TAWASUL

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Children with autism spectrum: a mysterious disorder

SERC Director to Tawasul:

We hope the Centre's research will define future steps for energy policy in Oman

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Editorial

Rapid pace of research

The rapidly growing world is witnessing many changes, especially in the vital area of scientific research. As a result, the inventions of today may seem a normal part of life tomorrow. This is mainly due to the huge investments in developing the research capabilities of scientists in all that serves humanity through an incessant flow of inventions, which are turned, through mass production, into tangible products.

Such achievements, which are delivered by pioneering scholars, require an integrated research environment which is equipped with all the resources needed to enhance innovative products. An invention emanates from an idea developed by someone who picks it up, examines it from various aspects, and translates it into reality. This is how other countries have managed to achieve big strides in scientific development.

No doubt, there are huge challenges ahead of us, and the path to progress and development is not easy, but what we see makes us realize that people are capable of greater and greater achievements, and with divine guidance, can make use of their talents, abilities and skills for the benefit of humanity.

In competing with others in generating inventions, innovations and even research, our institutions must attract researchers and innovators, and provide them with what they need to find solutions to certain issues, especially societal matters. More importantly, we should support them and encourage them to achieve competitiveness, transfer knowledge, and establish a thriving industry based on innovations and inventions which will contribute to the national income.

Although the road to scientific success is long and difficult, there are still heartening efforts and achievements made by our researchers and youth which are a source of pride and underline the importance of focusing all efforts to stimulate a culture of research in our country.

Just as the world has witnessed ongoing advances in various fields, so has Sultan Qaboos University encouraged research efforts. In the current issue of Tawasul, we shed light on an innovative product developed by our ambitious students, two newly established research centers to be added to the other ten centers at the University, and various studies and research projects, some which have been completed, while others are still underway.

Editor

To highlight its students' scientific achievements
SQU launches its first student research conference

SQU will organize the first scientific research conference for undergraduate and postgraduate students covering various disciplines. This initiative comes as part of the University's effort to bring into focus its research and academic capabilities and achievements, which could help develop society at all levels.

The conference, due to be held in April 2018, will seek to promote a culture of research and innovation among the students in all colleges by creating an environment that stimulates and encourages their participation in their research work leading to innovations. It is hoped that their work will be utilized by both the private and public sectors for the welfare of society. Furthermore, some companies and agencies might show an interest in their innovations and research projects. The event could also be an excellent platform to market them locally and globally. The student conference looks forward to promoting the culture of scientific research, creativity and innovation among University students, thus developing their abilities to become prominent researchers in the Sultanate. It also aims to strengthen their research potentials, build scientific collaborations among them to contribute to the development of society, develop their academic and personal skills, and underscore the values of academic cooperation, competitiveness and integrity.

In addition to the objectives mentioned above, the event hopes to ensure the proactive participation of students from various disciplines, provide them with the opportunity to keep abreast of the current advances in science and technology, and enrich their academic life with innovative and creative accomplishments. The conference will feature research papers, innovations, graduation projects, Master's and doctoral dissertations by undergraduate and postgraduate students majoring in the natural and social sciences. The Organizing Committee of the Conference has set out certain general rules and conditions. The contribution must reflect the applicant's thought and work, demonstrate scientific integrity and observe the intellectual rights of others. The applicant must still be enrolled at the University, or have graduated within the past academic year of receiving the graduation certificate from the Deanship of Admissions and Registration for undergraduate, postgraduate or doctoral studies. A graduate project, Master's or doctoral dissertation, or any other research project done by the applicant during the study period may be accepted in this conference. The applicant's work should not have received any earlier awards at local or international contests or events.

Predicting Omani students' academic achievement

Dr. Said Al-Dhafri - College of Education

Dr. Said Al-Dhafri, from the College Of Education, has been leading a team to see how to predict students' academic achievement using a model that includes three important teacher variables: the quality of life of teachers, their self-efficacy beliefs, and their emotional intelligence. The investigation is important because of the vital role of students' academic achievement (as a dependent variable) and its possible teacher-related predictors (quality of life, efficacy and emotional intelligence) that were found to influence teachers' performance, motivation and decisions to stay in the teaching profession, especially in an era of rapid economic, social and cognitive changes.

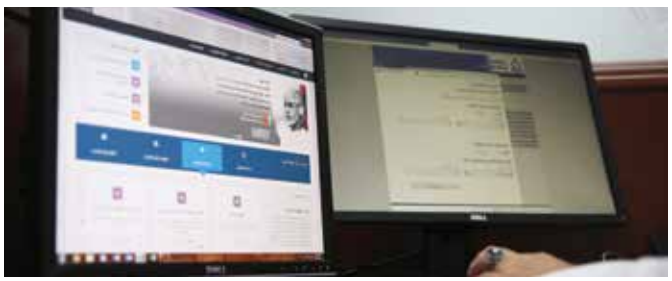
The researchers have used some existing international measures, as well as some newly designed measures after checking their validity and reliability. The sample consisted of 4271 male and female Omani math and science teachers. The researchers applied both quantitative and qualitative approaches in data collection and analysis. Using factor analysis as well as other validity and reliability checks, the data provided ample evidence for the reliability and validity of the study measures. Initial findings show high levels of the psychological variables investigated for the current sample of teachers. Comparison statistics showed some variations within these psychological variables based on gender, experience, degree, socioeconomic levels, students' number, and workload. Advanced statistics showed statistically significant interaction among the study

variables that influence teachers' behavior. Furthermore, the psychological characteristics of teachers' intending to leave the profession were analyzed. The researchers identified a group of factors motivating teachers to leave or to stay in the teaching profession. Currently, data are being analyzed to examine the effectiveness of a training program that was designed to promote the teachers' quality of life, self-efficacy beliefs, and emotional intelligence. Students' achievement scores are entered to examine the most predictive factors of the teachers' characteristics that may influence the students' academic performance, an investigation that will be very valuable for Omani policy makers to develop strategies that ensure high quality teachers as an important factor in increasing students' academic achievement and learning.

Quality of e-services in Oman

Dr. Taiseera Al-Balushi - College of Economics and Political Science

Dr. Taiseera Al-Balushi, from the College of Economics and Political Science, has embarked on a study to investigate the most important quality factors (i.e. usability, accessibility, security, etc.) when providing e-services from a service provider's perspective, and to see how such factors are measured and controlled. Entitled "Quality of e-services in Oman: A perspective of service providers and service users", the research project will assess the quality of the current state of public e-services using web diagnostic tools and service users' perceptions through qualitative surveys. Based on the findings, the study will propose a common quality framework for e-services that takes into account the perspectives of both service providers and users in the public sector in order to help government organizations to provide improved quality services to the public. The improvement in the accessibility of electronic networks has resulted in the delivery of information and services to customers that has led to a shift from traditional physical channels to electronic channels, including e-services (web based) and m-services (mobile computing based). Although great strides have been made in the provision of e-services in the Sultanate to Omani citizens and residents, little work has been done on the assessment and evaluation of the quality of e-service provision in Oman.



SERC Director to Tawasul:

We hope the Centre's research will define future steps for energy policy in Oman

Research centers are landmarks for generating research that contribute to the scientific and intellectual development of society. As such, they translate ideas into applications that benefit industry and society in general. Due to their significant role, such centers have received a lot of encouragement from SQU. Huge resources have been put in place in order to build research centers covering diverse fields. They have been supplied with state-of-the-art equipment as well as excellent researchers and technicians.

Recently, SQU has established two new research centers – the Sustainable Energy Research Center (SERC) and Nanotechnology Research Center – in addition to the other ten centers at the University.

In the following interview with Tawasul, Dr. Amer Al-Hinai, Assistant Professor in the Electrical and Computer Engineering Department, and the SERC Director, reflects on the duties and roles of the Center:

Dr. Amer Al-Hinai

How did the idea of the Center come into being?

The SERC was basically established to address the energy challenges that Oman faces, both now and in the future. These include the declining conventional fossil fuel resources, growing population of the country, and expanding industrial and tourist projects. Therefore, there is a need to diversify the country's energy resources through the wider use of renewable energy sources. A team of specialists in sustainable energy has been formed at SQU to develop this project and define its vision and mission for the benefit of the Sultanate.

What are the objectives of the Center?

The Center will bring together the efforts of researchers related to energy at SQU under one umbrella covering all areas of sustainable energy, including energy production from renewable sources, conversion and use, efficiency and management, and alternative and renewable energies. The proposed Center also aims to provide energy consultancy for the public and private sectors, and generate research that could be utilized in studies conducted by Master's and doctoral students. It will help build stronger links between industry and the University in the areas of sustainable energy research, and serve as a national research center that contributes to the development and diversification of the economy. The Center will also contribute to raising awareness, as well as hold short courses and workshops in the field of energy maintenance and the efficiency of environmentally friendly homes.

The Center came about in response to current and future challenges

What roles does the Center assume? What is its key research interest?

The Center is the first of its kind in the Sultanate that deals with sustainable energy. It is concerned with energy policy and strategies, renewable energy, integrated electrical energy systems, and rational energy management and uses. In doing so, the Centre will help provide all energy-related data, which would contribute to appropriate decision-making based on concrete evidence. At present, there is no specific approach to such areas, hence the significance of the studies to be carried out by the Center for the future steps on the energy policy of the country.

