

AN OMAN OBSERVER DIGITAL MAGAZINE

THE CORRESPONDENT

ISSUE 4 | SEPTEMBER | **SCIENCE & TECHNOLOGY EDITION**

ZONE 88

OMAN'S THRUST TOWARDS SPACE EXCELLENCE



Majority of the artwork including the cover and some of the stories were created with the help of artificial intelligence.

Decoding the first complete genome sequence of Frankincense tree

Physicists Move Closer to a Theoretical Duel

The agricultural tech driving the success of Million Date Palm project

THE CORRESPONDENT

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EDITOR'S NOTE

THE EVOLUTION OF SCIENCE IN OMAN AND BEYOND

In today's fast-paced world, technological advancements are sweeping across industries, revolutionizing the way we work, live, and even think. One of the most remarkable transformations we've witnessed is the integration of artificial intelligence (AI) into various sectors, and our September edition of **THE CORRESPONDENT** is a testament to this groundbreaking trend.

At the heart of this edition lies the intersection of human creativity and AI innovation. We've harnessed the power of AI to aid us in creating compelling articles that captivate and inform our readers. Through AI-aided article writing, we've achieved a harmonious blend of data-driven insights and the art of storytelling, ensuring that our readers receive accurate and engaging content.

But our journey into the realm of AI doesn't stop there. We've delved into the world of AI-generated images, where machines take prompts and turn them into visually stunning creations. This innovative approach has not only added a new dimension to our articles but also allowed us to explore and communicate scientific concepts in ways we never thought possible.

Yet, as we embrace AI, we recognize the importance of balance between human and machine interaction. While AI can assist us in generating content, it cannot replace the creativity, intuition, and expertise of our talented writers and editors. We view AI as a tool that enhances our abilities rather than a replacement for them.

In this September edition, we invite you to embark on a journey through the latest developments in science and technology across various fronts. Explore Oman's ambitious space program as it ventures into the cosmos, discover the cutting-edge innovations in health and wellness science that are transforming lives, and delve into the world of agritech, where AI is revolutionizing agriculture practices for a sustainable future. We've also incorporated international developments in science from the reputable New York Times to provide you with a comprehensive view of the global scientific landscape.

As you flip through the pages of **THE CORRESPONDENT** we hope you'll appreciate the fusion of human expertise and AI innovation that has gone into crafting this edition. Our aim is to provide you with a magazine that not only informs but also inspires, making science accessible and exciting to all. We invite you to enjoy this edition and look forward to continuing our journey of exploration and discovery with you in the future. Thank you for being part of the **THE CORRESPONDENT** community, where science and technology meet the future.

THE EDITOR-IN-CHIEF

Observer

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GCET: ESTABLISHING AN ASTONISHING EDUCATION EXPERIENCE BASED ON RESEARCH AND INNOVATION!

Following the wise and visionary thoughts of His Majesty Sultan Haitham bin Tariq, and the futuristic plans to develop the Sultanate to be amongst the most powerful countries around the world, the Global College of Engineering and Technology (GCET) established the Research and Innovation Office (RIO) in December 2020. This decision came in light of the changes and renaming of the Ministry of Higher Education to Ministry of Higher Education, Research and Innovation which reflects the importance and influential relationship between the three areas and their impact on building a competent and well-educated generations for Oman. The RIO acts as the planning and management body for research, innovation, entrepreneurship at GCET along with the outreach activities and relationships with industry.

The Institutional Research Strategy (IRS) at GCET sets 8 main strategic objectives including enhancing the research and innovation infrastructure and resourcing, ensuring and developing the research environment, capacity and capability, encouraging and evidencing the Research Teaching Nexus (RTN), addressing community needs and industry challenges, along with transforming students into entrepreneurs by supporting creativity and innovation

through the Incubation Centre. Furthermore, the IRS aims at supporting the research which aligns with the Sultanate's Research and Innovation Strategy and Oman Vision 2040, ensuring full participation with MoHERI funding division, encouraging research collaboration and consultancy, increasing research and innovation output from all academic staff to support the achievement of Oman Vision 2040 goals. These objectives are governed and controlled by 3 policies including GCET Research Policy, GCET Research Ethics Policy, drafted based on the British Educational Research Association (BERA), and GCET Intellectual Propriety Policy drafted based on WIPO IP guidelines for HEIs.

Aiming to support research activities and capacity building, the RIO successfully launched 7 interdisciplinary research groups in the areas of Cyber security, Data Science, Automation and Robotics, Communication, Renewable Energy, Mechanical Engineering, and Education and Community.

GCET strongly believes in research collaborations with academia and industry to fill the gap, which is reflected by the growth of GCET's collaboration networking every year. Several MoUs, LoUs, and Lols were signed with academia and industry including the National University of Malaysia, Ajman University, Majan University College, A'Sharqiyah University, International College of Engineering and Management, EC-Council, Tatweer Cyber Security LLC and Huawei.

As part of GCET's strategic entrepreneurship objective, an Incubation and Innovation Centre (IIC) was successfully launched in the college's Student Hub. IIC operates with maximum capacity of 16 workshops including 4 dedicated to incubating external startups. The IIC's

main focusing areas are Information and Communication Technology, Manufacturing and Engineering, Urban Planning, and Sustainable Environments. Additionally, GCET launched a Postgraduate Centre in building C to support the PG programmes at the college.

The college also signed a membership contract for the EJAAD platform to encourage the research collaboration and consultancy with business and industry. Moreover, GCET participated for the first time in MoHERI's Block Funding Program 2021. The college gained a total of OMR 21,500 funding for 2 projects in 2021, and OMR 29,000 funding for 4 projects in 2022.

In May 2023, GCET launched its solar station for educational and research purposes. The PV station is considered the first seed of "GCET Go Green" initiative by RIO, aiming to contribute towards developing clean and renewable energy sector. This initiative will provide other research test beds in the future including wind turbines and green hydrogen. Besides, GCET won the GHEDEX Award for Excellence in Education "Diversity of Teaching Faculty - Researchers Ratio" during May 2023 which proudly comes as the fruits of a strong competition with other Omani colleges and universities.

Making GCET a Centre of Excellence (CoE) in one of the Engineering and Technology areas in Oman is considered one of the long-term goals of Institutional Research Strategy.

Dr. Amjed Sid Ahmed Mohamed
Director of Research
and Innovation Office
Global College of Engineering
and Technology



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DECODING THE FIRST COMPLETE GENOME SEQUENCE OF FRANKINCENSE TREE

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Understanding the genetic makeup of Omani frankincense tree (*Boswellia sacra*) is crucial for conservation and sustainable management. In this light, researchers have completed the genome sequencing of the *Boswellia sacra*, revealing its large genome, wounding response mechanisms, and genetic diversity.

The unsustainable harvest of *Boswellia sacra*, a genus known for producing frankincense, poses a significant threat to its survival. It is estimated that over 70% of these trees could die within the next 25 years if current harvesting practices continue. To address this issue and gain a better understanding of the Burseraceae family, including the *Boswellia* genus, researchers have performed an RNA-Seq and whole genome sequencing of *B. sacra*.

A research study has been conducted at the Natural and Medical Sciences Research Center, University of Nizwa, to publish the complete genome sequence (complete genomic assembly) of the Omani frankincense-producing tree for the first

time.

In this study, a high-quality reference genome of the Frankincense tree was obtained with a haploid genome size of 667 million base pairs. This genome has about 18,000 protein-coding genes that perform different functions in the plant's cells.

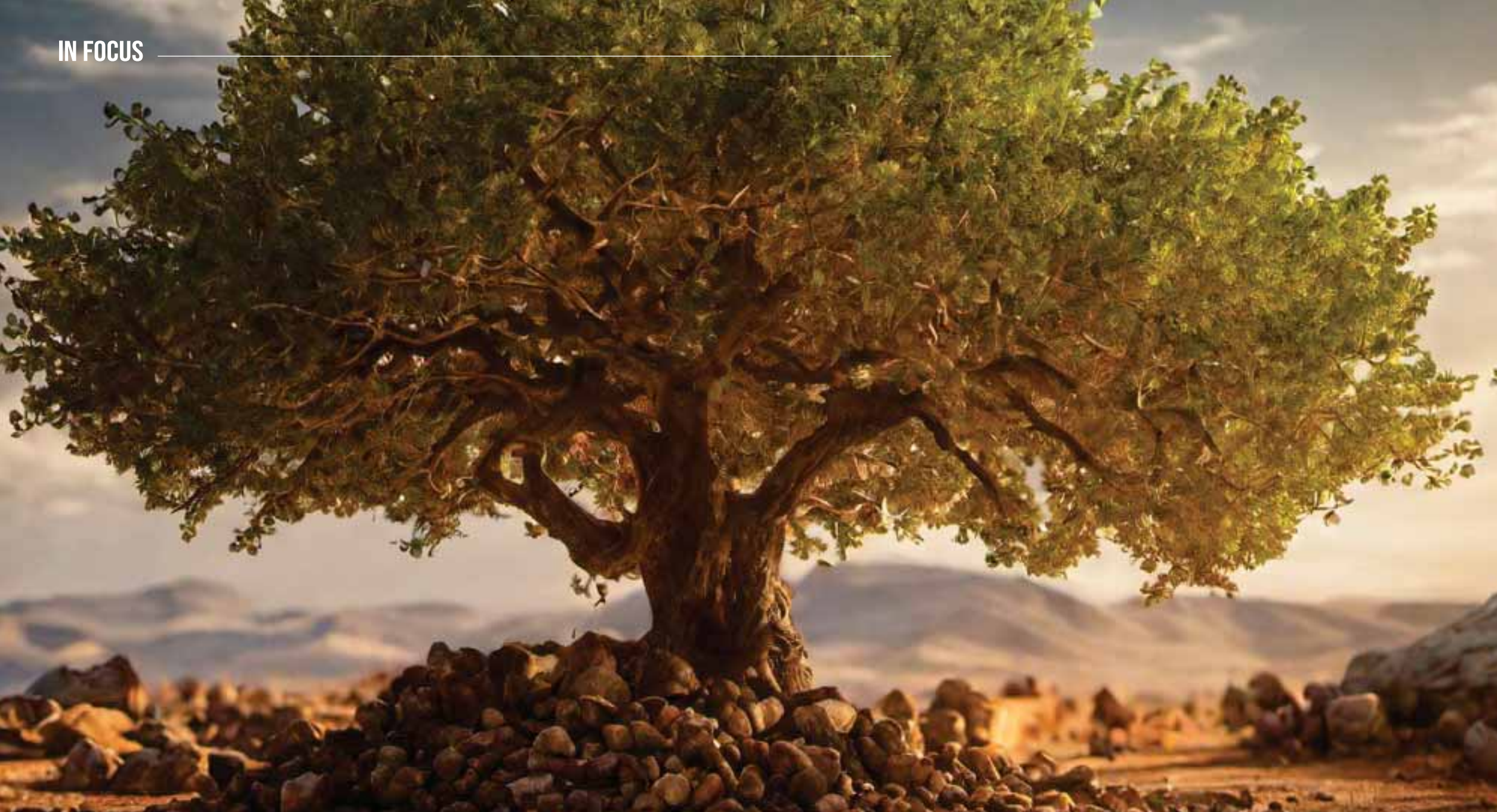
This genome sequencing effort is crucial for studying the genetics of frankincense and myrrh, as well as for improving sequence datasets in the Sapindales order, which includes over 7,500 species across nine families. Only 16 genomes have been sequenced in this diverse group so far.

