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A CREATIVE MINILATERAL APPROACH*

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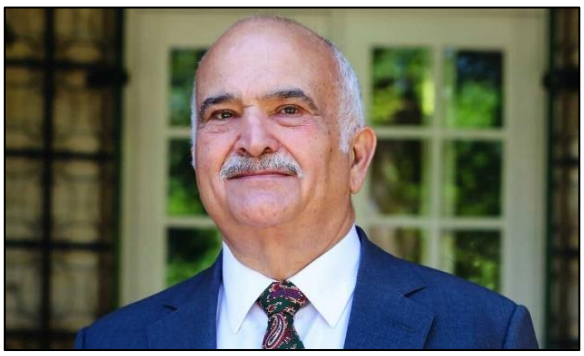
Founding Patron of the Islamic World Academy of Science

Minilateralism, a relatively recent concept in international relations, involves small groups of nations cooperating to address common issues and pursue shared objectives.



Minilateralism, a relatively recent concept in international relations, involves small groups of nations cooperating to address common issues and pursue shared objectives. A creative minilateral approach to tackle challenges in the region necessitates acknowledging the importance of authentic frustration, rather than concentrating solely on militancy. It is this genuine discontent that often drives us into political standoffs and a sense of futility. Recognizing and addressing the root causes of this frustration can be key to developing effective minilateral strategies for lasting solutions.

In my region, the Levant region, the prevalence of minilateralism has increased significantly, particularly as numerous countries grapple with the enduring repercussions of prolonged conflict, instability, and external interventions spanning several decades. The region encompasses 90 million people; Jordan, Iraq, Syria, Lebanon, Israel, Gaza and the West Bank – 175 million if we count Turkey – across the Greater Levant Within this context, states are showing a growing inclination to establish alliances and coalitions, working together to collectively address shared challenges. *(Continued on page 2)*

* *Source: https://moderndiplomacy.eu/2023/12/11/a-creative-minilateral-approach/*

PERMANENT HEAD QUARTERS OF THE ISLAMIC WORLD ACADEMY OF SCIENCES IN AMMAN, JORDAN

The permanent headquarters of the Islamic World Academy for Sciences is located in Amman, Jordan with an estimated building area of around 2,733 m^2.

The building was built with donations from various institutions and contributions from IAS Fellows.

The building hosts a large auditorium fully equipped with visual and sound systems and can fit up to 200 people, conference and seminar halls equipped with teleconferencing technology and can fit 20-30 people, a library containing various publications of IAS and other institutions, offices for the staff, a meeting room and two cafeterias. It has a spacious outdoor terrace, exhibit areas and an adequate parking space on the basement level.

(Continued on page 3)

(Continued from Page 1 - A Creative Minilateral Approach)

This shift towards minilaterism underscores the recognition that collaborative efforts are essential in navigating the complex and longstanding issues that have shaped the region's dynamics.

Historical Context

The Levant region has experienced its fair share of conflict, ranging from the Arab-Israeli conflict to challenges posed by civil wars across the region, and ongoing security concerns. Traditional multilateral efforts, such as those by the United Nations, often face difficulties due to divergent interests and longstanding hostilities. In response, minilateralism has gained traction as a flexible and adaptive alternative.

Palestinian civilians, whether in the West Bank or Gaza, are increasingly being pushed towards the fringes of extremism and nihilism if we fail to provide protection. It prompts us to inquire about the identity of the key actor capable of influencing Palestinians in their plight or instilling the necessary trust in Israel to construct a much-desired and lasting peace solution. While the need for intermediaries is evident, the conflicting parties show reluctance to assign themselves or each other the responsibility of pursuing political peace.

Cutting off water, food deliveries, electricity generation compounds – all basic human necessities – are challenges that 2.2 million people in the Gaza Strip face today, are leading to dire living conditions. The characterization of this campaign as a massive act of collective punishment against civilians underscores the gravity of the humanitarian concerns arising from the conflict.

The Jenin Refugee Camp has witnessed the evacuation of over a 1000 Palestinians, underscoring the precarious situation and the potential, forcible population transfer. In an ongoing debate of "can Israel do it alone?", the recent gravity of international legality and UN resolutions has been disrupted by the elevation of proxies. These proxies persist in their designated roles, pushing the boundaries of confrontation. The alignment of resistance and the normalizers does not seem to lead to an agreement on a diverse mutual respect, crucial in determining the future trajectory between war and peace. The intricacies of this dynamic underscore the challenges in achieving a consensus and fostering a pluralistic understanding that embraces mutual respect within the region.

Moving Forward

The establishment of regional initiatives that are minilateral and transboundary structures, such as a Citizens' Assembly for the Levant or an Economic and Social Council (ECOSOC), tailored to the unique needs of the region, led and organized by the region itself, would undoubtedly contribute to the advancement of our regional creative commons and that would support the goal of Detente from below. Such initiatives could serve as a platform for fostering economic and social cooperation among the participating countries in the Levant region.

In particular, a Levant Citizens' Assembly should be homegrown, as a civil society initiative, through a vision of 'people first' and 'people-centered diplomacy'. Similarly, can be said about the establishment of an ECOSOC. Why not empower the youth to create a simulacrum of such council in our region? A youth-led economic and social council could convene regularly, presenting regional priorities directly to the World Bank, the IMF, and remodeling the purposes of the Britton Woods objectives. This approach would enable young people to actively participate in shaping their future by becoming stakeholders in defining and addressing the challenges of their region.

Facing the challenges

Minilateralism while presenting a strategic approach to international relations, is not without its challenges. One notable criticism lies in its limited inclusivity, where the exclusivity of such arrangements may lead to the sidelining of key regional actors and their perspectives. The success of minilateral initiatives is intricately tied to the willingness of all relevant parties to engage, highlighting the ongoing challenge of achieving broad inclusivity.

Additionally, the sustainability of minilateral agreements is contingent upon the stability of participating nations and the durability of their commitment. Shifting geopolitical dynamics or changes in leadership could potentially impact the long-term effectiveness of these initiatives. Another concern revolves around the delicate task of balancing power dynamics among participating nations. Struggles in achieving equitable representation and preventing power imbalances from undermining the objectives of regional initiatives are crucial factors for ensuring its enduring success. Despite its advantages, addressing these issues is imperative for minilateralism to realise its full potential in fostering effective and lasting international cooperation.

Potential Benefits

While challenges in such approaches persists, minilateralism emerges as a strategic approach offering distinct advantages in navigating evolving regional challenges. One notable strength lies in its inherent flexibility and adaptability, allowing a select group of participants to tailor responses to specific issues, thereby promoting pragmatic solutions.

Moreover, minilateral initiatives prioritise incremental progress, concentrating on achievable goals amidst broader regional complexities. This approach not only facilitates tangible advancements but also enables participants to gradually build trust and confidence over time. Perhaps most significantly, minilateralism plays a pivotal role in conflict prevention by addressing issues at their roots.

By undertaking targeted efforts, this approach holds the potential to prevent the escalation of conflicts, contributing to the establishment of a more stable and cooperative regional environment. In essence, the strengths of flexibility, incremental progress, and conflict prevention underscore the value of minilateralism in addressing complex regional challenges with a nuanced and effective strategy.

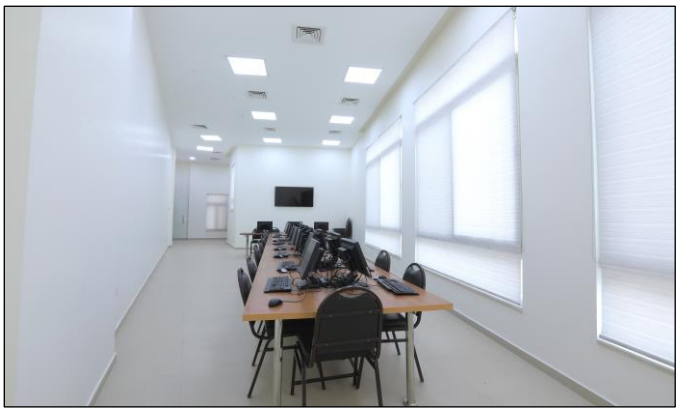
Conclusion

Certainly, a minilateral approach provides a fresh perspective for addressing long-standing regional challenges, one that is attuned to the grievances and aspirations of the affected population. By engaging a small group of nations with a shared interest in specific issues, a minilateral framework allows for a more focused and flexible response.

Minilateralism has emerged as a nuanced and practical approach to addressing the intricate geopolitical landscape of the Levant region. While challenges persist, the potential success of initiatives like a Levant Citizens' Assembly or an ECOSOC underscores the potential of focused collaboration among key stakeholders and enables us to build and sustain peace. As the region continues to navigate its complex challenges, minilateralism is likely to play a crucial role in shaping more effective and tailored diplomatic solutions.

(Continued from Page 1 – IAS HQ in Amman)

Petra Conference Hall is the main venue for conferences that fits up to 200 people contributed by the University of Petra. Suitable for conferences and large seminars. It is equipped with data show, big screen TVs and sound systems.



KFAS Training Hall contributed by Kuwait Foundation for the Advancement of Sciences and can fit up to 20 participants and is equipped with computers and teleconferencing facilities.

Saleh Kamel Symposium Hall contributed by the Jordan Islamic Bank can fit up to 30 participants and is equipped with teleconferencing facilities.

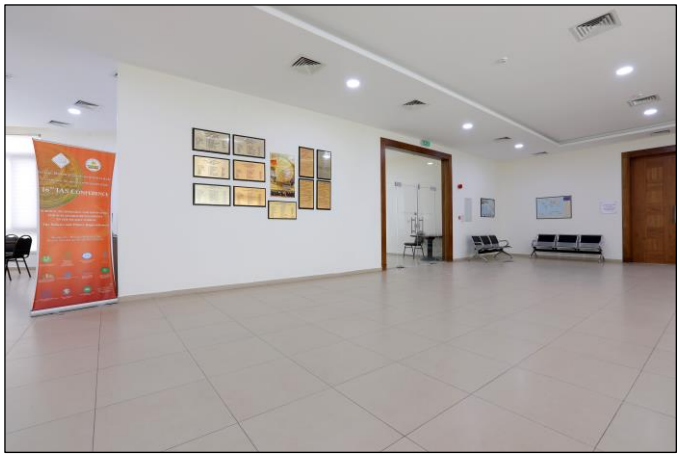
Samih Darwazeh Hall for Science Seminars contributed by Hikma Pharmaceutical Company can fit up to 30 participants and is equipped with teleconferencing facilities.

Abdel Salam Majali Meeting Room named in honor of the Late Prof. Abdel Salam Majali, President of IAS (1999 - 2022). It is used for meetings both in person and on Zoom.

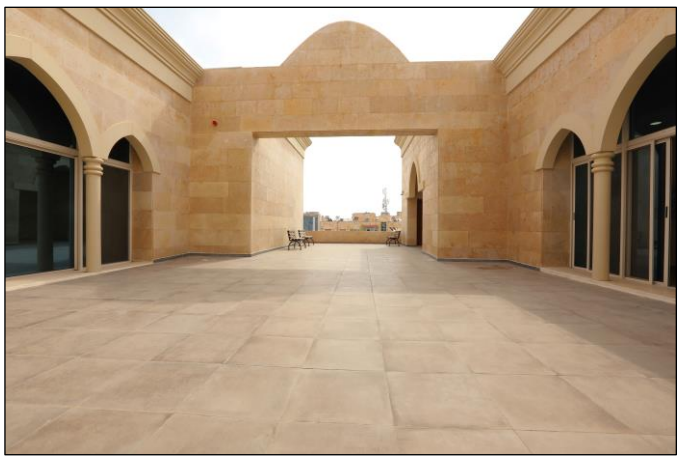
Library.

Reception Hall (First Floor).

