ISLAMIC WORLD ACADEMY OF SCIENCES

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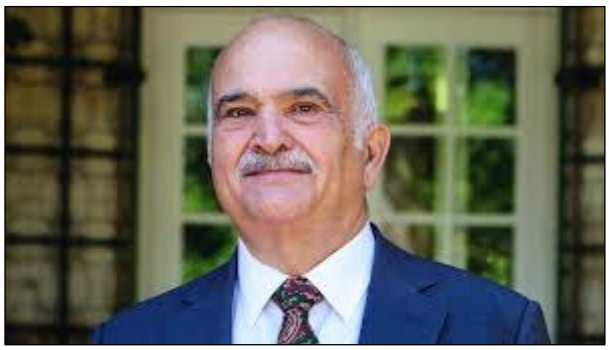
IN THE MEMORY OF RIO EARTH SUMMIT 1992

MESSAGE FROM HIS ROYAL HIGHNESS PRINCE EL HASSAN BIN TALAL
PATRON OF THE ISLAMIC WORLD ACADEMY OF SCIENCES (IAS)
DELIVERED AT THE 6TH IAS CONFERENCE IN KUALA LUMPUR, MALAYSIA, 1992



It is an honour and a pleasure to be asked to address you today, who represent a broad spectrum of countries, organizations and disciplines. I truly regret not being able to participate in person, but I very much look forward to hearing the results of your proceedings.

The Islamic Academy of Sciences (IAS) was founded to fulfill the aspirations of a multinational group of Muslim scientists. Through its conferences and seminars, the aim is to bring experts closer together in a free and independent forum. The resulting exchange of first-hand experience on shared problems has proved invaluable in the past, and I trust that this will once again be the case. I am sure that your deliberations will help to clarify our understanding of the relationship between environment and development, in particular the issues associated with science and technology.

Ladies and Gentlemen,

It is not for me to tell you, as scientists, of the dangers facing the earth today. Nor is it for me to tell you, who come largely from the Islamic world, of the problems of development. I would like only to make a few observations on the role that Muslim individuals, organizations and nations can play in harmonizing the demands of the environment with the needs of development, so helping to steer us all safely into the 21st century.

We stand at a threshold, the greatest that mankind has yet faced in all spheres of human activity. All over the globe, fundamental assumptions are being questioned and the structures and methods of an old world are found wanting. This is an age of mass communications, rapid industrialization, instant decisions; an age in which our earth and all it contains are subject to inconceivable pressures. Now more than ever, it is imperative to appreciate in advance the consequences of our actions; and herein lies the unique value of your calling. The changes sweeping the world mean that there can be no room for insularity. There is only room for those who acknowledge our mutual interdependence, and who strive to enrich our common lot. The Muslim world is no exception.

Indeed, while our countries may be classed as developing, our shared Islamic heritage provides a foundation deeply imbued with the respect for the environment. The paradigm most favoured by ecologists to describe humanity's proper relationship with the earth is one of stewardship.

The Islamic tradition has always been profoundly aware of the fragile balance of the natural order and its interconnected nature. It has always warned that the consequences of disruption of this balance will be felt by ourselves and those we hold dearest: our children. These are truths by which to plan the 21st century, truths with which our rich heritage abounds. Let us then embrace that heritage, and let us recognise its inspiration and its singular relevance.

Distinguished Delegates,

If such are to be the maxims by which we should plan for the century to come, what should be the chief pragmatic considerations? The conditions which prevail at the turn of the next century will be direct results of decisions made now. Today's choices and priorities thus require comprehensive examination; and I am fully confident that the present assembly is both qualified and motivated to play its part in this task. I hope you will allow me to list a few policy areas which merit immediate attention.

Firstly, changes in current patterns of production must be made by the industrialized nations. The reduction of waste products, support for developing countries, and the transfer of environmentally sensitive technology, are all vital components of any forward-looking strategy. But so, equally, is the input of the developing world: for we will live with the realities. Let us then be clear as to our goals, and why we wish to pursue them. One area in question is energy. The developing world provides much of the world's energy resources; and here as elsewhere, it is vital that our priorities be clearly focussed.

Secondly, a balance between environmental and economic considerations needs to be struck in the decision-making processes of both industrialised and developing countries. This should acknowledge that certain global development issues, such as the elimination of poverty, the provision of fresh water and the fight against desertification are key steps to sustainable development. New vision is needed at all levels, from global to grass roots. The rapid economic development model, with its environmental strains and human alienation, must give way to a new paradigm, sensitive both to the needs of the environment and the welfare of people. The articulation of such a model is among the main challenges of our time.

Finally, human values towards the environment must be addressed. Change, ultimately, begins and ends with individuals. The promotion of appropriate values and perceptions is therefore of the highest importance. Gatherings of this nature are extremely beneficial; for scientists of your calibre are uniquely capable of raising public awareness of dangers, while pointing the way to achievable remedies. I hope that the proceedings of this conference will be published, as with previous IAS conferences, so that the benefit of your collected wisdom may be made available to decision makers all over the Islamic community.

IN THE MEMORY OF RIO EARTH SUMMIT 1992

ADDRESS BY HIS EXCELLENCY MAHATHIR MOHAMAD
PRIME MINISTER OF MALAYSIA

DELIVERED AT THE 6TH IAS CONFERENCE IN KUALA LUMPUR, MALAYSIA, 1992

Bismillahir rahmanir rahim.
Assalamualaikum warahmatullahi wabarakatuh.

It gives me great pleasure to welcome you to Malaysia. Malaysia is indeed proud to be given the opportunity of hosting this conference, and I feel honoured to address such a distinguished group of Muslim scientists, planners and decision-makers who are here to discuss major issues on environment and development in the context of the Islamic world. I wish to congratulate the Islamic Academy of Sciences for organising this conference which is a fitting follow-up to the Earth Summit that was held in Rio de Janeiro, Brazil in June, 1992.

Environmental degradation and the need for economic growth and sustainable development is a common concern of all. It is a concern that should rightly transcend limited and parochial interests as it affects present and future generations. The Rio Summit highlighted this concern as well as underscored the inter-relationship and interlinkages between environment and development.

At Rio, while there was agreement on the common concern, the rich industrialised countries unfortunately failed to respond favourably to the developmental needs of the developing countries, which in fact included all the countries of the Islamic world. Indeed they even failed to respond to the environmental problems of their own countries. The rich were preoccupied with population growth and management of natural resources in the South, attributing the degradation of the world's environment almost exclusively to these factors.

Admittedly, there exists significant differences between the developed and developing countries as to the priorities. The rich North, obviously reluctant to curb its profligate lifestyles, is merely concerned with extending its control over natural resources, particularly resources such as tropical forests, which are only to be found in the South. The South mired and entrapped in poverty, urgently requires economic growth and development, which are only achievable if a supportive international economic system is in place. Such a system requires vision and meaningful commitment from the North to the democratisation of global decision- making, and to make available the necessary resources. If the Earth, in terms of the environment, is to be regarded as a single entity, as a nation is considered a single entity, then the wealth of the rich must be redistributed equitably also among the poor. This is the overriding principle that governs the nations as a unit. It is not the poor begging from the rich. It is pure inadul erated fairness and justice. For Muslims in particular, this concept of justice is familiar. Zakat and Fitrah are not charity contributions but are religious obligations in the interest of social justice in any human society.

During the Earth Summit, the leaders reiterated that problems of the environment and development were global, regional, as well as national in nature. Just as environmental problems have transboundary implications, development issues, particularly for developing countries, have transboundary implications as well. Synthetic rubber, plastics, glass fibres and numerous other substitutes for natural products, devised by the developed countries, all retard the development and well-being of the people in the developing countries. The need for continuing dialogue between rich and poor, between North and South, is obvious. If the South is to be effective in ensuring that the protection of the environment will not result in retarding development, then they must achieve solidarity and argue from a common stand point. the Islamic countries must play their part in achieving this.

While North-South interaction and cooperation is central to the prevention of global environmental degradation and the need for sustained economic growth, the South must not ignore the many opportunities available to also enhance South- South cooperation. This Conference, in itself, is a tangible manifestation of South- South cooperation. We have much to gain by learning and working together on these important matters.

The scientists of the Islamic world have much to contribute toward South-South cooperation in the field of environment and development hrough intensified interaction among themselves, they can project a model of the kind of cooperation that can be emulated by all the countries of the South. There should be closer collaboration among the scientists in

such areas as climate change and biological diversity. Your research findings and technical data will also serve to strengthen the bases of our negotiators as they negotiate the various environment-related conventions and protocols. Sound and verifiable data are crucial if the South is the safeguard its interests in multilateral negotiations.

Science and technology have a critical role to play in the global endeavour to protect the environment and to promote sustainable development. Through science and technology, our understanding of issues relating to the ecology, economics and society has become more matured, providing us with the bases for making choices in the direction of environmentally acceptable development. In this regard, scholars, scientists and researchers in the Muslim world must not lag behind if they wish to help the Ummah expand and consolidate their scientific and technological base, particularly in the vital area of research and development. Islamic countries, in many instances very richly endowed, must improve their educational and scientific research facilities so as to ensure the capacity of the Ummah to keep up with scientific and technological advancements and to improve on them.

In order to accelerate this process and indeed to make the quantum leap that is necessary to improve the quality of life of the Ummah, Muslim scientists must accumulate as much knowledge as possible so as to enable them to develop environmentally sound and appropriate technology. What is suitable for developed countries may not be suitable for developing countries. It is up to the scientists in developing countries to devise and modify the technologies of the developed countries to suit the needs of the developing countries.

We are aware that although the basic infrastructure of science and technology is available in many Islamic countries, it is neither large enough nor strong enough to cope with the rapid development in this field that is taking place worldwide. The importance of a strong and sound base of science and technology cannot be over- emphasised. The base underpins our efforts to solve the problems of food, defence, security, shelter, fuel and energy, health pollution, exploitation of mineral resources and the enhancement of agricultural and industrial production.

Malaysia has recognised the need to develop our technological capabilities in our quest for the status of a fully developed nation by the year 2020. Indeed, acquisition of such capabilities represents one of the key strategies under the Second Outline Perspective Plan and the Sixth Malaysia Plan.

To be a developed nation does not mean merely achieving the same GNP per capita of the rich countries. This is important of course because national poverty tends to undermine independence. But equally important is the acquisition of knowledge that can contribute towards national security and scientific and technological independence. Without these we will always be supplicants, dependent on the charity of others.

But it must be clear that true independence should not lead to the kind of arrogance that results in rash actions and acquisitiveness. As much as we value independence, we must respect the independence of others. Thus being developed must include the practice of good moral values within society and between societies and nations.