The results of this study were compiled over nearly five years of continuous efforts with the help of internationally recognized scientists from seven different universities and leading

research centers.

The genome of the Omani frankincense tree (*Boswellia sacra*) was found to be approximately 45 percent larger than the genome of the 367 million-base orange trees, roughly 29 percent larger than the grape tree, 28 percent larger than the papaya tree, and 36 percent larger than the cashew tree, which is considered to be the closest tree with the complete genome published.

In this study, the research team made a groundbreaking discovery about how the frankincense tree responds to injury and cutting by releasing hormones and other metabolites that trigger the production of the resins. Here, they have also revealed the complete genomic map, decoded the genetic sequence, and studied the evolution of the frankincense



The first genome sequence of the frankincense tree was discovered through this successful endeavor, which took a lot of time, effort, dedication, and resources, which is similar to the process of extracting high-quality DNA from resinous trees, in addition to the tremendous effort in analyzing this large amount of bioinformatics-related work to get the whole genome assembly.

The research activities of the Natural and Medical Sciences Research Center carried out in the past few years have clearly formed the first nucleus for understanding the Omani frankincense tree (*Boswellia sacra*), as they helped to answer

many scientific questions related to the following topics:

- a) History and origin of the tree
- b) Complete genomic sequence of the tree
- c) The biosynthesis pathways of resin production and its main components
- d) Biological, chemical, and physical variations along with related species.
- e) Transcriptome analysis of *Boswellia sacra* unveiled genes linked to terpenoid biosynthesis, phytohormonal regulation, and cell-wall synthesis.

GENETIC DIVERSITY, WOUNDING RESPONSE

One of the key areas the

research explored is the wounding response in *B. sacra*, which is essential for frankincense production. Understanding this response may aid in stem regeneration processes, with a focus on the role of jasmonic acid and salicylic acid as key regulators.

The genetic diversity and population structure of *Boswellia sacra*, or frankincense tree, are facing a serious threat due to unsustainable resin harvesting practices. This unsustainable exploitation of resin makes these trees vulnerable to attacks by mites, beetles, and fungal pathogens. Most of these trees are found in the Dhofar region of Oman, where thirteen distinct

populations have been identified in three different areas: central, western, and eastern Dhofar.

To understand the population structure of *B. sacra*, researchers sequenced chloroplast DNA from twenty trees representing the thirteen populations. Specifically, they examined the sequences of *trnG-psbA*, *rbcl*, *ycf*, and *rpoC1* genes designed for *B. sacra*. The data analysis using STRUCTURE software revealed the presence of four main population clusters, with the highest delta K at K = 4. The primary clade contained over 64.1% of genotypes from eastern and western

populations, all located along the Arabian Sea coast. The other three clades were geographically dispersed.

To investigate the tree's response to wounding stress, selected trees were exposed to various durations of wounding stress, and their levels of endogenous salicylic acid (SA) and jasmonic acid (JA) were compared to control trees. The results showed a significant increase in JA levels during wounding, peaking at 12-fold higher than controls, while SA also exhibited a similar trend but at lower concentrations.

To delve deeper into the wounding response, RNA-

Frankincense Through History

Frankincense, a resin derived from the *Boswellia* tree, has woven itself into the tapestry of human history, leaving behind a fragrant trail of cultural, religious, and medicinal significance. Join us on a journey through time as we explore the remarkable history and enduring importance of frankincense.

ANCIENT BEGINNINGS:

Frankincense's history stretches back over 5,000 years. Its use is believed to have originated in the Arabian Peninsula, where it was highly valued by ancient civilizations, including the Sumerians, Egyptians, and Phoenicians. These early cultures burned frankincense as incense during religious ceremonies, believed to connect them with the divine. The fragrance was also used in cosmetics, perfumes, and embalming.



THE ANCIENT EGYPTIANS:

The ancient Egyptians held frankincense in the highest regard. It was used in the embalming process for its preservative properties, ensuring the eternal journey of the deceased. Additionally, it was a key component in cosmetics and perfumes, enhancing the allure of the elite.

THE BIRTH OF TRADE ROUTES:

Frankincense became a cornerstone of ancient trade routes, including the famous Incense Route. This network connected the Arabian Peninsula to the Mediterranean, with frankincense as one of its most sought-after commodities. The wealth generated by the trade in frankincense transformed entire empires, such as the incense-rich Kingdom of Sheba.



seq analysis was performed on wounded and unwounded stem tissues, identifying 1,451 upregulated differentially expressed genes (DEGs). Among these, 118 were known wounding response-related genes from other plants. These DEGs were associated with processes such as cell-wall biology, defense mechanisms, carbohydrate metabolism, and oxidative stress responses.

Quantitative real-time PCR validation confirmed the upregulation of DEGs involved in terpenoid synthesis, cell wall function, and development during wounding. Additionally, the application of exogenous JA after wounding activated specific genes associated with cell wall fortification.

The study suggests that the wounding response in *B. sacra*, crucial for frankincense production, involves the upregulation of genes related to defense, cell wall strengthening, and terpenoid synthesis. Furthermore, the study highlights the importance of phytohormones like JA in regulating these responses, indicating that calcium and other phytohormones play significant roles in long-distance signaling during tissue damage. Understanding these processes is essential for the conservation and sustainable management of frankincense-producing populations facing the threat of overharvesting.

Resin derived from *Boswellia* trees plays a crucial role in their defense mechanisms against wounds and pathogens. This resin, comprised of over 300 chemical constituents such as monoterpenes, diterpenes, and triterpenes, is synthesized through two pathways: the methylerythritol 4-phosphate (MEP) or mevalonic acid (MVA) pathways. These pathways converge at farnesyl diphosphate, a key precursor in triterpenoid biosynthesis. The Cytochrome p450 family, especially subfamily CYP71, is involved in modifying terpene-based resin components, with some genes like CYP72A and CYP716B1 playing vital roles in resin acid formation.



Upon wounding, terpenoid synthesis is significantly activated, including terpene synthase (TPS) activity, which is essential for resin acid production. In *Boswellia sacra*, 16 TPS genes were identified. Terpenoid biosynthesis pathways are also linked to defense signaling in various tree species.

Additionally, genes related to amyrin synthesis, a precursor of boswellic acid and a significant component of frankincense, were found to be upregulated during wounding. The analysis revealed a total of 17 genes involved in amyrin synthesis in *B. sacra*.

Furthermore, genes related to wounding stress

and cell-wall biogenesis were examined. While some genes had orthologous counterparts in other species, *B. sacra* showed unique paralogous genes related to pollen allergies and cell wall development.

Utilizing the existing experimental insights and extending their application to wider-scale field trials has the potential to address the issue of dwindling tree populations not only in Oman but also in various other communities. This approach is crucial for securing a sustainable supply of frankincense, especially in light of anticipated market-driven challenges that were predicted to lead to its depletion in the coming decades. ■

RELIGIOUS SIGNIFICANCE: Frankincense holds a central place in various religious practices. In Judaism, it was used in the Temple of Jerusalem and continues to be a part of Jewish rituals. In Christianity, it symbolizes the gifts brought by the Magi to the infant Jesus. Islam also recognizes the significance of frankincense, mentioning it in the Quran.

MEDICINAL AND THERAPEUTIC USES: Throughout history, frankincense has been treasured for its medicinal properties. Ancient healers used it to treat a wide range of ailments, from respiratory conditions to arthritis. Modern research is rediscovering its potential as an anti-inflammatory and analgesic substance, potentially offering relief for various modern diseases.



MODERN RELEVANCE: Today, frankincense remains an essential part of many cultures and religious practices. It is still used as incense in churches and mosques, connecting modern worshipers with ancient traditions. Moreover, the fragrance industry continues to value frankincense as a prized ingredient, finding applications in perfumes, cosmetics, and aromatherapy.

CONSERVATION CONCERNS: The *Boswellia* tree population faces significant threats due to overharvesting and habitat degradation. Sustainable harvesting practices are crucial to ensure the survival of these ancient trees and the communities that rely on them.

THE EVOLUTION OF THE SPACE SECTOR IN OMAN

Oman's Vision 2040 plan aims to diversify income sources from oil. The Ministry of Transport, Communications, and IT launched the Digital Economy Program to boost the ICT sector. It also established the National Center for Space, Advanced Technologies, and AI to develop the space sector.

BY SAUD HUMAID AL SHUEILI

The Sultanate of Oman is embarking on a long-term development strategy known as Oman Vision 2040. The strategy has various national objectives. At the forefront is diversifying the sources of national income away from national resources, mainly oil and gas exports. This objective will be realized through various initiatives, one of which is the adoption and localization of advanced technologies to enhance the efficiency, productivity, and competitiveness of the economic sectors.

All public and private entities are playing active roles in realizing the vision of Oman 2040. The Ministry of Transport, Communications, and IT (MTCIT), which was established by Royal Decree 90/2020, is a major contributor to the vision through its two economic sectors: logistics and ICT.