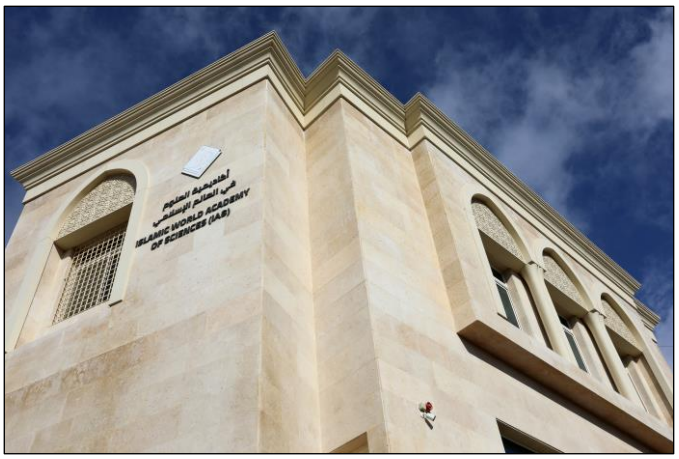
Staff Offices.



Reception Hall (Second Floor).



Terrace.



Outside view of the IAS Building.

BIOLOGICAL DIVERSITY AND HUMAN RESOURCES

Adnan Badran FIAS, FAAS*
President, Islamic World Academy of Sciences

Biological diversity is the totality of life on earth, in all its variety, molecular, cellular, species, ecological and landscape patterns. Human activity is rapidly eroding the biological diversity of our planet. Agriculture and industry depend on the variety of earth flora and fauna. With the destruction of the habitat over the next 30 years, the number of losses is likely to increase to 15,000-50,000 per year, or about 40-140 species per day.

There are about 30 million species on earth (some scientists go up to 80 million estimated) of which only about 1.5 million have been identified and described. Of this figure, the majority (750,000) are insects, 41,000 are vertebrates and 250,000 are plants. The remainder are invertebrates, fungi and microorganisms. Most biological diversity is seen in the tropics near the equator in tropical forests and coral reefs. One hectare in the tropics may have 40-100 species as compared to 10-30 species in the north.

As a matter of fact, in Borneo (an island in Southeast Asia, the third largest island in the world), 700 tree species have been found in 15-hectare area of rain forest the same number as in the whole of North America. Also, some regions of the world support a climate that produces an abundance of species which are unique to the region; the Mediterranean is an example. 80% of plants found in such areas as southern Africa grow only in that region, while the proportion is 70% in South-West Australia, and in California.

Wetlands are unique in supporting a mixture of species and are considered the most productive biological ecosystem in the world, they are also regarded as the wasteland and habitat of pests and disease carrying insects, and are being destroyed in almost every region. Europe has lost almost its entire wetlands, the United States lost 50% and some tropical countries have lost 80%.

Over the planet's life, species appear and disappear all the time. The biological beauty of the DNA molecules double-helical strands, how it is engineered, how it duplicates and how it diversifies production of millions of species through the simple sequencing of the nucleotides to give the millions of character-genes to produce diversity within, and among species... is unique, and it carries with it the most hidden secrets of life. Appearance of species is due to the power of DNA to regenerate for the continuity of life.

The disappearance of species is due to climate change, an unsuitable environment for survival, natural disasters etc. Those lost naturally over the planet's history, or since life appeared on the planet over time, account for perhaps 99% of all species that ever lived and existed. However, human activity is now killing them much faster. The rate of destruction is terrifying and is a nightmare for those who realize and appreciate that millions of years were taken for nature-inputs in building the genes blocks of unique and adaptable species for every macro and microclimate of mother-earth are sentenced to waste. Not only that, but the biological engineering network of the web of life, the life interdependance and the life-system itself are being destroyed which is going to bring disaster rapidly to man himself.

About one-quarter of earth's species risks extinction within the next 30 years. Scientists estimate, that by the year 2050 over half of earth's species will become extinct and be lost forever. This obviously will upset the natural balance of the ecosystem, destroying vulnerable species. One reason for the accelerated catastrophe by man, is that the natural habitat which took millions of years to evolve, is being destroyed. Tropical forests which cover only 14% of earth surface but contain 50% and 90% of the world's species and current rates of deforestation are eliminating those natural gene banks at between 17 and 20.4 million hectares per year.

Many species are put at risk even face extinction of commercial interests (i.e. whales, elephants). Pollution of air, water and land has also reduced the number of species.

It is extremely important to preserve the numerous varieties of fauna and flora that belong to any one species. Each variety within a species contains unique genes, and the diversity of genes within species increases its ability to adapt to changing environments such as pollution, diseases and other factors.
When varieties of plants and animals are destroyed, the genetic diversity within the species is diminished. Maize and rice contain only a fraction of the genetic diversity they harbored within the species a few decades ago.

I. Biological Diversity for Food

Food production will have to be tripled over the next 40 years to meet the doubling population pressure growth or the world-demographic explosion.

* *Biologist, Professor and Chancellor of University of Petra, Jordan.*

To achieve this, new strains of existing crops must be developed of higher yield, of resistance to pests and of strains that grow under hostile environments and under stress. This means that new genetic materials have to be reintroduced every 5-10 years to ensure that commercial food crops continue to flourish-that is biotechnology. Because traditional agriculture can no longer meet the demands imposed on it, a minimum diet for one person requires at least 0.6 hectares of arable land. Traditional agriculture on today's arable land can hardly feed half of today's population. So better genetic materials (seeds) through biotechnology is the answer. And the genetic building blocks needed to bring this about are only available in the wild which is under dramatic destruction by today's man. The number of chronically hungry people in the world increased from 460 million in 1970 to 550 million in 1990, 650 million by the year 2000, 800 million by 2020. The greatest diversity is usually found under conditions of low productivity, poor soil and inadequate moisture. Since such environments are unlikely to support productive sustainable agriculture or forestry, high-density tropical forests in the Amazon have produced repeated failures to either productive agriculture or productive plantation forestry so far.

Over most of human history, economics dictated land-use for agricultural purposes; and the tragedy of the current wave of burning the Amazons and tropical deforestation of inherently low-productivity land is that they are likely to be of little or no economic value. Those forests of maximum biological diversity (the gene pool) are being destroyed for short-sighted and minor economic gain. Moderately productive soils in the tropics have already been converted several hundred years ago to agriculture and the present rainforests are best suited for low-intensity uses such as watershed protection, extracting highly selected valuable vegetative resources, medicinal plants, wild genetic building blocks for new strains of food and medicinal crops-for the preservation of biological diversity.

This is not just of academic interest. Resistance to seven serious diseases is being introduced into commercially cultivated maize using genes from a wild plant ancestor found growing in Mexico. The same plants can also turn maize into a perennial crop. These two innovations would save an estimated US$ 250 million a year.

Another commercial application from rainforest biological diversity is the derivation from a Paraguayan plant of calorie-free sugar which is 300 times sweeter than sugar. Also, the application of gene transfer techniques in producing high-yielding rice, wheat, etc., made many countries self-sufficient in basic food production.

One gene from a single Ethiopian barley plant protects California's US$ 160 million annual crop from yellow dwarf virus. It is estimated that 4.5 percent of the United States Gross Domestic Product is attributable to the harvest of wild species.

II. Biological Diversity for Medicines

The exploitation of biological diversity of the wild to produce new medicines is used extensively in biotechnology by industries. The discovery of a drug to treat leukemia in Madagascar's rosy periwinkle, for example, has increased the survival chances of children from one in five to four in five. World-wide, medicines from plants are now worth more than US$ 40 billion a year.

Another application includes the derivative of diosgenin, the contraceptive pill, from Mexican Yam.

There is also much to learn from people who for centuries lived in harmony with the forests. In Amazonia over 1,300 plants are cultivated and used for medicinal purposes by indigenous peoples.

III. Biological Diversity for Industries

Industry benefits from natural products from wood to rubber, from natural oils used by chemical industries to cornstarch used in making paper or hydrocarbons derived from a fish, in making inks. Investigations underway include identifying natural oil substitutes for petroleum.

In Asia, over half the world's population, new strains are needed to cope with this population increase. Many of the world's basic food plants originate from Asia: rice, beans, onions, apples, pears, bananas, sugar cane, tea, etc. Winged bean is a potential new food crop. Wax gourd which produces four crops a year and can be stored for 12 months without refrigeration is another potential crop. However, the habitat of other new crops is being destroyed. The Philippines for example lost 55% of its tropical forest and only 10% of the country's coral reefs remain in good condition, while its mangrove forests have been reduced from 14,000 hectares in 1980.

IV. Gene Banks and Biosphere Reserves

Governments and international organizations and NGOs have taken steps to conserve biological diversity; one way is to insure plants and animals are used sustainably, another is to establish protected areas which cover 5% of the earth's surface. UNESCO is the most active organization where 300 biosphere reserves have been established covering all habitats of the world, terrestrial and aquatic, under its well-known Man and the Biosphere (MAB) Program. Sustainable utilization in harmony with the endemic population and setting also were established. So, biosphere reserves are by no means isolated islets, but are natural reserves with all their ingredients including human activity.

In addition, gene banks for wild and cultivated plant species are being built. FAO is the most active for plant species, while UNESCO is the most active concerning microbial species through its well-known MIRCEN network.

Challenges to Human Development Index (HDI) in Islamic Countries Despite Prolific Scientific Output

Zabta Shinwari
Vice President, Islamic World Academy of Sciences

Introduction:
Human Development Index (HDI) is a widely used metric to gauge the overall well-being of a nation's citizens, considering factors such as life expectancy, education, and per capita income. Despite the increasing number of scientific publications emanating from Islamic countries, the HDI in many of these nations remains unsatisfactory. This paradox raises questions about the effectiveness of scientific advancements in translating into improved living standards and human development. This article delves into the reasons behind the discrepancy between prolific scientific output and unsatisfactory HDI in Islamic countries.

Resource Allocation:
One primary reason for the gap between scientific achievements and HDI in Islamic countries lies in the allocation of resources. While these nations may be investing significantly in scientific research and development, the distribution of resources is often skewed. Funds may be concentrated in urban centers or specific industries, leaving rural areas and marginalized communities without adequate access to education, healthcare, and economic opportunities.

Education Quality and Access:
Despite the increase in the number of scientific publications, the quality of education in many Islamic countries remains a concern. High illiteracy rates, particularly among women, limited access to quality education, and outdated teaching methods hinder the development of a skilled and competitive workforce. The lack of emphasis on practical skills and critical thinking in education systems can impede the application of scientific knowledge to address real-world challenges.

Gender Inequality:
Gender inequality is a persistent issue in many Islamic countries, impacting HDI indicators such as education and employment opportunities. Limited access to education for women and cultural barriers that restrict their participation in the workforce can hinder the overall development of a nation. Addressing gender disparities is crucial for achieving sustainable human development.

Political Stability and Governance:
Political instability and ineffective governance can undermine the impact of scientific advancements on HDI. Corruption, lack of transparency, and mismanagement of resources can divert funds away from essential sectors such as healthcare and education. Additionally, political unrest and conflicts can disrupt social and economic systems, exacerbating poverty and hindering progress.

Economic Diversification:
Overreliance on a single sector, such as oil or natural resources, is a common issue in many Islamic countries. While scientific advancements may contribute to the development of these industries, the lack of economic diversification leaves nations vulnerable to fluctuations in global markets. A diversified economy is essential for sustained development and resilience against economic shocks.

Conclusion:
While the publication of scientific articles is a positive indicator of intellectual growth, it alone does not guarantee improvements in Human Development Index (HDI). Islamic countries need to address systemic issues such as resource allocation, education quality, gender inequality, political stability, and economic diversification to ensure that scientific advancements translate into tangible improvements in the well-being of their populations. A holistic approach that integrates scientific progress with social and economic development is essential for achieving sustained and meaningful human development in these nations.

MOLECULAR LIFESTYLE

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It was held the 24th Islamic World Academy of Sciences Conference on "Challenges to Promote Science & Technology for Socio-Economic Development in OIC Countries" at the International Center for Chemical and Biological Sciences (ICCBS), University of Karachi, March 7-8, 2023. In this conference the terminology **"Molecular Lifestyle"** was defined and introduced for first time, in the scientific lecture of Ali A. Moosavi-Movahedi, the Fellow of Islamic World Academy of Sciences.