How can the University support the Center?

The Center will bring together all energy research efforts at the University, including collaborations between SQU and other institutions. At this juncture, we extend an open invitation to all researchers to work closely with the Center to achieve its goals. No doubt, the University's administration will spare no effort to overcome obstacles in order to enhance research at all centers.

We will bring together the efforts of energy researchers under its umbrella

How will you reach out to the community?

The Center will serve all bodies in the Sultanate, in both the public and private sectors. We will provide recommendations and consultancies and enhance collaborations for the good of the society.

Are there any plans to expand the Center?

We hope that the SERC will act as a primary national research center in its field in Oman, bringing under its umbrella all energy research efforts.

Estimating natural groundwater recharge and discharge in northern Oman

A study shows a long-term water balance deficit

Dr. Osman Abdalkhaliq Abdalla – College of Science

A research project has been conducted to identify sources of groundwater recharge and discharge, characterize its flow path, and detect different potential sources of contaminants and water mixing relationships.

Carried out by Dr. Osman Abdalkhaliq Abdalla – College Of Science – the research assessed natural groundwater recharge and discharge fluxes for the first time in northern Oman using hydrochemical and modeling tools. It thoroughly examined the patterns of stable and radioactive isotopes in groundwater, surface water and precipitation, as well as their major and trace concentration.

Groundwater stored in some of the major aquifers in Oman is infrequently recharged from occasional major storms and cyclonic events. The main recharge zone lies at the two-sided foothills of the North Oman Mountains (NOM) that represents the water divide. It has been shown that these aquifers are connected and shorter groundwater residence time is observed along fractures. The age of Omani groundwater ranges from ancient to modern (30000 years to recent times) depending on the depth and location with reference to NOM. Older groundwater is found in the low-lying desert areas which were covered with lakes till a few thousands of years ago.

The researcher said that increasing groundwater salinity was observed along the flow path owing to mineral dissolution and evaporation. Carbonate minerals dissolution influences the water chemistry of the Hajar Super Group (HSG), whereas the Mg-bearing silicate minerals dissolution is dominant in the ophiolite aquifer. Isotopic characteristics of Oman's rainfall indicate two main sources from the Indian Ocean and the Mediterranean Sea. δ2H and δ18O of groundwater confirm two recharge mechanisms: lateral flow from the HSG with depleted isotopes from high elevation, and direct infiltration at lower elevation with enriched isotopes showing evaporative enrichment. Evaporation is a secondary process affecting groundwater chemistry, as compared to water-rock interaction.

Dr. Abdalla added that groundwater modeling conducted during this study shows a long-term water balance deficit as the abstraction (51.5 Mm^3/yr.) exceeds natural recharge (31.23Mm^3/yr.). The system is balanced by inflow from aquifer storage and the sea, leading to advanced seawater intrusion and consequently increasing salinity. It is highly recommended to find a balance between downstream and upstream abstractions to reduce the load on the coastal areas. He noticed that the recharge flux from the upper catchment (highland) to the coastal zone is a major contributor (12 MCM/yr). This is the primary source of recharge to the coastal plain, sustaining the hydrological system along the southern margin by flow from the storage in the adjoining highland-fractured aquifers, he pointed out, adding that direct recharge from precipitation over the plain is comparatively small. It is recommended that total abstraction should be adjusted to match the annual lateral recharge and policies can be revised accordingly.

He found that the average natural groundwater recharge using the CMB method was 45 mm/year (24% of rainfall) in the highland and 8 mm/year (11% of rainfall) in the coastal area. However, the WTF method indicated a 9-14 mm annual recharge values (9-17 % of rainfall) in the coastal area.

Dr. Abdalla further pointed out that the analytical modelling conducted in this study has improved the understanding of the LNAPL leak in porous media (which can be applied to unmanaged landfills of Oman). It has also developed an exact 2-D and approximate 1-D theory of flows in heterogeneous aquifers of Al-Batinah, which significantly advanced the very foundations of hillslope hydrology. The regional submarine discharge in Oman has made possible the development of simple codes written in computer algebra (Mathematica) for prediction of submarine discharge (sea water intrusion) and dam seepage, he concluded.

Teaching pupils with RDs: new framework

Dr. Mahmoud Mohamed - College of Education

Given the harmful consequences of poor reading on pupils' educational opportunities, it is important to identify children with reading disabilities (RDs) early, and provide them with adequate intervention. In this regard, Dr. Mahmoud Mohamed Emam, from the College Of Education, has carried out a research project entitled "Development of an Optimal Framework for the Identification and Intervention of Pupils with Reading Disorders in Oman".

Having a national perspective, the project is aimed at establishing a national optimal framework for teaching pupils with RDs in Oman. The framework represents a paradigm shift in service provision for these pupils. In addition, it is clear that early identification leads to early intervention, thereby improving reading outcomes for those at risk for RDs. Delays in providing intervention in RDs have a negative impact on multiple areas related to reading development, including vocabulary, fluency, and comprehension.

The project was conducted through 2012-2015 and achieved a number of outcomes, including an optimal framework based on four empirical models for the identification and intervention of RDs in elementary schools in Oman. In addition, 13 psychoeducational tests/scales were validated for the Omani context, 30 teachers were trained on how to implement the best practices in the identification and intervention of RDs in schools, and a number of research papers were published in international refereed journals.

MFC technology in energy production and seawater desalination

Dr. Mohamed Abdullah Al-Mamun - College of Engineering

A new research project is underway at the Department of Civil and Architectural Engineering to combine Microbial Fuel Cell (MFC) and desalination technologies for the simultaneous production of electrical energy from the organic degradation of wastewater and desalination of seawater. Such desalination will be accomplished without any electrical energy inputs, but rather, by using the source of organic matter as the fuel to desalinate water.

The research team, headed by Dr. Mohamed Abdullah Al-Mamun, has managed to modify the MFC to a microbial desalination cell (MDC) by placing three different types of membrane between the anode and cathode, and creating two middle chambers, one for acid production and another for desalination.

Rapid urbanization and economic growth around the world has created a higher demand for freshwater and energy supplies. Both water and energy supplies are costly and unsustainable due to over-utilization and inadequate technology. MFC technology provides new prospects for the sustainable production of electrical energy from the biodegradable organisms present in wastewater, using bacteria as biocatalysts.

MFC is an emergent eco-friendly technology, where anaerobic bacteria grow on the anode electrode. These bacterial biofilms on the anode surface oxidize organic matter as their food and produce electrons and protons (H+). The produced electrons are transferred from the bacterial metabolic cycle to the anode electrode by their respiratory enzymes, or nano-proteins on the cell surface (cytochrome c), or bacterial nano-wires. Protons created at the anode migrate through the solution to the cathode, where they combine with oxygen and the electrons to form water. Further background information on how an MFC works is yet to be investigated.

A long-term solution for national food security

Seawater greenhouses as a sustainable agricultural solution in seawater-intruded areas in Oman

Dr. Abdulrahim Al-Ismaili – College of Agricultural & Marine Sciences

The seawater greenhouse (SWGH) system is a promising solution to enhance agricultural production in seawater-intruded areas of Oman and similar arid areas. The SWGH is an agricultural engineering technology that integrates crop cultivation and seawater or brackish water desalination inside one structure. In Oman, the first SWGH was built in 2004 at the SQU desalination station in the Al-Hail site, which was funded by His Majesty's Trust Fund. However, this greenhouse system was adversely affected by the catastrophic cyclone, Gonu, in 2007, which somewhat impaired its full functionality. On this issue, Dr. Abdulrahim Al-Ismaili, from the College of Agricultural & Marine Sciences, has headed a team of researchers to investigate the potentials of seawater greenhouses as a sustainable agricultural solution in seawater-intruded areas in Oman.

The researcher suggested that the success of the SWGH technology relies heavily on the condensation unit which is still cost-intensive and inefficient. He added that the study seeks to enhance the performance of the SWGH to produce irrigation water for greenhouse cultivation in seawater-intruded areas at low cost and high efficiency. He pointed out that the research team is composed of researchers and technicians from various disciplines, including Agricultural Engineering and Natural Resource Economics (College of Agricultural and Marine Sciences, SQU) and Mechanical Engineering (College of Engineering, SQU). It will include one researcher from the American University of Sharjah and another from Qatar University. The study will also involve three MSc. students, two from SQU and one from Qatar University, in addition to one research assistant. Dr. Al-Ismaili said that the research team from the three GCC universities would model, simulate, design, fabricate and validate three types of condensers in order to evaluate their technical and economic feasibilities for the SWGH. Two condensers will be direct-contact dehumidifiers (packing media and showerhead/fogging types) and one condenser will be a tube-bank surface (indirect-contact) dehumidifier. The three condensers will be investigated for technical effectiveness and economic feasibility. This study is expected to find the best design among the three types that will make the SWGH an effective solution for greenhouse cultivation in arid areas suffering from seawater intrusion. It could also renovate and restore the full functionality of the SWGH in Oman to give a good opportunity for Research and Development. In the long term, the SWGH will contribute in reviving the greenness to seawater-intruded areas, and consequently contribute to food security in the country.