Muslim scientists must always remember and adhere to good moral values. Their knowledge should be for the good of the Ummah in general. The Ummah with the help of Muslim scientists must project to the world the true meaning of human civilisation and progress for it is enjoined upon Muslims to acquire knowledge not for evil but for the good of mankind. Certainly the protection of the environment would constitute the application of knowledge for the good of mankind.

Fellows of the Islamic Academy of Sciences have a significant role to play in promoting the development of science and technology in the Islamic world. As scientists in the Islamic world, you have a catalytic role in promoting growth and progress of the Islamic world in particular and the rest of the world in general. Individuals as well as Non-Governmental Organisations similarly have their own part in this collective exercise to safeguard the environment while promoting sustained economic growth. The Islamic Academy of Sciences, as an NGO, has a valuable contribution to make, particularly through the morally sound application of science and technology.

Islam is a progressive religion. There are no injunctions against the acquisition of knowledge as long as it is not intended for evil. I believe that the many challenges and difficulties that we face can be overcome if we adhere closely to the true teachings of Islam. It was the adherence to the true teachings that led to the Golden Age of Islam. It was during this Age that the various branches of science flourished as a result of the work of Muslim scientists. But when superstition and narrow interpretations of the teachings took over, the glorious Age faded. For as long as we submit to this kind of interpretation, for so long will we be subservient to others.

It is my earnest hope that your deliberations in this Conference will result in a better understanding of the problems and issues facing the Muslims scientists in this age, when in addition to their role of uplifting the Muslim Ummah, they have also to contend with the need of developing in a constantly restrictive environmental regime.

SCIENCE POTENTIAL FOR SUSTAINABLE WATER POLICY

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Unlimited potential what science can do on our planet, where salt water comprises 97.5% of planet waters, and fresh water of 2.5%: 70% tied in polar caps, and of what is left to humanity only 30% of the 2.5% freshwater; in rivers, lakes and ground water.

At the global level, it is advised to direct scientists to the following tasks in meeting the challenge of water scarcity and finding new solutions in the following:

- Nanoscience in cloud seeding.
- Monitoring climate change.
- Nanomembrane in diffusion technology.
- Efficient RO's for harvesting fresh water from oceans & seas.
- Nanosolar technology for renewables, and for sustainable desalination.

At the regional level, scientists should seek regional solutions in sharing transboundary waters among riparian countries of basins of rivers and ground waters in the following:

- Remote sensing of water basins and aquifers.
- Monitoring shifts of shared water of river basins and ground water.
- Monitoring pollution by upstream countries.
- Multilateral or bilateral agreements of riparian countries for shared lakes, rivers and ground aquifers, for dividing just shares and collective management against pollution and misuse.
- Creating a network of science research centers and institutions of shared rivers and aquifer basins for collecting and sharing data.

At the national level, scientists should direct their R&D to solve the scarcity of waters at home, particularly in the following:

- R&D for efficient agricultural and irrigation techniques, protected plasticulture etc…
- R&D on genomic crops, utilizing less water, or new cultivars tolerant to aridity and salinity-stressed physiology.
- Adopt science-based agricultural practices.
- Acquiring water virtually through crops from water-rich countries, and concentrating on high value-added crops that generate foreign exchange, through well-balanced trade policies. i.e:
- 1 kg wheat needs 1000 liters of water.
- 1 kg rice needs 1400 liters of water.
- 1 kg red meat needs 13000 liters of water.

There are enough water resources in the world, but lack of distribution, management and increased pollution make it unavailable to the masses.

[1] *Biologist, Professor and Chancellor of University of Petra, Jordan.*

NATURE'S APOTHECARY:
THE HEALING POWER OF MUSHROOMS IN MODERN MEDICINE

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Mushrooms have been revered not only for their culinary versatility but also for their profound medicinal properties, which have been acknowledged in traditional medical practices for centuries. Recently, the scientific community has begun to validate these traditional uses, leading to renewed interest in mushrooms as a significant source of natural therapeutics.

Traditional and Modern Uses

In traditional Chinese and Ayurvedic medicine, mushrooms like Reishi (*Ganoderma lucidum*), Shiitake (*Lentinula edodes*), and Cordyceps (*Cordyceps sinensis*) have been utilized for their health-promoting properties. Reishi, often referred to as the "mushroom of immortality," has been traditionally used to manage a range of conditions, including inflammation, fatigue, and cardiovascular diseases (Wachtel-Galor & Benzie, 2011). Shiitake mushrooms are renowned for their antiviral capabilities, while Cordyceps have been employed to enhance physical stamina and overall vitality (Zhou et al., 2009).

Modern research has pinpointed specific bioactive compounds in mushrooms, such as polysaccharides, terpenoids, and phenolic compounds, which contribute to their medicinal effects. For instance, beta-glucans found in mushrooms like Reishi and Shiitake are known to enhance immune responses, making them valuable in the prevention and treatment of infections and certain cancers (Zhang et al., 2007). Additionally, the antioxidant properties of mushrooms combat oxidative stress, a key factor in aging and various chronic diseases (Liu et al., 2015).

Health Benefits

1. **Immune Support**: Mushrooms are abundant in beta-glucans, compounds that help regulate the immune system, improving its ability to combat infections. Reishi and Maitake mushrooms are particularly noted for their immune-enhancing effects (Vetvicka & Vetvickova, 2015).
2. **Anti-Cancer Properties**: Several studies suggest that mushrooms such as Turkey Tail (*Trametes versicolor*) and Shiitake contain compounds that may inhibit the growth of cancer cells and enhance the effectiveness of conventional cancer treatments (Lindequist et al., 2005).
3. **Anti-Inflammatory Effects**: Chronic inflammation is implicated in various diseases, including arthritis, heart disease, and diabetes. Reishi mushrooms have demonstrated potent anti-inflammatory properties, which may help manage these conditions (Wasser, 2011).
4. **Cognitive Health**: Lion's Mane (*Hericium erinaceus*) has attracted attention for its potential to stimulate nerve growth and protect against neurodegenerative diseases like Alzheimer's. Compounds in Lion's Mane promote the production of nerve growth factor (NGF), which is essential

for the maintenance and regeneration of neurons (Mori et al., 2009).

5. **Cardiovascular Health**: Mushrooms like Reishi and Shiitake have been found to lower cholesterol levels and improve cardiovascular health. Their ability to prevent platelet aggregation and lower blood pressure contributes to their heart-protective effects (Tong et al., 2009).
6. **Antimicrobial and Antiviral**: Mushrooms possess natural antibiotic properties that can combat bacterial and viral infections. Compounds in Shiitake and Maitake, for example, have demonstrated effectiveness against a range of pathogens (Elsayed et al., 2014).

Conclusion

Mushrooms offer a promising natural approach to health enhancement and disease prevention. Their diverse bioactive compounds have shown potential in addressing a variety of health concerns, from immune support to cancer prevention and cognitive health. As the scientific understanding of mushrooms continues to evolve, their role in modern medicine may become even more significant. However, it is essential to approach the use of medicinal mushrooms as part of a comprehensive health strategy, ideally under the guidance of healthcare professionals, particularly when used alongside conventional treatments.

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FAO APPROACH TO THE WATER-ENERGY-FOOD-ECOSPHERE NEXUS (WEFE)

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Under the Nexus paradigm, scientists and policymakers have to integrate priorities from a single sector policy to overall trade-off solutions and evidence-based policy making particularly in the approach of principles and meeting the challenges.

I. The Fundamental Principles of WEFE Nexus:

- **Understand the interdependence of resources within a system across space and time.**
  - Integrate silos of disciplines to trans and interdisciplinary approach.
- **Recognize the interdependence between water, energy, food and ecosystems.**
  - Rationale, inclusive dialogue between scientists and decision makers.
- **Identify integrated policy solutions to optimize trade-offs and maximize synergies across sectors.**
  - Enhance potential cooperation among various components of the ecosystems.
- **Ensure coordination across sectors and stakeholders.**
  - Synergy and solutions sustainability.
- **Value the natural capital of land, water, energy resources and ecosystems.**
  - Enhance governments and business to support transition to sustainability: nature-based solutions.

II. The Challenge of WEFE Nexus:

- **Population Growth**
  - 9 billion by 2050. Energy demand to grow by 80% (IEA), food demand by 50%. (FAO), Agriculture is already consuming 70% of the world fresh water.
- **Economic Development**
  - To move people from poverty to middle income. Straining out natural resources, a demand on the nexus, inequalities, depleted planet resources becomes irreversible.
- **Urbanization**
  - WEFE security, ecosphere degradation.
- **Climate Change**
  - Shared basins and transboundary resources would increase the impact of the Nexus on meeting the challenge. Managing water resources, water harvest, international control of gas emission to the ecosystem's sequestration and clean-energy resources.

[2] *Biologist, Professor and Chancellor of University of Petra, Jordan.*

TOOLS OF ARTIFICIAL INTELLIGENCE

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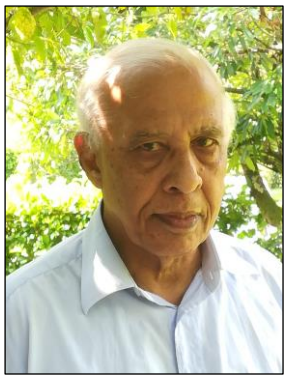

Abstract: This document treats the principle of artificial intelligence (AI), and its practical application through a series of every-day examples.

1. Introduction.
Artificial intelligence (AI) is the science of machines that can think like humans. It can do things that are considered "smart." AI technology can process large amounts of data in ways, unlike humans. The goal for AI is to be able to do things such as recognize patterns, make decisions, and judge like humans **(1).**

The AI systems operate by merging large amount of data with intelligent, iterative processing computer-based algorithms. This combination allows AI to learn from patterns and features in the analyzed data. Each time an Artificial Intelligence system performs a round of data processing, it tests and measures its performance and uses the results to develop additional expertise.

2. AI-based image recognition.
AI image recognition employs machine learning technology, where AI learns as an iterative process, by reading and learning from large amounts of image data, and the accuracy of image recognition is improved by learning from the continuously stored image data.

3. Examples of AI-based image recognition (2).
a. Detection of people, objects, and vehicles, Figure 1.

The algorithm detects people, objects, and vehicles through images. People detection looks for congestion in streets and open spaces, and the behavior of people at work in construction sites. Vehicles detection is to check for congestion on roads.

Figure 1. Detection of people, objects, and vehicles.

b. Detection human skeletal structure and posture, Figure 2.
The AI-based system detects the skeletal structure and posture of the human body by recognizing information about the neck, hands, and other parts of the body. Deep learning is used to detect not only parts of the human body, but also the optimal connections amongst them.

