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Research requires dedication and perseverance

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Researchers are key

Researchers constitute the key element in any research process. They lead this endeavour, which has become a necessity for nations to achieve progress and development and serve mankind. A research project starts with an idea, which is then put forward for analysis, experimentation, application, and finally concluding results and recommendations, to achieve direct or indirect returns from the whole venture.

As fundamental tools in scientific research, researchers can only move forward if internal and external incentives are provided for them to achieve excellence and recognition and accomplish their goals. In this way, they will be encouraged to transform ideas into applications and translate them into reality. Such incentives may be internal to the researchers themselves, that is, their enthusiasm, patience, passion and love of the work, or external, within their workplace, through the provision of an integrated research environment, relevant supplies and equipment, rewards for achievements and other services, all of which encourage research.

Due to the key role of researchers in promoting research, Sultan Qaboos University, being a thinktank, has given special attention to their contribution. It has maintained full confidence in them and attended to their needs whenever possible, thus paving the way for them to go forward in pursuit of their goals. It has also helped them to overcome the difficulties they have encountered in their research projects, in order to develop distinct models, some of which have received global recognition, and accomplish tremendous achievements registered in their names and that of the University and the Sultanate.

In this new issue of Tawasul, we highlight the achievements of Dr Fatima Al-Maamari, a distinguished researcher, who has been able to promote her name and that of the University through publishing in highly prestigious scientific journals. In addition, we also mention the House of Small Animals, which is a research environment set up by the University to offer free services to researchers; there is an article about students who created their own company and won an award in the Injaz Oman contest; we talk about a research device provided by the University to researchers and students of the College of Engineering; we review a recent book launched by the Department of Academic Publication & Outreach, and shed light on the University's recent participation in two international book fairs in Sharjah and Doha, in addition to several studies and news reports on conferences and events related to scientific research.

DAPO presents new titles at Doha and Sharjah Book Fairs

Dr. Al-Wahaibi: Such exhibitions provide a real opportunity to build bridges of collaboration with other institutions

SQU's Department of Academic Publication and Outreach (DAPO) took part in two international book fairs, one held in Sharjah from October 31 to November 10, and the other in Doha from November 29 to December 8 2018.

Real opportunity

Dr. Yahya Al-Wahaibi, Dean of Research, pointed out that participation in such events is in line with the University's policies and plans for marketing its scientific research output, publications and titles at regional and international forums. It is also aimed at shedding light on the University's academic activities in promoting research and publication, thus enhancing the image of the Sultanate, he said.

Dr. Al-Wahaibi added that attending such exhibitions provided a real opportunity to gain access to the latest publications, and build bridges of collaboration between the University and other institutions based on common goals. He said that the decision to take part in the two fairs was taken owing to the large number of publishers and visitors they usually attract.

Sixty titles

The University's two pavilions exhibited over sixty publications, covering various religious, literary, social and historical topics, in both Arabic and English. They are part of the ongoing effort to support research activities in the Sultanate, disseminate the national culture, and pre serve the historical heritage. One important publication exhibited at the fairs was "The Scholarly Contributions of Sheikh Ibrahim

Emir of Qatar during his visit to SQU pavilion

Sheikha Mozah being briefed on SQU pavilion

Said Al-Abri, Former Grand Mufti of the Sultanate", which is a four-volume encyclopedia edited and compiled by Dr. Ali Hilal Al-Abri, Jumaa Mubarak Al-Sarmi, Sulaiman Saif Al-Kindi, and Muhammad Saif Al-Shuaili. Another publication, "The Diwan of Abi Al-Hakam Sheikh Ahmed bin Abdullah al-Harthi", edited by Dr. Jokhha Mohammed al-Harthi, includes the poems of the contemporary Omani poet, Sheikh Ahmad Abdullah Ahmed al-Harthi, known as the poet of the East of Oman, who died in 1995. Some of the other books exhibited were, "Natural Geography of the Sultanate of Oman" by Dr. Salem Al-Hatroushi, Department of Geography, College of Arts and Social Sciences, "Ceramic Coatings" by Dr. Badr Mohammed Al-Maamari, "Demarcation of the Maritime Boundaries between Oman and Yemen" by Dr. Abdullah Hamad Al-Badi, and "Techniques of Quantitative Social research".

Two books launched: "Postmodern Arts" and "Islamic Banks"

Two new publications

The University also launched two new books at the Doha International Book Fair: "Postmodern Arts" by Dr. Fakhriya Al-Yahya, Associate Professor at the College of Education, and "Policies for Finance Investment in Islamic Banks" by Dr. Jaber Shuaib Al-Ismail, Lecturer at the Institute of Public Administration.

Large turnout

The University's pavilions attracted many visitors who were impressed by the books and academic journals, including the bulletin "Tawasul," as well as the University's efforts in marketing knowledge.

Dr. Fatma Al-Maamari

She has published research in leading journals

Dr Fatma Al-Maamari: Research is a passion, not merely a job

The journey of a thousand miles begins with one step. This is the journey of science which starts with an idea, which is then formulated, developed and later translated into useful products. In such an endeavour, scientists usually face various challenges, but with determination, they can overcome them and achieve their greatest objectives.

Dr. Fatma Al-Maamari, Assistant Professor in the Department of Physics, College of Science, is one of those successful researchers who has managed to publish solid research in international leading journals. In the following interview, we will try to shed light on her academic career:

Let's talk about your early plans. Was it your dream to be an academic?

Since my childhood, I've always been a hard-working, diligent and competitive student, taking up all challenges and seeking excellence. At secondary school, I was very interested in the subject of physics, and so I majored in this field and got a BSc in Medical Physics from the College of Science.

Why physics?

My passion for physics started specifically in Grade 10, when chemistry, physics and biology were taught to us as separate subjects, which were conflated in one subject called Sciences. Then I realised my love for the subject, thanks to the consistent encouragement of the teacher.

What did you do to translate such passion into action?

I worked hard and managed to use my time productively to achieve excellence in the Department before taking up an academic position.

Tell us about your postgraduate degrees.

I received my PhD from the University of Leeds, UK, in October 2016, and then jointed the Department of Physics there as a visiting researcher, in collaboration with SQU. Earlier, I had earned an MSc in Condensed Matter Physics from Loughborough University, UK.

Can you talk about your publications in leading journals?

I have published three papers in the journals, *Nature, Nature and Communications, and Nature and Nanotechnology,* respectively. These are: 1) "Beating the Stoner criterion using molecular interfaces" (Lead Author), which is a groundbreaking study that demonstrates that it is possible to alter the electronic states of non-ferromagnetic materials, such as diamagnetic copper and paramagnetic manganese, to overcome the Stoner criterion and make them ferromagnetic at room temperature; 2) "Optical conversion of pure spin currents in hybrid molecular devices," which builds on the aforementioned research; 3) the third paper was published in *Nature and Nanotechnology*, which accepts only distinguished research papers on nano science and nanotechnology.

What does it mean to publish in such journals?