Public school graduates and their weakness in English

Dr. Rahma Al-Mahrooqi, Deputy Vice Chancellor for Postgraduate Studies & Research

Dr. Rahma Al-Mahrooqi, Deputy Vice Chancellor for Postgraduate Studies & Research has carried out a nation-wide study of the reasons for public school graduates' weakness in English from the perspectives of various stakeholders. The study entitled, "Public school graduates and their weakness in English: Stakeholder perspectives", has as its overriding concern the reasons why Omani school graduates continue to have poor English language proficiency following their graduation, in spite of the large investment in terms of curriculum reform, resources, teacher training, material development and so on to support the effective learning and teaching of the language. In order to explore this issue, a series of questionnaires and qualitative data collection techniques, including interviews and observations, were employed with all the groups of stakeholders, while checklists were also used to evaluate certain aspects of the use of English in Omani schools. Stakeholders included students, teachers, parents, supervisors, and administrators. The results indicate that the curriculum, including textbooks and assessments, may be in need of reform, teachers need more access to professional development events and clearer promotion pathways, schools need more resources to support English learning, and that students who are experiencing difficulties with the language should be provided with more effective support.

A framework for utilization of social media by government agencies in Oman

Dr. Yousuf Al-Hinai - College of Economics and Political Science

Dr. Yousuf Salim Al-Hinai, Dean of Student Affairs, is conducting a study aimed at introducing a systematic approach through which social media can be strategically incorporated into governmental agencies and other similar contexts in Oman. The study entitled, "Creating a strategic presence in social media: A framework for the utilization of social media by government agencies in Oman", uses a mixed-method approach that includes a literature review, netnographic study, questionnaires, and interviews. The ultimate objective will be to develop an integrative framework based on established IT-governance standards (namely, the COBIT standard) for creating, maintaining, and utilizing an online strategic presence for government agencies in Oman.

Information and Communication Technology (ICT) enables governments to improve service delivery, encourage effective citizen participation, and achieve organizational goals. Social media (SM) is one such type of ICT that governments have recently started to utilize. This technology brings many advantages for governments, most importantly, ease of reaching, communicating and interacting with citizens in a direct and timely manner. Yet, despite such advantages, many governmental agencies are challenged by how to utilize this technology to ensure a solid alignment between actual use and organizational objectives. Information technology (IT) governance is an area of research which ensures that the utilization of technology is in line with organizational goals, objectives and strategies. Most existing social media usage guidelines were created based on best practices rather than using established IT governance standards.

The research is expected to contribute to both theory and practice. As far as theory is concerned, it provides a better conceptual understanding of how social media can be integrated into the core elements of an organizational entity. It also analyses and synthesizes a handful of existing SM guidelines used around the world, based on established IT-governance principles and standards. In terms of practice, the framework developed in this project serves as a practical guideline for social media managers or accounts' administrators to learn how the participatory use of social media can be exploited to support the public strategies and goals of the Omani government

Peroxisomal Disorders (PDs) in Oman and UAE

Almundher Al-Maawali, from SQU

Peroxisomal disorders (PDs) are genetic diseases caused by impaired peroxisomes. Patients with PDs often suffer from severe multisystem diseases. In Oman and the UAE, the spectrum and characteristics of PDs are largely unknown due to the lack of structured studies that address this important group of inherited metabolic diseases.

A team led by Almundher Al-Maawali, from SQU, and Osama Aldirbashi, from the UAE University, has been investigating PDs in the two countries at the clinical, biochemical and molecular levels. This represents the first step in reducing the burden PDs cause to affected families and the healthcare system, they said, adding that their objectives would be achieved through the development of local testing capabilities to study the changes in the relevant metabolites and proteins, followed by molecular analysis, which will provide confirmation on the specific genetic defects in patients. This multi-tier approach will allow for a comprehensive and thorough understanding of these disorders in our populations.

It is expected that establishing a local infrastructure for comprehensive investigations of PDs will result in better diagnosis and management of these disorders. The availability of biochemical and molecular data would improve outcomes through better treatment decisions, genetic counselling and family planning.

Urban Gardens and Gardeners of Muscat

Ahmed Al-Mayahi-College of Agricultural & Marine Sciences

Studies have shown many benefits of home gardening for people and for the environment. Home gardening provides direct access to diverse foods that can be harvested, prepared and consumed by family members. It also reduces the net discharge of greenhouse gases, particularly CO2, and absorbs other air pollutants generated by various activities in cities.

However, home gardening may pose some major challenges to people, soil, water, and other natural resources if misused by the residents. Recent studies have shown, for instance, that soils irrigated with untreated wastewater could be contaminated with heavy metals and pathogenic microbes. Therefore, people who are in contact with these soils, or consume food from plants irrigated with untreated wastewater, could get ill. Therefore, it is of a high importance to understand the practices, perceptions and attitudes of garden holders if home gardening is to be practiced in a sustainable way. To the best of our knowledge, there is not even a single study that has been conducted to characterize and address gardeners' knowledge, perceptions and attitudes in Oman.

In this regard, Ahmed Al-Mayahi, an MSc student of Soil and Water Management, has conducted a socio-environmental study aimed at identifying the characteristics of home gardens, and understanding the knowledge and perceptions of gardeners in Oman. His study focused on Al-Hail and Al-Mawaleh areas, since they are densely populated and have widespread gardening activities.

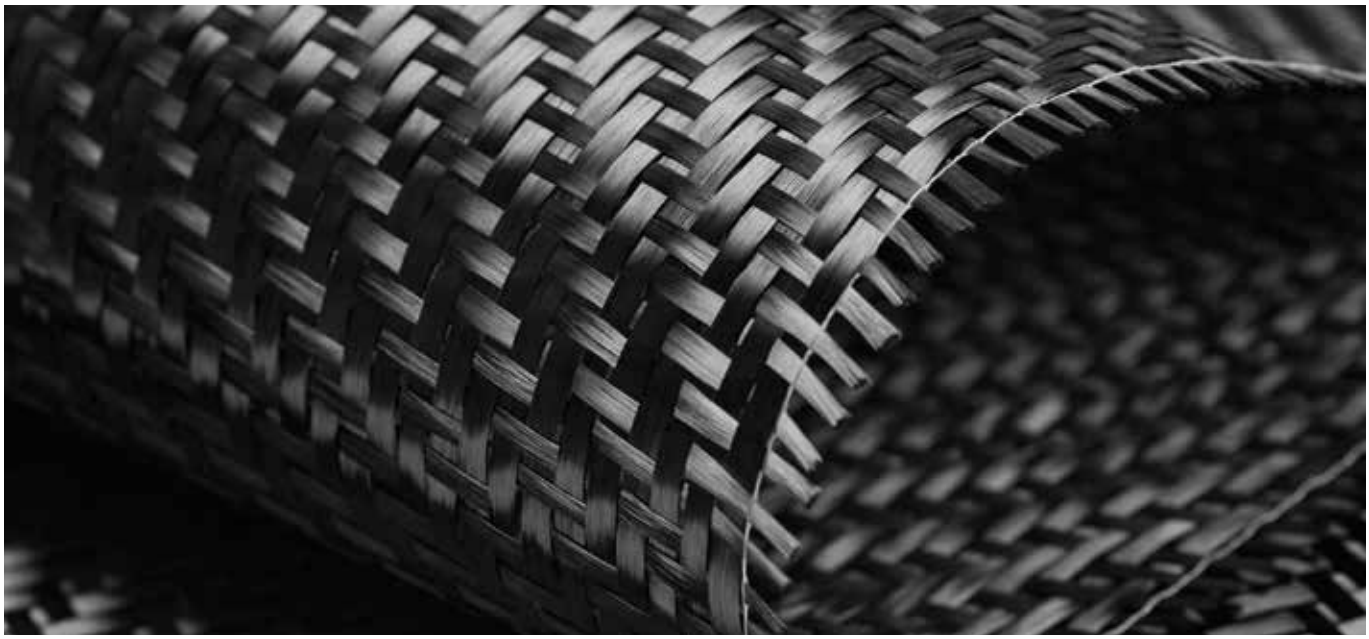
The study indicated a flourish of home gardening in the study area and came up with the following findings:

- Home gardening was characterized as a relatively young activity of a length of time ranging between <1 to 16 years.
- Three top motives of the respondents to have a garden were house beautification, providing shade, and as a form of exercise while gardening.
- Gardens were cultivated with ornamentals, food crops and medicinal plants, with an equal proportion of people growing these either directly in the soil or in pots or raised beds.
- The yards of many houses were not efficiently cultivated due to the high percentage of paved area, in these houses.
- Many householders were not personally involved directly in gardening practices, but instead hired a gardener, or asked the housemaid to take care of the garden. This explains why the residents showed unsustainable practices incorporated with soil or water use and conservation, in spite of the fact that most of them were highly educated.
- Most people changed the native soil of their house yard prior to the establishment of any gardening activities. They also frequently changed the soil substrate of the potting material or soil filled in raised beds, believing that the soil could get exhausted and infertile over time.
- Many people irrigated their gardens using the desalinated water that is supplied or subsidized by the government. Unfortunately, most people used the same quantities of irrigation water for seasonal and perennial plants with no change in the water irrigation scheme between summer and winter.
- The majority did not use any water saving practices or technologies.
- Interestingly, many households showed willingness to expand gardening activities to the roof, and acknowledged the need for new technology which can save water and reduce the water bill. They also expressed their readiness to attend any development or extension program which could expand their knowledge on home gardening in terms of increasing crop production and the efficient use of irrigation water.