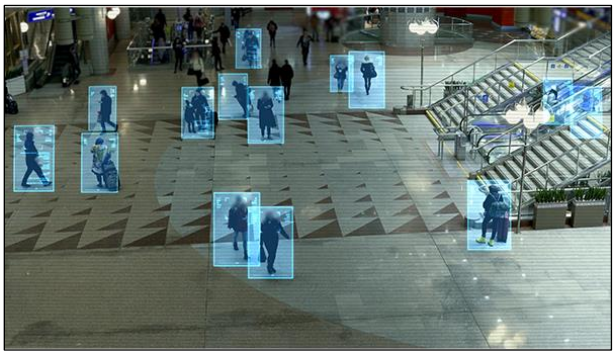

Figure 2. Detection of human skeletal structure and posture.

c. Facial recognition, Figure 3.
The AI-based technology recognizes the eyes, nose, mouth, other helpful information from 2D or 3G image information and checks against a database of pre-registered facial information to confirm a specific person.

Figure 3. Facial recognition.

d. Identification of diseased images from medical images (CT or MRI), Figure 4.
The Technology helps to identify diseased locations from medical images (CT or MRI) such as cerebral aneurysms. Recently, it has become possible to obtain high resolution CT and MRI data. By having AI learn iteratively from a large amount of stored high-resolution image data, the accuracy of the technology to identify diseases has also improved dramatically.

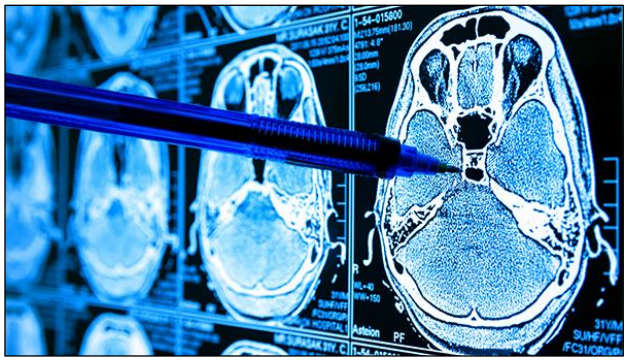

Figure 4. Identification of diseased images from medical images (CT or MRI).

e. Access control for buildings, Figure 5.
The access control system based on AI image recognition, uses biometric authentication technologies such as facial recognition, iris recognition, and fingerprint recognition to identify individuals and allow them to enter and exit without touching the authentication device.

Figure 5. Access control for buildings.

f. Monitoring road traffic conditions, Figure 6.
Here the system uses AI cameras along with other devices to detect and monitor road traffic conditions such as increased traffic which can be indicated in real time through road signs. The AI image recognition is also employed in technologies that measure road conditions and the quality of visibility in bad weather.

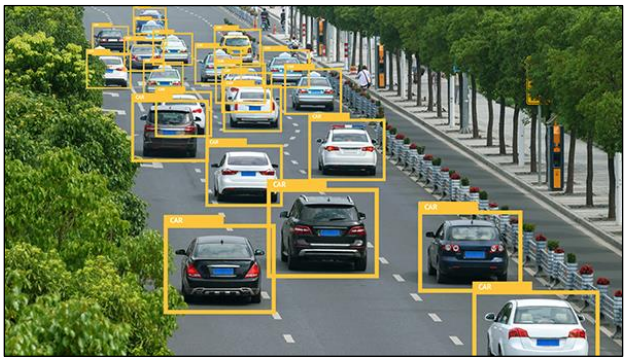

Figure 6. Monitoring road traffic conditions.

g. Quality control, of products and food products in factories, Fig.7.
At factory production lines, the quality of the products is tested through the conventional rules of visual inspection. However, the general variety of products in different forms and shapes is better monitored continuously through the AI-based tools.

Figure 7. Quality control of products and food products in factories.

4. Conclusions.
The powerful tools of AI are being applied more and more in different sectors of daily life, economy, warfare, and in social, cultural, and even scientific domains through sophisticated computer-based algorithms.

References
1. Courtesy Wikipedia.
2. "Contec Technology for a better life", courtesy Google

HALOPHILA STIPULACEA: A COMPREHENSIVE REVIEW OF ITS PHYTOCHEMICAL COMPOSITION AND PHARMACOLOGICAL ACTIVITIES[1]

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Abstract:
Halophila stipulacea (Forsskål and Niebuhr) Ascherson is a small marine seagrass that belongs to the Hydrocharitaceae family. It is native to the Red Sea, Persian Gulf, and Indian Ocean and has successfully invaded the Mediterranean and Caribbean Seas. This article summarizes the pharmacological activities and phytochemical content of H. stipulacea, along with its botanical and ecological characteristics. Studies have shown that H. stipulacea is rich in polyphenols and terpenoids. Additionally, it is rich in proteins, lipids, and carbohydrates, contributing to its nutritional value.Several biological activities are reported by this plant, including antimicrobial, antioxidant, anticancer, anti-inflammatory, anti-metabolic disorders, and anti-osteoclastogenic activities. Further research is needed to validate the efficacy and safety of this plant and to investigate the mechanisms of action underlying the observed effects.

Keywords:
Halophila stipulacea; seagrass; phytochemistry; pharmacology; natural products

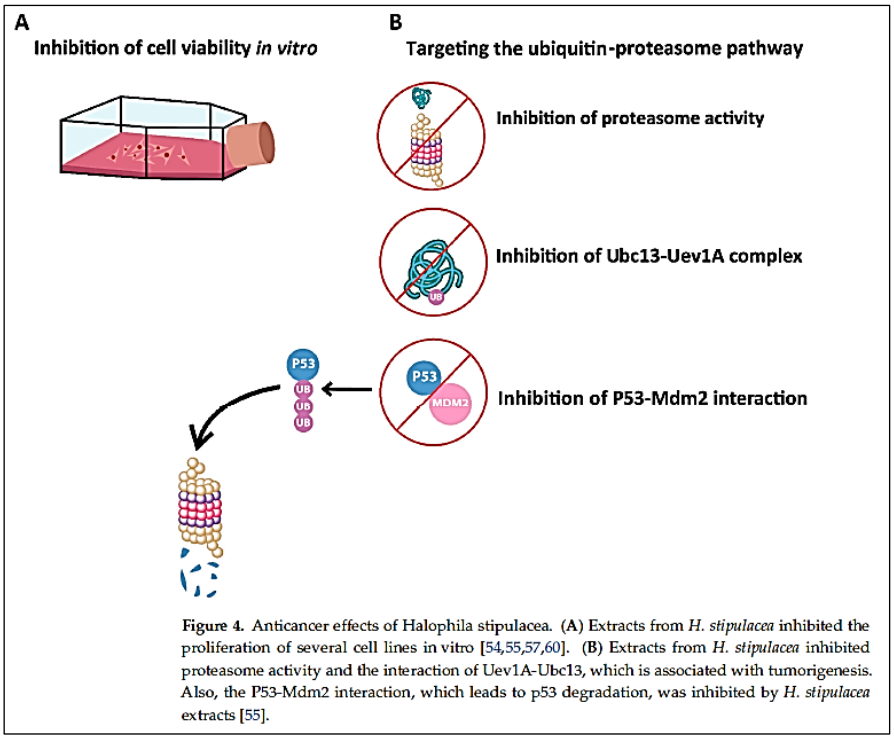

Figure 4. Anticancer effects of Halophila stipulacea. (A) Extracts from *H. stipulacea* inhibited the proliferation of several cell lines in vitro [54,55,57,60]. (B) Extracts from *H. stipulacea* inhibited proteasome activity and the interaction of Uev1A-Ubc13, which is associated with tumorigenesis. Also, the P53-Mdm2 interaction, which leads to p53 degradation, was inhibited by *H. stipulacea* extracts [55].

[1] *Link to the whole publication: https://www.mdpi.com/2218-273X/14/8/991*

THE CHARISMATIC ROLE OF NANOPARTICLES IN SCIENCE AND SOCIETY

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The study of matter at the nanoscale and its comprehension, manipulation, and application constitutes the multidisciplinary discipline of nanotechnology. Nanoscience is the study of phenomena related to objects having size between 1 and 100 nm. It is now being widely used in environmental science, engineering, electronics, energy, agriculture, health, medicine, and many others. Different nanostructures like functionalized nanoparticles, quantum dots, nanopolymers, and porous structures have substantial applications these days.

Regarding characteristics and transport, nanoparticles act as single units in nanotechnology. Owing to their unique dimensions and ability to display new and much better physical, chemical, and biological properties than their bulk counterparts, they have many advantages. Size reduction improves a particle's molecular interactions, durability, conductivity, surface strength, and surface area per weight at the nanoscale. These particles transform many industries, including healthcare, life sciences, and energy generation.

Manipulation of nanoparticles is a significant area of interest in nanotechnology. Regulating and determining the behavior and reactions of the particles entails the purposeful engineering of structure and properties at the nanoscale. For instance, precise medication delivery systems can be made possible in healthcare system by engineering nanoparticles to target particular cells or tissues. Using nanoparticles in electronics enables the creation of more compact and potent devices. The distinct chemical and physical characteristics of nanoparticles are being leveraged to create renewable energy sources, like solar cells.

The production of nanoparticles is a quickly developing field with up-coming technological applications. There are numerous diversionary techniques for creating nanoparticles, such as chemical, biological, and physical processes. Physical procedures include easy-to-implement, high-production-rate techniques such as evaporation-condensation and milling or attrition. However, chemical procedures provide more control over size distribution and concentration. They include reduction in solution, homogeneous precipitation, sol-gel processes, and micro-emulsion techniques. Biological approaches, which are often referred to as green synthesis, are safer, more environment-friendly, and economically feasible, because they involve the use of bacteria, fungi, plant extracts, and enzymes as reducing sources.

Since these materials can interact at the same scale as biological processes, they can be precisely manipulated in electronics and medicine. For example, they are used in antimicrobial treatments, medication delivery, cancer therapy, and diagnostic assays in biomedical science. In electronics, they manufacture highly efficient solar materials, quantum dots, and transistors. Waste identification, heavy metal removal, and nano-filtration are environmental applications. Aside from this, because nanoparticles can significantly improve functionality and longevity while lowering waste, they are also used in product lifecycle management. Therefore, the synthesis of nanoparticles has opened up a wide range of research and development opportunities, and transformed industries like technology, healthcare, and the environment.

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Applications

The unique qualities of nanoparticles render them valuable in a number of spheres. For example, nanoparticles are employed in healthcare to deliver medicines more efficiently and with fewer adverse effects, such as in the treatment of cancer. For example, silver nanoparticles are prevalent in wound dressings because of their antibacterial qualities, and gold nanoparticles are used in photothermal cancer therapy.

The use of nanoparticles in medicine and the biological sciences represents a revolutionary development in healthcare. Because of their large surface area to volume ratio, which enhances their ability to interact with biomolecules, nanoparticles provide novel approaches to the detection, treatment, and prevention of diseases. For example, the advantages of nanoparticles in medication delivery include reducing drug loss and degradation, averting adverse side effects, and boosting drug bioavailability, which permits targeted release. This considerably lowers systemic toxicity while improving therapeutic efficacy.