Nature is a multidisciplinary scientific journal and one of the leading periodicals in the world that publish solid, original research. Getting published in it is highly prized among scientists as research articles can only be accepted if they adhere to specific, strict criteria. The papers are normally subjected to meticulous preliminary examination and peer-review.

What sort of support have you received to achieve this?

I would like to express my gratitude for all the support I have received, specifically from the University, which helped me develop my research projects.

How do you cope with the pressure of academic and research responsibilities?

It's not easy to be an academic and researcher at the same time, but it is possible with patience and hard work. Time management is key to working under such pressure. I try to do research in summer and focus on academic work during the two semesters.

I have liked physics since my secondary education and wish to see an integrated research centre

Any ambitions on the horizon?

My ambitions are infinite! I would like to see an integrated research centre in the Sultanate, which is concerned with nanotechnology and its applications and can contribute to the national development plans. Such an institution would combine the three branches of nanotechnology, i.e. physics, chemistry and biology, and would be globally competitive.

Why specifically such a centre?

As I said, nanotechnology is concerned with research in the areas of physics, chemistry and biology, but it is more about physics. Therefore, I hope such a centre will apply research strategies and scientific methodologies, combine basic and applied studies in such fields, and become an international research institution that brings together scientists from Oman and other countries so that research can become comprehensive and complementary rather than merely rudimentary and basic.

Combining research and academic duties requires patience

Is there any message you would like to give to Omani youth and specifically researchers?

Yes, I would like to tell them that university life is a stepping stone to future success, and in order to achieve that, they should work hard and benefit from learning. I have a strong belief that young researchers have huge potentials to contribute to the progress of our nations. All they need to do is to maintain their perseverance, dedication and patience, face the challenges and hurdles along the way, and take advantage of the various opportunities open to them.

What are the challenges facing researchers in application and experimentation?

Researchers consider experimentation as a tool used to attain a result that could either be positive and applicable, or negative and therefore useless. In both cases, this is very important as it motivates researchers to conduct research. It is only one stage at which to verify the validity of a theory and could involve some obstacles. Regarding this, I think we need a certain system to support and take care of scientific projects in general, rather than focusing on specific aspects of research, which poses a huge challenge to scientists.

In your opinion, how can Omani researchers achieve excellence in research?

In order to excel in their fields, they should have a real passion for research, not merely as a job they have to do. Research involves a lot of barriers that have to be overcome. For researchers, the main objective of research is to satisfy their desire for knowledge and come up with findings. That is why it is so important that researchers demonstrate resolution, willingness and a passion for research. Every step and finding should be carefully examined because this will lead to further outcomes. Planning and team organization are also key to collaborative research. I hope to see all researchers work as part of teams to produce better results.

Which areas should the authorities in charge of research matters in the country focus on?

It seems that the focus now is on an application-related research centre. However, there is insufficient support for studies on the basics of sciences that are not related to this aspect. Therefore, I hope the scope of research will cover the basics as well as applications, rather than being confined to one aspect, if we want to compete globally.

SQU gave me the confidence to pursue my scientific career

Were there any hurdles you have faced during your academic career?

The PhD study was like a springboard to a new career in research. It's not easy to be a researcher in a certain experimental scientific field. Yet, on the other hand, it was such an excellent experience as it polished most of my skills. No doubt, there are plenty of challenges which can be addressed with a strong will.

Any concluding remarks you would like to make?

I would like to extend my gratitude to the University and Dr Ali Al-Bimani for the continuous support provided for researchers and academics. I would also attribute my success to a group of academics including Profs Hisham Widatallah and Mohammed Al-Zain, and Salma Al-Kindi, Dr Issam Ali and Nadia Al-Numani from the Centre of Personnel Development. Special thanks go to Dr Oscar Cespedes and my team at the University of Leeds, and finally I would like to express my deep sense of gratitude to my father, who took care of my education since my childhood.

Dr Al-Maamari working on her research

the SAH offers SQU researchers free-of-charge services

There is no doubt that an effective research environment is instrumental in helping researchers and academics carry out their scientific projects in a suitable manner. It provides them with the equipment that helps save time and effort, and attain the research objectives and results on which future strategies can be drafted.

SQU has sustained such an environment by developing a variety of laboratories, well equipped for conducting experiments and applications, in different colleges and research centres. A recent on-campus facility is the "Small Animal House" (SAH), a lab designed to carry out experiments on small animals. In the following interview, Dr. Badraldin Hamed Al-Hashmi, a professor at the College of Medicine and Health Sciences, sheds light on the goals and functions of the lab.

The House serves diverse research and teaching purposes

What was the reason behind establishing the lab?

Many universities host a centre or house for the purposes of animal experimentation, research and teaching in various fields. The SAH provides experimental animals, like rats and mice, for researchers and students of the College of Medicine and Health Sciences and College of Agricultural and Marine Sciences (CAMS).

Better technical equipment and facilities are needed

How can the lab help researchers in their work at the University?

Many research studies in biology and basic medical sciences, such as physiology, anatomy, drugs, toxins, nutrition, etc., depend on experiments carried out on laboratory animals, on organs taken from them, or on isolated cells. The SAH also provides such animals for teaching purposes in the fields of medicine, agriculture and science at the University, and in secondary schools to be used in teaching biology. The SAH's role in community service is manifested in exhibitions and other events.

What about the sections and staff in place?

There are three Omani technicians. Two of them are graduates of the Department of Animal and Veterinary Sciences, CAMS.

What services does the lab offer to researchers? Are they free of charge? Do other institutions benefit from your facilities?

We offer SQU staff experimental rats and mice free of charge and upon the prior approval of the Animal Research Ethics Committee. We also provide our services to other universities and secondary schools in the Sultanate.

Are there any challenges encountered by the SAH?

Just like any other teaching department or scientific facility, the lab needs more resources to develop its services. For example, sufficient funding should be available to provide the personnel with the proper training at foreign institutions; new experimental animals and other genetically modified types should be brought in; the air-conditioners and odour absorbers need to be regularly maintained. Another requirement has to do with the requests made by those who want some samples. Such requests should be submitted sufficiently early since the breeding of specific animals requires more time.

Approval of the Animal Research Ethics Committee is necessary

Are there any plans for improving the House?

We hope to see expansion of the technical equipment and facilities for different animals, such as a section for germ-free animals.

Any concluding remarks?

I would like to take this opportunity to thank the University for committing all the resources to the development of research and teaching and thus sustaining a stimulating environment for its academics and students.

Working actively in the lab

Investigating the inclination of people to practise sports in Oman

Dr. Majid Al-Busafi – College of Education

Nowadays, the development of countries is partly measured by the level of progress achieved in sports. The development of sports and competitive athletic activities is a significant indicator of the interdependence between different sports sciences that seek to improve the performance of sports activities. The interest in sports is one of the goals that many countries seek to promote. Therefore, it is important to promote a culture of sports and have in place sports programs to meet the needs of society. No doubt, allocating sufficient resources for enhancing such activities has become one of the key responsibilities of sports agencies.