To enhance the contribution of the ICT sector to the objectives of Vision 2040 in a strategically coordinated fashion, MTCIT has launched the Digital Economy Programme in 2021, which includes the efforts of various digital sectors including space, AI, cybersecurity, electronic commerce, and digital infrastructure. This programme aims at enhancing the contribution of the digital sector to the overall economy to 10% of the overall GDP by 2040. For this, MTCIT established the national space programme to develop and enhance this sector in the wider economy. This article will detail how the space sector evolves in the national economy.

Oman Space Sector, 2020 onward Until August 2020, the space sector was not considered a standalone economic sector in the country. Many national space-based efforts have taken place before 2020, including the government's initiative to launch a national satellite. Moreover, all other sectors have been benefiting from space-based services and applications.

Despite all that, the sector was not defined in the economy, and its contribution to the economy was not captured. The major space-based services across all sectors are telecommunications services like broadband connectivity, mobile and fixed communications, and VSAT.

Moreover, various public and private entities have been engaged in sector activities, directly or indirectly, but all those efforts were scattered and there was no national champion to orchestrate the development of the sector.

As such, the result was a lack of proper governance in the sector, a lack of efforts in integration and alignment, and many duplications across various entities.

By 2020, when MTCIT was established by Royal Decree 90L2020, the National Center for Space, Advanced Technologies, and AI was established in the ministry. The royal decree mandates MTCIT with various tasks to develop the

programmes: the National Space Program and the National AI and Advanced Technologies Programme. MTCIT established the national space programme to execute MTCIT's mandates for the space sector.

Since its establishment, the space programme has taken various strategic initiatives to develop the sector, including determining the key players in the local space sector and identifying the efforts that have been executed by the stakeholders to create an integration and alignment mechanism to achieve national objectives.

Following this, and to develop the sector through constructive



space sector. The establishment of this centre is the first official recognition of the space sector as a standalone sector along with advanced technologies and artificial intelligence. The establishment of this sector shows the government's seriousness to develop and enable the space sector in the economy and also to benefit from its technological advancements. MTCIT operationalized the Centre into two

and coordinated efforts, the space programme developed the national space policy in partnership with an internationally specialized consultant. The policy defined the future direction of the sector and its vision and proposed multiple initiatives and projects to realize the vision. The details of the development of the national space policy and its executive programme will be detailed in the next phases. ■

ZONE 88: OMAN'S THRUST TOWARDS SPACE EXCELLENCE



BY AHMED AL KAABI
The Correspondent

Oman is propelling itself into the global space arena, aiming to launch its own satellite by 2025. The nation recently unveiled "ZONE 88," a cutting-edge space science hub within Duqm's Special Economic Zone.

Photos used in this story are AI generated.

Space operations are advancing rapidly towards astonishing horizons as the world witnesses tremendous development in the field of space. In this context, the Sultanate of Oman seeks to enhance its role and international position in this vital sector. Oman is making relentless efforts to secure its position in the world of space by joining international agreements and treaties, establishing projects, attracting investments related to space sciences, and working on launching the Omani satellite. This comes at a time when countries and giant companies are racing to invest in this field.

Eng. Said bin Hamoud Al Maawali, the Minister of Transport, Communications, and Information Technology, confirmed that efforts are ongoing to launch the Omani satellite, with recent estimates indicating that the launch will take place in 2025.

In light of this significant progress,

the Global Space and Technology Company recently announced "ZONE 88," a scientific and economic area dedicated to space sciences and industries, as well as advanced technologies. It is located in the Special Economic Zone in Duqm, Oman.

"ZONE 88" includes five international projects, including the Space Habitat Center, Commercial Space Launching Area, Unmanned Vehicles Technology Center, Artificial Intelligence and Advanced Technology Testing Area, and Ground Station. These projects are designed to enhance the aerospace and technology industries, attract international investments and scientific research, and build a sustainable knowledge economy in the region.

The Space Habitat Center is a project aimed at creating an environment to simulate living in



HOW WOULD THE DESERTS OF OMAN LOOK LIKE IF ZONE 88 IS REALIZED?

As per AI prediction, transforming Oman's deserts for space exploration involves building infrastructure like launch facilities, research labs, and simulated celestial terrains. It requires international collaboration, rigorous safety measures, and environmental considerations. This ambitious project aims to enhance space exploration, research, and development while fostering educational outreach and potentially space tourism.





space, such as on Mars and the moon, and studying the behavior of astronauts before joining manned space flights. Scientists and researchers will also use this center to conduct experiments in the aerospace, artificial intelligence, and advanced technology sectors.

The Commercial Spacecraft Launch Area is one of the most important sites globally, intended to be an investment center for launching commercial spacecraft. The

area attracts governments and international companies specializing in launching spacecraft and also prepares the area as an international station for intercontinental space travel.

The Drones Technology Center provides a scientific and applied environment for drone operations (aerial, land, and maritime) and related systems. This includes a school for training on unmanned aircraft and

granting licenses to operators. Additionally, partnerships with specialized global institutions will be established to attract investments in various types of drone manufacturing and to transfer knowledge and technology to the region.

The Artificial Intelligence and Advanced Technology Experimentation Zone aims to provide facilities for companies and scientific institutions to conduct experimental research and tests related to



“ZONE 88” includes five international projects, including the Space Habitat Center, Commercial Space Launching Area, Unmanned Vehicles Technology Center, Artificial Intelligence and Advanced Technology Testing Area, and Ground Station. These projects are designed to enhance the aerospace and technology industries, attract international investments and scientific research, and build a sustainable knowledge economy in the region.

the aerospace sector, artificial intelligence, and advanced technologies. The Ground

Transmit and Receive Station will be used to provide infrastructure for international governments and local and international companies to set up their ground stations in a suitable environment, either for commercial or scientific purposes.

Engineer Bahiya bint Hilal bin Sultan Al Shuaibi, the founder and CEO of the company, emphasized that these projects will open opportunities for local and international institutions to invest in the aerospace industry and leverage Oman's strategic position as a suitable destination for spacecraft launches and a hub for aerospace research and activities in the region.

Regarding the agreements and treaties in the space sector,

the Ministry of Transport, Communications, and Information Technology, in collaboration with the Ministry of Culture, Sports, and Youth and the Omani LNG Company, signed an agreement to establish a special corner for space sciences and technologies at the Children's Museum. This corner simulates the virtual reality of a spacecraft and consists of two compartments to simulate a scientific and educational space journey using the latest multi-sensory virtual reality technologies. It targets children and youth, including school students in Oman.

The agreement aims to enhance active community partnership, achieve the public interest of society, promote the culture of space sciences and technologies among generations, create a fertile environment for scientific tourism programs and initiatives in the field of space sciences, and enhance the use of virtual and augmented reality technologies in the aerospace sector. ■

THE DEEP-BLUE ETHICS



BY AHMED AL LAWATI
Marine Biologist

A marine biologist shares a transformative encounter with a blind and injured dolphin, highlighting the ethical responsibility humans hold towards marine life and our interconnectedness with the ocean.

The vast blue expanse of the ocean can be mesmerizing. It's home to an unparalleled range of marine life, from the tiniest plankton to blue whales. But with great beauty comes an even greater responsibility, as I learned during the various surveys I conducted as a marine specialist in the Red Sea and Arabian Peninsula. I have learned that conservation is not just about numbers or ecosystems; it's deeply intertwined with our core values as human beings. And sometimes, it takes a single encounter to cement this belief.

In one of my recent whale and

But more than just an eye-opener about the state of our oceans, the blind dolphin became a symbol for me—a symbol of the deeply ethical responsibility we owe to the marine world and, by extension, to our planet. Every organism and every species, regardless of their size or perceived importance, has an intrinsic value. A value that we, as stewards of this planet, are duty-bound to protect and cherish.

Why? Because conservation isn't only about maintaining ecological balance or ensuring

of marine life and ecosystems would rob future generations of the aesthetic, economic, and nutritional benefits the ocean provides (just to name a few). Ensuring the preservation of the ocean is a way to uphold our ethical obligation to those who come after us.

Finally, the degradation of marine ecosystems can primarily be attributed to human actions such as overfishing, pollution, and coastal developments. Thus, those actions can in fact be not only a matter of justice but also of empathy. The suffering of marine animals due to anthropogenic factors calls into question our capacity for



dolphin surveys in the Red Sea, my team and I came across an awakening scene. We came across a dolphin, distinctively marked by missing a chunk of its dorsal fin, which is often the case when they are hit by a passing vessel. As the dolphin came by and swam gently by us, stating its presence, I noticed something bizarre. The dolphin also had the misfortunate luck of being born with a deformity, causing it to be blind. This dolphin, which was fighting all odds to survive living in solitude and separated from its pod due to its injuries, gave us a stark reminder of the resilience of nature and the consequences of human interference.

This encounter was a paradigm shift for me. How many times have we unwittingly passed by animals suffering silently from injuries or adapting against the odds to the challenges we, directly or indirectly, inflict upon them? How many of them have been affected by polluted waters, entangled in fishing nets, or injured by marine vessels?



resources for future generations. At its core, conservation is a humanitarian act. The health of our oceans directly impacts our well-being, from the air we breathe to the food we eat. And if that isn't reason enough, then the sheer wonder, beauty, and mystery of marine life should be.

Humanitarianism, traditionally associated with alleviating human suffering, has to be broadened to include all sentient beings. Our blue planet, 70% of which is covered by oceans, is a shared home. If a blind, injured dolphin strives to live, it is not just because of its biological instincts but also because of its sheer will to be a part of this shared story of life.

In addition to the intrinsic value that philosophers often debate, which states that every creature has a right to exist, irrespective of its utility to humans, the concept of intergenerational justice comes to mind. The degradation



compassion and care. Preserving the ocean reflects a broader ethical stance of recognizing our interconnectedness with all life forms and caring for them.

The moral case for ocean preservation is robust and deeply rooted in both empirical science and ethical philosophy. From a scientific perspective, the health of our oceans is critical for biodiversity, climate regulation, and human well-being. Philosophically, the imperative to protect the oceans derives from recognizing their intrinsic value, our duty towards future generations, and a fundamental ethic of care.