Another area where nanoparticles are helpful is in disease diagnostics. The distinct physiochemical characteristics of nanoparticles are utilized by nanobiosensors, in which bio-conjugated nanoparticles function as biosensing probes to identify disease biomarkers or track therapeutic responses. This may be extremely important for prognosis care and early illness diagnosis.

Genomic research is progressing by using nanotechnology in gene therapy. Because of nanoparticles, gene delivery can be facilitated with less intrusion and a more potent therapeutic outcome. Similarly, nanomedicine has had a profound impact on the management and treatment of cancer. A novel idea known as "nanoparticle-based photothermal therapy" involves the use of nanoparticles to transform absorbed light into heat, thereby causing localized hyperthermia, which kills cancer cells. Therefore, numerous applications of nanoparticles in diagnosis, delivery, therapy, and regenerative medicine provide enormous promise for modern healthcare. Integrating biological entities in diagnosis and therapies is made possible by the confluence of life sciences, specifically the nanotechnologies, which are opening up new avenues for medical and healthcare developments.

Owing to their distinctiveness and versatility, nanoparticles have various applications in plant science and agriculture. Nanoparticles are also used in environmental remediation. For instance, iron nanoparticles are used in groundwater treatment to remove heavy metals and other pollutants.

Advantages

When compared to their bulk counterpart, a multitude of functional groups can be adsorbed onto their surface because of their large surface area to volume ratio, which significantly boosts reactivity and makes cleaner, low-waste technologies possible. Catalysts made of nanoparticles, for example, can guarantee that reactions happen fast and precisely while lowering potentially dangerous emissions.

Moreover, the smaller size of nanoparticles makes it easier for interdisciplinary teams to work together to address challenging problems, particularly in the medical field. Better addiction management, high-resolution imaging, and tissue engineering—from drug delivery and cell targeting to diagnostic sensors—are made possible by them. When compared to their bulk form, nanoparticles' physical characteristics change significantly. This can produce stronger yet lighter materials in metallurgy, as well as highly efficient semiconductors, superconductors, and magnets.

Nanoparticles can safely and precisely deliver pesticides and fertilizers to plants, which is helpful in plant science and agriculture. As a result, less product is required, and less harm is done to the environment. Specific nanoparticles can identify plant illnesses early on. Farmers can now take action to lessen crop loss due to their use. A controlled release of nutrients from nanoparticles promotes healthier growth and increases crop output.

Nanoparticles can also purify water to remove hazardous chemicals and microorganisms to ensure safe irrigation. They can aid in the remediation of contaminated soils through toxin removal or soil chemistry modification.

Additionally, from the standpoint of the energy sector, nanoparticles promise improved

durability, increased energy density, and increased power output, opening the door to the development of effective, reasonably priced, and long-lasting fuel cells, batteries, and solar cells.

Finally, but just as significantly, nanoparticles can help with desalination and purification procedures and the transportation of materials needed for ecological restoration. Further research beyond these domains will reveal many more opportunities. These benefits, which come from the versatility and dexterity of nanoparticles, open up new avenues for prosperity and progress worldwide.

Disadvantages of Nanoparticles

Undoubtedly, nanoparticles provide a myriad of benefits across many industries, but they also have multifarious disadvantages. The biggest issue is the possible harm they could do to the environment and people's health. Because of their increased surface area-to-volume ratio, nanoscale materials are reactive to radicals and may, therefore, introduce detrimental interactions into ecosystems or living creatures. Due to the wide variations in how they interact, their effects on the environment and human health are frequently unpredictable and poorly understood. For example, due to their small size, nanoparticles can cross organ-specific cell membranes easily, which may result in harmful immunological reactions and toxicity in living things.

The difficulties in successfully utilizing nanoparticles represent another drawback. Maintaining the unique qualities of the small size can be difficult. Nanoparticles may need to be synthesized, stabilized, functionalized, and characterized using sophisticated machinery to survive real-world environmental circumstances. Alternatively, they may clump together and lose their beneficial qualities.

Finally, additional standards and laws pertaining to nanoparticles are required. The absence of guidelines impedes their more comprehensive implementation, hence impeding future technical progress. The public's worries regarding the liability implications of using and releasing products based on nanoparticles, especially regarding workplace safety, make their widespread adoption even more challenging. Therefore, even if nanoparticles have a lot of promise, it is essential to address these drawbacks and produce more thorough risk assessments for the environment and human health that are followed by the formulation of guidelines. Undertaking primary research in nanotechnology could provide additional insight into this unexplored complexity and help understand the extent of the risks related to nanoparticles. This could facilitate the advancement of technology by utilizing the benefits of nanoparticles while mitigating their drawbacks.

Conclusion

In a nutshell, the development of nanoparticles has unquestionably transformed many industries, including technology, energy, the environment, health care and several others. Their unique qualities hold great promise for improving product functions, creating new opportunities for applications, and laying the groundwork for future technological breakthroughs. Because of their capacity to interact at the cellular level, they hold great promise in exact diagnostics and therapies in life sciences and medicine. However, to fully use the potential of nanoparticles, it is apt to recognize and resolve the accompanying disadvantages. There is still more to learn about the impact of nanoparticles on the environmental settings and human wellbeing, so as to forecast, alter, and control these effects. Likewise, regulatory frameworks require assistance to keep up with the rate of advancement and application of nanoparticles. Therefore, maximizing the potential advantages of nanoparticles will necessitate not just scientific advancements but also robust risk assessment frameworks and regulatory backing that guarantee safe and sustainable use. To remove obstacles to the ethical and environmentally sound application of nanotechnology, we must find a balance between preventive measures and scientific developments as we work to realize the potential of nanoparticles fully.

ROLE OF FUTURE TECHNOLOGIES OF SMART AGRICULTURE AND AGRICULTURAL INNOVATION IN THE DEVELOPMENT OF FOOD SECURITY

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Abstract

The Iraqi economy and its great dependence on oil revenues and imports has become necessary to adopt policies to diversify the sources of smart agriculture and agricultural innovation in the development of the Iraqi economy and the development of the economic base without relying on the oil sector and raising the productive investment capabilities in the various economic sectors ,the most important of which is the agricultural sector (smart agriculture ,agricultural investment, Agricultural innovation in Iraq) and thus creating a national economy that allows agricultural policy to develop and increase the success of the efficiency and development of the Iraqi economy.the state in Iraq adopted development programs and policies during the seventies and eighties of the last century, but these policies and programs did not achieve any of their objectives in developing the living reality of the Iraqi society, as a result of the unusual circumstances that Iraq went through, represented by Iraq entering wars and sieges that exhausted all the elements of the development process Its resources, especially the natural represented by water and arable lands, have been depleted as a result of the excessive and irrational use of these resources and the reliance on traditional methods of agriculture, in addition to the waste of oil revenues achieved in areas that did not serve development, due to the military spending on most other spending, including investment spending and after The political system in Iraq changed in 2003, and entered the stage of the American occupation until 2011. Iraq lost many of its resources, part of them as a result of the repercussions of the security reality, or as a result of terrorism's control over large areas of Iraq in.2014

Keyword: Smart agriculture, Agricultural innovation, Climate smart agriculture, Food security, Climate change, Iraqi agriculture.

Introduction

Agriculture is one of the main economic activities that contribute to the national economy, and food security is linked to national security, and achieving food security depends primarily on providing food from local agricultural production, and the advancement of the agricultural sector balance contributes to diversifying the economy and improving the movement of poverty directly and indirectly.

In other words, the development of the agricultural sector contributes to combating unemployment, reducing the volume of imports, the development and advancement of society and the strengthening of the national economy, in addition to the fact that the local product is safer for the health safety of the consumer compared to the imported one, which leads to concern for the health of the individual because most of the diseases of the age are related to food and food consumption. The development of the agricultural sector is also reflected positively on the improvement of the environmental reality.

This is in addition to the drought conditions in the region .Consequently, this was reflected on the available natural resources of water and arable land, due to military operations and the failure to maintain irrigation projects. Which led to the desertification of a lot of land and low agricultural productivity. In addition, official mismanagement and the spread of financial corruption in state agencies have led to the loss of most of the revenues generated from oil exports in achieving the development of productive sectors, including the agricultural sector, which has negatively affected the economic and social reality of Iraqi society. These repercussions were represented by the exacerbation of many negative phenomena, foremost of which is the high percentage of people living below the poverty line, high unemployment rates, and the displacement of about 12% of the Iraqi population after they lost their job opportunities and economic activity, especially a large part of them depend on agricultural activity, which indicates the deterioration in the Agricultural development work, which constitutes a dangerous situation in securing even part of the food security of the Iraqi society, and its reflection on future generations. This study aims to raise awareness of the structural obstacles to agricultural development in Iraq as the scientific approach to addressing this problem, and to clarify the properties of agricultural development as it is the starting point for developing and raising the efficiency

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of its exploitation, because the agricultural production capacity is determined by natural, material and human resources, the degree of their exploitation, and the policies that direct these resources. This study is based on the hypothesis that Iraq has an integrated and effective economic formation if it uses its economic resources in a rational manner that can play an effective role in the development process by liquidating the production relationship prevailing in the Iraqi countryside and encouraging the base of individual and collective investments and in the field of competition forces by work.

The aim of the study is to show the progress the role of smart agriculture and agricultural innovation in the development of the Iraqi economy:

1- The Iraqi economy and its great dependence on oil revenues and imports has become necessary to adopt policies to diversify the sources of smart agriculture and agricultural innovation in the development of the Iraqi economy and the development of the economic base without relying on the oil sector and raising the productive investment capabilities in the various economic sectors, the most important of which is the agricultural sector (smart agriculture, agricultural investment, Agricultural innovation in Iraq) and thus creating a national economy that allows agricultural policy to develop and increase the success of the efficiency and development of the Iraqi economy.

2- This study aims to raise awareness of the structural obstacles to agricultural development in Iraq as the scientific approach to addressing this problem, and to clarify the properties of agricultural development as it is the starting point for developing and raising the efficiency of its exploitation, because the agricultural production capacity is determined by natural, material and human resources, the degree of their exploitation, and the policies that direct these resources. This study is based on the hypothesis that Iraq has an integrated and effective economic formation if it uses its economic resources in a rational manner that can play an effective role in the development process by liquidating the production relationship prevailing in the Iraqi countryside and encouraging the base of individual and collective investments and in the field of competition forces by work.