To live a better life today, we need to know more about the molecules and biomolecules that govern humans and other organisms. No one is exactly alike, so everyone should have personal and social self-knowledge for a healthy lifestyle. The progress of a country depends on its health. The World Health Organization (WHO) defines health in four parts: physical, mental, social, and spiritual. Human physical and mental functions are carried out by molecular reactions and interactions. Molecules make up the body. For example, the vitamins, hormones, drugs are molecules. Some human actions secrete rewarding molecules inside human body such as oxytocin, serotonin, melatonin, etc. and others are generous molecules that exist in nature outside the human body such as curcumin, gingerols, etc. which in this report cited molecules are called **"Molecular Blessings"**. Blessing is an invisible sustenance that supports and guides' man.

Rewarding molecules: There are molecules that are secreted in the internal body as a result of good deed, and human is satisfied with these rewards. A few examples are as follow:

Oxytocin: satisfaction molecule.
This molecule is called life, happiness, love, trust and kindness. Oxytocin, as a multifunctional neuropeptide, provides the basis for the emergence of generosity, trust and altruistic relationships. A person who lay a hand on an orphan's head, show kindness to his/her mother, heal a pigeon's broken leg, at this time, this molecule will be secreted and inner body satisfaction will be achieved, then you can live happily in this way. Oxytocin facilitates communication with others and is associated with positive social behaviors, thus creating happiness by facilitating social relationships [1].

Serotonin: happy molecule.
Serotonin is a neurotransmitter that causes happiness and optimism. Serotonin levels increase following smile therapy and decrease in depression and most modern antidepressants. Gentle exercise effectively regulates the serotonin system. There is a lot of evidence that serotonin in the brain increases during prayer, and on the other hand, the clear intestine is very important in this secretion. Spiritual practices can have significant anti-depressant effects due to the increase of serotonin and dopamine. Gut microbiome is one of the sources of serotonin secretion in the body. The most important issue of microbiomes is the diversity and balance of the population of good microbes, which is one of the keys to health. Each person's microbiome is unique like a fingerprint.

Based on the results of ourself research, serotonin reduces the oligomeric size distribution of αB-crystalline, so when the oligomers are reduced, the toxicity of the eye lens cell environment is reduced [2].

Melatonin: sleep molecule.
Serotonin turns into melatonin via an enzymatic reaction during the dark night. The happier we are during the day, the easier we sleep. After sunrise, even if the space is completely dark, only resting happens, not sleep. Sleep just defines by biological clock. Melatonin regulates sleep and wakefulness, central body temperature regulator, anti-aging, anti-cancer, strong tumor inhibitor, immune system booster, anti-depressant, stroke prevention, blood pressure reducer and pain relief.

This molecule (hormone) passes through the placenta during the fetal period and is transferred to the child through mother breast milk after the birth of the baby. According to the results of ourself research, melatonin inhibits the accumulation of human αB- crystalline. Therefore, melatonin probably plays an important protective role in the transparency of the eye lens and preventing cataract [2].

Generous molecules:
There are molecules in nature and outside the body that are generous and help humans and other creatures.

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Some molecules act as nutraceuticals (molecular food as a medicine). Quoted by Avicenna: your food should be your medicine. The below is the example of two nutraceuticals.

Curcumin: a versatile and tailor molecule. The curcumin molecule is the tailor of the body and is a very good food medicine for disease modulation, especially anti-diabetic functions and its complications. Curcumin is a multifunctional molecule and can modulate and regulate different signaling pathways in cells. Its modulating effects lead to antioxidant and anti-inflammatory activity in cells. It has various isomers that are created following the tautomerization of ketonol (hydrogen jumps and isomeric states) and each one has a unique function; hence a wide range of chemical functions are reported for the curcumin molecule. Curcumin significantly reduces the production of reactive oxygen species (ROS) and their destructive effects in the body [3]. Cell phone electromagnetic radiation causes ROS and increase in the body [4].

Gingerols: Pain killer. Among the most important uses of gingerol molecules, we can mention anti-nausea and vomiting, protective coating of memory and digestive system, removal of blockage and muscle cramps, anti-flatulence, strengthening of vision and improvement of blurred vision and strengthening of lungs. These molecules manage free radicals and prevent damage to cells. In this context, a book titled " Ginger: Natural Pharmacy " has been published [5].
Caution: So far, all good molecules have been introduced. But below is a warning molecule:

Acrylamide: neurotoxin
Acrylamide is formed when starch-based foods (which are high in hydrocarbons) are cooked or fried at high temperatures. Acrylamide is known as a neurotoxin and potentially carcinogenic to humans.
A very important issue is the rule of accumulation in the body! Like fried potatoes in very hot oil. Always keep this point in mind to pay attention to the concentrations, many poisons work in high concentrations and show their effects after accumulation [6].

Conclusion: healthy lifestyle

Be inspired, forgive, live happily.

A healthy person with a good lifestyle creates balance inside the body and outside the body (nature). Human inner-nature and nature both have the same essence and are related to each other. Therefore, humans should know nature well and imitate it, and innovations and technologies should be created based on biomimetics and bioinspiration science and technology should be considered in the healthy lifestyle [7]

A good lifestyle is a good management of the secretion of rewarding molecules from within the body and recognition of healing molecules in nature.

Keywords: Rewarding molecules, Good deeds, Nature generous molecules, Molecular blessing, Molecular lifestyle

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Ali A. Moosavi-Movahedi is Professor of Biophysics and Head of Institute of Biochemistry and Biophysics, University of Tehran. His research career has been mostly marked on protein structure function relationship. He is already the Fellow; I.R. Iran Academy of Sciences; the Fellow of The World Academy of Sciences (TWAS); the Fellow of Islamic World Academy of Sciences (IAS), the Chairman of UNESCO Chair on Interdisciplinary Research in Diabetes.

HIGHER EDUCATION IN THE ARAB WORLD: ARTIFICIAL INTELLIGENCE

Adnan Badran[1] FIAS, FAAS
President, Islamic World Academy of Sciences and President, Arab Academy of Sciences

Arab Academy of Sciences has announced the title and the date of the Higher Education conference in Beirut on November 22-23, 2024.

The academy has been active in holding its annual conference in Beirut in cooperation with the University of Petra in Jordan and the American University of Beirut with attendees from various universities abroad.

Books which were published by Springer Nature based on the conferences of the Arab Academy of Sciences on each theme were:

1. ***"Universities in the Arab World: an Urgent Need for Change"*** was based on the output of the 2016 annual conference of the Academy and was published by Springer Nature in 2018.
2. ***"Major Challenges Facing Higher Education in the Arab World: Quality Assurance and Relevance",*** was based on the output of the 2017 annual conference and was published by Springer Nature in 2019.
3. ***"Higher Education in the Arab World: Building a Culture of Innovation and Entrepreneurship"*** was based on the output of the 2018 annual conference and was published by Springer Nature in April 2020.
4. ***"Higher Education in the Arab World: Government and Governance"*** was based on the output of the 2019 annual conference and was published by Springer Nature in December 2020.
5. ***"Higher Education in the Arab World: Research and Development"*** was based on the output of the 2020 annual conference and was published by Springer Nature in February 2022.
6. ***"Higher Education in the Arab World: New Priorities in the Post Covid-19 Era"*** was based on the output of the 2021 annual conference and was published by Springer Nature in September 2022.
7. ***"Higher Education in the Arab World: E-Learning and Distance Education"*** was based on the output of the 2022 annual conference and was published by Springer Nature in August 2023.
8. ***"Higher Education in the Arab World: Digital Transformation"*** was based on the output of the 2023 annual conference and was accepted for publication by Springer Nature.
9. For information, the first book published by the Academy was entitled "Water, Energy & Food Sustainability in the Middle East: The Sustainability Triangle". It was based on the output of the 2015 annual conference of the Academy and was published by Springer Nature in 2017.

The next conference is on Artificial Intelligence in Higher Education (AIEd) which will be held in Beirut. The following is the scope of the conference which was prepared by the **organizing committee**:

Artificial Intelligence at a Glance

The term Artificial Intelligence (AI) was first coined in 1956 by John McCarthy who is considered one of the founding fathers of AI. He defined AI as *"the science and engineering of making intelligent machines"*. Since then, AI has metamorphosed into computing systems characterized by "*human-like processes such as learning, adapting, synthesizing, self-correction and the use of data for complex processing tasks".*

AI in Higher Education

In the academic sphere, AI is taking center stage as a transformative force, often acknowledged as AI in Education (AIEd). Grasping the essence of AIEd within the higher education milieu is imperative. Commonly described as the advent of the 'Smart University,' AIEd represents a paradigm

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

shift in the operational ethos of Universities and Colleges.

Smart Universities in the context of AIEd are marked by several key characteristics. With regards to admissions and enrollment, AIEd tools can harness data on a plethora of metrics including recruitment, retention, and graduation outcomes. Teaching and learning are now entering an era of personalization and adaptability, thanks to the facilitative role of AIEd instruments. These digital tools are instrumental in pinpointing at-risk scholars, projecting academic trajectories, ensuring originality via plagiarism checks, and guiding course selection.

Researchers are also benefiting from AIEd tools to sift through large data banks and analyze and identify patterns and insights that can inform their practice. Administrative spheres similarly reap the benefits of AIEd's prowess, yielding heightened efficiency in operations, financial stewardship, and resource management - an endeavor that alleviates administrative load and, consequently, reallocates fiscal resources towards educational and research priorities. Additionally, the domain of human resource management is undergoing a renaissance under AIEd's influence, enhancing everything from hiring to career progression through a data-influenced, employee-centric approach. To seamlessly weave AIEd into the institutional fabric, a series of steps must be adopted such as:

University Leadership - The role of leadership is pivotal in guiding the university through the transformative journey of AIEd and digitization. Leaders must be visionary individuals with an acute understanding of technology's transformative potential in pedagogy.

Campus-Wide Discussions - Universities must embark on comprehensive, pan-campus dialogues aimed at demystifying AIEd's intent and ramifications.

Strategic Integration - Following these discussions, the university must formulate a coherent strategy, interlacing AIEd into the very sinews of academia - from pedagogy and research to operations and infrastructure.

Mindful Innovation Culture - This means that universities must establish an environment that nurtures the absorption and facilitates the assimilation of AIEd within their academic community.

Ethical Governance Framework

Universities should work on developing an ethical governance framework for AI to ensure that all of the challenges that come with AIEd are addressed and minimized as well. AI in education raises ethical and legal considerations, such as the ethical use of student data and AI systems that do not violate students' rights.

From an ethical standpoint, the utilization of AI in educational settings raises concerns regarding the equitable treatment of students. Potential biases encoded within AI algorithms, whether due to skewed training data or developer oversights, can lead to discriminatory outcomes affecting admissions, grading, and the provision of educational resources. Ensuring that AI systems function without prejudice and in a manner conducive to the advancement of all students is a paramount ethical imperative.

The virtuous use of student data is another salient ethical issue. AI systems require expanses of data to operate efficiently, yet the collection, processing, and storage of such data must be conducted with the highest degree of respect for students' privacy and consent. This involves the establishment of transparent data governance policies that uphold the integrity and confidentiality of personal information.

Legally, the application of AI in educational environments intersects with several regulatory frameworks. Data protection laws, such as the General Data Protection Regulation (GDPR) in the European Union, impose rigorous mandates on the handling of personal data, with implications for AI systems' design and operation. Institutions must navigate these legal requirements assiduously to prevent breaches that can attract substantial penalties.

Intellectual property rights also intersect with AI in education. The generation of content, whether it be course materials or research outputs, via AI raises queries about authorship and ownership. Academic institutions need to scrutinize how intellectual property laws apply to AI-generated works and establish clear policies accordingly.

Furthermore, questions surrounding the accountability and transparency of AI decision-making processes can lead to legal quandaries. Students and staff affected by decisions made with the assistance of, or entirely by, AI systems have a

reasonable expectation to understand the basis for such decisions. This calls for explainable AI systems that can break down their decision-making process in intelligible terms. Failure to ensure transparency may lead to legal challenges, contending that such obfuscation violates principles of due process or fairness.