Al-Mayahi's study has emphasized the importance of improving people's perceptions and attitudes regarding soil preparation, fertility, water use and conservation practices.

Modeling mechanical properties of composite materials

Mousa Al-Kharousi - College of Engineering



Micro-carbon fibers have unique mechanical, electrical, thermal and magnetic properties that make them useful in many applications in various engineering fields. They are useful for their mechanical strength and high thermal and electrical conductivity. In this regard, the researcher Mousa Al-Kharousi has submitted a scientific paper entitled «Multi-dimensional computer modeling of mechanical properties of composite materials reinforced with nano-fluorocarbon fibers». The paper consisted of an introduction, four sections, and a conclusion. The introduction provided a brief overview of the subject and the research methodology used. It also touched on the key new topics discussed in the study. The four sections included an analysis of the mechanical properties of nanotechnology and nanotubes at the atomic level, and then used these properties to analyze the material at the micro level. The conclusion summarized the main findings of the study and the most important elements of the study compared to the published research. The study has also shown the areas to be expanded and researched using the innovative model.

In developing a multi-dimensional computer model to study the mechanical properties of composite materials containing nano-carbon fibers, the researcher has used a finite element method based on atom mechanics, and an understanding of the interactions between composite materials. The study has shown that a change in the mechanical properties of these fine elements has a direct and significant effect on all other properties, such as thermal, electrical, optical and magnetic conductivity, which has made this kind of study a fertile ground for many researchers in the field of developing micro-materials. Generally, studies in this area can be divided into two main groups: (1) research based on the extraction of the mechanical properties of this type of material in a laboratory, and (2) research based on the modeling of these materials by simulating interactions and changes in the real matter at invisible and higher levels, and defining their effect on the mechanical properties of materials at the visual level. Most published research relies on laboratory analysis, which gives practical and useful results to improve the performance of existing materials. However, experimentation is limited in scope as it is time-consuming, especially in the analysis of nanomaterials, which often depends on their manufacturing properties.

The results have shown concordance between the published theoretical and numerical data. They have also identified the effect of changing the type, size and order of the nanocrystals on the properties of the material at the upper levels.

It should be noted that all the above mentioned and certain other constraints have made it necessary to develop a computer model capable of predicting the properties of the material under different conditions, before it can be analyzed in a laboratory. In addition, computer models can assist in the development of new materials with improved and different features suitable for specific applications to maximize performance with minimal effort.

Developing techniques for an enhanced renewable energy system

A challenge to be addressed in the Sultanate

Dr. Amer Al-Hinai – College of Engineering

Renewable energy (RE) is underutilized in several countries due to their large reserves of oil and natural gas and because these resources provide a cheaper source of power than renewable options. Oman benefits from a long coastline and exposure to the strong summer and winter monsoon winds. It has an average wind speed slightly over 5 m/s and an estimated 2,463 hours of full load per year, making wind power an economically viable form of RE. One disadvantage of wind over solar power is that the wind is more seasonal. Studies undertaken in Oman show that, in general, wind speed is higher during the summer months of June, July and August, and lower during October and November.

A research group led by Dr. Amer Al-Hinai is working to develop a renewable energy management system (REMS) tool, which aims to achieve power-dispatching strategies based on forecasting to guarantee optimal dispatch of Hybrid Wind-Solar Photovoltaic Power Systems (HWSPS).

He added that the tool collectively utilizes forecasting models for wind speed and solar irradiance, in addition to optimization techniques to size a suitable wind and PV plant capacity. An Energy Storage System (ESS) is required to complement the HWSPS to achieve a robust and dispatchable plant. REMS strategies aim to make full use of the complementary nature of the wind and solar PV, whilst using minimal ESS capacity to ensure power fluctuation mitigation and high power supply reliability. Based on profiles of wind speed and solar irradiance, preliminary results indicate that over 95% of the available renewable energy can be used.

He pointed out that the main challenges of utilizing RE resources in the Sultanate of Oman are the high capital cost and fluctuations in output. The recent development of renewable energy technologies have shown a declining trend in terms of cost and advancement in the integration of RE resources with the existing power systems.

He mentioned that population growth and the expansion of industry increased the demand for electricity during the past 10 years by more than 240%. On the other hand, average oil production costs have increased over the last few years through the adoption of enhanced oil recovery techniques on a large scale, and the consumption of petroleum products has doubled in the past ten years. All of this necessitates diversifying the energy resources for electricity generation.

The researcher said that variability and ramp events in power output are the key challenges to the system operators due to their impact on system balancing, reserves management, scheduling, and commitment of generation units.

He concluded his remarks by emphasizing the importance of enhancing the integration of the generation of renewable wind and solar power into the traditional power network, which requires the mitigation of the vulnerabilities posed to the grid as a result of the intermittent nature of these resources.

Relevance of pesticide exposure to cancer risk

Dr. Mostafa Waly- College of Agricultural & Marine Sciences

Pesticides are widely used throughout the world because of their benefits to maintain the high quality and quantity of agricultural products. However, there is growing epidemiological evidence that exposure of humans to pesticides correlates with an increased incidence of cancer. Agricultural health studies have commonly established a positive correlation between occupational exposure to pesticides and different types of cancer; however, data on non-occupational exposures are inadequate to draw any conclusion. The frequency of cancer diagnosis has increased dramatically among adult populations, and there are no studies addressing the impact of pesticides or their residues on cancer development among high risk groups of adult populations. Cancer is the second leading cause of chronic diseases-related deaths among adults, yet there is not enough information to link pesticides exposure and the incidence of cancer. The biological link between pesticide use and increasing cancer incidence needs to be addressed, in particular the biochemical and epigenetic modifications that might be associated with continuous pesticide exposure.

Lack of evidence in this regard has prompted Dr. Mostafa Waly, from the Department of Food Science and Nutrition, to address the mechanisms by which pesticides may lead to cancer. He has hypothesized that long-term exposure to pesticides could induce cellular oxidative stress, epigenetic modifications, and alterations of DNA methylation in multiple human organ systems, leading to cancer development among high risk groups.

Based on increasing evidence given by epidemiological and agricultural health studies associated with exposure to pesticides and carcinogenesis, the International Agency for Research on Cancer has considered chronic low-dose exposure to pesticides as one of the important risk factors for cancer incidence. Therefore, carcinogenicity tests are underway to detect the carcinogenic potential of pesticides before allowing them to be marketed. According to a new list of chemicals evaluated for carcinogenic potential by the Environmental Protection Agency›s pesticide program published in 2010, more than 70 pesticides have been classified as probable or possible carcinogens. This classification was accomplished based on the information extracted from animal genotoxicity and mutagenicity-based studies, and there is a need for human-based clinical trials to further address these issues. Pesticide-associated carcinogenesis is considered the major disorder affecting public health in the 21st century. The relationship between cancer risk and environmental exposures, particularly to pesticides, has

Children with autism spectrum: a mysterious disorder

Difficulties in rehabilitation . . . and efforts for integration

In recent years, the autism spectrum disorder, which is not linked to gender, age or culture, has become widespread. It is defined as a psychological disorder that cannot be diagnosed by radiography or tests, but is mainly based on monitoring the child's behavior and relationships with others. Statistics show that more than 3,500 families in the Sultanate have autistic children, and that autism affects more males than females, at the rate of 4: 1. Diagnosis in the Sultanate is still in its infancy. There is a shortage of specialized agencies, qualified human resources, and diagnostic tools in Arabic.

Tawasul has talked with a number of specialists to shed light on several issues, including the concept and causes of autism, ways to integrate autistic children into society, whether the services provided to autistic people meet the expectations, and how science can help them.

Insufficient services

Dr. Yahya Al-Farsi – Associate Professor at the Department of Family Medicine and Public Health – describes the disorder and its causes: "Autism is an evolutionary developmental disorder that hampers the brain's absorption and processing of information. It causes difficulties for the child in communicating with those around him/her, and in acquiring behavioral and social learning skills. It is one of the most common ailments affecting the child's developmental system."

He added that: "Several studies have been conducted by the Autism Research Team at SQU in order to better understand the dimensions of the autism spectrum disorder and its implications in Omani society. One study has examined the prevalence of autism in the Sultanate through a sample of 111 diagnosed cases. It found that the rate of infection is 1.4 in every ten thousand children, which is very low compared to the rates recorded globally, especially in western countries."