In this regard, Dr. Majid Al-Busafi, Deputy Director of the Humanities Research Center, is embarking on a study aimed at examining the competitive and entertainment motivations for the practice of sports activities in the Sultanate. He is assisted by the researcher Al-Hashemi.

Dr. Al-Busafi said that the study is the first of its kind to focus on what motivates individuals in Oman to engage in sports activities. It is expected that the findings of the study will help the public institutions concerned with sports, recreation, health, education, and housing, as well as the Municipality to build future plans to address the needs of the society and to deliver on sports services. He added that the research will assist the government to pay special attention to fitness and health programs, diversify programs of athletic activities, and to promote the resources for stimulating motivation among individuals. The results of his research will also help to build a comprehensive and systematic plan for sports activities in the Sultanate.

Dr. Al-Busafi: the findings will help relevant agencies develop new plans

Al-Busafi outlined the goals of the study as, to identify the factors behind practising sports activities by the community in both rural and urban areas, and specify the different motives for practising sports activities according to the variables of age group, gender, educational level, and monthly income. It will also investigate the services provided to increase motivation, define the sports needs and activities of the community, and determine the type of sports training that should be provided in the future.

He pointed out that the research will follow a descriptive approach to measure the levels of motivation within the different sections of Omani society. It will be based on a selective sample of about 5000 individuals in Oman, in addition to documents and periodic reports collected from the organizations concerned with sports, in order to assess the current situation of sports services and budgets assigned for sports services.

Young people working out on the beach

Benefits of natural antioxidants in experimental CKD

Dr. Badreldin Ali – Department of Pharmacology

Researchers at the College of Medicine and Health Sciences have tested the safety and effectiveness of some well characterized chemical entities against chronic kidney disease (CKD) induced in rats. They used adenine in the feed and, in one experiment, it was administered intraperitoneally, by injection. They also examined the possible impact of swimming against the ameliorative effect of some of the commonly used natural products.

CKD is a long-term condition that represents a major and growing public health problem in both developed and developing countries. It is considered an important determinant of the poor health outcomes of major non-communicable diseases, which are rated as the main causes of death in the world. This is because of the high prevalence of its associated morbidity and mortality. CKD can both cause and be the result of hypertension, obesity, tobacco abuse and dyslipidemia and diabetes mellitus. It is established now that CKD is an independent risk factor for the development of cardiovascular disease (CVD), and the main and common cause of mortality in patients with CKD is related to a high incidence of CVD.

CKD may progress to become end-stage kidney disease, where patients need either dialysis or transplantation to survive. Both of these possibilities are expensive and not always available, especially in countries with poor economies.

Herbal medicines are nowadays the most preferred ways of complementary and alternative medicine. For example, in the USA and Turkey about 40% and 50% of the population use herbal medications, respectively. However, what is urgently required is to study the active ingredients of these herbal medications, firstly to confirm their usefulness, whether alone or, as is more common, as supple-

ments to existing drugs, and also to explain their effects in terms of conventional biochemistry and pharmacology.

The research team conducted experiments as part of a research project led by Dr. Badreldin Ali, from the Department of Pharmacology. They confirmed the safety and usefulness of at least four chemically characterized natural products in an established and valid animal model for human CKD. The results are a call for more intensive research to discover new promising compounds that can lead to new therapies.

The present study is probably the first to show the usefulness of chrysin, curcumin , gum arabic and anthocyanins from Hibiscus sabdariffa against an adenine-induced model of chronic kidney disease in rats, Dr. Ali disclosed, adding that a significant finding was the experimental evidence provided by this project of the usefulness of the co-administration of some of these natural products with the exercise of swimming.

Pending further studies on the safety and effectiveness of these compounds in animals with chronic kidney disease, these agents could be tested on humans in the future.

The team called for further studies to test other natural products that are known to possess antioxidant and anti-inflammatory properties. They also recommended that more involved and intensive research on the tested compounds be carried out to elucidate their mechanisms of action at the cellular and molecular levels.

Drinking a daily glass of wine for health reasons may not be so healthy after all

Dr. Jumana Saleh – Biochemistry Department

A new study at the college of Medicine at Washington University showed astonishing results after analyzing data of 400,000 people aged 18 to 85. The findings showed that consuming one to two drinks four or more times per week, an amount supposed to be healthy by current guidelines, increases the risk of premature death by 20 per cent, compared with drinking less or not at all. This risk of death was consistent across age groups. The results were surprising as they were also released in the Sunday Times last October.

It has been thought that drinking small amounts of alcohol was not problematic and some studies showed it may even improve health, said Dr. Sarah M. Hartz, MD, PhD, the author of the study, "But now we know that even the lightest daily drinkers have an increased mortality risk." The team analysis focused on light drinkers: those who consumed only one or two drinks a day.

Although some earlier studies have linked light drinking to improvements in cardiovascular health, Hartz said the new study shows that those potential gains are outweighed by other risks. Her team evaluated the risk of heart disease and of cancer and found that although in some cases, drinking alcohol may reduce the risk of heart-related problems, daily drinking increased the risk of cancer and, as a result, the mortality risk.

According to Dr. Hartz "Consuming one or two drinks about four days per week seemed to protect against cardiovascular disease, but drinking every day eliminated those benefits". "With regard to the cancer risk, any drinking at all was damaging."

This study followed a study published in *The Lancet*, which reviewed data from more than 700 studies around the world and concluded that the safest level of drinking is "none".

Hartz predicted that as medicine becomes more personalized, some doctors may recommend that people with family histories of heart problems have a drink from time to time, but in families with a history of cancer, physicians may recommend abstinence. Even though some may believe that occasional drinking potentially could be helpful," she said that "overall, I do think people should no longer consider a glass of wine a day to somehow be healthy."

Clinical and molecular characterization of vWD disease patients in Oman

Dr. Anil Pathare – College of Medicine and Health Sciences

A research team has recently carried out a study to characterize the subtypes of von Willebrand disease (vWD) diagnosed at SQU hospital. The team was led by Dr. Anil Pathare, from the Department of Haematology at the College of Medicine and Health Sciences. The team administered a couple of bleeding score questionnaires to Omani type 1 vWD patients and correlated the responses with the clinical phenotype, as well as studying the severity of their bleeding symptoms.

The disease is the most common inherited bleeding disorder in humans, occurring in approximately one percent of the population. It is the result of qualitative or quantitative abnormalities of the von Willebrand factor (vWF), a large adhesive glycoprotein that plays two key roles in primary hemostasis. The protein is responsible for platelet adhesion to collagen at sites of exposed subendothelium, and it acts as a protective carrier in the plasma for factor VIII.

Dr. Pathare has remarked that, although several laboratory tests are required to accurately diagnose vWD, the current standard for classifying it is the evaluation of vWF multimers, which enables the different types and subtypes of the disease to be discriminated. The diagnosis of vWD thus remains a challenge for the treating physician, because of clinical and laboratory variability. Moreover, many patients are asymptomatic and no single laboratory test is entirely diagnostic.