Lastly, compliance with accreditation standards and educational regulations when employing AI in curricular and assessment procedures is a legal consideration that cannot be overlooked. Institutions must maintain adherence to established standards to ensure that the incorporation of AI does not diminish the quality or integrity of the educational experience.

Addressing these ethical and legal challenges necessitates holistic strategies that encompass policy development, stakeholder engagement, and continuous evaluation of the AI systems employed. It also requires proactive collaboration among educational institutions, AI developers, legislators, and regulatory bodies to create a balanced ecosystem where AI can flourish without compromising ethical values or legal standards.

Implementing AI in higher education on a national scale is an ambitious undertaking, requiring methodical planning and execution. It necessitates a multifaceted approach that is underpinned by collaborative visioning, regulatory framework development, and robust infrastructure investments. The progression toward an AI-augmented future involves:

- Crafting a unified national strategy that encompasses policy guideline establishment, stakeholder consensus, and technological infrastructure advancements.
- Catalyzing AI adoption through incentivized research, educational curriculum revamps, and proactive workforce skill development.
- Ensuring responsible scaling with pilot projects, systematic evaluations, ethical AI governance, and continuous learning commitments.

By following these steps, a nation can move toward implementing AI in higher education in a strategic, responsible, and impactful manner. It is essential, however, to strike a balance between innovation and caution, ensuring that technology serves to enhance the educational ecosystem rather than undermine its foundational values.

The Way Forward for Universities

What is the reality of AIEd as we enter 2024?

The purpose of this edition is to explore and critically examine the actual and potential impact of AIEd within all aspects of higher education: teaching, learning, research, faculty, community services, students, administrative operations, infrastructure and campus life and facilities.

This year's conference will focus on understanding AIEd within universities in the Arab region and also shed the light on its realities in this region. It will explore different elements of AIEd in universities and present case studies. It brings together multidisciplinary academics from different parts of the region to speak of their research both within and beyond the academic environment to enhance the student experience and to sustain the university.

Contributions to the conference may focus on (but not limited to):

- The university's AI-related initiatives and strategies;
- Towards a responsible AIEd (Ethical and Legal)
- The reasons for adopting AI within the university's activities;
- A vision-based AI;
- AI and university leadership;
- Faculty's perception of AI;
- Perceptions of machine learning among faculty and staff;
- The role of AI in generating value;
- Key AI university practices;
- AI and student engagement, experiences and perceptions;
- Cases studies of AI in universities;
- AI and data analytics;
- Building the smart university;
- AI and sustainability;
- AI and the smart campus;
- The development of AI capabilities.

EXPLORING THE ENVIRONMENT TO PROMOTE THE DISTRIBUTION OF KNOWLEDGE AND TRANSFER OF TECHNOLOGY IN THE FIELD OF MEDICAL RADIONUCLIDES IN GERMANY AND THE METHODS TO SUPPORT COUNTRIES WITH WEAKER ECONOMIES*

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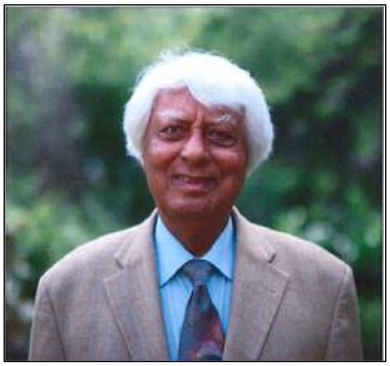
1. Introduction



The basic aim of the development of science and technology is to benefit the whole of mankind. Although this principle is generally accepted, possessive instincts and national economic interests during the industrial revolution in the 19th century created a big disparity in the standard of living of inhabitants in various geographical regions of the world. This is particularly evident while comparing the countries of the North to those in the South. On the other hand, a dormant moral realization has also recently existed to improve the situation. Thus, from 1950s onwards, many of the technologically advanced countries started paying considerable attention to the distribution of knowledge and technology not only within their own domains and neighbouring regions, but also to some lesser developed countries. In this article I would like to describe some of my personal experiences and views in this direction, while working in Germany for a period of more than 50 years. It is mostly related to the teaching, research and development of technology within Germany, but also partly to the transfer of knowledge and technology under various cooperative agreements to six other countries with weaker economies.

2. Working environment and available facilities related to radionuclide production at the Forschungszentrum lillich (FZJ)

Originating from Pakistan and educated in the U.K. as a nuclear chemist, I emigrated to Germany whereby I was appointed as a research scientist in 1970 at the Institute of Nuclear Chemistry (INC) to its big national research centre, now called the Forschungszentrum Julich (FZJ), with the assignment to establish a "Nuclear Data and Radionuclide Production Group". The major facilities available on site were two nuclear research reactors (MERLIN and DIDO), a powerful DT Neutron Generator, a fully equipped radiochemistry laboratory and a good technical workshop. Furthermore, access to an intermediate energy cyclotron (JULIC) was available. Later, a medium-sized cyclotron (CV28) and also two other smaller medical cyclotrons (JSW BC1710 and GE PETtrace) were procured. Some time ago the cyclotron CV28 was dismantled, and recently a 30 MeV IBA Cyclone 30 XP was installed. The available infrastructure has thus all along been ideal for performing research and development work. Furthermore, since the Head of the Institute has also invariably been a professor at the nearby University of Cologne, many Ph.D. scholars have been actively 'working in the institute. In the 1990s, I also become a professor at the University of Cologne, in addition to my responsibilities at the FZJ. Thus, a blend of fundamental and applied research has continued all through my life.

The policy of future work was already defined in the mid-1970s. Research reactors were used for fundamental nuclear research as well as for neutron activation analysis. Since reactor-produced radionuclides were commercially available within Germany even at that time, it was decided not to enter that field but to devote our full attention to fundamental and applied aspects of accelerator-based production of radionuclides. Over the years, the emphasis shifted more and more to radionuclides for Positron Emission Tomography (PET) because the cooperation between INC and the Institute of Medicine (IME) within the FZJ grew closer and stronger. Today all the medically-oriented activities exist in a merged Institute of Neuroscience and Medicine (INM) with Nuclear Chemistry (INM-5) which is an important entity. This report therefore deals mainly with accelerator-produced short-lived radionuclides for medical applications.

3. Overview of research and development work done at FZl in relation to medical radionuclides

Research work carried out in nuclear chemistry at the FZJ encompassed all aspects of radionuclide and radiopharmaceutical development using cyclotrons. Regarding radionuclides, investigations covered four areas, namely, nuclear data, high-current targetry, extensive chemical processing and quality assurances of the radioactive product. The original aim was to develop suitable methodologies for clinical scale production of radionuclides for Single Photon Emission Computed Tomography (SPECT), in particular the halogens ^{123}I and ^{77}Br, as well as short-lived standard PET-radionuclides (^{11}C, ^{13}N, ^{15}O and ^{18}F). After establishing routine production technologies of those radionuclides, the emphasis got shifted to longer lived novel positron emitters which are more useful for theragnostic applications. In this context, the basic production methodologies of a large number of

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novel radionuclides were developed using nuclear reactions on highly-enriched targets. They included, among others, ^{38}K, ^{51}Mn, ^{55}Co, ^{61}Cu, ^{64}Cu, ^{73}Se, ^{83}Sr, ^{86}Y, ^{94m}Tc, ^{120}I and ^{124}I. Furthermore, development work on the production of the therapeutic radionuclides ^{67}Cu, ^{76}Br, ^{103}Pd, ^{117m}Sn, ^{193m}pt, etc. was also carried out. Based on research and development work carried out under my guidance, about 30 German and foreign scholars prepared their doctoral theses and submitted them to various universities within Germany or abroad (e.g. Egypt, Pakistan, Morocco, Malaysia, Turkey, Bangladesh, etc.). Those alumni now hold good positions in universities, research institutes or the industry.

As regards radiopharmaceutical development which was carried out under the direction of other professors of nuclear chemistry at the FZJ, a large number of known and new SPECT- and PET-tracers were established for clinical studies, and about 70 doctoral theses were submitted to the University of Cologne. The major emphasis has been on the synthesis of ^{123}I-labelled compounds for SPECT and ^{18}F-labelled compounds for PET investigations. The most prominent among them was the 2-]^{18}F]Fluorodeoxy-D-glucose which gained worldwide attention and thus revolutionised the whole field of PET imaging. Today about 50 full-fledged PET centres (consisting of a cyclotron, a radiochemistry laboratory and a PET scanner) exist in Germany, and more than half of those centres employ leading radiochemists trained at the FZJ/University of Cologne. Some of the other alumni hold leading positions in the radiopharmaceutical industry or have become owners of small companies.

Through research and development activities at the FZJ, scientific knowledge has been constantly flowing and extensively shared within Germany; it was also transferred to several other countries. On the other hand, a few other groups within Germany, e.g. those in Dresden, Leipzig, Mainz, Heidelberg, Karlsruhe and Munchen, also contributed appreciably to the development of radionuclide technology and its transfer to others. However, the contribution of the FZJ remains exceptional in terms of professional education and diversity of research areas pursued.

4. Overview of availability of medical radionuclides in Germany and contacts between academia and industry

Radionuclides and radiopharmaceuticals are extensively used in Germany for patient care (diagnosis and therapy). Besides university hospitals and big clinics, even some private practitioners have the proper facilities for their use. Most of the radionuclides used are reactor produced. In the former East Germany, some radionuclides were produced at the Rossendorf reactor. From 1995 to 2003 some irradiations were also carried out at the DIDO reactor at the FZJ to produce fission ^{99}Mo, but its chemical processing was done in Belgium. Today, only tracer quantities of a few radionuclides are produced at the Mainz TRIGA reactor. Some efforts are also underway to utilize the Munchen Research Reactor (FRM II) for irradiating samples for production of fission ^{99}Mo, and especially ^{177}Lu, by some associated companies. In general, however, almost all the reactor radionuclides used presently in Germany are imported from other European countries where research reactors for radionuclide production still exist. Several companies based in Germany manage the import of those radionuclides in raw form. Further processing and dispensing are efficiently done by those companies. Because of the European Union (EU), the import procedures are well streamlined and the radioactive material is generally available at the planned time of application. Some examples of the aforementioned are ^{99}Mo/^{99m}Tc and ^{90}Sr/^{90}Y generators, ^{125}I, ^{131}I, ^{177}Lu, etc.

Among the accelerator-based radionuclides, ^{123}I and ^{18}F are produced in large quantities in Germany in a few laboratories and dispatched by some intermediate companies to the users within Germany and other neighbouring countries. The fully equipped PET centres have their own production program of standard positron emitters for in-house use in patient care. Some of them also produce non-standard positron emitters, e.g. ^{44g}Sc, ^{45}Ti, ^{61}Cu, ^{64}CU, ^{124}I, etc. for their own research or for delivery to nearby satellite medical units. In those cases either commercial or cooperative agreements exist. Two other accelerator-produced short-lived positron emitters, namely ^{68}Ga and ^{82}Rb, used in a few PET centres without a cyclotron are, on the other hand, available from generator systems which are imported mostly from the U.S.A. Some attempts to produce ^{68}Ga at small medical cyclotrons for local use are also underway.

It should be pointed out that in this field of work the possibility of technology transfers from academia to industry is Vigilantly considered and observed. Occasionally a Ph.D. scholar may be financed by the industry for some collaborative effort, or preferential production rights may be purchased by a company from some research institution. Some young innovators interested in initiating their own startups, based on spin-off results, are generally encouraged to do so. The development of large scale production of an important novel radionuclide for general use is always pleasing to its originators, even if the production methodology was published in the open literature. This is, for example, the case with three novel positron emitters (^{64}CU, ^{86}y and ^{124}I) which were developed at the FZJ about 30 years ago, but not patented. The industry is commercialising their production today.