"The study found that this percentage is nonetheless very disturbing because it does not reflect the rare prevalence of the disorder in the Sultanate; rather, it underscores the lack of diagnostic services in the country, which demonstrates the absence of a national record of autism" he said. "The reason why we don't know enough about the actual rate of autism in the Sultanate" may be attributed to the fact that the diagnostic services are only available in one hospital in the Sultanate, the SQU Hospital, and the lack of a national register of cases, whether those diagnosed inside or outside the Sultanate."

Dr. Yahya Al-Farsi

Research doesn't indicate that the prevalence of the disorder is rare in the Sultanate, but rather it underscores the lack of diagnostic services

As to the difficulties to improve the conditions of autistic children, he elaborated: "There are several hurdles in this regard. The Sultanate is a big country with several governorates and scattered cities. We have also the high cost of rehabilitation and education for autistic children, late diagnosis which leads to the delay of therapeutic intervention, and lack of awareness among the community about autism. Another problem is that there are different public bodies that assume the responsibility for this disorder." Concerning the integration of autistic children into the society, Dr. Al-Farsi said that: "Several important services must be provided: health care services capable of diagnosing the disorder early in the life of the child, rehabilitation services in specialized centers to carry out early intervention and help the child according to age, and educational services of appropriate competence in public or private schools in terms of specialized curricula and qualified teachers."

Al-Farsi believes that it is important to establish specialized centers or units in all governorates. He also called for expanding direct and indirect financial support, training public and family doctors in provincial health centers on the detection and early diagnosis of the disorder, raising awareness among parents of autistic children, recruiting skilled staff from abroad to bridge the gap in qualified personnel, and preparing teachers to deal with autistic children, which requires an ad hoc curriculum.

Dr. Athra Al-Ma'wali

Autistic children suffer from difficulties in communication and social interaction

Difficult communication between autistic children and society

Upholding the above opinion, Dr. Athra Al-Ma'wali – Director of the Center of Studies and Research at the Ministry of Health – states that: "Autism is evident in the first three years of a child's life. It is defined as a disability that impairs the development of social skills, verbal and nonverbal communication, and imaginative and creative play. It is due to a neurological disorder that affects the way in which information is collected and processed by the brain, causing problems in social skills, such as the inability to connect, create relationships with individuals, play and use leisure time, as well as the lack of visual perception and imagination."

Regarding the extent to which autistic children are able to integrate into society, she explained: «They find it difficult to communicate or express themselves automatically in an appropriate functional way. They also cannot understand what others say or use other skills besides verbal ones to communicate with others."

She carried on: "This leads to difficulties in adapting to the environment because of the inability to carry out effective work performance with people, cope with changes in the environment or tolerate the interventions of other individuals."

Collaboration with other institutions

Dr. Samira Al-Hashmi – a counselor at the Student Counseling Center, SQU – spoke about the performance of government,

private and community institutions: "Over the past decades, the Sultanate has managed to provide extensive healthcare services for the benefit of people with disabilities. Such services are related to physical and sensory disabilities, rehabilitation, education and health cooperation between the government, civil societies and the private sector. In recent years, the Sultanate has shown greater interest in autistic children, and I can say that no country is immune from this problem."

She added: "Given the seriousness of this issue and the fact that autistic children are citizens having all the rights and duties guaranteed by the Basic Law of the State, the government has been keen to address it through its educational and social agencies and the three ministries for Social Development, Education and Health. They have provided such services as rehabilitation and training programs for autistic children and their families, diagnosis, treatment and integration within schools and society, as well as supervising the centers of autism in Oman."

Al-Hashmi urges families with autistic children to have them quickly registered in early intervention centers, where they can receive help to learn a variety of skills through training and rehabilitation. The families will also be able to assist their children to actively participate in the community. Various difficulties can be overcome when joint efforts are made by civil and community institutions to help such children."

Dr. Samira Al-Hashmi

Some agencies provide healthcare services for them

Dr. Haidi AlAskari

Early intervention will mitigate the consequences of autism

Rehabilitation and educational programmes

Dr. Haidi Alaa Al-Din Al-Askari – Deputy Director for Research at the Prince Salman Center for Disability Research – pointed out at a conference held at SQU that there are four main themes that should be considered by the Arab countries in order to address this spectrum in children: raising awareness, intervention, diagnosis and research.

She added that: "We need a complete set of tools that could be used according to the needs of the child and his family. We stress the importance of early intervention to mitigate the consequences of autism, since there is still no complete cure for autism. Families can help their autistic children to get along at school."

As for the Early Intervention Programme, Dr. Al-Askari said that there are six main points for this program, including the individual›s strengths and challenges, development of an individual plan, the parents' role in the rehabili-

tation, setting plans, implementation of exercises and the need to adopt programs that have been developed and tested for many years. Behavioral modification and applied behavior analysis, in addition to rehabilitation, and change or modification of the environment. The use of the Arabic language, in both colloquial and standard forms, is important for the development of rehabilitation programmes."

Dr. Najma Al-Kindi

A strategy and a plan of action are in place to provide educational services for integration autistic children in basic education schools

Plans and strategies

As for the plans and strategies needed to address autism, Dr. Najma Al-Kindi – an educational researcher at the Ministry of Education – said that: "There is no specific cause for such a disorder. However, there are certain factors that may lead to the condition, such as parental age, brain, fetal factors, genetics, immunity and environment."

She went on: "There is currently no treatment for autism, but it has been shown that early and intensive intervention can help overcome autism symptoms and can significantly improve the independence of autistic people."

Regarding the ways to integrate autistic people into the community, she explained that: "There are certain strategies in this regard, such as raising awareness in the community about this disorder, early detection, diagnosis and supporting services in terms of respecting them, enhancing their self-reliance, facilitating their active participation in the community, training parents, teachers and doctors on the most effective interventions to overcome certain behaviors that may occur in some autistic children. It is also imperative to provide education to autistic children and useful information about the disorder to their families so that they are able to take care of their family members."

Reflecting on the services offered to autistic children in the Sultanate, she said that: "In my opinion, the performance of government, private and civil institutions in this regard cannot be compared with that in some European and Gulf countries. However, great efforts have been made by the Ministries for Health, Social Development and Education to develop the services provided, and it is worth mentioning that there is a strategy and a plan of action to provide education services for this group and their integration into the basic education schools in the Sultanate.»

She underlined the importance of studying the statistics of the autism spectrum disorder and its prevalence in the Sultanate, and investigating the reasons for the rising number of autistic children in the country. She also called on the public, private and civil agencies to work together to help such children.

She concluded her remarks by giving advice to those families who have autistic children: "The families should accept and embrace their autistic children, help them develop self-confidence and independence, try to bring the child closer together with his peers at home, focus on verbal and nonverbal communication and ensure that the child understands our requests and succeeds in what they do."

A database of lactic acid bacteria to be established

SQU, UAEU examine camel milk benefits

Dr. Mohab Al Hinai - College of Science

Several studies have confirmed the many benefits of camel milk in treating different diseases such as high blood pressure, diabetes and cancer. Recently, it has been used as a dietary alternative for children, especially for those who are allergic to cow›s milk. It has also been shown that camels outperform cows in the Arab world in terms of their potential ability to produce milk in the presence of limited foodstuff.

Gulf countries are the main producers of camel milk, particularly the Sultanate of Oman, the United Arab Emirates (UAE) and Saudi Arabia. The GCC countries have implemented several government projects to breed camels and increase their dairy products, including milk. Such projects were aimed at turning camel milk production into an established, permanent industry. As a result, many dairy companies producing camel milk and dairy products were established in the UAE and the Sultanate. The dairy industry in the GCC accounts for nearly 50% of the food industry in the GCC.

The production of camel milk and its derivatives, particularly the milk and cheese group, faces many challenges. Providing milk and natural cheese from camel milk is not easy. This is due to the proteins found in camel milk, as well as enzymes and lactic acid activity. Lactic acid bacteria are a key factor influencing the quality of daily dairy production, especially milk and cheese production. The production of lactic acid (a normal acid found in milk and other dairy foods that become acidic) depends on yoghurt, and the flavor of compounds in cheese on the activity of lactic acid bacteria during the process of fermentation and storage.

Because of the distinctive quality of camel milk, the lactic acid bacteria struggle during the fermentation process and the maturity of the cheese due to the excessive quantities of antimicrobials normally present in camel milk. Therefore, the selection of antimicrobial acid-resistant lactic bacteria in camel milk would improve the quality and production of dairy products, especially yoghurt and cheese.

In this regard, a research team led by Dr. Mohab Al Hinai, from SQU, and Dr. Mutamad Mohammed Ayash, from the UAE University, is conducting a research project on lactic acid bacteria in Omani and UAE camel milk. The project aims to isolate pure lactic acid bacteria from local camel farms in the Sultanate and United Arab Emirates, as well as explore the industrial properties of proteolytic, lipolytic, exopoly-

saccharide production, tolerance to NaCl, and antibiotic resistance of isolated lactic acid bacteria.

The researchers will also investigate the properties of microbiological organisms such as probiotic, bile acid, cholesterol removal, anti-oxidant and cancer, anti-colon, anti-hypertensive, anti-hypoglycaemia, anti-microbial properties of isolated lactic acid bacteria. They will seek to establish a bank of lactic acid bacteria in both Sultan Qaboos University and UAE University to preserve them for industrial and research purposes, and finally establish a database of information about the original lactic acid bacteria isolated from local camel milk.