Smart agriculture:

The importance of investing in the agricultural sector and its contribution to increasing production:

Agriculture, its goals and components:

Agriculture is one of the main economic activities that contribute to the national economy, and food security is linked to national security, and achieving food security depends primarily on providing food from local agricultural production. In other words, the development of the agricultural sector contributes to combating unemployment, reducing the volume of imports, the development and advancement of society and strengthening the national economy ,in addition to that the local product is safer and more reassuring about the health safety of the consumer compared to the importer, since most of the diseases of the age are related to food and food consumption, and the development of the agricultural sector Positively reflected on the improvement of environmental reality.

Picture (1) of Agricultural Innovation in the Marshes of Iraq, Maysan Governorate.

Agricultural innovation:

The peculiarities of the agricultural sector

1. Dealing with a living organism (plant and animal), both of which require varying lengths of time.
2. It is related to unsecured environmental conditions that affect production.
3. Its connection with the activities and production of most state ministries ,especially the security aspect, electricity, oil, industry, commerce ,environment, water resources, higher education and scientific research ,finance.
4. It needs a large capital and the period of its growth is very slow.

Therefore, all of these factors overlap and participate in influencing the growth and development of the agricultural sector in a way that is different from other sectors (17,15,13).

Here we must talk about the importance of agriculture for the national economy:

1. Agriculture and the agricultural production resulting from it, whether plant or animal production, represent fuel for humans.
2. Agriculture still represents in our society and in developing societies the profession that absorbs large

numbers of workers, as it protects society from the devastating effects of unemployment.
3. Agricultural production is a basic material for many industries.

In order to advance the agricultural sector in Iraq, we must find the answer to the following questions: (Al-Zuki, 2007:32).
A- What are the objectives of agriculture in Iraq?
B- What are the ingredients available to achieve these goals and how to develop them?

Picture (2) of Agricultural Innovation in the Marshes of Iraq, Maysan Governorate.

Agriculture goals:
1. Achieving an abundance of agricultural production, both plant and animal, as well as agricultural industrialization.
2. Achieving a surplus in agricultural production that allows us to export to save foreign currency and works to improve the trade balance and the balance of payments.
3. Working on the optimal use of production requirements (land, water, etc.).
4. Work to reduce the percentage of wastage in agricultural production and reduce it to the least possible extent.

The components of agricultural activity and how to develop them
1. human iraq is characterized by a large population and the availability of technical and qualified cadres, but on the other hand, we find a low level of employment in terms of health and professional competence and a lack of knowledge of the rules of modern agriculture. For all agronomists on modern farming methods.(10).
2. Earth iraq possesses large and fertile agricultural land, but it is subject to erosion as a result of population pressure, in addition to the small areas of possession, which limits the optimal use of it. In addition, the laws of tenure, rent and ownership do not allow the establishment of modern agriculture, and the other available land in the desert is limited to the quantities of water that we can provide It or from groundwater sources, and some of this land finds it difficult to transfer water to it, which is represented by the high rate of loss due to evaporation or leakage, as well as the high transportation costs, whether for agricultural inputs or production.
3. Water water is one of the necessary ingredients for agriculture, but the problem of water is the problem of the future in the world and with the increase in the population, **it is necessary to take the following:**
Encourage farmers to use modern irrigation systems, develop detailed maps of groundwater in desert areas and the extent of water sufficiency for a number of years, so that the farmer sets his vision based on realistic facts.
Failure to expand water transportation projects over long distances, as large quantities of water will be lost by evaporation, in addition to the costs incurred by lifting and transportation operations that make the product uneconomic.
The processes of mixing water with waste water must be careful to avoid problems of salinization of the earth.
Modern technology by this we mean advanced irrigation ,modern mechanization, genetic engineering, and bio-agriculture that do not use chemicals harmful to human health. Modern technology plays a major role in facilitating agricultural operations and reducing time and effort.
Determinants of agricultural investment in Iraq Most of the opinions and studies related to investment activity agree that there are three main elements of the investment climate that together constitute the general frameworks for investment (the determinants), namely the economic, political and legal framework, and with the increasing mutual influence between the various social, cultural, political and economic variables, and in the context of economic development, in addition to the obstacles And the common determinants facing the economic sectors, each sector has its own determinants, and moreover, the productive activity of a particular economic sector faces determinants that differ from those related to its consumption or investment activity, so the decline in income is no longer the only responsible for the decline in demand, as well as interest rates (11,12,13).

Picture (3) of the use of Smart Agriculture and Agricultural Innovation to Produce Organic Fertilizers - Maysan Governorate.

Agricultural reality and the elements for its advancement in Iraq

Investment is an important element in the economy of any country through its role in the economic system, and its close relationship directly and indirectly with other variables such as savings, consumption, income, growth level, economic development, and the level of employment. Agricultural investment has a social role, in addition to its economic role. It contributes to the production of necessary commodities, the preparation of raw materials for industry, and the employment of manpower, in addition to its important role in the process of economic development due to the nature of the links between it and other economic sectors such as industry and trade (1,2,3,4).

Picture (4) of the use of Smart Agriculture and Agricultural Innovation to Produce Organic Fertilizers - Maysan Governorate.

Gross domestic product:

The gross domestic product at constant prices amounted to (42.3) billion dinars in 2000, then it decreased to (26.9) billion dinars in 2003, where the reason for the significant decline is attributed to the war of 2003 and its devastating effects. (Zinni, 2010: 20) Thus, the gross domestic product in 2008 at constant prices amounted to (51.7) billion dinars, as it was in 2007 (48.5) billion dinars. In fact, the increase is due to the rise in oil prices, and the entry of some investment companies into Iraq(5,9,28). Then it increased until it reached (73.3) billion dinars in 2013 As shown in Table No (1).

Table No. (1) The evolution of the gross domestic product in Iraq for the period (2000 - 2013) billion dinars at constant prices (1988 = 100)

Annual growth rate of output gross domestic %	GDP at constant prices (billion dinars)	year
1.4	42.3	2000
2.3	43.3 43.3	2001
-6.9	40.3 40.3	2002
-33.3	26.9 26.9	2003
54.6	41.6 41.6	2004
4.3	43.4	2005
10.1	47.8	2006
1.4	48. 48.5	2007
6.6	51. 51.7	2008
5.8	54.7 54.7	2009
5.8	57. 57.9	2010
9.8	63.6 63.6	2011
10.0	70.0 70.0	2012
4.4	73. 73.1	2013

Source: Ministry of Planning data, Central Agency for Statistics and Information Technology, Directorate of National Accounts (2000-2013), pp. 3-20.

As for the structure of the GDP, the proportions of the contribution of the economic sectors to the generation of the GDP vary through the development process in Iraq, but this discrepancy was accompanied by a constant and well-established reality represented in the oil, mining and quarrying sector obtaining a high percentage of contribution to the generation of the GDP, with Fluctuation in the rise rates in connection with the unstable internal and external political and economic conditions that have passed on the Iraqi economy, as well as the impact of the oil variable on international data ,especially prices. The contribution of the oil and agricultural economic sector to the generation of GDP First: the contribution of the oil sector (mining and quarries) to the gross domestic product The oil sector is one of the sectors of great importance to the gross domestic product in most oil countries in general and Iraq in particular. It can be started by defining oil as a sovereign national wealth and the process of extracting oil for export represents a monetization of it, i.e. converting part of it into foreign currency and when we know development on a scale National Wealth The society and its political elites face a great challenge, because this means that additional material wealth must be created on the surface of the earth, equivalent to at least the value of the depleted part of the oil wealth. (16,15,14,11) The oil sector contributes in high proportions to the GDP, as its contribution rate reached 61% in 2000 as shown in Table (2), which is the highest contribution rate recorded during the period (2000 - 2013), but this percentage decreased in 2001 to (59%) due to the decrease To the deterioration of the productive capacities of this sector on the one hand and the drop in global demand after the events of September 2001 and after 2003, and because of the destruction inflicted on the Iraqi economy and because of the war and then terrorism, which began to spread throughout Iraq to reach its peak in 2005, we note in Table (2) The percentage of the oil sector's contribution in that year decreased to (42%) due to the fact that this sector was exposed to 227 cases of attacks and sabotage until May 4, 2005 ,which led to

Iraq losing approximately $4 billion annually from its oil revenues, which led to the import of oil products after If Iraq was a source of it, the contribution rate reached (41.5%) in 2013, as the table shows stability in the oil sector's contribution rates for the period 2005-2013.

Iraqi Agriculture:

The Contribution of the Agricultural Sector To The Gross Domestic Product:

Usually, its contribution fluctuates towards the rise and fall, and this is what we notice in Table (2), as the share of this sector in 2000 was (10.8%) and then reached (%12.9) in 2006 and started to decline after this year, reaching (7.3%) in 2009. And to (6.9%) in 2013 and the reason is due to dependence on imports and lack of investment in the agricultural sector, knowing that the increase in Iraq's population from 31 million in 2009 to 35 million in 2013 exacerbated the large food gap that the country suffers from, among other reasons for the deterioration of production Agriculture in Iraq is the drought resulting from the lack of rainfall, the decline in the flow of the Tigris and Euphrates rivers, the spread of salinity, mismanagement at the level of cultivation of the land or at the governmental level, and the failure to provide a kind of protection for local crops.

Table No. (2) The contribution of the oil and agricultural sector to the gross domestic product in Iraq at constant prices (1988 = 100) for the period (2000 - 2013).

Agriculture Sector%	Oil Sector%	Year
10.8	61	2000
10.7	59.2	2001
13.5	54.8	2002
14.3	51.6	2003
10.9	47.6	2004
13.7	42.2	2005
12.9	40.4	2006
9.2	42.8	2007
7.6	45.2	2008
7.3	43.6	2009
6.7	41.6	2010
7.1	42.9	2011
6.8	43.3	2012
10.8	61	2013

Source: Ministry of Central Planning for Statistics and Information Technology, National Accounts.

The agricultural reality entered into narrow labyrinths and corridors as a result of complex circumstances that passed through Iraq, making it in a dark corner and transforming, as a result of that country, from an agriculturalist to an importer of all agricultural products.

This is what burdens the Iraqi economy and makes the situation based on this framework. The government must provide the capabilities that contribute to the advancement of agriculture, and we will try to shed light on the reasons that led to the deterioration of agriculture on the one hand, and the means and solutions that can restore and promote agriculture and provide food for the people on the one hand. Again, effective attention must be paid to the advancement of the agricultural reality, its removal from its miserable situation, and the achievement of positive results in light of the current situation.

Picture (5) Smart Agriculture.