In today's rapidly changing world, where anthropogenic pressures threaten marine ecosystems, understanding the profound moral importance of ocean preservation is more crucial than ever. Only by acknowledging the depth of our responsibility can we hope to muster the collective will needed to ensure the continued health and vitality of our oceans. ■



SOLUTIONS FOR CARBON EMISSIONS: RENEWABLE ENERGY



BY LAKSHMI KOTHANETH
The Correspondent

Oman is shifting from oil and gas to sustainability, pledging net zero emissions by 2050. Solar and wind energy projects reduce carbon emissions.

Oil and Gas once reigned supreme as Oman's economic powerhouse, but today, Oman is taking bold and resolute strides toward slashing its carbon footprint to create a sustainable future.

In the groundbreaking publication by the Environment Authority of Oman, titled 'The Sultanate of Oman's National Strategy for an Orderly Transition to a Net Zero Plan,' Oman, under the visionary leadership of His Majesty Sultan Haitham bin

Tarik, has made an unwavering commitment to achieve net zero emissions by 2050. This pledge aligns seamlessly with the ambitious goal set forth in the Paris Climate Agreement, aiming to curtail global climate change to a mere 1.5 degrees Celsius above pre-industrial levels. Oman, by embracing this mission, has ascended to a prominent position on the global stage, where it spearheads the charge in charting an enduring and sustainable path towards the future.

This extraordinary document unveils Oman's resolute vision for attaining net zero emissions by 2050, marking a monumental and unwavering declaration of intent.

According to Engineer Salim bin Nasser al Aufi, Minister of Energy and Minerals, Oman's orderly energy transition will be underpinned by a set of fundamental objectives: ensuring environmental sustainability, minimizing economic costs to Omani citizens and industries, optimizing the economic impact arising from the transition,

encouraging job creation, and ensuring a secure energy supply.

"The vision is as compelling as it is challenging; the transition will involve many changes to the economy and will involve trade-offs along the way. But thanks to Almighty Allah, Oman is blessed with a bountiful endowment of natural resources to support the transition: plentiful sunlight, ideal windspeeds, and a favorable geographic location to grow a new hydrogen economy," he explained.

While the net zero 2050 pathway is a critical step in the journey, it is only the beginning. With the announcement of the creation of the Oman Sustainability Center, the Sultanate has laid the foundation to ensure the necessary supervision, implementation, and support for the net zero 2050 plan.

The two sectors of renewable energy Oman is investing in are solar energy and wind energy.

One challenging aspect is the cost of producing renewable energy.

According to Oman 2040, the

environmental cost of generating electricity using solar energy in Oman is lower than using natural gas. Accordingly, the government has established a series of projects in solar energy, which together add up to a total capacity of 500 MW.

As per expectations, this capacity should be able to cover 33,000 homes with electricity, which could reduce 340,000 tons of carbon dioxide emissions per year.

The Amin Solar project is one of the largest projects that would see a reduction in dependency on gas power plants and reduce carbon dioxide emissions.

As per the details from Oman 2040, the project has 336,000 photovoltaic panels stretching over full kilometers with a capacity of 100 MW which results in about 226,000 tons of reduction in carbon dioxide emissions annually.

Oman's coastline is 3165 km, and with it comes great potential in wind energy. Wind energy is another source that is being tapped to help achieve the government's objective

of reducing greenhouse gas emissions.

Project Dhofar Wind Energy is located in the Wilayat of Shaheen and the Halaniyat Islands. The project is to meet the requirements for electricity in 16,000 homes in Dhofar Governorate.

The project that was completed in 2019 is equipped with the latest pneumatic actuators that are suitable for the environment.

Masdar delivered the first large-scale wind farm in the Gulf Cooperation Council, comprising 50 MW. The Dhofar Wind Power Project is Masdar's first investment in Oman's renewable energy sector.

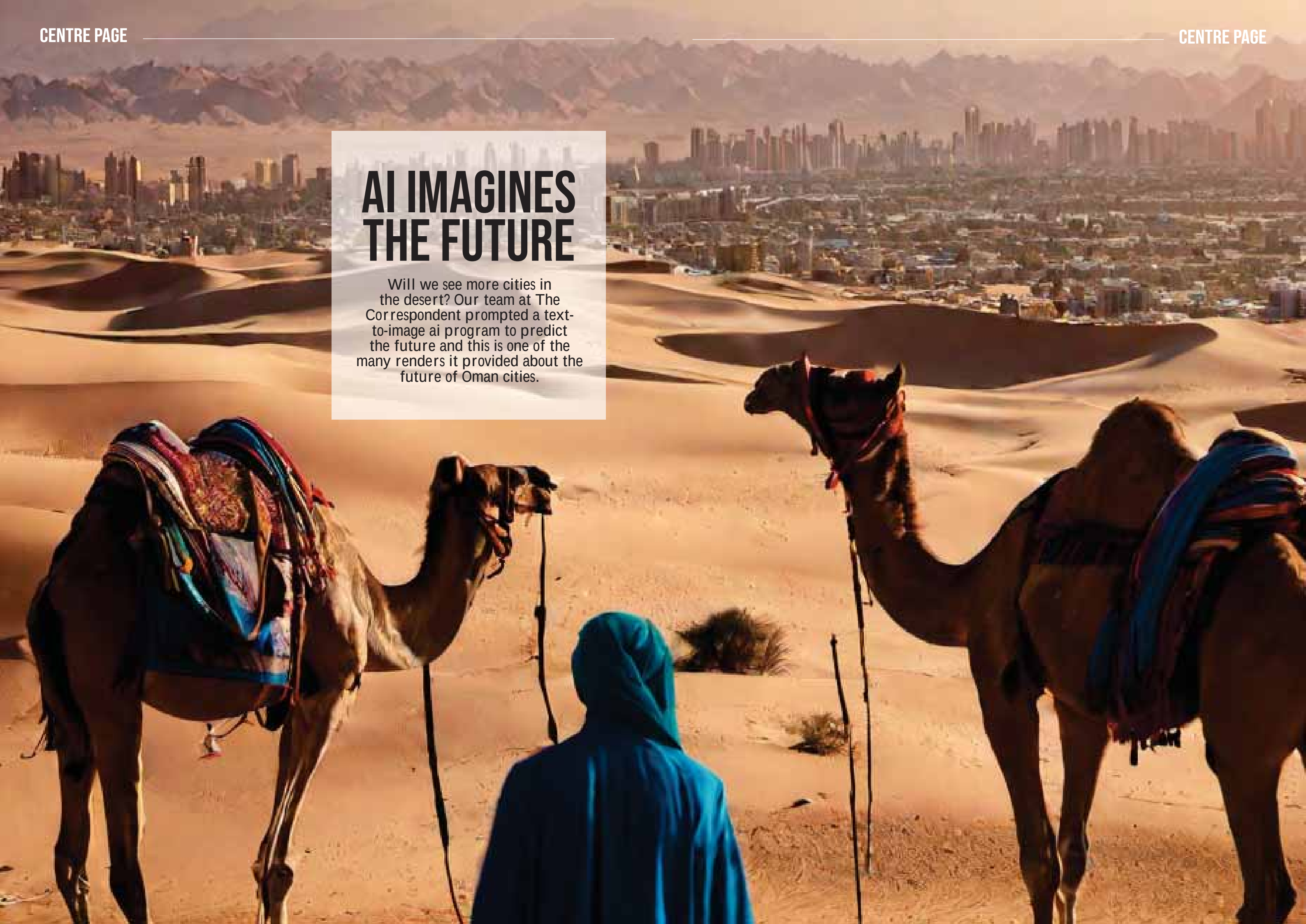
According to Masdar, the Thumrait plateau, where the project is constructed, provides the ideal conditions for the wind farm, with an average wind speed of 7 to 8 meters per second.

Thirteen wind turbines operate with each having an electricity generation capacity of 3.8 MW.

The production sees wind energy penetration of seven percent of the Dhofar Governorate's electricity needs. ■

AI IMAGINES THE FUTURE

Will we see more cities in the desert? Our team at The Correspondent prompted a text-to-image ai program to predict the future and this is one of the many renders it provided about the future of Oman cities.



THE AGRICULTURAL TECH DRIVING THE SUCCESS OF MILLION DATE PALM PROJECT



BY NASRULAH AL AJMI
The Correspondent

Oman's Million Date Palm Project combines tradition with technology, aiming to plant one million date palm trees using advanced agricultural techniques like precision farming, drone pollination, and smart irrigation systems. This initiative promotes sustainable agriculture in arid regions and fosters technological innovation in Oman.

In an initiative to meld tradition with technology, the Sultanate of Oman has embarked on an ambitious project to plant one million date palm trees. While the date palm has been a cornerstone of Middle Eastern agriculture for centuries, the name Million Date Palm Project signals a revolutionary approach, harnessing modern science and advanced technology to enhance the nation's food security and environmental sustainability.

In 2021, the Oman Investment Authority (OIA) took over the management of the Million Palm Tree Plantation Project, which now has 11 farms spread in different regions of the Sultanate, broken down into two farms in Al Dakhiliyah in the wilayats of Nizwa and Samail, three farms in Al Dahira in the wilayat of Ibri, one farm in North Al Sharqiyah in Ibri, one farm in South Al Sharqiyah in the wilayat of Al Kamil, two farms in Al Sunainah in Al Buraimi, and two farms in Dhofar in the wilayats of Sheleem and Maqshan.

The project capitalizes on the resilience of date palms to arid conditions, a characteristic that makes them well-suited to Oman's desert landscapes. However, it's the integration of cutting-edge technology that truly sets this initiative apart and positions it at the forefront of innovative agriculture. Oman is leveraging advancements in agricultural technology (AgTech) to maximize the efficiency and productivity of the project.

Internationally, a report by the International Journal of Innovative Research and Scientific Studies, said, "Drone pollination is being done on a tall date palm tree. The time taken to pollinate each inflorescence is from 4 seconds to 20 seconds, which means that the entire farm of 50 trees can be pollinated in less than 15 minutes. This was well within the battery capacity of the drone."