The Department of Haematology maintains a database of about 300 patients who have been suspected of vWD over the past 15 years. Molecular characterization is essential, especially in patients with Type II and Type III cases, as this information will

be useful in prenatal diagnosis of these disorders. Moreover, owing to the high incidence of consanguinity, their prevalence is reportedly high. Increasing knowledge of the pathophysiological mechanisms of vWF mutations and their impact on vWF structure and function, as well as their translation into a particular clinical phenotype, will allow for a more refined classification of vWD, with types and subtypes that are defined ideally by a clear phenotype–genotype correlation.

The results have shown that, in Type II vWD patients, there was a variable clinical bleeding phenotype that was not correlated with the measured factor levels. However, there was a good correlation with multimer analysis and the vWF type 2 subtype.

In another group of patients, the bleeding score was calculated based on a history of bleeding from 12 different sites. Overall, bleeding from the oral cavity was the most predominant symptom [59%], but amongst the females, menorrhagia was the most prevalent symptom [94%]. The prevalence of other symptoms were epistaxis [44%], tooth extraction [44%], bleeding from minor wounds [37%], cutaneous bleeds [33%], bleeding at surgery [33%], GI bleeds [7%] and hematoma [7%]. None of the patients had haemarthrosis, or CNS bleeds.

Another bleeding score questionnaire designed to reflect the severity of bleeding amongst vWD patients demonstrated the inherent variability of the bleeding pattern, with 41% below the bleeding score from the normal population reported in the literature.

SQU purchases a power system and transmission simulator for OR 350,000

SQU provides an integrated research environment that includes the equipment and technologies required for conducting research projects and experiments. This article sheds light on a simulation system installed in the Electrical and Computer Engineering, College of Engineering.

The equipment

It is a power system and transmission simulator used by academic staff and senior power system engineers to simulate electrical power transmission networks in steady-state conditions, as well as over time scales of a few seconds to tens of seconds.

Applications

The laboratory is well equipped to meet the requirements of under- and post-graduate studies and research work. Through lab experiments, the electrical power simulator can conduct practical demonstrations for power system generation, transmission, and distribution concepts. Students are familiarized with the use of digital computers in the different aspects of power system analysis by using PSCAD. The electrical power simulator can be used to conduct lab experiments related to polyphase voltage regulation and the characteristics of interconnected and isolated power systems, load flow analysis, overhead transmission lines, and the coordination of power system relays.

The simulator consists of the following parts:

1. Power factor controller
2. Transformer protections and substation
3. Three-phase load
4. HV transmission module
5. Generator and synchronizing and protection
6. MV distribution line
7. Transformer protection
8. Generator, protection and power grid module.

The instrument is operated by Omani & non-Omani experts. In addition to analytical services, the Unit also offers training for students and researchers from SQU and other organizations.

The equipment costs OR 350,000.

Frankincense under the research spotlight

Oman is rich in plant genetic resources – a habitat for 1400 plant species

For thousands of years, medicinal plants have played an important part in the story of human development. Their effectiveness in treating diseases and helping people maintain physical and psychological health has ensured that the use of medicinal plants has remained widespread to this day across a diverse range of nations.

The use of medicinal plants not only has the potential to offer alternative approaches to drug development and the treatment of disease, but is also viewed by many as having significant cultural and historical value that is associated with the preservation of a living heritage and tradition. One example is frankincense, which has played an important role in Oman's history and has been utilized to produce perfumes and drugs.

The First International Conference on Frankincense and Medicinal Plants: Recent Advances in Research and Industry, was held between 30 October - 1 November 2018, at SQU to contribute to a better understanding of the opportunities and challenges associated with the production, preservation, and use of medicinal plants for producing countries, including Oman.

The conference featured 50 presentations and 30 posters. In the following, we have selected three papers that shed light on the importance of frankincense for the Sultanate.

Rich in plant genetic resources

Dr. Ali Hussein Al-Lawati presented a paper entitled "National Conservation Efforts of Medicinal Plant Genetic Resources in Oman", in which he pointed out that Oman is a country rich in plant genetic resources (PGR), especially those that are classified as socio-economically important species. He added that there are more than 1400 plant species, 70 percent of which are classified as having socioeconomic importance. They are divided into two classes: those that are for food and agriculture purposes, such as grains, legumes, vegetables, and fruits, are mostly cultivated, while the other class, which includes medicinal plants (MP), forestry and ornamentals, and Crop Wild Relatives (CWR), grow wild. He remarked that conservation efforts in form of ex situ or in situ have not been fully made at the national level, especially

for the second class.

The study aimed to plan and develop a conservation strategy for MP species. The strategy was based on records of geographical distribution of MP species, and information on conservation of each plant species gathered from research publications or reports. Gap analysis of conservation for each MP species was established.

It was found that most of the MP species were in the Dhofar region in the southern part of the country, and Jabal Al Akhdar and Musandam in the northern part. Projected climate change showed that conservation and use of MPs were strongly impacted, especially in the long term. The study suggested activities for conservation and use, and provided an overview and analysis of Oman's PGR diversity, the challenges it faces and their causes.

Frankincense tourism

"Frankincense Tourism: Creating Healthy Multisensory Visitor Experiences to Maximise Benefits from Oman's Premier Natural Product" was another paper presented by Dr. Debra Enzenbacher, who noted that frankincense was viewed rather narrowly in relation to the country's tourism. She underlined the need to change such a view if greater benefits, shared between stakeholders and tourists, were to be derived from this vital resource.

Frankincense has enormous potential for tourism products and services

Underpinning her study is the notion that creating healthy sustainable tourism products and services from Oman's frankincense may help preserve and protect this crucial resource, along with its associated cultural heritage, production and harvesting techniques, and place in local economies. This beneficial natural product is underused at present and holds enormous potential for healthy multisensory and other valuable spin-off tourism products and services. Increasing and enhancing the sensory dimensions of frankincense tourism in Oman offers the prospect of developing this form of tourism further in places where the precious product is produced.

The study proposes a range of new tourism products and services drawing on Oman's frankincense, which will help develop new economic pathways for the industry, help protect, preserve and promote local culture along with this natural product's heritage and production value chain, as well as foster greater cooperation between stakeholders within Oman. Further research is needed to examine the relationship between frankincense and Oman's tourism industry more fully in order to deliver greater results in relation to the Government's economic diversification strategy, and better spread the health and sensory benefits of this fascinating natural product.

Economic analysis

Dr. Mehdi Jaaffar, on behalf of Dr. Mohsin Al-Amri, gave a presentation entitled "A Preliminary Economic Analysis of

the Production and Manufacture of Omani Frankincense". He referred to the absence of scientific standards to measure the cost of Omani frankincense production and manufacturing in Oman, which represents the problem to be resolved in this research. In Dhofar, frankincense was the main source of income and the only exported product from the province. Omani frankincense has been known since the sixteenth century BC as the main source of olibanum in the old world, yet Omani literature lacks scientific research that traces the cost of producing, and the income derived from frankincense.