Climate smart agriculture:

Food security, Climate change:

Requirements for the application of climate-smart agriculture:

Climate-smart agricultural practices are defined based on agro-ecological and socio-economic conditions by enhancing resilience and reducing greenhouse gas emissions by providing support

Targeted countries to increase productivity, and this calls for:

1. Identify appropriate systems, practices and technologies.
2. Develop an enabling institutional structure in accordance with the social, economic, environmental and climatic conditions of each.
3. Providing capabilities, methodologies and tools to carry out the required assessments and analyzes.
4. There is also a need to go beyond small-scale projects in order to demonstrate the potential of climate-smart agriculture, and there is an urgent need for governments and society to work in order to achieve transformational changes that address the interrelated challenges of food security and climate change ,and we can no longer differentiate between the future of Food security and the future of the environment Social development is closely linked to climate change, and so must the response (16-17).

Picture (6) Smart Agriculture.

Smart agriculture:

Introducing the Global Alliance for Climate-Smart Agriculture and its goals:

1. The Global Alliance for Climate-Smart Agriculture was launched during the United Nations Climate Summit in September 2014 in New York, and by 2020 ,it is expected that at least 25 countries will have put in place policies and programs that will enable 25 million smallholder families to adopt Climate-smart approaches, practices and systems

2. The mission of the alliance is focused on facing the challenges facing food security and agriculture by pressing the richness and diversity of resources, knowledge, information and experiences among its members, in order to stimulate concrete initiatives at all levels. It also provides a forum for those involved in climate-smart agriculture to exchange experiences and exchange information and opinions on issues that need immediate attention. What does and does not work when adapting to climate change and mitigating greenhouse gas emissions in the agricultural sector.

3. The vision of the Global Alliance for Climate-Smart Agriculture is to improve food security, nutrition and resilience in the face of climate change . By stimulating the establishment of companies to encourage development work that reflects an integrated approach, the three pillars of improving agricultural productivity of farmers and sustainable income; building farmers 'resilience to weather and climate change; and to reduce greenhouse gas emissions associated with agriculture, where possible(18).

Picture (7) Smart Agriculture.

Conclusions

Excessive and irrational use of water resources and reliance on traditional methods of agriculture, in addition to wasting oil revenues achieved in areas that did not serve development, leading the military spending on most spending.

Poor official administration and widespread financial corruption in state agencies led to the loss of most of the revenues generated from oil exports in achieving the development of productive sectors, including the agricultural sector.

Iraq is characterized by a large population and the availability of technical and qualified cadres, but on the other hand, we find a low level of employment in terms of health and professional competence and his lack of knowledge of the rules of modern agriculture.

4. The Iraqi economy's dependence on oil as the only source of wealth ,which is an immediate and not strategic option, and neglecting other sectors , including the agricultural sector.

The optimal use of land and water resources in the world leads to a doubling of the green area on the surface of the globe.

The lack of financial allocations from the central and local governments to support the agricultural sector in all its details has led to the deterioration in this vital sector.

Recommendations

1. Engaging in industries supporting the agricultural sector, such as the manufacture of fertilizers, pesticides, mechanization, sprinkler and drip irrigation systems, agricultural nylon, and greenhouses...etc.

2. Entering agricultural industries such as the canning industry, dairy and tomato paste, and promoting the manufacture and trade of dates, grains, and others.

3. Focusing on reducing post-harvest losses or harvesting to reach the consumer through the development of agricultural marketing in all its episodes ,including refrigerated and frozen means of transport to transport agricultural crops, and the establishment of modern regular, refrigerated and frozen stores ,and attention to packaging, grading, storage, marketing and manufacturing to protect the product and the consumer.

4. Adopt the establishment of major stations for raising dairy cows and factories for fodder with modern technology, and the dairy industry, in other words, the establishment of agro-industrial complexes, the use of agricultural cycles, and the expansion of the areas allocated for the production of fodder.

5. Establishment of agricultural insurance companies to work in the agricultural insurance system.

6. Supporting the establishment of specialized associations concerned with the various activities of

the agricultural sector, such as mechanization , marketing, specialized transport and others.

7. Proceeding with encouraging local and foreign private investment in the infrastructure supporting the agricultural sector and rehabilitating some major agricultural projects such as cattle, buffalo and poultry stations ,fertilizer factories, veterinary supplies, cold and frozen storage, seed laboratories, agricultural mechanization and modern slaughterhouses for poultry, cows, buffalo, sheep and goats, and working on developing investment maps based on Bases and foundations for agricultural information and statistics.

8. Expansion of organic agriculture, dissemination of its technologies ,the use of integrated control methods (IPM) and the production of biological predators.

9. Develop and implement an effective policy for agricultural extension with the aim of moving towards modern agriculture and using modern innovations and proper application of research results using improved, high-yield ,good-quality seeds that are resistant to drought conditions and various diseases.

10. Orientation towards the optimal use of irrigation water and management of drainage projects in the fields by continuing to establish extension centers and farms in all agricultural rural areas.

11. Directing farmers and farmers to focus on vertical expansion in agriculture to raise agricultural density and improve land productivity per unit area within the available water quotas along with horizontal expansion in the cultivation of economic agricultural areas that are actually arable.

12. Energy sources (electricity and oil derivatives) represent a major focus in the high costs of agricultural production (plant and animal) and service, so we believe that exceptional and continuous support for oil derivatives and the pricing of the electrical unit for farmers, farmers and investors in the agricultural sector to contribute to reducing the costs of agricultural production.

13. Establishing factories for the manufacture of milk and dairy products, meat and fish to invest the available natural resources, as on-site manufacturing ensures that the chances of product spoilage are reduced and its investment is better, which encourages the population to increase the investment of livestock, and thus increase income.

14. For the purpose of actively contributing to identifying the practical problems and obstacles that the agricultural sector suffers from, it is necessary to involve the researchers of the Ministry of Agriculture in discussing the research plans of the agricultural research centers in the country and to enhance cooperation between researchers and specialists of the Ministry of Agriculture and experts of agricultural research centers and Iraqi universities to discuss research programs and projects.

15. Directing the research of graduate students in colleges of agriculture, colleges of veterinary medicine and technical colleges so that the outputs of their research are applied to solve the problems and obstacles of the agricultural sector.

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PROF. HALIMATON HAMDAN (MALAYSIA) ELECTED IAS FELLOW FOR THE YEAR 2023

Academician Datuk Dr. Halimaton, Hamdan, PhD, FASc., FIAS, FMIC
Director, Gelanggang Kencana Sdn Bhd (GKSB)
R&D Director, Green Tech World (GTW) Pte Ltd, Singapore

Prof. Halimaton is the Director of Gelanggang Kencana Sdn Bhd and R&D Director of Green Tech World Pte Ltd; retired Professor of Chemistry, Universiti Teknologi Malaysia. She is also the Chairman, Board of Trustees, Yayasan My-Prihatin (Prime Minister Office) and a Senior Fellow of Akademi Sains Malaysia. She received her Ph.D in Physical Chemistry from University of Cambridge UK in 1989, M. Sc degree from Marshall University, USA (1981) and B. Sc degree from Indiana University, USA (1979) and was UTM's first woman Professor at 40.

Prof. Hali has successfully promoted her research and innovative activities globally. She pioneered the Zeolites and Nanostructured Materials Research in Malaysia in 1990. She is actively undertaking research, technology development and commercialization initiatives of Renewable Silica (RenSil) nanomaterials as clean, green and safe process for global industrial use. Silica aerogel from rice husk, which she invented, is the lightest solid and best insulator known today, was selected as the product of 2008 by International Clean Energy Circle, UK. It is patented in Malaysia and 22 other countries worldwide. In addition she owns 14 patents on zeolites and mesoporous materials technology.

Her silica based research has evolved into the establishment of Renewable Silica Technology (RenSil), focusing on technology licensing and manufacturing of nanocatalysts and aerogel, design of new generation hybrid, chiral, bifunctional and functionalized heterogeneous catalysts, drug delivery systems, nanostructured materials, aerogel nanofibers and functionalized silica nanosphere chain contributing to sustainable, green, renewable and waste-to-wealth technology. Her current commercial project with GTW is Second Generation Catalytic Depolymerisation of EFB Biomass to Sustainable Aviation Fuel (SAF).

Prof. Hali was the Director responsible for the development of Ibnu Sina Institute for Fundamental Science Studies UTM (2000-2006). She established the Nanotechnology Initiatives (2010) and NanoMalaysia Bhd. (2012) and was seconded to Ministry of Science, Technology and Innovation to be the UnderSecretary of the National Nanotechnology Directorate (2010-12). She chairs the Science Outlook 2015 and 2017. She is an advocate of STEM education and was a member of National Science Research Council (2010-2013) and National Science Council (2014-2017). Her scientific work received recognitions, including Petronas Inventors Award (1993), Seoul International Invention Fair (2002), National Intellectual Property Award (2006). IFIA Cup for Woman Inventor (2008) Int. Federation of Inventors Association, Great Women of Our Time Award (GWOT 2008) and Merdeka Award for S&T and Health in 2009.

She is a Fellow of IKM and MSA, TRSM, President of Malaysia Nanotechnology Association (MNA) and Chairman of International Science, Technology & Innovation Center (ISTIC) under the auspices of UNESCO (2019-2021) and Independent Member of Merdeka Award Board of Trustees (Petronas, ExxonMobil and Shell).

PROF. ABDUL RAUF SHAKOORI (PAKISTAN) ELECTED IAS FELLOW FOR THE YEAR 2024

Prof. Abdul Rauf Shakoori
Professor Emeritus, Distinguished National Professor, School of Biological Sciences
University of the Punjab

Aizaz-i-Kamal, Tamgha-i-Imtiaz, ECO Laureate
Fellow, Islamic World Academy of Sciences
Fellow, The World Academy of Sciences (TWAS)
Fellow, Pakistan Academy of Sciences
Ex-Visiting Professor, U Mass Medical School, MA, USA
Full Member of SIGMA Xi
Academician, Shandong Academy of Agricultural Sciences, Shandong, China
(Rtd) Meritorious Professor

Honorary Director, Center of Biotechnology Research, SAAS, Jinan, Shandong
President, Zoological Society of Pakistan
Professor Emeritus, Distinguished National

Prof. Abdul Rauf Shakoori was born in Sialkot on October 1, 1942. He obtained his Master's degree in Zoology from University of the Punjab in 1962 and doctoral degree from University of Hohenheim, Stuttgart, West Germany in the field of Biochemistry/Cell Biology in 1972. He came back to Pakistan in 1973 to rejoin his position as a Lecturer in the University of the Punjab, where he became Professor of Zoology in 1987 and Meritorious Professor of Zoology in 2002.

Prof. Shakoori has put in more than 58 years of meritorious service as a teacher and research scientist. He is amongst the pioneers who introduced modern trends in Biological Sciences and played a key role in introduction of Cellular and Molecular Biology as a subject of study and research in the Universities of Pakistan. He has worked extensively in the field of Cell & Molecular Biology, Biochemical Toxicology, Environmental Biotechnology and Cancer Biology; and made some significant contributions of fundamental importance in understanding the Mechanism of Regulation of Gene Expression in Eukaryotes. His research publications in the domains of Osteogenesis, Growth and Differentiation, Bioremediation, Bioinsecticides and Herbal Medicine have significant implications on the economy of Pakistan.