5. Methods to support countries with weaker economies

5.1 Educational aid

In the framework of manpower and capacity building on a global scale, educational aid was provided by the FZJ in the field of applied nuclear sciences to several countries under various programmes, namely:

- The Transfer of Knowledge through Expatriate Nationals **(TOKTEN)** Programme of UNO. This involved me making several short-term teaching/research visits to Pakistani universities and research institutes over a period of 20 years.
- **TEMPUS** Programme of EU (after the breakdown of the iron curtain) for mobility of university teachers from Eastern Europe to Western Europe and vice versa. A cooperation agreement was established between Debrecen (Hungary) and Cologne/Julich

(Germany) for the development of teaching curricula (1995-2000). I often travelled to Debrecen to offer short condensed special courses.

- The Research Professorship of the Third World Academy of Sciences (**TWAS**) involved short visits to Bangladesh for the development of an M.Sc. course on "Radionuclide Technology" at the University of Rajshahi (2006-2011).
- The Honorary Professorship of the Government College University Lahore (GCUL), Pakistan, has been bestowed to me with financial support of the National Talent Pool of Pakistan (**NTP**), the Higher Education Commission of Pakistan (**HEC**) and the International Centre for Theoretical Physics (**ICTP**), Trieste, Italy, for developing courses in Nuclear Data and Medical Radionuclides (2003 - to date).
- I have had short assignments to teach at Assiut University, Egypt, under a **bilateral agreement** for improving M.Sc. curriculum (1987, 1995, 1999).
- There have been lectures by me at Advanced Training Schools on Nuclear Data and Radionuclide Technology for participants from developing countries held in various parts of the world under international sponsorships;
- **IAEA** (Debrecen: 1978,1982; Istanbul: 1980; Karlsruhe: 1984);
- **Bulg. Acad. Sci.** (Varna: 1981);
- **PAEC** (Nathiagali: 1984);
- **ICTP** (Trieste: 1980, 1999, 2007, 2013), the last three as Course Director;
- **COMSTECH** (Islamabad: 2013), as Focal Person; **KAERI/WCI/IAEA** (e-Iearning courses: Daejeon: 2020, 2021, 2022, 2023), the last three as tutor.

Germany facilitated and supported my teaching activities at all the above-mentioned 15 Advanced Training Schools related to the transfer of knowledge to countries with weaker economies.

5.2 Technical training and visits of foreign guests

As technical aid to developing and emerging countries, a large number of scientists, engineers and technicians from all parts of the world visited the INC of the FZJ on an individual basis. About 60 of them got research training in the area of nuclear data and radionuclide technology under my supervision. They came from more than 20 countries, among them China, Taiwan, Malaysia, Indonesia, Bangladesh, India, Pakistan, Israel, Turkey, Egypt, Morocco, Hungary and Brazil. At the INC they all worked in harmony. Financial support was provided by the IAEA, Deutscher Akademischer Austauschdienst (DAAD) or some indigenous Program. A few scientists also came as experienced researchers from Ukraine or Russia (under the Eastern Europe Program of the DFG) or from other countries under the auspices of the Alexander von Humboldt Foundation.

5.3 Joint research and development projects: bilateral agreements

A very special feature of the German support for science in countries with weaker economies consisted of the establishment of long-term "bilateral cooperative agreements", which at one time extended to about 35 countries across the world and covered diverse areas in both science and technology. For a few favoured countries, several projects could be run simultaneously. In this context, the projects and finances were globally approved by the responsible ministries of the collaborating countries. The movement of personnel in both directions and the procedures for donation of some research materials and small instruments by the German laboratory to the foreign counterpart were simplified. The transfer of bigger equipment, however, needed special approval of the trade export authorities. In Germany, the policy of collaboration was directed by the Federal Ministry of Science in consultation with the Ministry of Economic Cooperation but, for day to day activities, considerable autonomy was entrusted to the regional coordinating offices, termed as International Offices. One such office was located at the FZJ.

During the 20 year period of 1970 to 1990, cooperation agreements with countries in transition, like Brazil, Egypt, India, Pakistan, Yugoslavia, etc. were favoured, but in the 1990s the emphasis got shifted to the newly liberated countries in Eastern Europe and to South Africa. From 2017 onwards the DFG and the German Federal Ministry of Science have been allocating special funds to TWAS to support science in Africa.

The research group "Nuclear Data and Radionuclide Production" at FZJ officially collaborated with several research groups in Western Europe, North America and Japan on equal terms. But official bilateral research agreements were established with only a few groups in Bangladesh, Egypt, Hungary, Pakistan, South Africa and Ukraine (with some financing outside of the International Office). A list of those groups is given below:

1. Department of Applied Chemistry and Chemical Technology, Rajshahi University, Bangladesh (1996-2011).
2. Institute of Nuclear Science and Technology (INST), Atomic Energy Research Establishment, Dhaka, Bangladesh (1991-1996; 2008-to date).
3. Cyclotron Project, Egyptian Atomic Energy Authority (EAEA), Cairo, Egypt (1997-2007).
4. Radionuclide Production Division, Pakistan Institute of Nuclear Science and Technology (PINSTECH), Islamabad, Pakistan (1983-1991).
5. S. Physics Department, Government College University Lahore (GCUL), Lahore, Pakistan (2003-to date).
6. Radionuclide Group, iThemba LABS, Cape Town, South Africa (1998-2009).
7. Cyclotron Group, Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI), Debrecen, Hungary (1984-2002).
8. Institute of Experimental Physics, Debrecen University, Debrecen, Hungary (1982-2015).
9. Kharkov Institute of Physics and Technology (KIPT), Kharkov, Ukraine (1999-**2002**; 2010-2018).

The research results were shared by the participating laboratories in the form of joint publications or partly as doctoral theses. The nuclear data and production

methodologies developed for a few novel radionuclides were jointly utilized. Some salient results are given below:
- **^{82}Sr/^{82}Rb generator** improvement, intermediate energy data (iThemba/ FZJ).
- **^{67}CU, ^{103}Pd** production (FZJ/ KIPT).
- **^{81}Rb, ^{82}mRb, ^{123}I, ^{124}I** production, data measurements using enriched gas targets (FZJ/ ATOMKI).
- **d(D2) neutron source** optimisation at the cyclotron, neutron data measurements, nuclear modelling of isomeric cross sections (Univ. Debrecen/ FZJ)
- **^{76}Br, ^{124}I** production, nuclear modelling, radiochemical separations (FZJ/ Cairo).
Other joint achievements were:

The Characterisation of Am(Be) and the TRIGA reactor neutron spectra (Rajshahi/Dhaka/ FZJ/ Univ Debrecen); Integral tests of evaluated data (Dhaka/ Rajshahi/FZJ); the production of cyclotron radionuclides ^{57}CO and ^{123}I at a reactor in tracer quantities (PINSTECH/FZJ); the standardisation of production data of novel positron emitters (GCUL/FZJ).

All projects and joint efforts thus involved a mixture of capacity building in economically weaker countries and science development in all participating laboratories. A total of about 200 research papers were published.

5.4 Donations of major equipment and transfer of technology to foreign countries

As mentioned above, the transfer of knowledge and donations of small equipment have been occurring rather freely from Germany to other countries under cooperative scientific programmes; however, under strict control of intellectual property rights as well as national and international patent and trade regulations.

For larger technology transfers, on the other hand, approvals of high-level authorities were required. Three special cases are described below.

i. The donation of a 111 GBq Am/Be source by FZJ to Rajshahi University, Bangladesh, with some radiation measurement equipment. The IAEA regulations were strictly followed, and the local supervision was done by the Bangladesh Atomic Energy Commission (BAEC).
ii. The donation of the old compact cyclotron (CV28) by FZJ to KIPT in Kharkov, Ukraine. A long process of approval was necessary.
iii. The transfer of technology related to the nucleophilic synthesis of the universal PET-agent 2-[^{18}F]FDG from FZJ to the whole world on a commercial basis had to undergo all the procedures of approval because it was a big enterprise.

6. Concluding remarks

The above described activities should serve as an indicator of the working environment and typical available facilities for radionuclide production in Germany. The reactor-produced radionuclides for patient care are mostly imported from neighbouring countries, but the associated extensive chemical and pharmaceutical work is efficiently done by several companies within Germany. As regards to accelerator-based radionuclides, short-lived positron emitters are produced and used in several clinics. The radionuclide ^{18}F is produced rather extensively and ^{123}I to a lesser extent. They are commercially distributed. Some novel radionuclides like ^{64}CU, ^{86}Yand ^{124}I are produced at a few centres and used mostly within Germany. Fairly good information flows and cooperation exist between academia and industry. There is strong support for the transfer of knowledge and technology to countries with weaker economies in the area of peaceful applications of radionuclides, especially those related to human health. The scientific institutions also grant considerable freedom to individual scientists engaged in international activities. But it should also be emphasized that institutions can only create suitable conditions and an atmosphere for cooperation and technology transfers. The real implementation and success of such endeavours depends on the enthusiasm and vigour of the collaborating partners on both sides. In this regard, a feeling of a joint venture, mutual trust and respect to one another are very important.

7. Suggestions and recommendations

- For technology transfers in a chosen field, bilateral agreements appear to be the most effective; at the national level between two institutions and at the international level between two countries. The research and development work followed should have a character of joint venture.
- The two e-Learning courses on radionuclides and radiopharmaceuticals, arranged every year by WCI in close cooperation with the KAERI and IAEA, offer excellent opportunities to young scientists and technologists in developing countries to gain more knowledge on isotopes. This is particularly important because presently about 1000 new small medical cyclotrons are being installed in various parts of the world. The WCI should continue to support, further strengthen and modernise those e-learning courses.
- The WCI could start a series of webinars on special topics for the benefit of participants from all countries (both advanced and developing).
- The WCI could endeavour to get some funds from the industry to grant bursaries to young scientists from all countries to participate in its international conferences.

Acknowledgements
The Forschungszentrum JOlich, and especially the directors of Nuclear Chemistry in succession (Gerhard St6cklin, Syed M. Qaim (interim), Heinz H. Coenen and Bernd Neumaier) have supported research on radionuclides for more than 50 years. The strong institutional backing I received made it possible for me to pursue my activities continuously in three directions, namely, research and development work on accelerator-based radionuclides, regular teaching at two German universities (Cologne and Aachen), and assistance to several countries with weaker economies with respect to education and technological research. The enlightening discussions with the cooperation partners in various institutions around the world and the encouragement and moral support extended to me by all colleagues in my own institute are highly appreciated. I am grateful to WCI for inviting me to write this advisory document based on my personal experiences.

AGRICULTURAL TECHNOLOGY AND SCIENTIFIC INNOVATION SCIENTIFIC STUDY PREPARATION AND STORAGE OF PLANT EXTRACTS OF GROUND OIL SEED POWDER IRAQI DATE PALM

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Abstract:
This study was conducted for the purpose of extracting date pit oil (Phoenix dactylifera L.) from the pits of three local Iraqi varieties, namely Al-Zahdi, Al-Halawi, and Al-Sair, using the saxolite method. The effect of storage at 25°C for a period between 14 and 40 days on the physical and chemical properties of the extracted oils was studied. The results of storage tests for the extracted oil at a temperature of 25°C for 14 and 40 days showed an increase in the properties of (viscosity, acidity number, peroxide number, saponification number and insoluble substances). For saponification) and a decrease in characteristics (Refractive index, specific gravity, melting point, and iodine number).