The research was based on field information taken directly from frankincense harvesters in the four regions of the Governorate of Dhofar. It followed frankincense price costing from the field, through middlemen, to the end users.

The results show that frankincense marketing passes through four channels before it reaches the final consumer, and the profit from one ton of olibanum is OR 10,837 if frankincense is used for industry; 23.6% is for the tree harvesters, 4.8% goes to the commercial dealers, 6% for the wholesaler, while 65.3% of frankincense is the profit of the oil extractor. As much as OR 7,000 is the value if the frankincense is sold in a local market, 46% of which goes to the dealer. There are two main factors that maximize sale profitability: seasonal khareef visitors, and local frankincense manufacturing. It is important to organize the harvesting time so as to avoid unfair competition.

Field data: Frankincense marketing undergoes four stages before it reaches the consumer

The researcher cited the "just-in-time" technique of production as one of the best modern costing systems applicable to olibanum manufacturing that could maximize the overall market value and, hence, profitability and ideal tree exploitation. One way to maximize profitability is through a frankincense manufacturing process to add to other industries, not just frankincense and extracts of oil, in order to create more added value.

Biopiracy and frankincense

Shaikha Al-Akhzami, Deanship of Research

A new study has shown increasing activities of patenting frankincense, a matter which has sparked great concern over the biopiracy of this important resource.

Shaikha Nasser Al-Akhzami, Deputy Director of the Department of Innovation and Entrepreneurship, Deanship of Research, said in a research paper that biopiracy is a term that refers to the unauthorized use of biological resources, which is usually experienced by countries rich in natural resources that are often of high value for food, pharmaceutical, cosmetics, perfumes and industries.

She pointed out that frankincense, being a genetic resource, could not be protected as intellectual property, but rather preventive measures need to be taken to regulate its extraction and transfer across borders. She added that the resulting knowledge might be protected as patents under the industrial property law, in addition to protecting other resulting new plant varieties, with or without traditional knowledge, under the Protection of New Varieties of Plants Convention (UPOV).

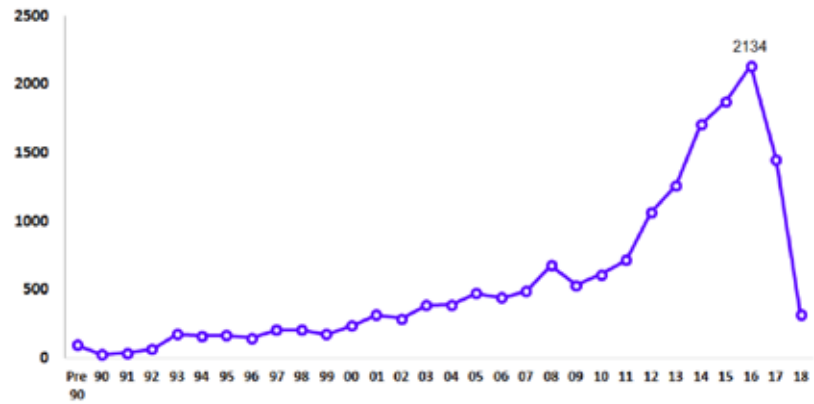
Al-Akhzami disclosed that there have been over 16,798 patents for frankincense deposited worldwide. There was a steady increase of patent applications during the period 2011-2016, she said, adding that, in just 2016, 2134 patent applications were filed. It was found that the largest number of patent applications were deposited at the Chinese office, amounting to 86 per cent, followed by the American Patent Bureau and the International Patent Cooperation Treaty (PCT), with 4 per cent each, and finally the European Bureau and Korean Bureau with 3 per cent each. The scientific fields of these patents are concentrated in the fields of chemistry, pharmacy, biotechnology, microbiology and polymers.

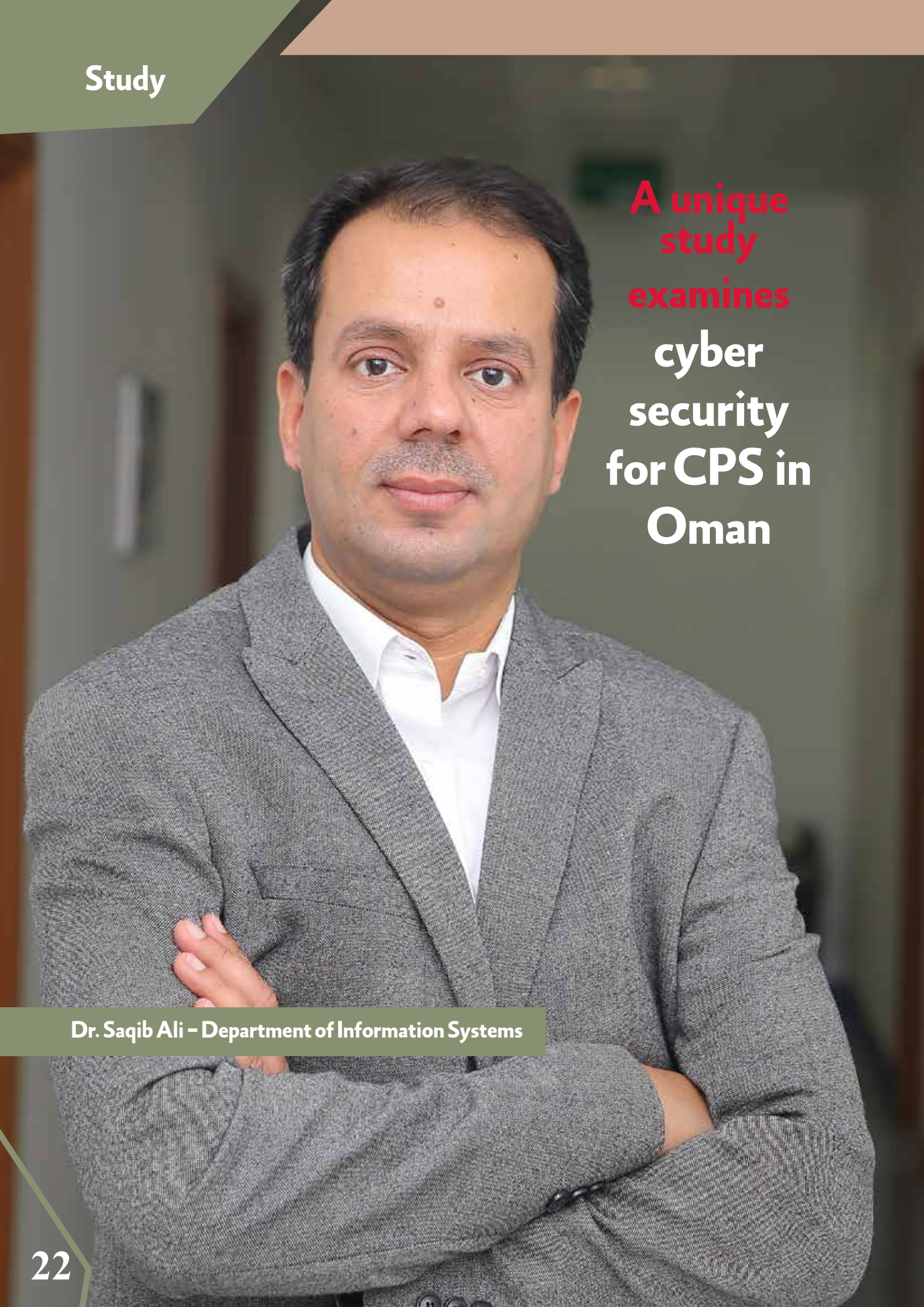
Preventive measures are needed to regulate its extraction and transport

According to Al-Akhzami, the marketing of frankincense clearly shows that huge quantities are being harvested and shipped as raw material or pure oils for use in factories and laboratories in other countries, to produce medicines, drugs and chemicals over the next few years. She noted that the frankincense tree could be adversely affected if it is not harvested according to conventional methods, and therefore the components of biodiversity in the region would be impacted as a result of its extensive harvesting.

