for Arab women, Dahlan feels they are becoming more empowered and that work opportunities are increasing. "I believe Arab women are getting educated, have more civic sense and have the drive to reach the zenith by breaking through in male-dominated fields and making society a better place to live in."

In Saudi Arabia, massive change is underway. The focus of Vision 2030, the new economic policy, is firmly on changing the country's public sector-dependent ethos into one that promotes and fosters private sector entrepreneurial spirit. And in many ways, Saudi women already embody this spirit. ♡

Top: Zeydan Abu Issa Pfizer, Cherie Blair, Sofana Dahlan – Founder and CEO Tashkeil, HE Sultan Bin Saeed Al Mansouri – UAE Minister of Economy and Sophie Le Ray at the 16th edition of the Women In Leadership Economic Forum (WIL) in Dubai.



The Golden Age of ISLAMIC SCHOLARS

While Europe was in the throes of the Dark Ages, important scientific breakthroughs were being made in the Islamic world

Abu Ibn Sina is known in the West as 'the Father of Early Modern Medicine'.

In the Hadith teachings, the Prophet Mohammed (PBUH) taught his followers that "The seeking of knowledge is obligatory for every Muslim" and urged them to seek knowledge "even as far as China". Despite these instructions it is often forgotten today that while Europe was stumbling through the Dark Ages, knowledge, learning and scholarship flourished throughout the Middle East. Under the rulership of the Abbasid Caliphate between the eighth and the 13th centuries, the Islamic world saw unprecedented advancements in science, astronomy, medicine and

philosophy in what has become known as the 'golden age' of Islam. For roughly four centuries, the Abbasid caliphs poured money into education and turned Baghdad into a heartland of learning and knowledge, with the now-destroyed House of Wisdom at its centre. Scholars from the Middle East and Europe flocked to Baghdad to collect, share and ultimately preserve knowledge through the translation of ancient texts into Arabic. Meanwhile, under the Fatimid dynasty across North Africa, the University of al-Qarawiyyin in Fes, Morocco, became what is regarded as the world's

first educational institution to award degrees following its establishment in 859, with Cairo's Al-Azhar University following suit a century later.

The following disciplines are just some of the areas that saw monumental growth throughout the Islamic world during this period, and this knowledge would live on for centuries through the European Renaissance and beyond.

SCIENCE

One of the most cited contributions of the Medieval Islamic world scholars is their approach to scientific discipline. They embraced learning through a holistic mentality and their focus on a variety of subjects led to the rise of polymaths, known as hakeems or sages. Of these Al-Hasan Ibn Al-Haytham (965–1040) is counted among the most important. Primarily recognised for his contributions to the fields of astronomy and optics, Al-Haytham was also among the first pioneers of controlled scientific experimentation in the 11th century. His experimental and mathematical approach to science supported many of his theories of vision, light and colour, and helped dispel the belief that the human eye emitted light. Suggesting that the mathematics of reflection and refraction needed to be consistent with the anatomy of the eye, Al-Haytham revolutionised the study of light and optics and cast doubt upon the theories of the ancient thinkers Ptolemy and Euclid. His theories were published in the seven-volume work *Kitab al-Manazir* (Book of Optics), which was hugely influential during the European Renaissance several centuries later.

It was under the Abbasid era that the Greek invention of the astrolabe, used to predict the positions of the sun, moon and planets, was re-worked and perfected to be used to calculate the beginning of Ramadan, the hours of prayer and the direction of Mecca. Calculating prayer times also played a vital role in the Islamic world's improvements to the theory and construction of sundials, which they inherited from the Greeks and Indians. House of Wisdom astronomer Muhammad al-Khwarizmi invented tables for these instruments that shortened the calculation of time and completely transformed the study of Islamic astronomy.

MEDICINE

During the Islamic Golden Age, physicians and medical practitioners embraced the Hadiths that said Muslims have a duty to take care of the body and spirit in what is referred to as the 'Medicine of the Prophet'. These teachings influenced an

overall holistic approach to health that looked at care, air quality and diet as part of diagnosis and treatment.

The Islamic scientists' approach to experimentation also underpinned much of the medical research carried out. Physician Muhammad al-Razi (1029–1087) used his experiments to become one of the first to challenge the classical authority of Roman doctor Galen. Controversially, Al-Razi showed that Galen's theory of the four humours, an accepted wisdom on the cause of disease, was fundamentally inaccurate. Another notable example of his methods was that upon being asked to choose a new hospital location in Baghdad, Al-Razi hung meat in locations around the city and selected the spot where the meat rotted the least. He assumed that the patients would be less likely to suffer from illness and putrefaction of the flesh in this location. Al-Razi's observations from treating patients in hospitals also helped him write the first clinical characterisation of diseases such as smallpox and measles.