Keywords: oil storage, ground date pit oil, varieties, Phoenix dactylifera L. pits, ground Iraqi date palm pits, study of physical and chemical characteristics after oil storage**.**

Introduction:
Date pits contain protein, fats, fibres, mineral salts, and carbohydrates in percentages ranging between 5-7.7-10.10-20 and 1-2.80-75%, respectively. Date pits are also called pits, stones, kernels, seeds, and they are the waste of the production of many industries based on the technical transformation of dates. Large quantities of pits can be collected from date factories or from production waste. A little research has been conducted on date pits, especially on their chemical composition, as follows: Moisture: 5-10%, protein 5-7%, oils 7-10%, crude fibers 10-20%, carbohydrates 55-65%, and ash 1-2%. [1] pointed out the uses of date palm pits in many fields, including preparing charcoal for use in crafting jewelry and using it as fuel in traditional copper bleaching furnaces. The pits are used as animal fodder after being crushed or soaked in water because they are a rich source of carbohydrates, fat, and protein, and some poor people use them as food. Cook them as you cook legumes to benefit from their high content of essential nutritional components, in addition to their fiber content, which protects the body from the symptoms of poor digestion, constipation, and colon problems. The oil extracted from the pits, which amounts to 8%, was exploited for human consumption and in the soap industry. It was also used as a medical preparation in the treatment of some kidney and urinary tract diseases, after roasting them, then grinding them and boiling them with water. The oil extracted from them was also used as an ointment to treat rheumatism, gout, and joint pain. Ground seeds mixed with rose water to treat the eyes and used after softening as an alternative to kohl. Iraq is considered the original homeland of the date palm, especially the Shatt al-Arab and the head of the Arabian Gulf, from which it moved to all regions with suitable weather [2, 4, 7, 13, 14]. The dwelling. Palm trees occupy an important position in human life, especially in hot and dry regions, because their fruits represent a high-energy food source and an industrial, commercial and agricultural source. Dates are one of the most important fruit crops in Iraq and the Arabian Peninsula, and you rarely find a home without dates, as they are a fruit, medicine, drink and... It is a sweet for the rich and the poor alike [5,3,7,17,15] and it is an ideal food sufficient for humans. Dates occupy fifth place on the list of tropical and subtropical fruits, after citrus fruits, mango, bananas and pineapples. They also occupy the top spot on the list of dried fruits such as raisins and figs.

Picture 1 - Photo of Iraqi dates powder (Powder of Hilawi date seeds).

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The Theoretical Framework of The Study:
Objectives of the Study:
This Study Seeks to achieve the Following Objectives:
1- This study was conducted for the purpose of extracting date pit oil (Phoenix dactylifera L.) from the pits of three local Iraqi varieties, namely Al-Zahdi, Al-Halawi, and Al-Sair, using the Soxolite method.
2- The effect of storage at 25°C for a period between 14 and 40 days on the physical and chemical properties of the extracted oils was studied. The results of storage tests for the extracted oil at a temperature of 25°C for 14 and 40 days showed an increase in the properties of (viscosity, acidity number, peroxide number, saponification number and substances). Unsaponifiable) and a decrease in properties (refractive index, specific gravity, melting point, and iodine number).

The Importance of Studying:
The importance of this study lies in the scientific study of the preparation and storage of plant extracts of ground Iraqi date palm kernel oil.
Study structure:
The first topic:
First/Materials and work methods:

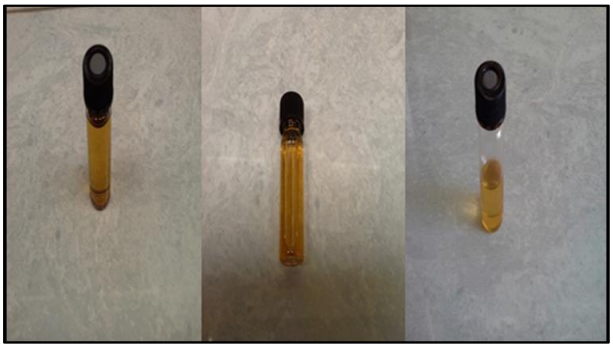
1- Storing oil:
The effect of storing the extracted oil at a temperature of 25°C for (40.14) days on its physical and chemical properties was studied.
2- Oil extraction:

The ground oil of the ground date pits of the three varieties of dates (Zahdi, Al-Halawi, and Al-Sayer) was extracted using a petroleum ether solvent with a boiling point (40-60 °C) and using a Soxhlet device. According to what was stated in (Pearson, 1971), 10 grams of ground dry date pits were taken (and removed). Moisture from it before the extraction process so that the efficiency of the solvent in extraction remains high and does not mix with moisture) and I placed it in the thimble and placed a piece of fat-free cotton over the sample inside the thimble to the inside of the siphon. I filled the beaker with a sufficient amount of solvent (250 ml) so that this amount is sufficient to fill the siphon. The extraction began for 6 hours until the solvent in the siphon was colorless and free of any yellowing at the end of the extraction. He took the beaker and evaporated the solvent in it, then dried it in an oven until the weight was constant. After the process of evaporating the solvent, the oil was collected in dry glass containers and preserved by refrigeration. The oil produced in this way is known as crude oil. The extracted oil is transferred to the baker for the purpose of studying its properties.

Results and Recommendations:
1- The Effect of Storage on the Physical Properties of Date Pit Oil:
The table (Table 1) shows the effect of temperature and duration of storage on the values of the physical properties of date pit oil. It is noted that the specific gravity of date pit oil reached (0.9146), the refractive index (1.4403) and the melting point (15.4)°C decreased with increasing storage period, while it is noted that the value The viscosity of Al-Zahdi date pit oil increased (18.50) centipoise. It is also noted that the values of Al-Halawi date pit oil decreased for both the specific gravity (0.9208), the refractive index (01.451), and the melting point (17.2) C. It is noted that the value of the viscosity of Al-Halawi date pit oil increased (20.51) It is also observed that the values of Al-Sayer date pit oil decreased in terms of specific gravity (0.9208), refractive index (1.4574), and melting point (19.3) C, while it was noted that the viscosity value of Al-Sayer date pit oil increased (20.42) centipoise at a temperature of 25 degrees. C and storage period of 40 days. The results of the statistical analysis indicated that there were significant differences between the types of oils studied at the probability level ($p<0.05$), and the results of the statistical analysis indicated that there were no significant differences at the probability level ($p<0.05$)) for the color degree values, as a result of the influence of the date varieties and the type of treatment on The degree of yellow color and the degree of red color for the studied date pit oils, and the duration of storage does not affect the appearance of the color during storage, as we note that the value of the color degree for Al-Zahdi pit oil reached (yellow 20, red 0.1), for Al-Halawi pit oil (yellow 15, red 0.1), and for Al-Sayer pit oil. (yellow 20, red 0.2), as for the refractive index value, and in comparison with the types of date pit oil studied, it was found that the refractive index value of Al-Zahdi date pit oil at a temperature of 25 °C and a storage period of (14) days in a row was higher than the refractive index value, as it reached (1.4399) at a temperature of 25°C and a storage period of (40) days, and in comparison with the Halawi date pit oil variety, it was found that the refractive index value of the Halawi date pit oil at a temperature of 25°C and a storage period of (14) days was higher than the refractive index value, as it reached (01.450).) at a temperature of 25°C and a storage period of (40) days.

In comparison between the types of date pit oil studied, it was found that the value of the specific gravity of Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was higher than the value of the specific gravity, as it reached (0.9144) at a temperature of 25°C and a storage period of (40) days. In comparison, With the Halawi seed oil variety, it was found that the value of the specific gravity of the Halawi date pit oil at a temperature of 25°C and a

storage period of (14) days was higher than the value of the specific gravity, as it reached (0.9201) at a temperature of 25°C and a storage period of (40) days. To compare with Al-Sayer date pit oil, it was found that the value of the specific gravity of Al-Sayer date pit oil at a temperature of 25°C and a storage period of (14) days was higher than the value of the specific gravity, which reached (0.9202) at a temperature of 25°C and a storage period of (40) days. As for a comparison with Al-Sayer date pit oil, it was found that the refractive index value of Al-Sayer date pit oil at a temperature of 25°C and a storage period of (14) days was higher than the refractive index value, as it reached (1.4573) at a temperature of 25°C and a storage period of (40). day. As for the melting point value, and in comparison ,with the studied varieties of date pit oil, it was found that the melting point value of Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was higher than the melting point value at a temperature of 25°C and a storage period of (40) days, as it reached (15.3) C. In comparison with the Halawi date pit oil variety, it was found that the melting point value of Halawi date pit oil at a temperature of 25 C and a storage period of (14) days was higher than the melting point value at a temperature of 25 C and a storage period of (40) days, as it reached (17.1) C. As for a comparison with Al-Sayer date pit oil, it was found that the melting point value of Al-Sayer date pit oil at a temperature of 25 C and a storage period of (14) days was higher than the melting point value at a temperature of 25 C and a storage period. (40) days, when it reached (19.2) C. The decrease in specific gravity, refractive index, and melting point is attributed to the fact that the temperature of storage led to the oxidation of the double bonds of fatty acids [2,9,12,13,14]. As for the value of viscosity, in comparison with Varieties of date pit oil studied. It was found that the viscosity value of Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was less than the value of the viscosity at a temperature of 25°C and a storage period of (40) days, as it reached (18.51) centipoise, compared to the variety Halawi pit oil, as it was found that the viscosity value of Halawi date pit oil at a temperature of 25°C and a storage period of (14) days was less than the viscosity value at a temperature of 25°C and a storage period of (40) days, as it amounted to (20.55) centipoise either in comparison with... Al-Sayer date pit oil was classified as it was found that the viscosity value of Al-Sayer date pit oil at a temperature of 25°C and a storage period of (14) days was less than the viscosity value at a temperature of 25°C and a storage period of (40) days, as it reached (20.52) centipoise. The reason for this is that the temperature of storage led to the oxidation of the double bonds of fatty acids [2,9,12,13,14].



Picture 2 - Date seed oil.

1- The Effect of Storage on the Chemical Properties of Date Pit Oil:

Table (2) shows the effect of temperature and storage duration on the chemical properties of stored date pit oil, as we observe them for ascetic (acidity number, free fatty acids FFA%, peroxide number, iodine number, saponification number) (41.2 mg KOH/g oil, 0.142%, 1.70 mEq/kg oil, 47.30 mg/100 g oil, 221.65 mg/g oil) respectively, while for Halawi date pit oil (0.94 mg KOH/g oil, 0.133%, 1.71 mEq/kg oil, 49.41 mg/100 g oil, 218.21 mg/g oil) respectively, and for Al-Sayer date pit oil (0.60 mg KOH/g oil, 0.126%, 1.72 mEq/kg oil, 52.30 mg/100 g oil, 0208.3 mg/g oil) respectively, at a temperature of 25°C. And a storage period of (14) days. By comparing the types of date pit oil studied with different storage periods, it was found that the pH value of Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was less than the value of the pH value at a temperature of 25°C and a storage period of (40).) on a day when it reached (1.25) mg KOH/g of oil, and the Al-Halawi date pit oil was less than the value of the acidity number value, as it reached (0.95) mg KOH/g of oil. As for Al-Sayer core oil, the pH value was higher, reaching (0.70) mg KOH/g of oil. We notice an increase in the value of the acidity number as the storage period increases. The increase in the value of the acidity number occurred due to the increase in temperature and as a result of the activity of the lipase enzyme and the presence of traces of moisture [1,7,17,16,12]. The results of the statistical analysis indicated that there were significant differences between the studied oil varieties at the probability level ($p<0.05$) when the extent of storage and the percentage of free fatty acids differed. In comparison between the studied date pit oil varieties, it was found that the percentage of free fatty acids (FFA%) for the pit oil Al-Zahdi dates at a temperature of 25°C and a storage period of (14) days were less than the percentage of free fatty acids (FFA%) when stored for a period of (40) days, as it reached (0.146%), and compared to Al-Halawi seed oil, which amounted to (0.137%). As for Al-Sayer core oil, it reached (0.129%). The reason for the increase in the percentage of free fatty acids with increasing storage period is due to the action of enzymes that work to decompose

triglycerides into free fatty acids and glycerol [3,7,5, 8,11]. The results of the statistical analysis indicated that there were significant differences between the types of oils studied at the probability level ($p<0.05$) when the storage period for the peroxide number value differed.

Picture 3 - Photo of the seeds preparation for grinding.