As to the measures to protect Omani frankincense, she suggested joining the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits, which requires the adoption of local procedures for prior authorization by competent authorities to use biological resources for scientific research or for trading outside the country. She also recommended including the stocks of Omani biological resources, including frankincense, in a database available to patent examiners at all registration offices worldwide (as India did in order to satisfy the novelty criterion of patents), to ensure that the ingredient of frankincense is not included in the case of granting patents, thus ensuring that no patent applications using Oman frankincense are lodged globally.

She also called for regulating the registration of foreign patents of frankincense, which may monopolize the domestic market and rival traditional industries, including locally registered patents in e-databases, so that the public agencies can access them and have an idea about the registration activity of local or foreign patents that use Omani biological resources. University researchers are required to use Material Transfer Agreements (MTAs) in joint scientific research so that their use ends when the purpose is achieved, and to ensure the inclusion of a fair item of intellectual property in research collaboration agreements where ownership and distribution of returns from licenses are cleared defined.





A unique study examines cyber security for CPS in Oman

Dr. Saqib Ali – Department of Information Systems

Researchers at the Department of Information Systems have conducted a study to develop techniques for trust-based authentication, maintaining the integrity of Cyber Physical Systems (CPS) in the event of an outside attack, and for improving the availability of CPS in the event of a security attack.

According to the research team leader, Dr. Saqib Ali, information and communication technology (ICT) services are becoming increasingly dependent upon CPS to provide automated and efficient management of essential services. He called for paying adequate attention to ensure that they are secured.

The research had as its objectives to analyse existing security mechanisms in CPS in comparison with trust-based CPS, design an ideal and efficient scheme to provide trust-based secure CPS, and gain an understanding of what is needed to secure information in CPS.

With the growth of pervasive computing, Cyber Physical Systems gain greater importance, as they can be largely applied to different domains within the cyber physical world, he said.

The potential applications of CPS include factory automation, home automation, traffic control systems, integrated medical services, automotive systems, critical infrastructure control, research and rescue systems, environmental controls, distributed autonomous robotics, and so on. These services, or applications, could greatly improve the quality of life and makes current applications more effective.

Dr. Ali warns that any neglect of CPS security will ultimately present economic and safety-related threats in one of our most important infrastructures in most of the critical sectors in Oman. Solutions would contribute to the society and the economy at large. The proposed directions of research on variable execution times would benefit the embedded system community, specifically applications in electricity grids, water sewage and safety-critical systems which major sectors are undertaking in Oman. He believes future CPSs will be secure and trust oriented.

Through their initial study, the team had earlier highlighted some key factors that the majority of organizations are facing that hinder sufficient security awareness and implementation among individuals and organizations. This study highlights some important factors in depth and breadth, and recommendations are made with regard to securing systems and applications. It is probably the first project in Oman that explores security issues at the individual level, highlighting all the approaches used in this regard. It also targets organizations that are working on embedded systems as to what areas they need to emphasize to tighten their security measures.

The project has proposed a prototype for cyber physical energy systems that is capable of successfully measuring, transmitting and receiving the current magnitudes produced at the power generation system. The devised prototype has the potential to be utilized as a testbed for analyzing performance of power grid systems when under the influence of different types of cyber-attacks, along with being a potential platform for evaluating various security solutions. Remote monitoring of power grid systems is achieved at the control center by utilizing ZigBee wireless communication modules for both data transmission and reception. For evaluating performance of the prototype, three experimental scenarios have been considered, with two experiments executed for each scenario.

We propose a prototype for cyber physical energy systems

Research provides key findings on the impact of societal drivers on coastal areas

Dr. Choudri: The findings will help decision makers in ensuring efficient management

Dr. B. S. Choudri – Centre for Environmental Studies and Research

A research project was carried out at the Center for Environmental Studies and Research (CESAR) to understand how societal drivers influence coastal areas and ecosystems, and how these can be measured, monitored and managed in order to achieve sustainable development.

Dr. B. S. Choudri led a research team which included co-investigators, students and research assistants. They selected Al-Suwaiq Wilayat in Al-Batinah Region as it best represents the drivers of change in coastal areas. The focus was on coastal management issues and on managing the impact of development activities on ecosystems. The project analyzed the ways the drivers of development and its interactions with the natural systems, impact Oman's coastal resources. It also sought to develop a measuring, monitoring and management system of the development of the coastal area. Overall, the project activities involved analyzing the key variables affecting coastal resources and ecosystems, with particular focus on agriculture, land resources and groundwater. The information developed over the period of project activities would help decision makers in the efficient management of coastal areas in Oman.

The team collected and analyzed data that would result in an updated information status of groundwater, agriculture and land use changes in the coastal area, as well as better understanding of how human activities affect changes in the coastal environments of Oman. At the national level, the research will contribute to the formulation of the initial and subsequent NATCOM reports for the Sultanate, which is required under the United Nations Framework for Climate Convention (UNFCCC) and the Oman Regional Development plan 2020.

The team developed strategies of adaptation to anthropogenic pressure focused on natural resources planning and conservation that would be handy information for the authorities and ministries responsible for sustainable coastal land resource management in Oman. The project was multidisciplinary in nature as it brought together and integrated the interests and cooperation of multiple stakeholders like researchers, government ministries, international organizations, NGOs and local people, to share project outputs. It also provided an opportunity for capacity building and environmental management in the areas of the coastal zone, by providing experience to young Omani scientists, developing professionals through PhD and MSc research programs, and the training of field assistants and local communities towards environmental stewardship.

A coastal area in Oman

Another important aspect has to do with raising wider environmental awareness of coastal ecosystems, and the need for their conservation and sustainable development, through education and outreach.

Dr. Choudri summarized the research findings and recommendations as follows:

• Waste management and pollution were identified as major issues in Al-Suwaiq Wilayat, particularly in rela-

tion to solid waste and waste from businesses. Therefore, waste management and minimization should be considered.

• Coastal area degradation and saltwater intrusion contributed significantly to the problem. Therefore, such problems could be minimized by enforcing existing regulations for control over the pumping of groundwater.