In Oman, Wakan Tech, an Omani startup that focuses on the fields of artificial intelligence (AI), robotics, and drones for the agriculture

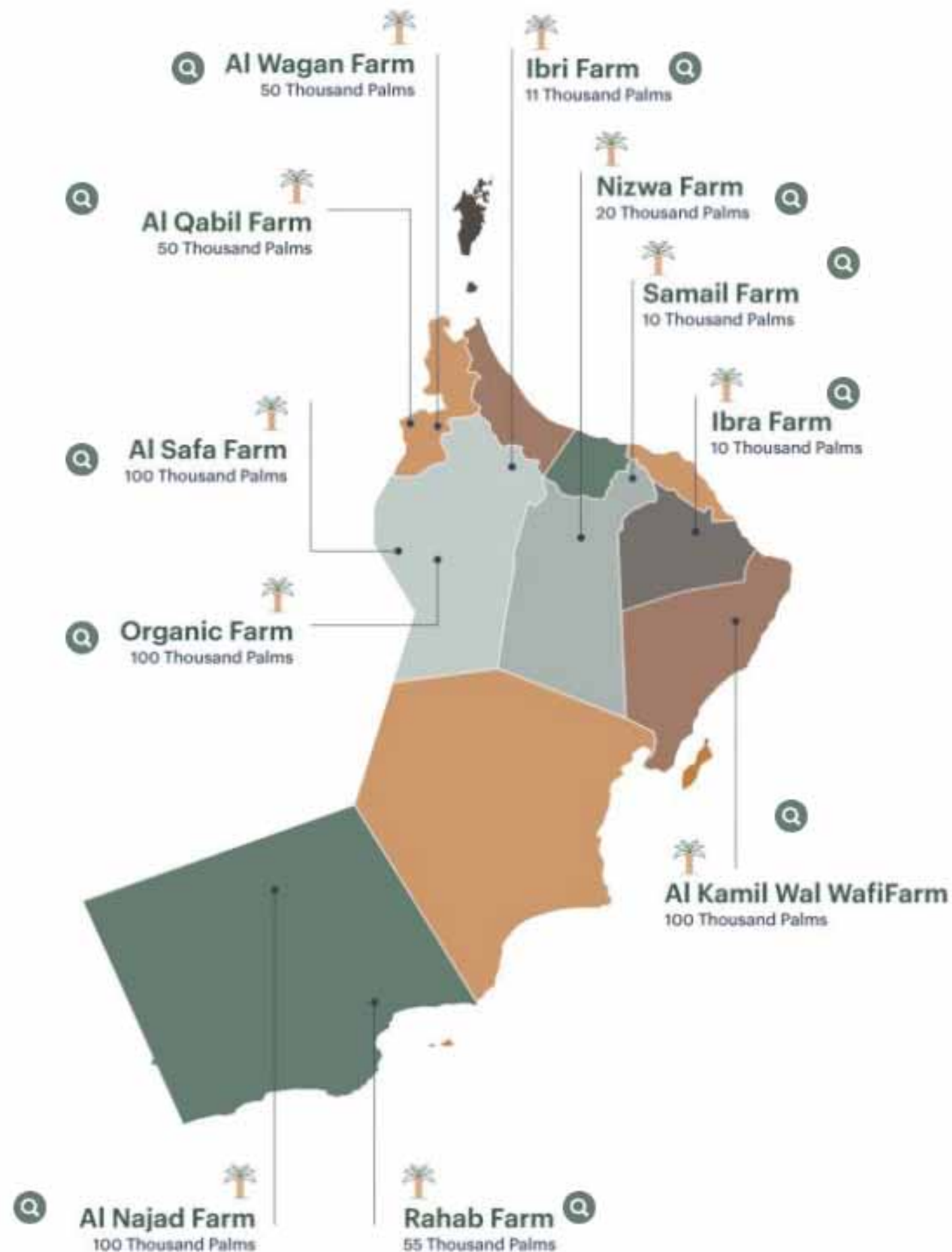
sector, has been delegated to look after the enhancements and development of the technologies used to ensure that the goal is reached.

The application of science and technology extends beyond the cultivation process. The Million Date Palm Plantation Project also incorporates modern irrigation techniques, utilizing groundwater as the primary source for irrigation. Through the careful management and monitoring of water resources, the project ensures the sustainability and long-term success of the date palm farms.

On the bioengineering front, scientists are working on developing date palm varieties that are more resistant to diseases and pests and can better withstand the harsh desert conditions. This genetic research, paired with the use of AgTech, aims to enhance the productivity and resilience of the date palms, ensuring the long-term success of the project. In addition to boosting agricultural output, the Million Date Palm Project is expected to stimulate technological innovation within Oman. As the project progresses, it will likely spur development in related sectors such as food processing technology, logistics, and AgTech, positioning Oman as a hub for agricultural innovation in the region.

According to Younis Al Siyabi, the chief executive officer and founder of WakanTech who oversees the success of the program, Oman's Million Palm Trees Project is harnessing the power of artificial intelligence, robots, and drones to transform date palm farming. These technologies address key challenges such as resource management, pest control, and productivity, promising a sustainable future for date palm agriculture. Remote sensing, AI, and agricultural robots are the driving forces behind this innovation. Collaborations with governmental and private entities are essential for sector development, while data security remains a top priority. This endeavor hints at





Oman's climate conditions pose challenges to the agriculture sector. Adaptations and innovations are necessary to ensure the effectiveness of technology solutions in this region.



“Collaborations and partnerships with government and private entities are essential for improving and developing the agricultural sector. These partnerships involve research discussions aimed at achieving quality results that support sustainability in the field.

-- Younis Al Siyabi
CEO, WakanTech

a promising future for agriculture, where technology and nature coexist harmoniously.

In an exclusive with The Correspondent, Al Siyabi shared the following insightful information about where the company stands and the developments happening in the project:

WHAT SPECIFIC CHALLENGES IN DATE PALM TREE CULTIVATION IS YOUR COMPANY ADDRESSING THROUGH AI AND ROBOTICS, AND HOW IS THIS BENEFITING OMAN'S AGRICULTURAL SECTOR?

Al Siyabi: The palm tree agriculture sector faces multiple challenges, some of which are addressed through artificial intelligence and robotics. What we do includes resource management and pest control. Artificial intelligence (AI) aids in tracking soil, water, weather, and plant data to optimize care for each tree. AI also diagnoses diseases and pests, enabling swift intervention. Robotics enhances productivity by automating tasks like irrigation and harvesting, reducing costs.

The Million Palm Trees Project in Oman aims to enhance agricultural practices and increase date palm productivity in the Sultanate of Oman. Artificial intelligence, robots, and drones are utilized in this project to improve production efficiency and provide effective care for date palms. Data is collected from palm fields using sensors such as remote sensing and environmental sensors, and AI techniques are employed to determine the specific agricultural needs of each tree.

CONSIDERING THE UNIQUE CLIMATIC AND ENVIRONMENTAL CONDITIONS IN OMAN, WHAT ADAPTATIONS OR INNOVATIONS HAVE BEEN NECESSARY TO ENSURE THE EFFECTIVENESS OF YOUR TECHNOLOGY SOLUTIONS IN THIS REGION?

Al Siyabi: Oman's climate conditions pose challenges to the agriculture sector. Adaptations and innovations are necessary to ensure the effectiveness of technology solutions in this

region. Technology solutions are customized to meet Oman's unique needs and challenges. For example, irrigation systems have been developed to address water scarcity.

Artificial intelligence algorithms contribute to precision agriculture for date palm trees by providing technical solutions for data analysis and sustainable decision-making. AI is used to analyze images to assess the condition of palm trees.

Robots and drones integrate with artificial intelligence systems to provide comprehensive data collection and decision support in date palm cultivation. They gather data related to palm growth and health, such as height, size, and potential threats.

LOOKING TOWARDS THE FUTURE, HOW DO YOU ENVISION THE ROLE OF AI AND ROBOTICS EVOLVING IN AGRICULTURE, SPECIFICALLY IN THE CONTEXT OF DATE PALM CULTIVATION, AND WHAT ARE YOUR COMPANY'S PLANS TO STAY AT THE FOREFRONT OF THIS TECHNOLOGICAL ADVANCEMENT?

Al Siyabi: Collaborations and partnerships with government and private entities are essential for improving and developing the agricultural sector. These partnerships involve research discussions aimed at achieving quality results that support sustainability in the field. Given the continuous advancements in artificial intelligence and robotics, they are expected to play an increasing role in agriculture, including date palm cultivation. Technological progress in this field is likely to result in significant improvements in productivity, resource utilization, and sustainability in date palm farming.

ARE THERE PLANS TO EXPAND THE APPLICATION OF YOUR TECHNOLOGY BEYOND OMAN'S MILLION DATE PALM TREES PROJECT?

Al Siyabi: Besides the Million Palm Trees Project, our company has undertaken various projects in different regions of Oman,



YOUNIS AL SIYABI

*CEO, Founder
WakanTech*

targeting different crops such as vegetables, fruits, and herbs. These projects have yielded excellent results, thanks to the company's commitment to providing high-quality and efficient services.

WITH DATA PRIVACY AND SECURITY BECOMING INCREASINGLY IMPORTANT IN AI AND ROBOTICS APPLICATIONS, HOW DOES YOUR COMPANY ENSURE THE PROTECTION OF SENSITIVE AGRICULTURAL DATA COLLECTED FROM THE PROJECT, AND WHAT MEASURES ARE IN PLACE TO PREVENT UNAUTHORIZED ACCESS OR MISUSE?

Al Siyabi: All data obtained through our projects is kept locally within the Sultanate of Oman and is not accessible or publishable. It is stored on private servers protected by specialized authorities within Oman to ensure the security and integrity of all data, guarding against unauthorized access. ■

A CROSS-CULTURAL EXPLORATION OF DIETARY TRADITIONS



BY LAKSHMI KOTHANETH
The Correspondent

A marine biologist shares a transformative encounter with a blind and injured dolphin, highlighting the ethical responsibility humans hold towards marine life and our interconnectedness with the ocean.



With the alarming surge in diabetes cases, prevention stands as the paramount solution, and extensive research has been channeled toward the crucial realm of dietary choices. This challenge is undeniably formidable, as food is deeply rooted in culture and tradition, making it a formidable adversary to alter.

While the Mediterranean diet has garnered widespread acclaim, it raises the question: does its popularity imply that alternative dietary approaches have been fundamentally flawed? Dr Khalid Shaikh, a distinguished specialist in internal medicine and diabetes with decades of medical practice experience in Oman, asserts that dietary guidance holds the key to managing cardiometabolic

and communal consumption. It presents itself as a compelling alternative to the Mediterranean diet predominantly followed in Western nations.