Lactic acid bacteria isolated from camel milk, play a major role in improving yogurt and cheese products, thus improving the dairy industry. In fact, lactic acid bacteria sold in commercial markets (commercial lactic acid is prepared by the fermentation of flour, honey, sugar, potatoes and whey) are usually isolated from traditional and local products in most countries. The research team believes that the original lactic acid bacteria may contain the properties of microbiological organisms (probiotic) that have anti-hypertensive, anti-oxidant, anti-cancer, immunological effects, and aid in the fight against diabetes. It has been confirmed that lactic acid bacteria used in daily industries in both the Sultanate and the UAE are isolated from different sources (cows, goats) other than camel milk.

Autism spectrum: a most painful condition

Dr. Al-Mutasim Al-Maamari

The Autism spectrum is a unique disorder affecting children at an early age, which affects their ability to communicate and interact with their surroundings in a severe and noticeable way. The symptoms of this disease may occur at different ages, but are often within the third year of the child's life. There are three main aspects leading to the diagnosis of autism: first, a significant delay in the development of language, in terms of a limited number of words, pronunciation difficulties and clumsy phrasing; secondly, the excessive isolation of such children, lack of interaction with their peers or even with family members, no eye contact and no exchange of normal reactions; thirdly, a tendency to repeat a certain "ritual of mobility". The child seems to repeat a specific movement of their hands or their body over and over again, without any justification. This dynamic repetition may go beyond the repetition of very specific words.

Thus, autistic children, who begin their journey in this world with difficulties in communication and interaction, undergo severe social isolation, living in a crystal ball that separates them from the whole world and preserves their own world that no one can share with them.

Further, the term "spectrum" refers to a wide range of possible disorders of autistic children, with very different degrees of severity. Some autistic children cannot be distinguished from healthy children except with intensive concentration and follow-up. Others show severe symptoms that require continuous professional attention.

This condition, debilitating for both the autistic child and his/her family, is enshrouded in mystery. Its direct causes remain unclear. The situation is getting worse, and the prevalence of the disorder is increasing.

In the Sultanate, one in 165 Omani children shows autistic symptoms according to statistics reported by a study conducted by an autism research team at Sultan Qaboos University. This is similar to the global rate, which was published by World Health Organization in 2013, i.e. about one out of every 162 children.

However, the most troubling issue in Oman is late diagnosis, or lack of diagnosis. Figures show that, out of nine autistic children, only one is diagnosed in the Sultanate, which suggests that the greater proportion of these children will have to face the condition without medical and possibly community-based assistance.

Therefore, serious efforts should be made at the national level by both the public and private sectors to increase the number of specialized centers to deal with this condition, and improve their services. This is consistent with the global trend to combat this disorder. Many scientific studies have shown that early intervention is the best way to fight the spectrum of autism and reduce its negative effects in the long term. This will open wide doors for autistic people to live a normal life in their later years, which is the most basic and important human right.

Innovation: the joy of achievement, or missed investment opportunities?

Magda Said Al-Hinai- Deanship of Research

When an idea is born in the mind of an innovator, they give it plenty of time and effort in research and experimentation to turn it into a tangible result, applicable in the form of a new product or technology, which can be manufactured and broadly disseminated. This may take months, or even years of study and research. In their excitement, the innovator may even share their innovative work with others by participating in scientific conferences, innovation contests, publishing, or taking part in media programs. Such activities also give the entrepreneur a sense of achievement, whether by winning prizes, or by enjoying high visibility in the media.

The inventor pursues the idea, just like someone who pursues a dream, investing their energy in realizing that dream and often material gains do not cross their mind. The material realization of this product is the merit and fruit of that great effort. John Locke's work theory of value states that the individual has the natural right to benefit from the product of their work, which includes the conversion of raw material available in nature into a marketable, developed product. This is one of the foundations on which intellectual property (IP) protection laws are based. Investment in any type of innovation, as a form of intellectual property, requires, by default, some form of protection, which ensures the rights of the owner of the innovation, including the material returns from it.

IP protection patents are usually granted for tangible inventions that are transferable to industrial products. From the investor's point of view, investment in innovations is ensured by better and more secure patents. The patent guarantees the investor the sole right to manufacture the product based on the license granted by the innovator, thus reducing competition and encouraging entrepreneurship in innovation. In fact, the patent is a reward for the inventor to disclose the new addition to human knowledge and encourage them to share that knowledge. The Omani legislation in the Industrial Property Rights Act of Chapter I (Patents), Part One (Technical Innovations) in Article (3) states:

"An invention shall be patentable if it is novel and involves a creative and industrially applicable step." It is clear from the text of the law that novelty is the most important criterion for granting patents. The procedure for obtaining a patent is long and takes place in several steps. The most important step, prior to registration, is to establish the authenticity and novelty of the idea through research of the previous literature, which includes all that has been previously published about the innovation. However, the previously published information about the innovation - whether written, audible or visual – may undermine the novelty of the innovation. This also includes publication in dissertations, scientific papers and research, which may deprive the innovator of obtaining a patent, which is a reward for delivering new knowledge.

As noted above, the joy of achievement may have prompted the inventor to disclose the innovation to others even before filing a patent application, and sometimes even before the technological process of innovation is completed. Patents are not an end in themselves, but rather they add value to the innovations, a value that drives companies to invest in such inventions, at a time where innovation has become the cornerstone of leading economies. Early disclosure will reduce the value of innovations and their competitiveness in the market.

The risks of early disclosure of innovations may lead to the innovation being stolen by others and registered as a patent, especially when the law in some countries – like Omani law - grants a grace period of twelve months from the date of the first publication of the application for patent registration. However, such a grace period does not protect the innovator if another application for registration for the same innovation is filed earlier. The right is granted according to the filing date of the application, and the date of publication is not significant. The older applicant has the right to obtain the patent. Based on what has been published about the innovation, it could be stolen, or some other similar invention could be marketed, thus depriving the original innovator of the right to use their innovation. The law will not protect them.

However, after the patent application has been filed, and before the patent has been obtained, the inventor can begin marketing their invention by ensuring some investment, which may include the development of the innovation, and therefore it is important that the inventor registers the patent before publication and public disclosure.

SQU students win an Upgrade award

A graduation project by three SQU students of the Electrical and Computer Engineering Department has won a prize in a contest held by the Upgrade programme of transforming graduation projects to start-ups in the area of information and communication technology (ICT).

The project, an Augmented Reality System for Tourism in Oman, is an app that uses technology-enhanced reality in tourism in Oman that enhances the experience of visitors in tourist spots, and through their mobile phones, provides a range of suggestions for locations and services, including nearby hotels and restaurants.

Another feature of the app is its ability to guide tourists towards their destinations, with pictures, texts, 3-d images and video clips.

The winning team will get all the possible assistance to turn their project to a start-up company through incubation and entrepreneurship consultancy with the partners of the Upgrade programme.

Towards a sustainable environment

Dr. B. S. Choudri - Center for Environmental Studies and Research

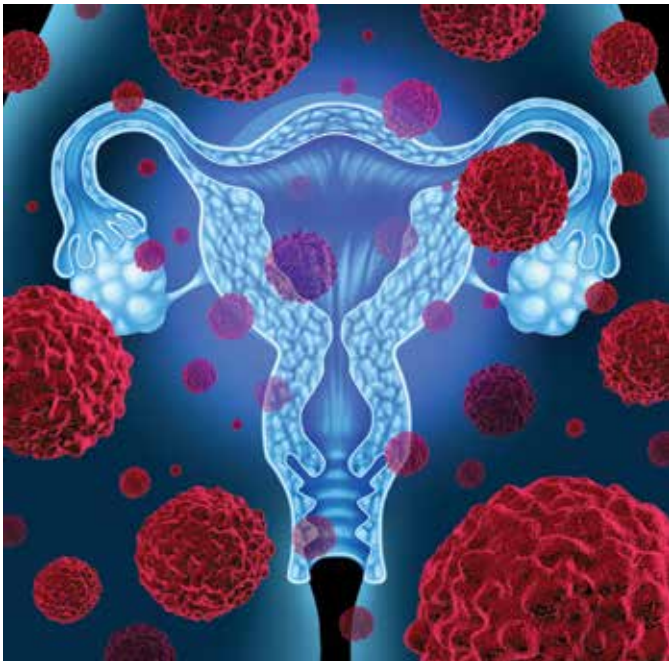
Dr. B. S. Choudri has carried out a study at the Center for Environmental Studies and Research to determine residents' local knowledge and perceptions towards environmental issues and management in the Al-Suwaiq Wilayat, Al-Batinah region. For this purpose, a questionnaire was used with questions on issues related to the environment across 109 households in the Wilayat, following a random sampling method in early 2015. The results show that education, health-related infrastructure and unemployment are ranked as the most important issues for government attention today and in the coming 10 years, along with concern for the environment. The residents' perceptions on the most important environmental issues were concerned with solid-waste pollution, degradation of coastal land areas, and salt-water intrusion. The sources for environmental information, government agencies, local media and schools, were regarded as most reliable. Top environmental priorities were recommended to deal with the enforcement of regulations and to provide effective environmental awareness and education programs. Further, it was suggested that additional studies should be conducted, such as on 'State of Environment Reporting', as such information would provide some form of verification of reported behavior and improved knowledge.