• Survey results indicated there is a need for environmental education and awareness programs for people in the Wilayat. Initiatives should include addressing broader issues of sustainable development, and information on the environment should be made available to the public.

• With regard to water use for agriculture, farms in Al-Suwaiq should start using treated wastewater for irrigation in order to reduce groundwater abstraction.

• Cropping patterns should be changed to lower water consuming crops. For instance, Rhodes grass requires large quantities of water for cultivation.

• Periodic assessments should be considered to improve the area by using high spatial resolution satellite images to detect the vegetation cover change with greater accuracy, and to identify the different types of crops affected by salinity in each area.

• Vegetation cover in Al-Suwaiq is expanding rapidly south of the highway, while north of the highway it continues to decrease. Therefore, agriculture activities south of the highway should be controlled to prevent degradation of water quality and agricultural farmland.

A new book on installation art in the space

Dr Fakhriya Al-Yahyai – College of Education

Postmodern Arts (Installation Art in the Space), by Dr Fakhriya Al-Yahyai, Associate Professor at the College of Education, is a recent book published by the Department of Academic Publication & Outreach, Deanship of Research, SQU.

Theme

The book introduces the Arab reader to the practices and foundations of installation art in the space and provides some insights into the construction of artworks. It covers the most important artists in the world in this area and highlights selective modest Arab attempts in this field.

Objectives

The publication aims to investigate the most important transformations and adaptations of installation art in the space based on selected models for research and analysis, and to review the interest of installation artists in the artistic and philosophical concepts that have been subject to changes in the fine arts movement since the late 1960s. It seeks to introduce new artistic works, revitalize the past and the heritage with a view to the future, and discard its individuality and self-propensity. The book also emphasizes the specificity and acceptance of the other, while benefiting from the world heritage. It sheds light on the artists' desire to depart from traditional frameworks and take art to the street.

Significance

The book refers to the importance of "the space" as one of the structural elements of installation art, whereby artworks depend on the real space versus the illusive space of the rules of perspective in photographic works. The significance of "the space" is underlined as the formal boundaries of an artwork when the artist organizes its elements within a specific space that cannot be replaced by another one for another display. It talks about the increasing positive participation between both the reader and viewer on the one hand, and the artwork installed in the space. Viewers are invited to wander through the space and reflect on the artwork as they do so.

Author: Dr Fakhriya Al-Yahyai, Associate Professor at the College of Education, SQU

Sherif Saadallah, Executive Director of the WIPO Academy

SQU hosts 1st summer school on IP and knowledge transfer

35 participants from different countries

SQU hosted the World Intellectual Property Organization (WIPO)-Oman Summer School from October 21 to November 1, 2018. The program focused on the topic of intellectual property (IP) and knowledge transfer. It was held in coordination between the WIPO and SQU's Innovation and Technology Transfer Center and Community Service Center.

The intensive program provided an opportunity for senior students, graduates and young professionals to develop a deeper knowledge of IP issues, and gain an understanding of both the tools used for IP management and the role of WIPO in the IP landscape. It covered a wide range of topics in the areas of IP and knowledge transfer, as well as relevant regulating procedures.

Dr. Sherif Saadallah, Executive Director of the WIPO Academy, gave a lecture on the Academy's roles and its main areas of activity. He said that the WIPO Summer School programs were designed to demonstrate the essential role that IP plays in promoting innovation and creativity. The focus is in particular on the correlation between IP and numerous public areas such as IP and public health, food security and climate change, he said.

As many as 35 participants, including academics, inventors, students and entrepreneurs from different countries, took part in the Summer School Program. They received training in a variety of such areas as how to set up a technology transfer office, regulation of domain names and domain name disputes, open government data, IP and museums, copyright, music and the performing arts, and international and regional patent landscapes. They also made field visits to the Royal Opera House and National Museum to have first-hand access to IP protection applications in place.

The participants showcased some applications based on the knowledge they received in the program, an initiative which was in line with the Sultanate's strategy to develop a knowledge-based, sustainable and competitive economy.

The special case of a 3-year-old child outlined at a world conference

Dr. Ali Murad, a paediatric dentistry specialist at SQU Hospital

Dr. Ali Murad, a paediatric dentistry specialist at SQU Hospital, delivered a presentation at the 14th Congress of the the European Academy of Paediatric Dentistry on the early development and eruption of permanent teeth.

The researcher stated that: "Early eruption of permanent teeth occurs due to local factors, such as trauma, and in systemic conditions. Congenital diffuse infiltrating facial lipomatosis (CDIFL) is a rare condition that belongs to a group of lipomatosis tumours. In this disorder, the mature adipocytes invade adjacent soft and hard tissues in the facial region. Accelerated tooth eruption is one of the dental anomalies associated with CDIFL."

He outlined a case study in which a 3-year-old boy was presented with a swelling of the lower lip, localised early development and eruption of permanent teeth, and dental caries involving many primary teeth. The planned treatment included biopsy of the swollen lower lip to confirm the diagnosis, surgical reduction and reconstruction of lip aesthetics. The management of the carious primary teeth included preventative and comprehensive dental care and extractions. The lip biopsy showed features of CDIFL, such as the presence of infiltrating adipose tissue, a prominent number of nerve bundles, and thickened vessels.

He pointed out that the high recurrence rate of CDIFL mandates long-term monitoring during the facial growth period of the child. He added that follow-up care by the paediatric dentist and maxillofacial surgeon had been required to manage all aspects of this congenital malformation. Dr. Al Mullahi concluded that such a rare disorder would have many implications affecting the child's facial aesthetics and psychological wellbeing, as well as developing occlusion and the risk of dental caries.

Dr. Ali Said Mohamed Al-Issa -
College of Education

Investigating QA in English Foundation Programs

Dr. Al-Issa: More research is needed to identify problems in the policies and practices

A research team has carried out a study aimed at investigating the mechanisms and measures of quality assurance (QA) used in English Foundation Programs (EFP) across Oman, and the challenges facing the implementation of the standards pertaining to the English component of the General Foundation Program Document approved by the Ministry of Higher education.

Led by Dr. Ali Said Mohamed Al-Issa from the College of Education, the team also explored the opportunities for improving student chances of success in English in the Foundation, post-foundation English courses, and beyond these. They also investigated the means of promoting quality in EFPs by sharing the best practices and solutions for pertinent problems.

QA in higher education has been widely viewed as a key element for checking that higher education institutions are effective, credible and accountable in delivering academic programs and services. It is also important because it leads to the achievement of transparency in academic and structural matters pertinent to higher education institutions. Quality and standards help promote public confidence in the system and in the institution. Some researchers hold higher education institutions responsible for monitoring quality enhancement. They particularly refer to academics, who should adopt a critical self-reflection approach leading to a continuous informed change in thinking and practices, and a significant and fundamental part in raising quality culture, that can subsequently impact quality enhancement.

In order to achieve the above goals, the research team used quantitative and qualitative data collection instruments, including questionnaires, interviews and focus group discussions with teachers, students and administrators at various higher education institutions in Oman.