To grasp the significance of this paradigm shift, we must delve into the historical context and rationale behind these dietary recommendations.

"Metabolic and nutritional diseases are emerging as a major global health care challenge. Diabetes, obesity, hypertension, and cardiovascular disease have gained pandemic status and show no signs of slowing down. As we try to address these diseases, the role of healthy nutrition is of paramount importance," he said.

He added, "Though there are myriad definitions of healthy eating, the term 'Mediterranean diet' is often associated with

defined the Mediterranean diet as an intricate tapestry of skills, knowledge, age-old rituals, sacred symbols, and cherished traditions, interwoven with the sacred cycles of crops, harvesting, fishing, tender animal care, meticulous conservation, meticulous food processing, and the sacred art of cooking. Central to this culinary saga is the profound act of sharing and consuming food, an act that breathes life into this timeless tradition. It encompasses the entire journey from the soil to the table, from production to processing to the joyous communion in food.

The modern medical world was awakened to the extraordinary virtues of the Mediterranean diet in 1958 when Ancel Keys orchestrated the landmark Seven Countries Study. This pivotal



diseases effectively. While diverse national and international guidelines advocate for varying macronutrient ratios, Dr. Khalid emphasizes the importance of locally tailored, person-centric dietary prescriptions, as they are more likely to yield higher compliance rates.

Dr Khalid introduces an innovative concept—an indigenous Traditional Indian Ocean (TRIO) diet. This diet mirrors the dietary traditions of the Indian Ocean's coastal inhabitants, focusing on principles of procurement, preparation, presentation, prioritization, preservation,

health protection and promotion. Current guidelines underscore the need for culturally relevant medical nutrition therapy prescriptions for the prevention and management of metabolic diseases, including diabetes."

He also said, "While multiple diet patterns are shown to have short-term benefits, the Mediterranean diet is suggested to be one of the most useful diets for long-term health. At the same time, it should be clarified that there is no single dietary plan that is suited for all people."

THE MEDITERRANEAN DIET
In 2010, UNESCO boldly

research unfurled irrefutable evidence of its cardiovascular prowess, etching it into the annals of nutritional excellence.

At the core of this dietary marvel lies the artful equilibrium between fibre-laden abundance, antioxidant-rich treasures, and the bounty of unsaturated fatty acids, all while holding animal fats at bay. The dietary alchemy dances to the tune of approximately 55% to 60% carbohydrates (with an impressive 80% being of the complex variety), a virtuous 10% to 15% of proteins (of which 60% hail from the animal kingdom), and a harmonious 25% to 30%

of fats, predominantly dressed in the regal robes of olive oil. Nutritionists and visionary policymakers depict this dietary wonder as nothing short of a Food Pyramid—a meticulously crafted treasure map to a healthier life. Here, a symphony of diverse foods beckons, each finding its rightful place in the grand orchestra of nutrition, to be savored in moderation.

However, when viewed through the prism of an Afro-Asian perspective, a disconcerting limitation emerges. The very nomenclature of the Mediterranean diet can inadvertently cast a long shadow, hinting that foreign fare supersedes the merits of locally nurtured provisions. An unwarranted fixation on the elusive and often costly olive oil, which neither readily graces every table nor aligns with the nuanced Afro-Asian culinary traditions, risks steering individuals towards extravagant and superfluous expenditures on their sustenance.

THE TRADITIONAL INDIAN OCEAN (TRIO) DIET

“Let us attempt to conceptualize and define an Indian Ocean diet, as an authentic and appropriate, alternative to the Mediterranean diet. The Indian Ocean diet is a diet that is inspired by and incorporates, the dietary preferences and habits of the people who inhabit the littoral countries of the Indian Ocean,” Dr Khalid said.

“We propose the traditional Indian Ocean (TRIO) diet as a healthy option for the prevention and management of metabolic diseases. We define the TRIO diet as the style and method of meal procurement, preparation, preservation, presentation, and partaking, followed by the inhabitants of the Indian Ocean region, which contributes to metabolic and overall health,” he added.

To understand the diet, we have to understand the Indian Ocean Littoral Region.

The Indian Ocean, the third-largest ocean in the world, touches the shores of

Africa, the Middle East, South and Southeast Asia, as well as Australia. He pointed out that though the inhabitants of this vast region represent a seemingly complex and diverse collection of people they are also united in many ways. Age-old trading and travel links have created a “fusion” of cultures, which has influenced cuisines as well.

“We would like to define the Indian Ocean littoral region as including all the countries and islands that touch the Indian Ocean or are included in it. The authors represent the following countries: Australia, Bangladesh, Indonesia, India, Iran, Kenya, Malaysia, the Maldives, Mauritius, Mozambique, Myanmar, Oman, Pakistan, Singapore, South Africa, Sri Lanka, Tanzania, Ghana, Thailand, and the United Arab Emirates.

Cooking and dining are family affair, and sometimes even a community affair. The sense of sharing (Ubuntu in South Africa) extends to presenting food and preparing food in joint family kitchens,” he noted.

Most traditional Indian Ocean littoral cuisines are based on locally available whole grains (rice, wheat, and maize), eaten in various forms. According to him, in recent years, the proportion of whole grain consumption as opposed to refined grain intake has reduced. This is especially true in island states, which import their cereal requirements.

The cereal is usually consumed with dishes that are made of vegetables, legumes, and lentils. Coastal cuisines have a strong presence of fish, seafood, and fish products. Meat is an integral part of Indian Ocean littoral states but is not a major contributor to caloric intake in most cuisines.

Beverages such as water, lemonade, hibiscus juice, kokum juice, coconut water, soup, tea, and coffee are a prominent part of the Indian Ocean diet. This is a necessity due to the hot weather that prevails throughout much of the year in the region.

Various means of cooking



are used across the region, including boiling, steaming, sautéing, baking, and frying. In most settings, the economy of fuel and the economy are in the interest of parsimony. A wide range of cooking oils are used, as per availability. Coconut oil and palm oil,

which are clubbed as ‘tropical oils’ and are used in the eastern Indian Ocean littoral region, while mustard oil, peanut (groundnut) oil, and clarified butter (ghee) are used elsewhere.

Mustard oil is a liquid oil that is low in saturated fat and is popular in South Asia. Australia, New Zealand, and the European Union (27 countries) have established upper limits for tolerable intake of mustard oil. In contrast, mustard oil is one of the most popular cooking oils in Asia, particularly in India, where it is recommended as a heart-healthy oil by the Lipid Association of India (LAI). However, the US Food and Drug Administration (FDA) has banned the use of mustard oil for cooking.

Fruits are ubiquitous in the Indian Ocean diet. Locally available, seasonal fruits are preferred. Some parts of the region, such as the Middle East and South Asia, exhibit a preference for rich (and tasty) desserts.

THE TRADITIONAL INDIAN OCEAN AND MEDITERRANEAN DIET

In most ways, the Indian Ocean diet that we describe is similar to the Mediterranean diet. Reliance on whole grains, vegetables, legumes, and fruits is common to both systems. The use of fish is noted in coastal Indian Ocean communities as well as the Mediterranean. Nuts and olive oil, important features of the Mediterranean diet, are represented by groundnuts and other cooking oils in the Indian Ocean. Less focus on the use of red meat, processed meat, and refined cereals is common in both traditional cuisines. Similarly, the concept of an Indian Ocean diet can be used to create an overarching model that can be customized as per local needs and requirements.

THIS RESEARCH SUGGESTS A HEALTHY TRAY. SO WHAT IS A

HEALTHY TRAY?

The study suggests using the healthy thali (tray) rather than the pyramid or plate to represent the Indian Ocean diet.

“The healthy tray provides a conceptually practical, person-friendly means of representing the food and drink that should be consumed by the regional population to ensure healthy nutrition and accomplish healthy outcomes. It represents a wholesome and comprehensive method of representing an optimal diet in a person-friendly manner. A healthy diet goes beyond mere nutrition by including culinary science and art in education. The concepts of presentation, along with portion size and meal sequencing, can be demonstrated through the tray model.

SO WHAT IS THE WAY FORWARD?

“This concept has the potential to become a useful tool for sharing and teaching healthy nutrition. The advantage is its relevance to a vast swathe of the world’s population and the sense of empowerment as well as the responsibility that it brings to them. This will hopefully invite more interest, discussion, and debate, as well as research to achieve this potential. In many countries, the local food is a blend of different cultures. For instance, people from Mauritius enjoy eating locally adapted Chinese cuisine as much as they enjoy Indian cuisine. Blending brings cultural enrichment to existing traditions. However, as much as we are keen to respect our traditions or any associated influences from other cultures, we must educate our parents on what could be deleterious to their health. For example, we may still respect and enjoy a particular dish while decreasing the proportion of carbohydrates. Quantity is often overlooked, and this issue should be addressed as well. Also, we may still address our food-eating behaviors while enjoying the same food without it being harmful to our health. For instance, some studies are advocating for meal sequencing for better metabolic benefits,” he concluded. ■

A GROUND BREAKING HEALTH OMANI INNOVATION



BY KABEER YOUSUF
The Correspondent

Omani Dr. Fares bin Abdullah al Farsi and team won a global award for their smart biochips that combat wound infections, fostering rapid healing without scarring.

Undermining the wholehearted national support for science and technology, an Omani doctor and his team are in the global limelight for groundbreaking scientific innovation.

This Omani medical doctor at Royal Hospital has made his nation proud by bagging the award for the best innovative research project at the prestigious Lindau Nobel Laureate meeting in Germany recently.

Dr Fares bin Abdullah al Farsi and his team won the prize for the best innovative research project in 'Sciethon', a science marathon in which more than 27 teams from various countries participated, during the Lindau Nobel Laureate Meeting. The innovative idea of the doctor—smart biochips—identified and eliminated bacteria that cause infections in chronic wounds and resist bacteria that cause infections in chronic wounds and claimed the top prize after competing with 353 innovations from over 18 countries around the world. Speaking to the Observer, Dr Al Farsi explained that the slides in the winning project contain microscopic antibodies manufactured in a laboratory and are linked to enzymes and sensors that help identify and eliminate bacteria as they approach the wound site. The sheet will be attached to the areas of the wound, and this will release the enzymes to kill the bacteria.