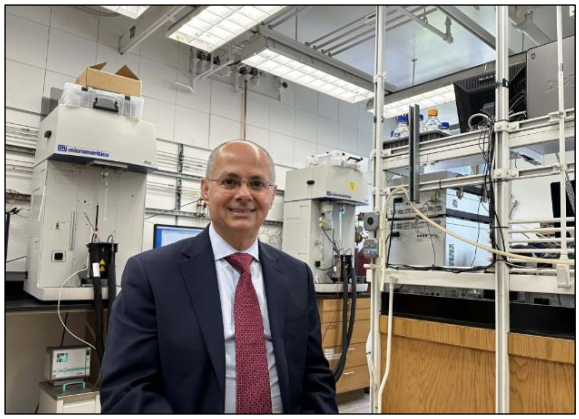
Prof. Shakoori has published 665 original research articles so far in the journals of international repute. He has more than 6300 Google Scholar citations, 37 h index and 2167 i10 index. Eighty three Ph.Ds., 55 M. Phils. and more than 250 B.Sc (Hons), M.Sc. and M.Sc. (Hons) degrees have been awarded to students who completed their research work under his supervision. He has written 23 books published by National (ZSP, PCTB and USB) and International Publishers (Springer Verlag and Elsevier).

Prof. Shakoori developed collaborative research programs with scientists at the University of Massachusetts, Worcester, MA, USA, where he also held a position of Visiting Professor of Cell Biology for more than 25 years. His research collaboration also extended to the Estee Lauder Companies, Melville, N.Y., USA, Department of Pharmacy, King's College, University of London, Department of Agriculture and Environmental Science, University of Newcastle upon Tyne, U.K., University of Marburg, Germany, University of Vienna, Austria, and University of Essex, Colchester, UK.

On the basis of his outstanding academic performance, he was (1) made Distinguished National Professor by HEC in 2005, (2) elected Fellow, Pakistan Academy of Sciences in 2 1991, Fellow, Third World Academy of Sciences (TWAS) in 2004 and Fellow of Islamic World Academy of Sciences in 2024 (3) rated among the top 5 Biologists, and first among Zoologists of the country during 1999-2011. In recognition of his outstanding services for the development of science and his achievements in the field of Cell and Molecular Biology, he was awarded the highest academic award, Aizaz-i-Kamal for the year 1996 by the President of Pakistan, a Civil Award Tamgha-i-Imtiaz by the Government of Pakistan in 1999, Distinguished Scientist of the year Award by Pakistan Academy of Sciences in 2011, and an International ECO Award in the field of Science & Technology by Economic Cooperation Organization in October 2012. In 2019 he was honoured and inducted as Academician in Shandong Academy of Agricultural Sciences, Jinan, Shandong, People's Republic of China.

The excellence achieved by Prof. Shakoori in teaching and research, in modernizing teaching of Biology, his pioneering role in introduction of Molecular Biology as a discipline in the universities, his continued efforts to strengthen University Education through collaborative research programs with leading Universities of the world and involvement in promotion of research culture in universities is also reflected in his efforts in establishing (i) Center of Advanced Molecular Biology, University of the Punjab in 1984, of which he remained Co-Director till 1991m, (ii) Department of Microbiology & Molecular Genetics, University of the Punjab in 2002, of which he was founding Director, (iii) School of Biological Sciences, University of the Punjab in 2002, of which he was one of the three founding Directors till 2019, (iii) Cancer Research Centre, University of the Punjab in 2019 of which he was the Patron in Chief, and (iv) Centre for Biotechnology Research, Shandong Academy of Agricultural Sciences, Jinan, Shandong, China in 2020, of which he is the founding Director (Honorary).

PROF. OMAR YAGHI FIAS RECEIVES THE 2024 TANG PRIZE IN SUSTAINABLE DEVELOPMENT



The Tang Prize, a biennial award established in 2014, has honored five cycles of laureates across various fields. This year, the announcement of the prize winners will unfold over four consecutive days, commencing with the Sustainable Development category. **Today (June 18th), the Tang Prize Foundation announced Omar M. Yaghi, an esteemed American chemist, as the recipient of the 2024 Tang Prize in Sustainable Development. Prof. Yaghi is awarded for his extraordinary contributions to sustainable development, particularly his pioneering work with Metal-Organic Frameworks (MOFs) and other ultra-porous frameworks that can be tailored for carbon capture, hydrogen and methane storage, and water harvesting from desert air.** Prof. Yaghi's research has revolutionized the field of chemistry and materials science, offering transformative solutions for sustainable development through the creation of customizable materials with exceptional properties.

Prof. Yaghi is currently the James and Neeltje Tretter Chair Professor of Chemistry, Department of Chemistry, University of California, Berkeley, a Faculty Scientist Affiliate at Lawrence Berkeley National Laboratory, and the Founding Director of the Berkeley Global Science Institute. He is also the co-director of the newly established Bakar Institute of Digital Materials for the Planet at College of Computing, Data Science and Society. Prof. Yaghi holds 60 US patents and has been honored with many prestigious awards from 17 countries, some of which are among the highest in Chemistry. **Prof. Yaghi has introduced a new method for controlling four of the smallest gas molecules in the atmosphere that significantly impact our planet's sustainable development: carbon dioxide, hydrogen, methane, and water. This was made possible through his pioneering development of a new field of chemistry known as reticular chemistry. Reticular chemistry is a new approach to creating materials by linking organic and inorganic units into strong, porous crystalline structures called metal-organic frameworks (MOFs) and covalent organic frameworks (COFs). Prof. Yaghi demonstrated how these novel framework materials can trap, concentrate, and manipulate hydrogen, methane, carbon dioxide, and water from the air,** offering innovative solutions to pressing issues related to the United Nations' Sustainable Development Goals (SDGs), including energy, environment, and water resources.

Unprecedented Success: First Sustainable Application Yields Amazing Results

As a pioneer of MOFs and COFs, Prof. Yaghi is the first scientist to apply these innovative materials to the field of sustainable development, demonstrating tangible and impressive results. His pioneering work has yielded impressive results. For example, he demonstrated that incorporating one of his MOFs increases the carbon dioxide storage capability at room temperature by 18 folds. Furthermore, chemically modified MOFs and COFs can selectively capture voluminous amounts of carbon dioxide from combustion gases. MOFs are already being utilized in the venting systems of cement plants in Canada. In the context of methane storage, a fuel tank filled with MOFs can triple the amount of methane stored at room temperature and safe pressures compared to a tank without MOFs under the same conditions. This achievement allows automobiles to triple the distance traveled without refueling. Additionally, for hydrogen storage, MOF and COF materials can store up to twelve weight percent of hydrogen (at 77 K and 100 bar) in a tank filled with MOFs, making this technology relevant to the safe and stationary storage of hydrogen.

Using just a kilogram of MOF materials, Prof. Yaghi can harvest water in water-scarce areas with low humidity, such as deserts, using only ambient sunlight. The water is concentrated in the pores of MOFs, and its quality exceeds the standards for drinking water set by the U.S. Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA). In collaboration with industrial companies including General Electric

and startups in the past few years, he has developed portable MOFs water harvesters capable of producing hundreds of liters of water per day in an energy-efficient and cost-effective manner, sufficient for meeting the needs of a family. Prof. Yaghi has stated that the amount of water in the air is nearly equivalent to the total fresh water in all rivers and lakes on the Earth's surface. He aims to help water-scarce areas achieve "water independence" through this technology.

Material Advantage: Pioneering New Solutions for Sustainable Development

The new materials, MOFs and COFs, developed and designed by Prof. Yaghi, have many advantages. First, they are highly crystalline with a stable and durable structure. For instance, the water harvesting device employing MOFs designed by Prof. Yaghi maintains optimal performance even after 30,000 cycles of use. Second, these materials possess record-breaking porosities, robust yet flexible crystallinity, and can scale to multi-ton quantities. Third, their structures can be chemically modified at the molecular level (Lego-like), showcasing the chemical flexibility and precision with which their structures could be designed and manipulated.

Fourth, Prof. Yaghi's research results are not only groundbreaking in basic science but are also rapidly demonstrated in practical applications for sustainable development, such as quantitative production through industry-academia cooperation with the well-known German company BASF. To date, hundreds of laboratories worldwide are actively working on applications for clean energy, clean air, and pure drinking water applications using the materials and technologies he has developed. Several international chemical, materials, and automotive companies and more than 30 start-ups have also launched related programs and products. Currently, it is estimated that more than 100,000 types of MOFs and COFs materials are produced by Reticular Chemistry worldwide. According to data from the Market Watch website under Dow Jones & Company in the United States, the market capitalization of MOFs and COFs was projected to be $270 million in 2021 and $350 million in 2022. These materials, based on technology developed by Prof. Yaghi, are also being applied in the field of medical science. This emerging technology is expected to continue flourishing with endless potential in the future, with market value projections exceeding one billion by 2030.

About the Tang Prize

Since the advent of globalization, mankind has been able to enjoy the convenience brought forth by the advancement of human civilization and science. Yet a multitude of challenges, such as climate change, the emergence of new infectious diseases, wealth gap, and moral degradation, have surfaced along the way. Against this backdrop, Dr. Samuel Yin established the Tang Prize in December 2012. It consists of four award categories, namely Sustainable Development, Biopharmaceutical Science, Sinology, and Rule of Law. Every other year, four independent and professional selection committees, comprising many internationally renowned experts, scholars, and Nobel winners, choose as Tang Prize laureates people who have influenced and made substantive contributions to the world, regardless of ethnicity, nationality or gender. A cash prize of NT$50 million (approx. US$1.7 million) is allocated to each category, with NT$10 million (approx. US$ 0.35 million) of it being a research grant intended to encourage professionals in every field to examine mankind's most urgent needs in the 21st century, and become leading forces in the development of human society through their outstanding research outcomes and active civic engagement.

News source: https://www.tang-prize.org/en/media_detail.php?id=1935

PROF. SHAHER MOMANI FIAS AWARDED THE OUTSTANDING RESEARCHER AWARD

Prof. Shaher Momani FIAS has been awarded the Outstanding Researcher Award in the scientific disciplines at the University of Jordan for the academic year 2023-2024.