In comparison with the types of date pit oil studied, it was found that the value of the peroxide number for Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was less than the value of the peroxide number when stored for a period of (40) days, as it amounted to (1.71) mEq/kg oil. Compared to Al-Halawi pit oil, it was lower, reaching (1.72) mEq/kg oil, while for Al-Sayer pit oil, it was lower, reaching (1.73) mEq/kg. The increase in the peroxide number may be the result of self-oxidation, which is represented by the combination of dissolved oxygen in the oil with other oil compounds to form peroxides, which are the primary products of starting the oxidation process [2,9,12,13,14,8]. The stability of any oil also depends on the composition of its fatty acids and its content of compounds such as tocopherols, sterols, and phosphorylated fats [1,7,2,9,12,13,14]. Also, the values of the acidity number, the percentage of free fatty acids, and the peroxide number were close to the values. Which was reached by [8,5,16,11,8] for palm oil during the storage period at room temperature, in the presence of light and air, for a period of (40) days, as the acidity number increased from 0.50 to 0.66 mg/g and the percentage of free fatty acids from 0.254% to 0.317% and the peroxide number ranges from 6.2 to 13.2 mEq/kg oil [8,5,16,11,8]. The results of the statistical analysis indicated that there were significant differences between the types of oils studied at the probability level ($p<0.05$) when the duration of storage for the iodine number was different. By comparison between the types of date pit oil studied, it was found that the value of the iodine number for Al-Zahdi date pit oil at a temperature of 25°C and storage duration (14) days was higher than the value of the iodine number when stored for (40) days, as it reached (46.2) mg/100 gm oil, and in comparison ,with Al-Halawi pit oil, which amounted to (49.26) mg/100 gm oil. As for Al-Sayer pit oil, it reached (52.1). mg/100g oil. We notice a decrease in the value of the iodine number at a temperature of 25°C and a storage period of (40) days. The reason is attributed to the temperature of storage leading to the oxidation of the double bonds of unsaturated fatty acids in the oil, so the iodine number decreased [7,5,14,13,9]. The results of the statistical analysis indicated that there were significant differences between the types of oils studied at the probability level ($p<0.05$) when the storage period for the saponification number differed. By comparison between the types of date pit oil studied, it was found that the value of the saponification number for the al-Zahdi date pit oil at a temperature of 25°C and the duration of storage. (14) days was less than the value of the saponification number when stored for (40) days, as it amounted to (221.70) mg/g. In comparison with Al-Halawi pit oil, it was less than it reached (218.23) mg/g. As for pit oil, it amounted to (208.4) mg. /Gloom. We notice an increase in the value of the saponification number at a temperature of 25°C and a storage period of (40) days. The reason is firstly due to the difference in the oils' content of fatty acids that differ in their chain lengths and which are linked to glycerides [8,5,16,11,8], and secondly to the different sources of the oils. . It is noted from the detailed results in Table (4-10) the effect of temperature and storage duration on the percentage of unsaponifiable substances in the stored date pit oil. The results of the statistical analysis indicated that there are significant differences between the types of oils studied for those substances at a probability level of $p<0.05$)) By comparing the types of date pit oil studied, it was found that the percentage of unsaponifiables in Al-Zahdi date pit oil at a temperature of 25°C and a storage period of (14) days was less than the value of the percentage of unsaponifiables when stored for (40) days. It reached (0.98%), and compared to Al-Halawi pit oil, it was lower, reaching (0.82%). As for Al-Sayer pit oil, it was lower, reaching (0.88%). The high percentage of unsaponified substances in some oils is due to their varying content of sterols and tocopherols, and the high percentage of unsaponified substances will reduce the exposure of oils to oxidation because they provide protection as natural antioxidants (Swern, 1979). It was pointed out by [8,5, 16,11,8] that the main component of the unsaponifiables in all vegetable oils is tocopherols and sterols. Tocopherols are natural antioxidants, and their presence rates are related to the amount of unsaturation of the fatty acids in order to give natural protection to the oil.

Recommendations:

1- The importance of this study lies in the scientific study of the preparation and storage of plant extracts of ground Iraqi date palm kernel oil.

2- Conducting studies on the effect of the storage period negatively on the physical and chemical characteristics and positively on the physical and chemical characteristics, as the negative and positive characteristics are directly proportional to the storage period.

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RESEARCH AND DEVELOPMENT IN JORDAN WITHIN REGIONAL AND GLOBAL CONTEXT AND PROPOSED MECHANISM TO CONVERT R&D INTO SCALABLE TECHNOLOGY

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This paper is intended to present the R&D status in Jordan as compared to that in the Arab Region and the world. Moreover, the paper discusses a proposed mechanism for effectively transforming the research efforts into marketable product or service.

1. Research Portfolio in Jordan.

Research in Jordan is mostly carried out in universities with few work in research centers. Researchers in university settings enjoy the liberty to work on topics that match their interest and often directed towards academic recognition and promotion. Such an effort is scattered in Journals and mostly produced no tangible development outcomes. Nevertheless, most knowledge generated in universities benefits the economy via better educated labor force.

Within the universities, basic research or even the bits and pieces of applied research are not intended or lead to a new product or process application. However, there exists a potential inertia within the system that could be exploited and put into action through a mechanism that converts the nation's portfolio of science knowledge into innovations generating new product or service with lasting impact on socioeconomic transformation.

It is noted that expenditure on research and development in Jordan doesn't exceed 0.8% of Gross Domestic Product (GDP). Although it is above that of the average expenditure value in the total Arab Region, but it falls significantly below the average in the world (Table 1).

Table 1: Research Expenditure as a Percentage of GDP and the Average for Arab Countries and the World

Country	Percentage of GDP	Year
Jordan	0.8%	2019
Arab Countries	0.56%	2010 - 2018
World	2.09%	2010 - 2018

In Jordan, there are 595 researchers per 1 million people working in 30 universities and few research centers. The number is less than half of the average number in the world and falls below that in the Arab Region (Table 2).

Table 2: Number of Researchers per Million People in Jordan and their Average in the Arab Countries and Globally

Country	Number of Researchers	Year
Jordan	595	2019
Arab Countries	778	2010 - 2018
World	1,347	2010 - 2018

According to Scimago classification, Patents registered for residents in Jordan was below that in the Arab Region or the world (Table 3). It is important to note that patents are considered an important indicator to reflect scientific research activities, but they do not necessarily convey their significance in terms of outcomes as a product or service.

Table 3: Patent Indicator for Residents in Jordan

Country	Number of patent registration requests	Year
Jordan	24	2019
Arab Countries	184	2010 - 2018
World	8,794	2010 - 2018

The research papers and documents output published annually by Jordanians show a gradual increase with noticeable growth starting from 2001 (Table 4 and Figure 1).

Table 4: Number of Research Papers Published Annually in Jordan according to Scimago Classification

Year	Number of Papers	Number of Citations	h-index
2010	2,374	2,306	176
2019	5,366	5,240	176

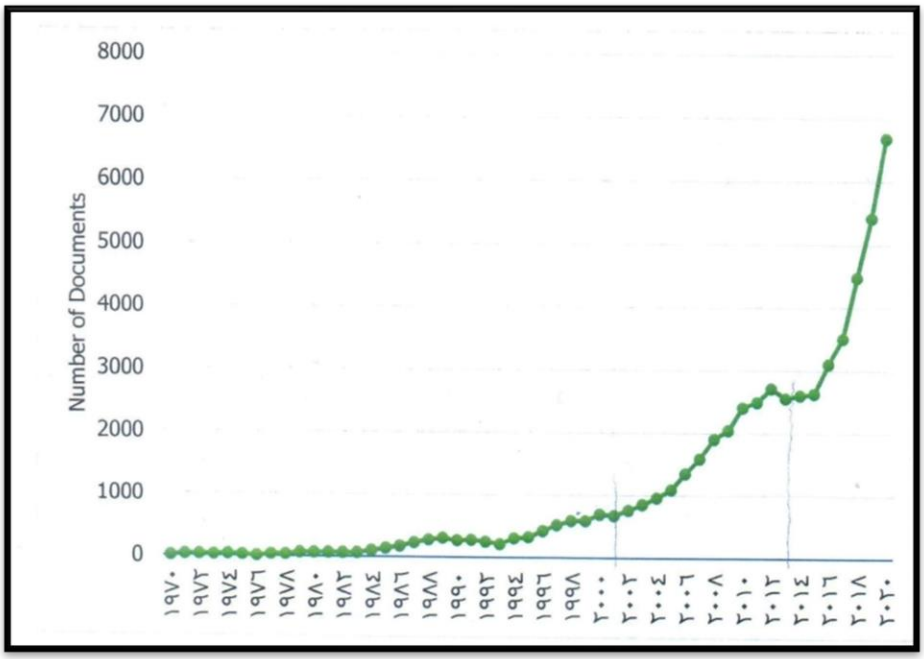


Figure 1. Growth in the number of published documents according to the Scopus database.

Despite the increase in the number of papers published annually, the research impact factor (h-index) has not changed during the period 2001 - 2019, reflecting a decline in total citations of the research documents during that period (Table 5).

Table 5: Total Citations of Research Documents according to Scimago Classification

Year	Number of Citations
2010	27,510
2017	22,226
2018	13,698
2019	3,415

2. Proposed Scheme to Convert the Portfolio of Research and Development into Marketable Innovations.

Scientific research and development is linked to enhancing production and productivity in various economic sectors, either through improving services or reducing cost. This could be achieved if we adopt a system that can lay out the pathway towards tangible objectives that culminate in scalable technology. Such a system should create a comprehensive and integrative environment to ensure the smoothness of procedures and processes accelerating the transformation of research into a product or service (Figure 2).

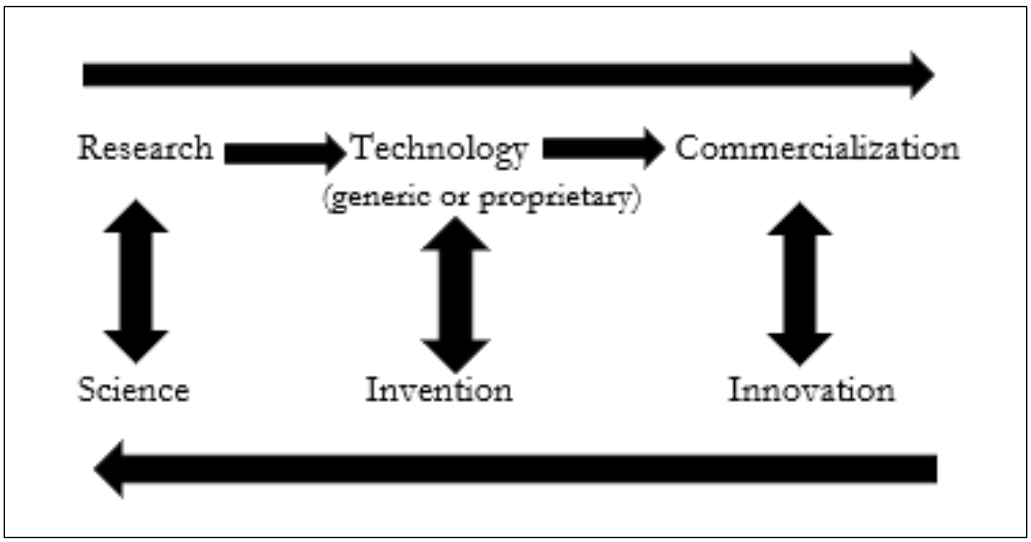


Figure 2. Cyclic Flow of STI.

The first requirement of this environment is to adopt a Science, Technology and Innovation Policy (STI) that augments a comprehensive national research and development strategy (agenda) with the scope of:

1. Identifying key sectors affecting mainstay of national economy taking into consideration the country's capacity and capability limitations to achieve tangible scalable R&D output and the uncertainty inherent in any R&D program.

   Of paramount significance is to consolidate and concentrate the R&D potential in the country on strength areas where physical and human resource can be prompted to excel. That is to say, the strategy should lead to certain R&D choices among competing demands and calls for coordination and integration among the highly trained researchers at the national level and encourages international out research.

2. Delineating research and development priorities in the different sectors.

3. Establishing a funding mechanism targeting the determined priorities. Funding should be extended to cover the early stage of technology development, whereas funding between developed technology and commercialization should be shouldered by the private sector.