The study was premised on the vital importance of providing quality education for Omani students enrolled in tertiary-level institutions. Since most of the institutions use English as a medium of instruction, it is incumbent upon them to develop QA mechanisms in their Foundation and post-foundation (or credit') English programs as these are essential in equipping students with the requisite language skills that will determine the degree of students' adjustment and, later, their success in their majors. In particular, QA measures should ensure the implementation of the English Foundation Standards specified by the Ministry of Higher Education and the Oman Academic Accreditation Authority (OAAA) in the General Foundation Program Document approved by the Ministry of Higher Education in 2008. They should also bridge the gap between school and higher education. Due to a critical dearth of research on the quality of English foundation programs, the current research was designed as a nation-wide study to assess this very important aspect.

The team came up with some significant results. They collected data from a number of public and private institutions and published one paper based on the data collected during the instrument piloting stage conducted at SQU, while another paper is in the pipeline. The findings suggest that there is a certain policy-practice drift in the General Foundation Program at SQU due to curriculum and teaching drawbacks. Therefore, the researchers suggested that more research be conducted to identify additional problems relevant to the program policy-practice drift in other institutions.

A student startup produces a tourist app

SQU backed us to bag Al-Raffd Fund award, says Shahad Al-Zakwani

SQU students have been able to achieve outstanding successes at the local, regional and international forums, which is a true testament to their competence and the advanced skills acquired throughout their education at the University.

In this edition of Tawasul, we shed light on a group of students who have created a startup company, called Plugin, and showcased an innovative product at the Injaz Oman competition, 2018.The company has developed a tourism-based application which won the Raffd Fund award, 2018. We met with its chairperson, Shahad Al-Zakwani, who gave details about the company's products and future plans.

Brainstorming

Al-Zakwani said: "The company consists of 13 people from various disciplines and colleges at Sultan Qaboos University. It came into being when we were developing our product for the Sharikati competition. We ran a brainstorming session and examined the market needs, in line with the Sultanate's policy for economic diversification. Finally, we came up with the idea of the first product, i.e. a tourist guide app."

Tourist guide

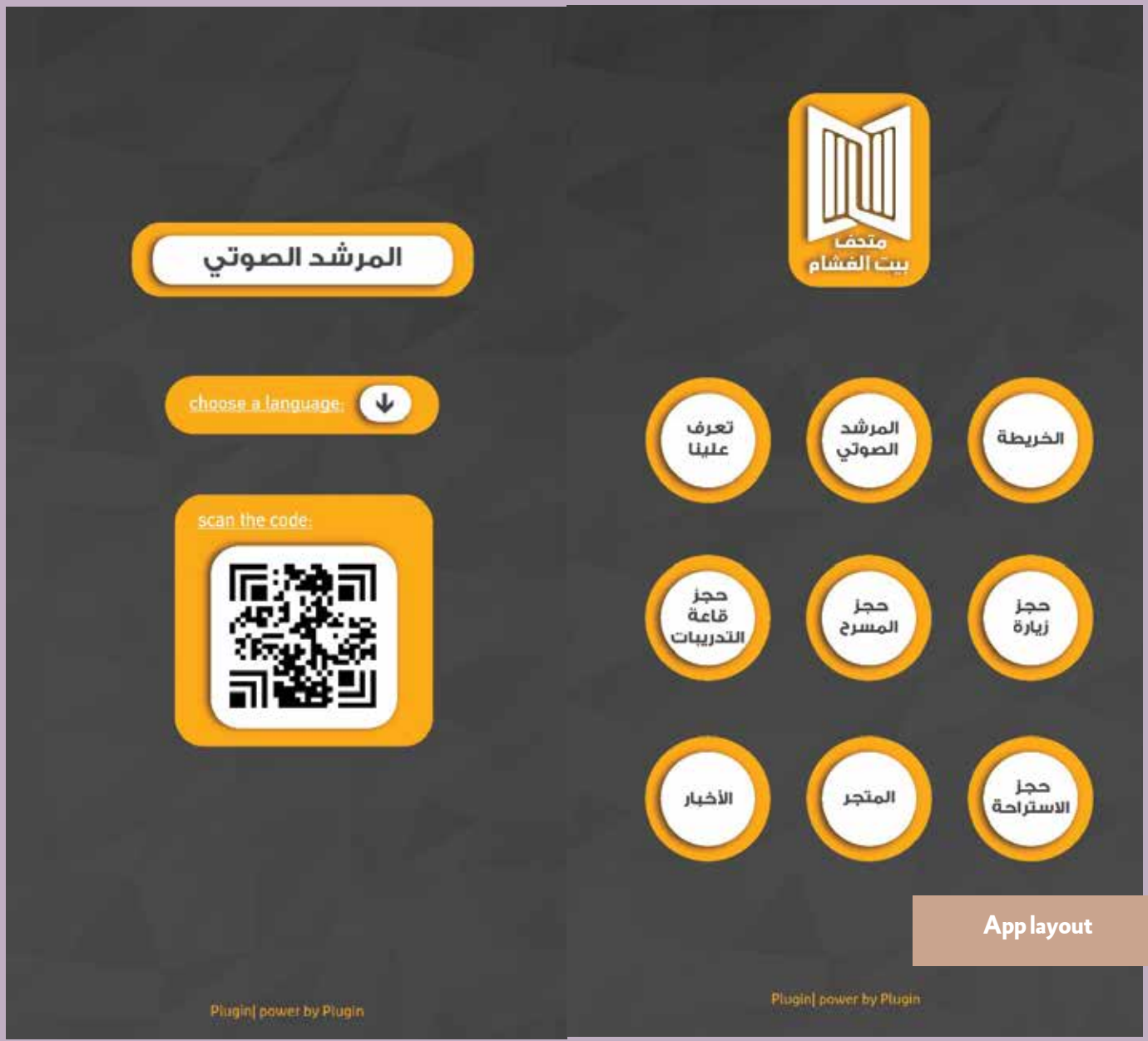
The app, according to Al-Zakwani, is "a personal electronic audio guide used for tourist destinations all around Oman. It allows users to follow up on the visited place easily by scanning Qr Codes, which are distributed around the place. It also allows them to enjoy their tour with a detailed audio description with sound effects and a 3D sound system."

SQU support

She expressed her gratitude to the University in supporting their efforts and providing a stimulating environment for developing their product. She also appreciated the unceasing guidance and advice offered by SQU officials and academics.

The first launch

The chairperson disclosed that Plugin won a contract for using the application by the Bait Al Ghasham Foundation for Publication, Translation and Advertising. The company has also inked a memo of understanding with the Ministry of Tourism to operate the app at Mutrah Fort. She hoped that the app could be used in all tourist sites in Oman in the future so as to benefit tourists from inside and outside the Sultanate.



App layout

2nd Students Research Conference

15 -16 April 2019

Themes

Education

Economic Diversification And Sustainable Development

Energy And Environment

For more details

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