THE LATE PROF. BEKHZAD YULDASHEV (UZBEKISTAN)

It is with a sense of sadness and sorrow that the secretariat of the Islamic World Academy of Sciences (IAS) announces the passing away of the eminent scientist and IAS Fellow; **Prof. Bekhzad Yuldashev (Uzbekistan).**

Professor Bekhzad Yuldashev was born in Tashkent on 9 May 1945. He graduated from Tashkent and Moscow Universities in 1968. From 1968 till 1971, he undertook research in particle and nuclear physics at the Joint Institute of Nuclear Research (Dubna, USSR) and obtained his PhD in Physics and Mathematics in 1971. In 1981 he defended his Full Professorship (Doctor of Physics and Mathematics) thesis.

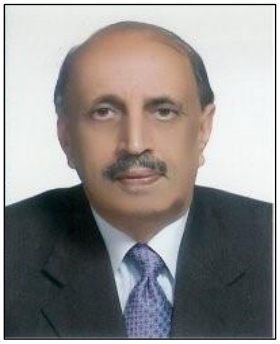
From 1972 till 1983 he was a senior researcher, and from 1984 till 1990 head of the laboratory at the Physical Technical Institute inTashkent. In 1990 he was elected as the Director General of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences and is occupying this position up to now. He is an elected member of the Uzbekistan Academy of Sciences, Fellow of Islamic World Academy of Sciences, member of the American Physical Society. He is an elected member of the Scientific Council of the Joint Institute of Nuclear Research (Dubna) and Head of Nuclear Physics Department of the Tashkent State University.

Dr Yuldashev was the Winner of the 1983 State Prize in Science and Technology. In 1977-78, 1980-81 and 1989-90 Prof. Yuldashev was visiting professor at the University of Washington (Seattle, USA), and in 1997, he was awarded a fellowship of the Indiana University (Bloomington, USA).

Prof. Yuldashev has published more than 200 scientific papers dedicated to various subjects of particle and nuclear physics and has some patents.

At different international conferences he presented numerous invited talks on a study of interactions of particles and relativistic nuclei with nuclei, on isotope production, utilization of gamma and neutron sources etc. He was among organizers and scientific advisories of many international conferences. His research also covers isotope production, utilization of research reactors and instrument making. Presently he is a spokesman for two experiments being performed by international teams of physicists from Uzbekistan, Russia, USA and Canada.

THE LATE PROF. ANWAR NASIM (PAKISTAN)



It is with a sense of sadness and sorrow that the secretariat of the Islamic World Academy of Sciences (IAS) announces the passing away of the eminent scientist and IAS Fellow; **Prof. Anwar Nasim (Pakistan).**

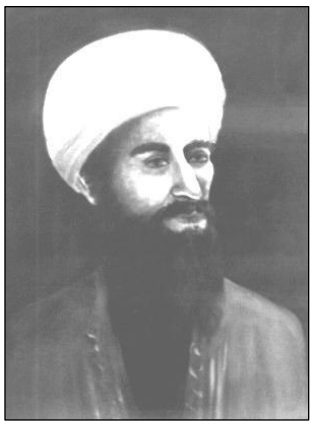
Born in Lahore in 1935, he earned his B.Sc. and M.Sc. from the University of the Punjab, where he was awarded a Gold Medal and Academic Roll of Honor for his exceptional academic achievements. He furthered his education at the University of Edinburgh, UK, where he received a Postgraduate Diploma in Genetics in 1963 and a Ph.D. in 1966.

His career spanned several decades and continents, with positions including President of the Pakistan Academy of Sciences (2015-2017), Secretary General of the Pakistan Academy of Sciences (2013-2014), Advisor for Science at COMSTECH, Islamabad (1996-2011), and Executive Secretary of the Pakistan Academy of Sciences, Islamabad (1994-1996). He served as an Adjunct Professor at the Department of Microbiology and Immunology, University of Ottawa (1983-1989), and the Department of Biology, Carleton University, Ottawa (1984-1989).

His international contributions included serving as Principal Scientist and Head of the Molecular Genetics Group at King Faisal Specialist Hospital and Research Center in Riyadh, Saudi Arabia (1989-1993), and as a Visiting Scientist at the Max Planck Institute in Tübingen, Germany, and Stanford University, USA (1978-1979). Earlier in his career, he held roles as a Senior Research Officer at the National Research Council of Canada (1973-1989) and Research Officer at the Atomic Energy of Canada Ltd, Chalk River (1966-1973). He began his career as a Lecturer in Botany with the Education Department of West Pakistan (1957-1962).

He was recognized with numerous awards, including the Pride of Performance in Molecular Genetics (Govt. of Pakistan, 1995) and the Sitara-i-Imtiaz (Govt. of Pakistan, 1999). He was a Fellow of the Pakistan Academy of Medical Sciences (2000), the Islamic Academy of Sciences (1998), and The Academy of Sciences for the Developing World (TWAS, 1987). His memberships included the Human Genome Organization (HUGO, 1994), and he served on multiple international editorial boards, contributing significantly to the field of Molecular Genetics, Environmental Mutagenesis, Biotechnology, and Bioethics.

JABER IBN HAIYAN* (DIED 803 AD)



Jabir Ibn Haiyan, the alchemist Geber of the Middle Ages, is generally known as the father of chemistry. Abu Musa Jabir Ibn Haiyan ,sometimes called al-Harrani and al-Sufi, was the son of the druggist (Attar). The precise date of his birth is the subject of some discussion ,but it is established that he practised medicine and alchemy in Kufa around 776 AD. He is reported to have studied under Imam Ja'afar Sadiq and the Ummayed prince Khalid Ibn Yazid. In his early days, he practised medicine and was under the patronage of the Barmaki Vizier during the Abbasid Caliphate of Haroon al-Rashid. He shared some of the effects of the downfall of the Barmakis and was placed under house arrest in Kufa, where he died in 803 AD.

Jabir's major contribution was in the field of chemistry. He introduced experimental investigation into alchemy, which rapidly changed its character into modern chemistry. Although the ruins of his well-known laboratory remained centuries after him, but his fame rests on over 100 monumental treatises, of which 22 relate to chemistry and alchemy. His contribution of fundamental importance to chemistry includes perfection of scientific techniques such as crystallization, distillation, calcination, sublimation and evaporation and development of several instruments for the same. The fact of the early development of chemistry as a distinct branch of science by the Arabs, instead of the earlier vague ideas, became well-established and the very name chemistry was derived from the Arabic word al-Kimya, which was studied and developed extensively by the Muslim scientist.

Perhaps Jabir's major practical achievement was the discovery of mineral and others acids, which he prepared for the first time in his alembic (*Anbique*). Apart from several contributions of basic nature to alchemy, involving largely the preparation of new compounds and development of chemical methods, he also developed several applied chemical processes, thus becoming a pioneer in the field of applied science. His achievements in this field include preparation of various metals, development of steel, dyeing of cloth and tanning of leather, varnishing of water-proof cloth, use of manganese dioxide in glass-making, prevention of rusting, lettering in gold, identification of paints, greases, etc. During the course of these practical endeavours, he also developed aqua regia to dissolve gold. The alembic was his great invention, which made easy and systematic the process of distillation. Jabir laid great stress on experimentation and accuracy in his work.

Based on their properties, he has described three distinct types of substances. First, spirits i.e. those that vaporise on heating, like camphor, arsenic and ammonium chloride; secondly, metals, for example, gold, silver, lead, cooper, iron; and thirdly, the category of 68 compounds which can be converted into powders. He thus paved the way for such later classification as metals, non-metals and volatile substances.

Although known as an alchemist, he did not seem to have seriously pursued the preparation of noble metals. He instead devoted his effort to the development of basic chemical methods and study of mechanism of chemical reactions in themselves, and thus helped evolve chemistry as a science from the legends of alchemy. He emphasised that, in chemical reactions, definite quantities of various substances are involved and thus can be said to have paved the way for the law of constant proportions.

A large number of books are included in his corpus. Apart from chemistry, he also contributed to other sciences such as medicine and astronomy. His books on chemistry, including his Kitab-al-Kimya, and Kitab al-Sab'een were translated into Latin and various European languages. These translations were popular in Europe for several centuries and have influenced the evolution of modern chemistry . Several technical terms devised by Jabir, such as alkali, are today found in various European languages and have become part of scientific vocabulary. Only a few of his books have been edited and published ,while several others are preserved in Arabic and have yet to be annotated and published.

Doubts have been expressed as to whether all the voluminous work included in the corpus is his own contribution or it contains later commentaries/ additions by his followers. According to Sarton, the true worth of his work would only be known when all his books have been edited and published. His religious views and philosophical concepts embodied in the corpus have been criticised but, apart from the question of their authenticity, it is to be emphasised that the major contribution of Jabir lies in the field of chemistry and not religion .His various breakthroughs e.g., preparation of acids for the first time ,notably nitric, hydrochloric, citric and tartaric acids, and emphasis on systematic experimentation are outstanding. It is based on such work that he can justly be regarded as the father of modern chemistry .

* *Source: Personalities Noble, 2nd Edition, 2000, Edited by Hakim Mohammed Said, published by IAS with permission of Hamdard Foundation Pakistan.*

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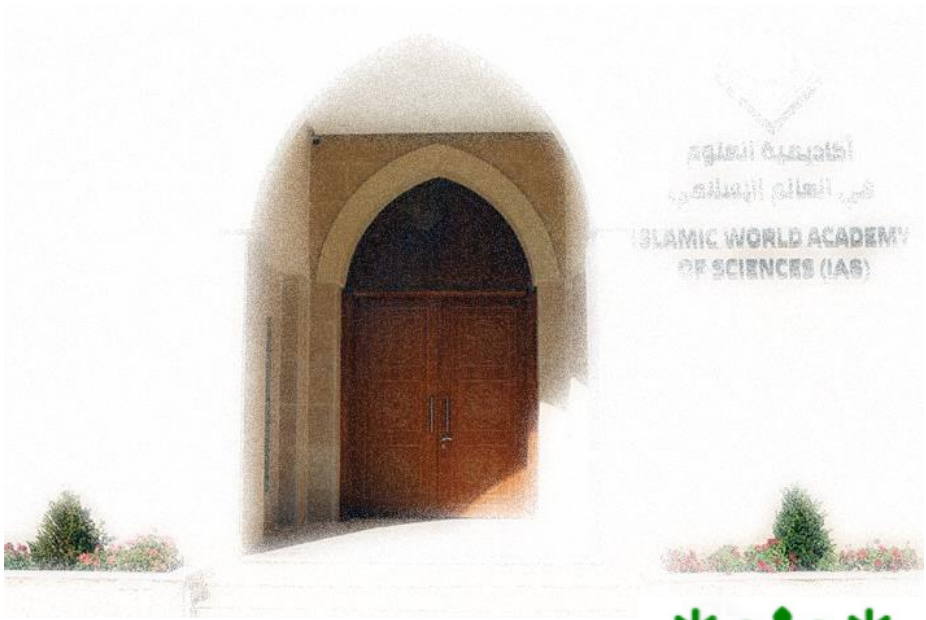

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