Anti-ovarian epithelial cancer compounds in marine organisms in Oman

Dr. Ikram Berney – College of Medicine and Health Sciences

Ovarian epithelial cancer is the fifth most common cause of cancer death in women. This is because most cases of the disease are diagnosed at very late stages, when they are in the third or fourth degree.

Surgical intervention and chemotherapy are the standard methods of treatment, and antimicrobial drugs are also used in some cases. Although initial response rates for chemotherapy are 60-70%, the vast majority of patients relapse after recovery. When the disease returns, a proportion of the patients still have the ability to respond to chemotherapy, while others have developed resistance to the treatment. Later, all patients become resistant to chemotherapy. In spite of the continuation of treatment, the survival of patients who have reached the third stage, i.e. 36 months, is average, and for those in fourth stage, the survival rate does not exceed 24 months. Therefore, there is an urgent need to find new strategies to overcome their resistance to chemotherapy. It is also important to understand the resistance mechanisms so that new treatments can be developed to eliminate ovarian epithelial cancer, including the type which is resistant to chemotherapy.



To address this issue, a research team headed by Dr. Ikram Berney, from the College of Medicine and Health Sciences, has launched a study on ovarian epithelial cancer and how to overcome its resistance to chemotherapy, using compounds in marine organisms in Oman. The study aims to find ways to stimulate cellular cytotoxic extracts, enhance the sensitivity of epithelial ovarian cancer cells to conventional chemotherapy, and thus help to overcome cell

resistance to drugs. Understanding this will help develop effective methods for treating ovarian cancer.

Describing the research methodology, Dr. Berney said: «The study will be conducted in several stages. In the first stage, both sensitive and resistant ovarian cancer cells will be exposed to the chemical treatment of marine extracts, with or without the addition of traditional drugs at different concentrations. Their effect will be examined by a variety of tests. Then, one or two extracts with the highest level of cytotoxic activity will be selected in cells resistant to chemotherapy for phase II."

He went on to say that: «In the second stage, gene expression will be studied using the Affymetrix gene assay. Genetic mutations will then be examined in terms of deletion, mutation and multiplicity of the genes involved in the cell cycle path and apoptosis pathway, using the quantitative intracellular polymerase reaction. In addition, the amount of protein produced and its modification to the genes involved in the Western Hemorrhagic technique will be measured, which is very important for understanding the mechanisms that control the double-pathways of apoptosis caused by marine extracts treatment.»

He added that: "To achieve the best results, eight pure and 32 marine extracts from Omani marine organisms were examined to study their cytotoxic properties and mechanism of action using breast cancer cells. The study showed that 40% of all extracts had cytotoxic properties through apoptosis induced apoptosis. The most effective compounds which have been observed are malformin, cannonamine, heminaldicine, galic acid and extracts from soft coral reefs."

Based on the findings, the research team suggests studying whether marine natural products that have toxic properties against breast cancer cells will also produce the same effect against epithelial ovarian cancer cells and trigger a synergistic effect of traditional cytotoxic drugs, or reduce resistance to chemotherapy in cancerous ovarian epithelium.

Smelling your food makes you fat

Dr. Jumana Saleh - Biochemistry Department

"If I only smell food, I become fat !!!!!". Sounds familiar?

According to a new study, this may be true, and now has scientific backing.

Interesting findings by researchers at the University of California were recently published in the journal Cell Metabolism. They developed ways to temporarily eliminate the sense of smell in mice by gene therapy that could be regained after three weeks.

Surprisingly, on a high fat diet, mice that lost sense of smell, did not gain much weight, while the litter mates with normal sense of smell gained twice the normal weight although they ate the same amount of high-fat food. The smell-deficient mice (25-30 grams) gained weight up to 33 grams. The normal mice gained up to 60 grams. The smell-deficient mice rapidly burned fat by activating their sympathetic nervous system. Their abdominal fat was also reduced.

On the other hand, genetically engineered super-smellers (with more olfactory nerves), gained more weight on a standard diet, and got even fatter on a high-fat diet than normal mice. These findings suggest that odor may play an important role in energy regulation, and suggest a key connection between smell and food metabolism. Humans who lose their sense of smell because of injury or disease as Parkinson's often become anorexic, and loss of appetite was thought to be the reason of their weight loss. This study suggests that smell itself may alter metabolism. But, loss of smell causes sustained stress hormone levels, which in humans, could cause a heart attack. Therefore, it would be hazardous to eliminate smell in humans planning weight loss. Prof. Andrew Dillin, a Distinguished Chair in Stem Cell Research implied that, only for obese individuals at risk, this gene therapy may be applied for a limited time, provided that the olfactory neurons grow back after weight loss, or possibly design a drug that doesn't interfere with smell but can block the metabolic circuitry linked to it.

Seems fictional? Yet, Dillin hopes that this gene therapy could be a future alternative for gastric bypass surgery.

The author of the paper, Céline Riera said: "This is one of the first studies that really shows if we manipulate olfactory inputs we can actually alter how the brain regulates energy balance". These findings point to an unexplored link between olfactory neurons and weight gain indicating that weight gain isn›t purely a measure of the calories taken in; it›s also related to how they are managed by the body. So now remember, the more delicious that pizza smells, the higher the likelihood that your body packs on the stubborn pounds.

Reference:

Celine E. Riera, et al. Cell Metabolism, 2017

Volleyball Panorama: a new publication by SQU

A new book on volleyball has been published by the Department of Academic Publishing and Outreach at the Deanship of Research. The book, entitled *Volleyball Panorama*, was authored by Dr. Atef Rashad Khalil, Associate Professor in the Physical Education Department, SQU.

The publication provides a comprehensive picture of the sport worldwide, elaborating on its various forms, such as indoors and outdoors, and at beaches and gardens. It also illustrates how modern technology is used to measure the physical and technical abilities of volleyball players, and for training.

The book is divided into ten chapters, going into great detail to cater to the needs of volleyball players, coaches, students, researchers and readers in general:

• **Chapter 1**, "The history of volleyball and its International Federation", provides an overview of the history of the game dating back to its inventor, William Morgan, in 1895. The year 1947 was a decisive moment in the history of volleyball as the International Federation of Volleyball was established by the federations of 14 member countries.

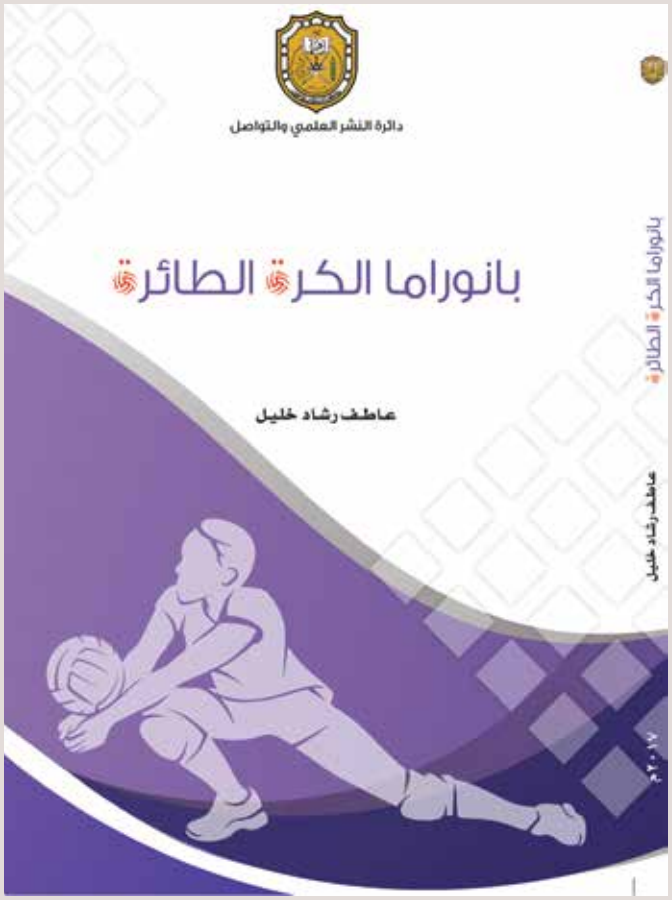
• **Chapter 2**, "The basic skills of volleyball players", reviews the basic motor skills which are one of the most important aspects of the sport, as they are required in all situations of the game.

• **Chapter 3**, "Volleyball modern techniques", describes the recent methods and formations in volleyball, which are important for players in the game.

• **Chapter 4**, "Minivolley", talks about the sport for children, which has come about as a direct result of the attempt to simplify and practise conventional volleyball, giving children the opportunity to develop and enjoy the sport, while exploring and getting to grips with the game.

• **Chapter 5**, "Beach volleyball", refers to the game that takes place on beaches between two teams, with two players each, playing the ball with any part of the body. It is so simple a game that it can attract a wider audience and many players.