This era is also credited as overseeing the earliest medical peer to peer reviews to investigate standards of care. Documented by Ishaq bin Ali al-Rahwi (854–931) in the *Ethics of the Physician*, medical practitioners were instructed to make duplicate notes of a patient's condition on every visit, which would then be reviewed by a local medical council of other physicians. Such a process would not become common practice in the West until the 18th century.

Yet perhaps the greatest and the most influential figure of this era was Abu Ibn Sina (980–1037), popularly known in the West as Avicenna or 'the Father of Early Modern Medicine'. A true embodiment of the medieval Islamic polymath, Avicenna sought to fit the medical traditions of Galen and Hippocrates with the philosophy of Aristotle. This scholarship led to his seminal work, the seven-volume encyclopedia *The Canon of Medicine*, which became a standard medical textbook throughout the Islamic world and Medieval Europe until the 18th century.

The *Canon* detailed many modern medical practices such as checking the pulse and urine to diagnose ailments. Avicenna's other valuable



Al-Hasan Ibn Al-Haytham was a polymath who made important breakthroughs in optics and astronomy.

“The astrolabe was re-worked and perfected to be used to calculate the beginning of Ramadan, the hours of prayer and the direction of Mecca”



The University of al-Qarawiyyin is the oldest existing, continually operating and the first degree awarding educational institution in the world.

➤ contributions include recognising the transmission of airborne disease, describing a detailed diagnosis of guinea worm infection, and many psychiatric conditions. He is also said to have recommended the use of forceps in deliveries complicated by foetal distress. Such was his renown and influence that Avicenna was ranked with Hippocrates and Galen as one of the *principes medicorum* 'prince of physicians', and even appeared in works of literature including Chaucer's *The Canterbury Tales* and Dante's *Inferno*.

MATHEMATICS

One of the most highly regarded mathematicians of all time was Muhammad Al-Khwarizmi (780-850), who left his name to the discipline's future in the form of 'Algorism'. The word itself comes from Al-Khwarizmi's book *Hisab Al-Jabr wal Muqabala*, from which the words 'Al-Jabr' or algebra and more recently algorithm evolved that can be heard in every school and technology start-up today. One of the first directors of Baghdad's House of Wisdom, Al-Khwarizmi's mathematical investigations led to the creation

of the first systematic solution of linear and quadratic equations in Arabic. These methods of 'reduction' and 'balancing' helped create the abstract mathematical language still spoken in the 21st century.

Other areas of progress made by Al-Khwarizmi included his contribution to bringing the decimal system to Europe, after Latin scholars began translating Al-Khwarizmi's work on the Indian numerical system during the 13th century. Yet Al-Khwarizmi's methods of problem-solving were not merely exercises in the theoretic, but instead had valuable practical purposes for contemporary society. Throughout the *Hisab Al-Jabr wal Muqabala*, substantial attention is given to methods of dividing up inheritances, surveying plots of land, lawsuits and commerce.

One of the other major developments of the Golden Age's mathematicians was in the domain of trigonometry, which examined and expanded on the Greek theories of sine, cosine and tangent. The trigonometry of this era uses Ptolemy's theorem but develops it in two respects: it employs the sine where Ptolemy used the chord and is in algebraic instead of geometric form. Abu Rayhan Al-Biruni (973-1048) is regarded as one of the masters in this field. His treatise, entitled *Maqalid 'ilm al-hay'a* (Keys to the Science of Astronomy) contained 1,000 pages of extensive trigonometry theorems, of which the crowning achievement was the demonstration of the tangent formula. Like his predecessors, Al-Biruni's studies were underpinned by both practical considerations and Islamic teachings. His study of spherical trigonometry enabled him to calculate the co-ordinates of cities and other places to establish the qibla, aiding Muslims to find the correct direction of Mecca at prayer time. These calculations could determine the qibla from any location in the world. By the close of the 10th century trigonometry occupied an important place in astronomy texts and eventually progressed into a discipline of its own right.

The Muslim scholars leant much from the classical thinkers and expounded upon it. By the end of the 13th century, as the Islamic empires fell into decline, the texts and teachings of the Muslim masters gradually found their way to Europe through Constantinople (now Istanbul), Sicily and Spain. Amid the turmoil and conflict that descended upon the East, the foundations of mathematics, science and philosophy that had been developed in the Middle East sowed the seeds of the European Renaissance and thus a new era of thought was born. †

FLASHES

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BY MOHAMMED BIN RASHID AL MAKTOUM FOUNDATION



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