"We went through different qualification tests at the national as well as international levels before getting selected and competing with thousands of projects, from which they selected only 600 young scientists; hence, you get to meet with even Nobel Prize winners," he said, adding that "we get to discuss and share knowledge with them throughout the event."

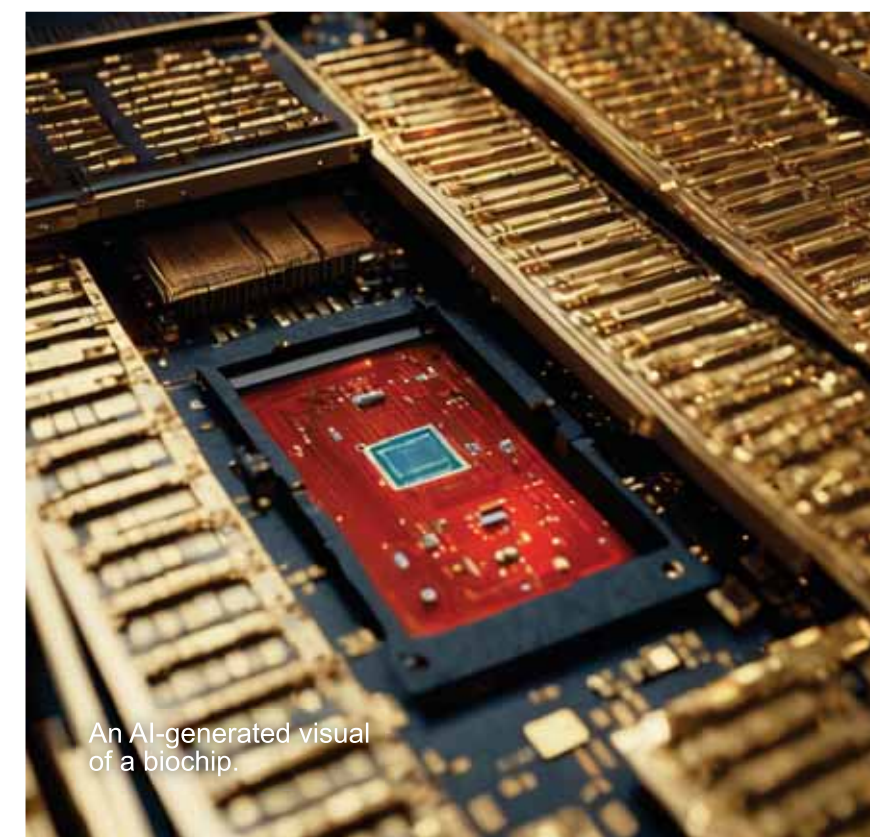
In Sciethon, there were 27 groups with ten participants each from different areas at the level of PHD and post-PHD and those young scientists who propose ideas in medicine."

The scientific marathon aims to find solutions to medical problems by bringing together experts in medicine, physiology, physics, chemistry, biology, pharmacology, immunology, biomedical and IT engineering, and astrophysics regularly.

The winning project was part of a research team consisting of young scientists from several disciplines and was with the support of the 'Max Planck' Foundation in the Federal Republic of Germany. The participating research projects were evaluated by a scientific committee consisting of several Nobel Prize-winning scientists as well as global investors in the field of developing scientific

The winning team consisted of experts from Germany, Oxford, and other major centres including immunology and enzymology, as well as people from pharmacology, software, engineering, and the like.

"We started working on the project from December 2022 until last June, before the presentation day. Our project, a bio sheet that can treat or prevent bacteria from getting into the human system through a wound, will also detect, resist, and antagonise the bacterial infection of the wound." It sends a molecule called immunoglobulin or antibody (IGA) that goes and attacks the bacteria, which will rectify



An AI-generated visual of a biochip.

research.

The Oman team's participation in the 72nd Lindau Nobel laureate meeting came with the support of the Ministry of Higher Education, Scientific Research, and Innovation to represent the Sultanate of Oman among the top 600 young scientists in the medical field, with the participation of more than 40 Nobel Prize-winning scientists.

the mechanism of the immune system in our body.

"The bonus part is that there won't be any scar on the wound as it will fade away after the use of the bio sheet, and all the wounds, including any chronic wound, will be healed at the same time because the idea is all about protecting one from infection, which makes the wound worse". ■

PHYSICISTS MOVE CLOSER TO A THEORETICAL DUEL

On July 24, a large team of researchers convened in Liverpool, England, to unveil a single number related to the behavior of the muon, a subatomic particle that might open a portal to a new physics of our universe.

All eyes were on a computer screen as someone typed in a secret code to release the results. The first number that popped out was met with exasperation: a lot of concerning gasps, oh-my-Gods and what-did-we-do-wrongs. But after a final calculation, "there was a collective exhale across multiple continents," said Kevin Pitts, a physicist at Virginia Tech who was five hours away, attending the meeting virtually. The new measurement matched exactly what the physicists had computed two years before — now with twice the precision.

So comes the latest result from the Muon g-2 Collaboration, which runs an experiment at Fermi National Accelerator Laboratory, or Fermilab, in Batavia, Illinois, to study the deviant motion of the muon. The measurement, announced to the public and submitted to the journal *Physical Review Letters*, brings physicists one step closer to figuring out if there are more types of matter and energy

composing the universe than have been accounted for.

"It really all comes down to that single number," said Hannah Binney, a physicist at the Massachusetts Institute of Technology's Lincoln Laboratory who worked on the muon measurement as a graduate student.

Scientists are putting to the test the Standard Model, a grand theory that encompasses all of nature's known particles and forces. Although the Standard Model has successfully predicted the outcome of countless experiments, physicists have long had a hunch that its framework is incomplete. The theory fails to account for gravity, and it also can't explain dark matter (the glue holding our universe together), or dark energy (the force pulling it apart).

One of many ways researchers are looking for physics beyond the Standard Model is by studying muons. As heavier cousins of the electron, muons are unstable, surviving just two-millionths of a second before decaying into lighter particles. They also act like tiny bar magnets: Place a muon in a magnetic field, and it will wobble around like a top. The speed of that motion depends on a property of the muon called the magnetic moment, which

physicists abbreviate as g.

In theory, g should exactly equal 2. But physicists know that this value gets ruffled by the "quantum foam" of virtual particles that blip in and out of existence and prevent empty space from being truly empty. These transient particles change the rate of the muon's wobble. By taking stock of all the forces and particles in the Standard Model, physicists can predict how much g will be offset. They call this deviation g-2.

But if there are unknown particles at play, experimental measurements of g will not match this prediction. "And that's what makes the muon so exciting to study," Binney said. "It's sensitive to all of the particles that exist, even the ones that we don't know about yet." Any difference between theory and experiment, she added, means new physics is on the horizon.

To measure g-2, researchers at Fermilab generated a beam of muons and steered it into a 50-foot-diameter, doughnut-shaped magnet, the inside brimming with virtual particles that were popping into reality. As the muons raced around the ring, detectors along its edge recorded how fast they were wobbling.

Using 40 billion muons — five times as much data as the



The Fermilab particle accelerator complex located in Batavia, Ill is used to study the deviant motion of the muon. This complex brings physicists one step closer to figuring out if there are more types of matter and energy composing the universe than have been accounted for.

researchers had in 2021 — the team measured $g-2$ to be 0.00233184110, a one-tenth of 1% deviation from 2. The result has a precision of 0.2 parts per million. That's like measuring the distance between New York City and Chicago with an uncertainty of only 10 inches, Pitts said.

"It's an amazing achievement," said Alex Keshavarzi, a physicist at

Chicago who was not involved in the work. "There was a lot of skepticism they would get here, but here they are."

But whether the measured $g-2$ matches the Standard Model's prediction has yet to be determined. That's because theoretical physicists have two methods of computing $g-2$, based on different ways of accounting for the strong force, which binds together protons

precise.

A newer technique called a lattice calculation, which uses supercomputers to model the universe as a four-dimensional grid of space-time points, has also emerged. This method does not make use of data at all, El-Khadra said. There's just one problem: It generates a $g-2$ prediction that differs from the traditional approach.

"No one knows why these

and a 3.7-sigma measurement done at Brookhaven National Laboratory near the turn of the century.)

But when they compared it with the lattice prediction, Keshavarzi said, there was no discrepancy at all.

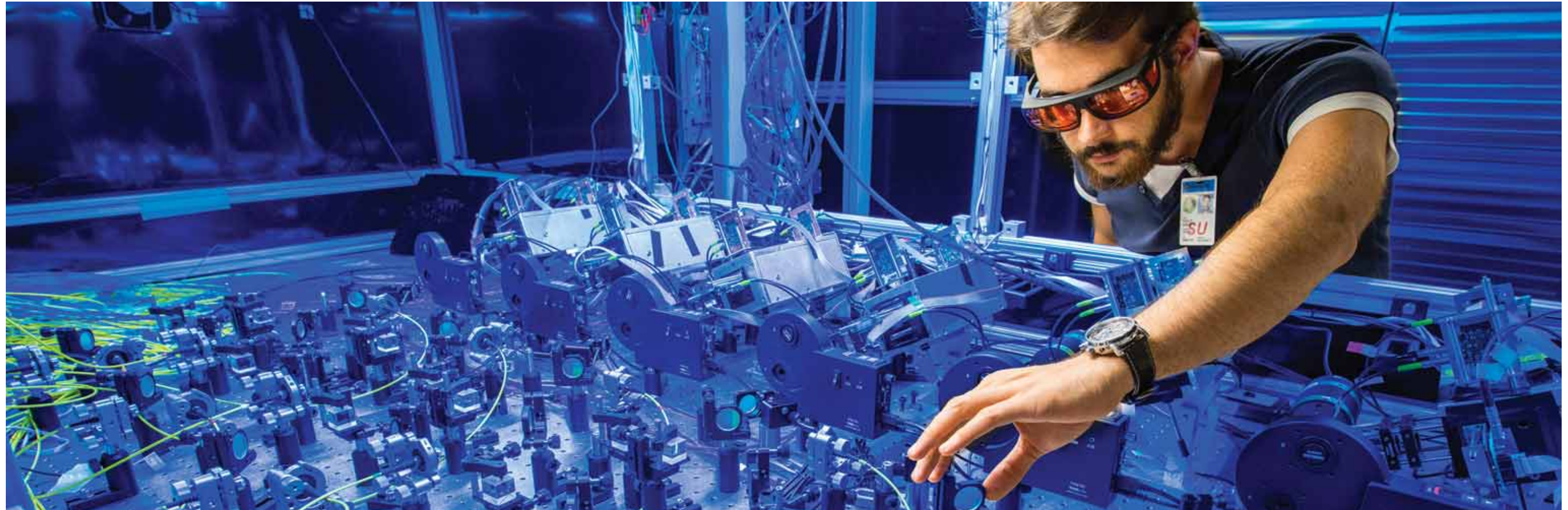
Rarely in physics does an experiment surpass the theory, but this is one of those times, Pitts said. "The attention is on the theoretical community," he

said. "And it might well be the first time that we've broken the Standard Model."