• **Chapter 6**, "Sitting volleyball", describes the form of volleyball which was designed for athletes with a disability. Having first made its appearance in Germany in 1953, the sport is a competitive recreational activity practised by physically disabled athletes to rehabilitate them physically and mentally. It is also used in their leisure time and in tournaments, and is based on many skills, strategies, and rules.



• **Chapter 7**, "Volleyball in parks", sheds light on the type of this sport which is practiced outdoors in parks and green river banks. The International Volleyball Federation Conference, which was held in November 1998 in Japan, marked the beginning of the game.

• **Chapter 8**, "Physical preparation of volleyball players", elaborates the most basic physical attributes associated with volleyball. These are muscle strength, speed, agility, flexibility and the ability to perform.

• **Chapter 9**, "Functional analysis of the muscles involved in volleyball", suggests that there are different muscles that play the main role in volleyball at every stage of the game.

• **Chapter 10** reviews the modern technologies used in measuring the physical and physiological abilities of volleyball players.

The book is an important reference for the students of the Department of Physical Education at the University, as it explains various useful concepts and terms.

Training adolescents with disabilities in self-determination skills: A paper at a regional event

Dr. Mahmoud Mohamed Emam – College of Education

Dr. Mahmoud Mohamed Emam, Associate Professor of Special/Inclusive Education in the Department of Psychology, recently took part in the 17th Gulf Disability Society Forum held in Kuwait, with a paper on training adolescents with disabilities in self-determination skills (SDS), and its impact on developing emotional and social wellbeing and improvement of quality of life.

The research paper provided an overview of such programs and presented a number of their strategies which could be employed by practitioners in the Arab world in order to develop SDS in adolescents with disabilities. It is expected that these skills can help these adolescents to actualize emotional and social stability and development, which could contribute to their quality of life. Dr. Emam pointed out that the SDS movement advocated the rights of individuals with disabilities. He said that: "In the last two decades, SDS for adolescents with disabilities have been acknowledged as one of the main components of their rehabilitation and social inclusion. In addition, they were included in policy acts and laws which aimed to support and advocate the rights of individuals with disabilities in many countries. The United Nations Convention for the Rights of Persons with Disabilities (UNCRPD) gave its support for this movement in 2008. According to the researcher, SDS are defined as a combination of skills, knowledge, and beliefs that enable a person to engage in goal-directed, self-regulated, autonomous behavior. An understanding of one's strengths and limitations, together with a belief in oneself as capable and effective, is essential to self-determination. When acting on the basis of these skills and attitudes, individuals have a greater ability to take control of their lives and assume the role of successful adults in society. He added that: "Empirical research studies provide evidence that rehabilitation programs for adolescents with disabilities have always focused on self-help skills in order to enhance adaptive behavior. The outcomes of such a focus, however, did not adequately fulfill the needs and expectations of individuals with disabilities and their families due to the lack of the important component of self-determination. SDS have therefore become an essential component of rehabilitation programs for adolescents with disabilities, particularly as adolescence is considered a transition phase between childhood and adulthood. A number of training programs have been developed in order to enhance SDS in adolescents with disabilities in different contexts. Examples of these programs include the McGill Action Planning System (MAPS), Choice Maker, and other programs which target the development of SDS, whether in general or special education environments."

The paper provides examples of training SDS in the context of the Sultanate and assesses the outcomes in comparison with other contexts where SDS were prioritized.

ZIRVE, a student startup, develops an innovative food container

The founding students say: We are now developing innovative products

Sultan Qaboos University has made big strides in supporting many talented students by providing them with the means and resources to sharpen their abilities and skills and thus achieve their goals. In the next few lines, our distinguished students will tell us how they managed to establish their own startup company and develop a product that preserves the freshness of food and protects it from deteriorating and becoming contaminated due to the hot weather conditions of the environment. They are members of ZIRVE, a company created by 13 students from various disciplines and colleges at SQU. Tawasul had this interview with them:

SQU is an incubator for all student projects

We have managed to overcome many challenges

What prompted your startup?

It was simply the conditions of high temperature, risks of food contamination, and rising food prices.

What are the areas of your interest?

We are engaged in the development of ideas, innovative manufacturing, and providing the best innovative products to preserve food at appropriate temperatures.

So, what products do you plan to produce?

We have started our project by producing a multi-purpose food storage container that has many advantages. It contains two sections for keeping food: one for cold and another for hot items, so that it can meet the different needs of consumers. The product is also lightweight, as it is made of a high quality insulating fabric to maintain the low and high temperatures of food. The container can also be folded for easy transportation and storage after use.

Are there any challenges facing your project? If so, how do you intend to address them?

There are always challenges when it comes to developing a new product or starting up a business. It was with the help of Allah the Almighty that our company managed to overcome the many difficulties encountered at the beginning of its formation. One of the most important challenges we faced was how to manufacture the company's first product in a way that could cater to the needs of consumers in terms of strength, efficiency and simplicity. It was through the spirit of teamwork and determination that we were able to overcome these problems. We produced the prototype of the product in two stages, and participated in two student startup exhibitions in 2017.

What kind of support have you received, or wish to get, from Sultan Qaboos University?

Sultan Qaboos University serves as an incubator for all student projects that are carried out on campus. Being students at this prestigious University, we have been endowed with a lot of support, attention and guidance by our supervisors at SQU. We were also lucky to enjoy a suitable atmosphere to work and benefit from its facilities. We always praise the efforts made by the University for all students.

Now that you have started your company, what are your future plans?

At the moment, we are focusing our attention on marketing our product, and hopefully, we will do well in this direction. After that, we will continue our efforts to develop more products that could be competitive in both local and regional markets. We hope that our company, ZIRVE, will win the trust of consumers.

Any concluding remarks?

The members of ZIRVE have always appreciated the ongoing support given by His Majesty Sultan Qaboos bin Said to the Omani youth. We have not forgotten his valuable words about the importance of knowledge and education in taking up the responsibility of developing our country. It is such words that have inspired us to work hard and dedicate ourselves to building our beloved country.

We are guided by His Majesty's support and encouragement

A study by SCC recommends SQU students are encouraged to attend counseling programs

Student Counseling Center

The Student Counseling Center (SCC) has produced a study to investigate the level of students' total academic, psychological, family and social counseling needs, in order to help them meet these, as well as the challenges and pressures they usually face. The study also sought to detect any differences in such needs according to a set of demographic variables related to the students and their families.

The base material of the study was a sample of 1156 male and female students who constitute 6.8% of the study community, i.e. 16982 males and females enrolled at SQU during the fall of 2017, in both under- and post-graduate programs, according to the statistics of the Deanship of Admission and Registration.

The survey adopted a descriptive approach and included a questionnaire to measure the level of counseling needs of the students. This was based on a scale of 57 phrases, divided into four dimensions (academic counseling needs, psychological counseling needs, social counseling needs and family counseling needs). The scale was evaluated and modified by some specialists in psychology and psychological counseling, and proven indicators of high measuring stability were retested to ensure consistency.

The results of the study revealed a high level of the total counseling needs of university students. The level of psychological and academic counseling needs was high, while the level of the social and family counseling needs was low. Psychological counseling needs were the highest among the students, followed in ranking by academic, social, and family counseling needs.

The study also showed that the highest psychological needs were represented in several factors, including "effectively investing my abilities", "eliminating obsessions and uncomfortable thoughts" and "understanding my strengths and weaknesses", while the highest academic needs were "learning how to manage time effectively» and «increasing my motivation to learn.» The highest social needs were «improve my ability to express myself in front of others," "the ability to adapt to the social environment of public life," and "the ability

to adapt to the university environment," while the highest family needs were "learning how to deal with family problems" and "learning how to interact positively with my family". The study revealed that there were no statistically significant differences in all the dimensions of counseling needs and in the total counseling needs due to gender, college (Humanities, and Sciences), and academic stage (under- and postgraduate studies). Overall, the results showed that the students who had recently joined the university (in 2015 and 2016) had higher levels of such needs than those who had joined the university in previous years. There were also some differences attributed to the place of residence. Those who live on campus, or share rented accommodations with friends, are in greater need of academic counseling than those who live with their families.

In addition, the study also showed that there were differences due to the GPA. Students with a low GPA (1.99 or less, or 2.00-2.49) had higher academic counseling needs than those with a high GPA of 2.50- 2.99 or more.

As for the family variables, the study found no statistically significant differences in all the dimensions of counseling needs due to the social status of the parents (living together, divorced, either or both deceased), while there were differences due to the monthly income of the family. When comparing students from low-income families and high-income families, it was found that the former had higher levels of counseling needs. There were also differences due to the parents' educational level. Unlike students whose father or mother had a higher level of education, those having either parent with a lower educational level demonstrated a higher level of social counseling needs.

According to the study, colleges, deanships, departments and the Student Counseling Center should work together in order to motivate SQU students to attend orientation and counseling programs (developmental and extended counseling, discussion and relaxation sessions and training courses in Fall 2017). They should also encourage students to take advantage of the counseling services provided by the specialists at the Center.

Those who live in dormitories are in greater need of academic counseling than those who live with their families

Initiative of SQU Award for best students' research

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