While the two camps of theory hash it out, experimentalists will hone their $g-2$ measurement further. They have more than double the amount of data left to sift through, and once that's included, their precision will improve by another factor of two.

of nature are incomplete would lay the foundation for a new generation of experiments, Keshavarzi said, because it would tell physicists where to look.

"Physicists get really excited when theory and experiment do not agree with each other," said Elena Pinetti, a theoretical physicist at Fermilab who was not involved in the work. "That's when we really can learn



the University of Manchester and a member of the Muon $g-2$ Collaboration. "This is the world's most precise measurement ever made at a particle accelerator." The results, when revealed to the public at a scientific seminar on Aug. 10, were met with applause.

"The kind of precision that these people have managed to attain is just staggering," said Dan Hooper, a theoretical cosmologist at the University of

and neutrons inside a nucleus.

The traditional calculation relies on 40 years of strong-force measurements taken by experiments around the world. But with this approach, the $g-2$ prediction is only as good as the data that are used, said Aida El-Khadra, a theoretical physicist at the University of Illinois Urbana-Champaign and a chair of the Muon $g-2$ Theory Initiative. Experimental limitations in that data, she said, can make this prediction less

two are different," Keshavarzi said. "They should be exactly the same."

Compared with the traditional prediction, the latest $g-2$ measurement has a discrepancy of over 5-sigma, which corresponds to a 1 in 3.5 million chance that the result is a fluke, Keshavarzi said, adding that this degree of certainty was beyond the level needed to claim a discovery. (That's an improvement from their 4.2-sigma result in 2021,

added. "The limelight is now on them.")

Binney said, "We are on the edge of our seats to see how this theory discussion pans out." Physicists expect to better understand the $g-2$ prediction by 2025.

Gordan Krnjaic, a theoretical particle physicist at Fermilab, noted that if the experimental disagreement with theory persisted, it would be "the first smoking-gun laboratory evidence of new physics," he

"The future is very bright," said Graziano Venanzoni, a physicist at the University of Liverpool and one leader of the Muon $g-2$ experiment, at a public news briefing about the results.

The latest result moves physicists one step closer to a Standard Model showdown. But even if new physics is confirmed to be out there, more work will be needed to figure out what that actually is. The discovery that the known laws

something new."

For Pitts, who has spent nearly 30 years pushing the bounds of the Standard Model, proof of new physics would be both a celebratory milestone and a reminder of all that is left to do. "On one hand it's going to be, Have a toast and celebrate a success, a real breakthrough," he said. "But then it's going to be back to work. What are the next ideas that we can get to work on?" — NYT ■



ADVANCING HEALTHCARE IN LINE WITH OMAN VISION 2040



BY AHMED AL KAABI
The Correspondent

The Oman Health Exhibition and Conference (OHEC) align with Oman Vision 2040, prioritizing healthcare progress, fostering global collaboration, innovation, and knowledge exchange. The event encourages cross-border knowledge sharing and cooperation, with a focus on healthcare technology and best practices.



In line with Oman Vision 2040, which identifies the healthcare sector as a pivotal industry for progress, the Oman Health Exhibition and Conference (OHEC) is launched annually. The event aims to drive advancements, enhance collaboration, and accelerate innovation in the healthcare sector. It is considered the leading international event in the industry and healthcare. The goals of the Oman Health Conference and Exhibition include developing the healthcare sector by bringing together experts to exchange experiences and information, aiming to generate innovative ideas and solutions that contribute to the development of the healthcare system, and promoting innovation in the technology and education fields. It is the largest international event in healthcare and medical tourism, launched in 2009 and accredited as a UFI-approved event in 2013. It is the first and only comprehensive event in the Sultanate.

Dr. Qamra al Sariri, the Director-General of the Quality Assurance Center at the Ministry of Health, stated that the Oman Health Exhibition and Conference 2023 is an important event that brings together healthcare members on

both national and international levels. It holds great significance for the healthcare sector in the Sultanate of Oman to share local experiences at the international level. The Oman Health Exhibition and Conference align with Oman Health Vision 2050 to position the Sultanate of Oman

Lebanon, Poland, Pakistan, Turkey, and the United Kingdom. The 12th edition of the exhibition presented a comprehensive file for exhibitors, including specialists in hospital infrastructure, the medical industry, medical tourism experts, well-known pharmaceutical



as an attractive destination for medical tourism.

This year's Oman Health Exhibition and Conference witnessed participation from more than 160 local and international exhibitors. It included dedicated pavilions for countries such as India, Iran, Malaysia, and Thailand. In addition to national companies, there was participation from

brands, nutrition specialists, and dietary supplements. The event serves as a platform for exchanging experiences and innovation, showcasing state-of-the-art high-tech medical technologies, and aims to facilitate collaboration between visitors and healthcare pioneers while promoting empowerment and sustainability within the healthcare field.

The Omani Health Conference was attended by experts from health universities, government institutions, and scientific research associations in the health sector. It is a platform to share technological advancements in the sector and exchange enlightened ideas about the latest trends and innovations in the industry. Mr. Khalid bin Hamad Al Busaidi emphasized the importance of the healthcare sector in the Sultanate of Oman, appreciating the attention it receives from His Majesty Sultan Haitham bin Tarik. He highlighted the significant presence of governmental and private institutions from Oman, as well as sisterly and friendly countries, at the exhibition, indicating the sector's importance and growth opportunities within the economic growth framework of Oman Vision 2040.

Dr. Said bin Mohammed Al-Mughairy, Director of the Quality Control and Safety Department, stated that such conferences and exhibitions play a significant role for the Ministry of Health in exchanging experiences and narratives among sister countries. Al-Mughairy confirmed the participation of the three directorates of the ministry—the Oman Quality Control Center, private healthcare institutions, and the General Directorate of Pharmaceutical Control—in this event.

Friezal Jaafar, acting CEO of the Malaysian Healthcare Travel Council, expressed his pleasure in participating in the Oman Health Exhibition and Conference. He emphasized the event's importance in transcending national boundaries and enhancing cooperation in medical knowledge, exchanging experiences, technology, and best practices. Jaafar underscored the Middle East's emergence as a hub for innovation, economic growth, and cultural diversity, especially in the healthcare sector, emphasizing the importance of exchanging best healthcare practices in the region.

"The Oman Health Vision 2050 aims to establish a stronger healthcare system in the country. Oman and Malaysia share a common inspiration for healthcare reform, striving for a well-organized, fair, responsive, and citizen-centric healthcare system. Jaafar added, "Presence and productivity."

The conference serves as a platform for healthcare experts, including those from government agencies, universities, clinical research institutions, and other healthcare projects, to exchange technical ideas, facilitate discussions, and develop the healthcare ecosystem. ■



THE ECO-FRIENDLY PAINT THAT REDEFINES X-RAY SHIELDING



An Omani innovator tapped into the potential of natural tomato extracts to craft a shielding paint, reinforcing hospital radiology room walls. This innovative solution not only guards against X-ray exposure but also reduces risks for healthcare workers and patients significantly.

Razan Al Kalbaniya, an innovative researcher from Oman, has pioneered a revolutionary solution to safeguard against the harmful effects of X-rays, surpassing traditional lead-based approaches with a remarkable eco-friendly alternative.

Al-Kalbaniya harnessed the power of natural tomato extracts to engineer a protective paint capable of fortifying the walls of radiology rooms in hospitals. This ingenious creation not only shields against X-ray exposure but also significantly diminishes potential risks to healthcare professionals and patients. What sets this innovation apart is its ability to strike a balance between safety, eco-friendliness, and global affordability.

At the heart of this groundbreaking paint lies lycopene, a vibrant red carotenoid found abundantly in tomatoes, watermelons, and a spectrum of red fruits and vegetables like carrots and red peppers. Extensive research has demonstrated lycopene's prowess in safeguarding against ultraviolet radiation and sunburn, making it an ideal, natural guardian against the perils of harmful radiation.

In rigorous experiments, this paint has showcased astonishing effectiveness, boasting an impressive protection rate of up to 97 percent. Given the paramount importance of industrial and medical X-ray systems, nuclear power facilities, and radiation-related research, effective radiation shielding is indispensable.

Historically, lead has enjoyed dominance as a radiation barrier due to its affordability and efficacy in thwarting gamma-ray penetration. However, lead's notoriety for toxicity and its classification as an environmental pollutant have steered society toward the quest for safer alternatives. Razan's eco-friendly paint stands out as a highly protective substitute with no associated environmental risks.

Furthermore, Al Kalbaniya's innovative work has garnered international acclaim. She has clinched top honors in numerous local and international competitions, including a prestigious first place at the Falling Walls Lab competition. Her groundbreaking project earned an endorsement from a German University, facilitating her participation in the Innovation Week held in Germany.

Razan Al Kalbaniya's tomato-based radiation shielding paint has also earned recognition as one of the top 15 global entrepreneurial initiatives. Her remarkable achievements led to her nomination as the Middle East's representative in the esteemed GLABMIIN competition in 2022. In 2023, she received an invitation from the Korean Intellectual Property Office (KIPO) and the Korea Women Invention Association (KWIA) to participate in the Korea International Women's Invention Exposition 2023 (KIWIE). This trailblazing researcher's work is not just transforming the field of radiation protection but also earning her a well-deserved place on the global stage of innovation. ■

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