4. The STI policy should be supported by legislative framework to ensure involvement of the private sector in the R&D- Innovation cycle through tax incentives, intellectual property and patent protection. The proposed innovation ecosystem is illustrated in (Figure 3).

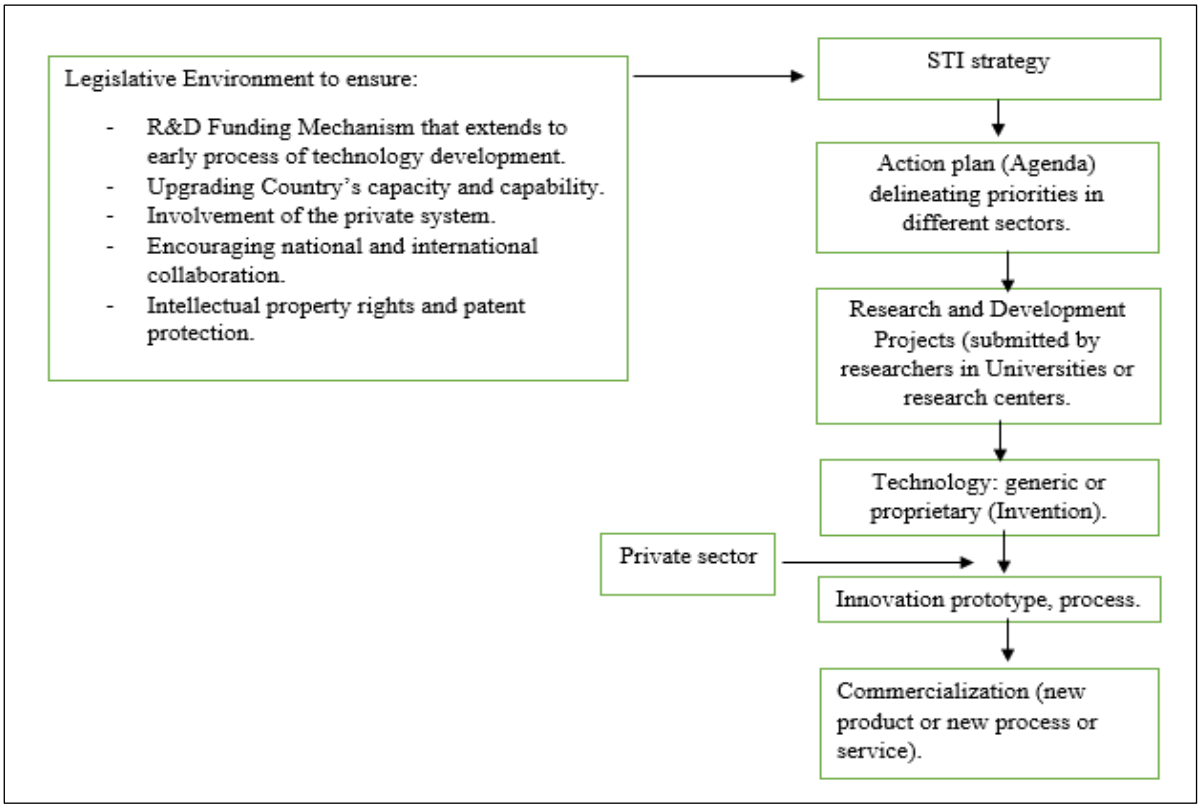


Figure 3. Proposed Innovation Ecosystem.

For successful implementation of STI strategy, its management should be entrusted to an entity bestowed with political commitment in the state at the highest possible level. The governance structure hierarchical order should be topped by a champion occupying high political level to patron the process and transcends any negative or restrictive aspects. The second tier of management is executed by colleagueship advisory committee whose task is to identify priorities and allocate tagged funds to them. This task could be performed by a commissioned expert drawn from the academia and industry. As an example, schematic presentation of identifying program for the production of hybrid vegetable seeds in Jordan is shown in (Figure 4).

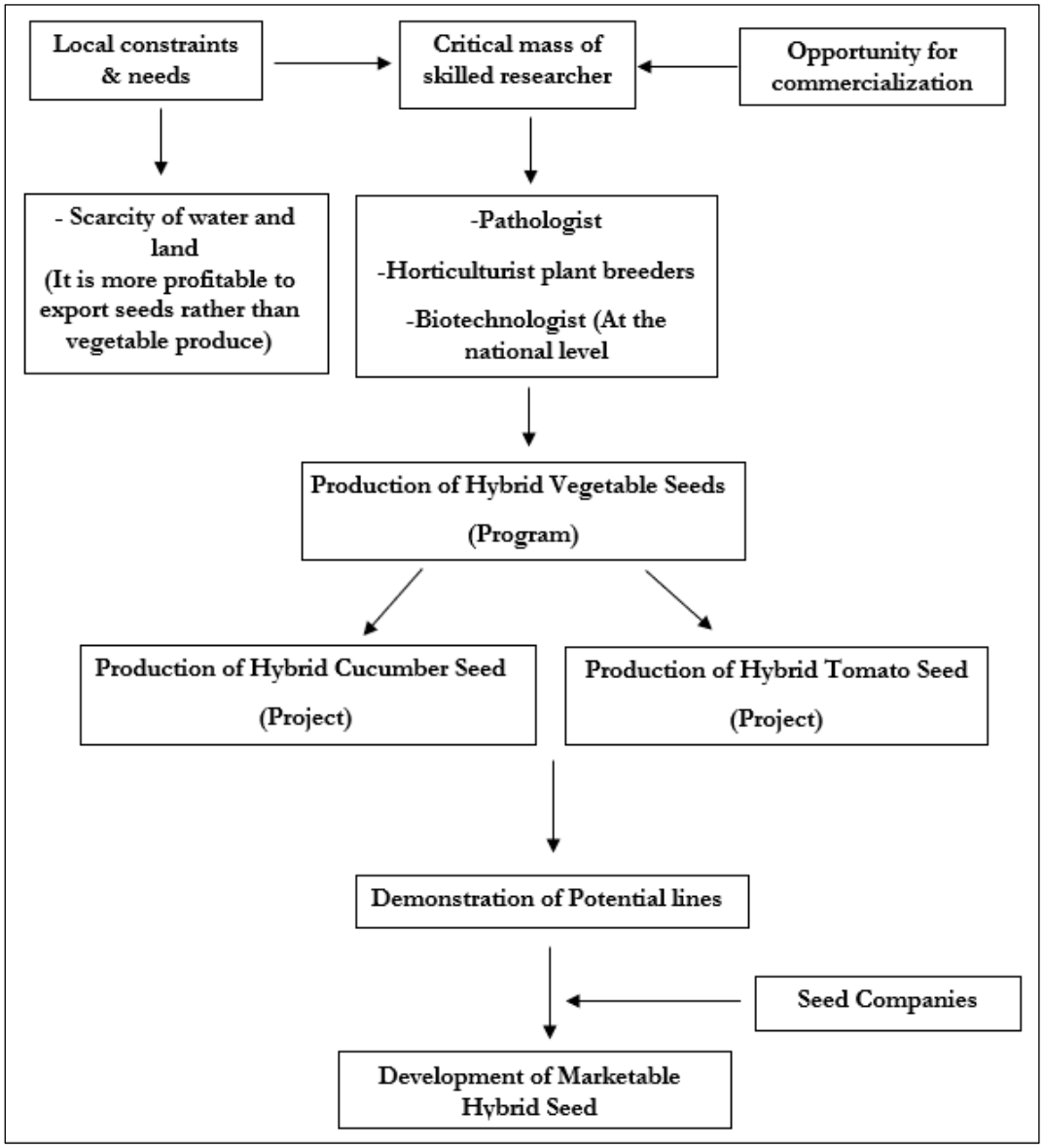


Figure 4. Situation analysis to identify R&D programs (e.g., Hybrid seed production).

The planners and managers in the managerial scheme are to overlook the key performance indicators to follow the progress of approved projects in the implementing units (Universities or research centers) and manage the financial aspects of the programs. (Figure 5).

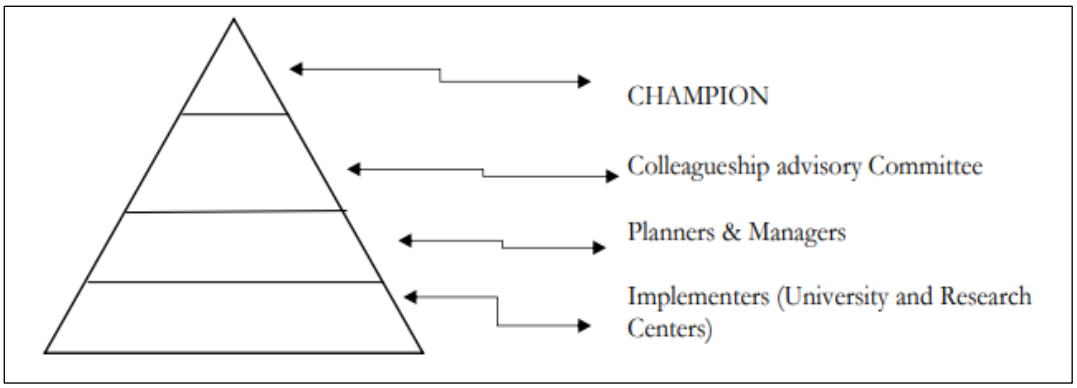
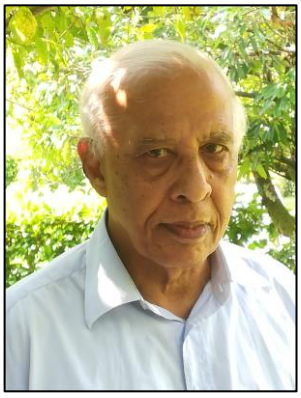


Figure 5. Proposed governance scheme for R&D strategy implementation.

SEARCH FOR EXOPLANETS

Muhammad Asghar FIAS*



Abstract: This text discusses the different experimental methods to find the exoplanets beyond the solar system and their harvest, and the number of potentially habitable exoplanets.

1. Introduction.

An exoplanet is a planet beyond the solar system. Most of these exoplanets orbit other stars but the free-floating exoplanets called rogue planets orbit the galaxy centers and are not tethered to any star. The first two exoplanets orbiting the pulsar PSR 1257 +12 were discovered on January 9,1992, by the Swiss radio astronomers Aleksander Wolszczan and Dale Frail.

2. Five methods of finding exoplanets.

a. Radial velocity method or Doppler Spectroscopy.

In astronomy, the radial velocity is the speed with which the object moves away or approaches the observer on the Earth. In the case of a parent-star and an exoplanet, due to the exoplanet's gravitational field, the parent-star also moves around the common center of mass, on a closed-orbit with an amplitude determined by its mass.

The radial velocity method to detect exoplanets is based on the detection of variations in the velocity of the star, due to the changing direction of the gravitational pull from an unseen exoplanet as it orbits the star. When the star moves towards the Earth-based detector, its spectrum is blue shifted, and it is red shifted, when it moves away from the Earth. By regularly measuring the star's velocity via the redshift and blueshift, one can find if it moves *periodically* due to the gravitational influence of an exoplanet. As the Earth-based detector is subject to its different types of velocities, the data must be corrected for these contributions. Figure 1 shows the periodic radial velocity graph of 18 Delphini b **(2)**. The radial velocity helps to find the minimum mass of the planet.

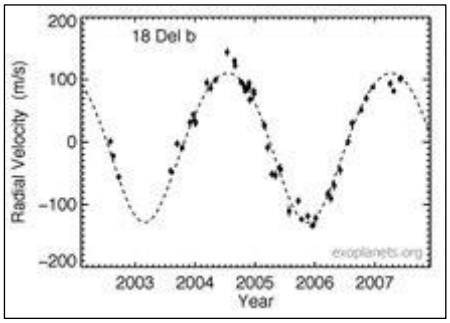


Figure 1. Radial velocity graph of 18 Delphini b due to the presence of an exoplanet ***(2)****.*

b. Transit photometry method.

If a planet crosses (transits)in front of its parent star's disk, Figure 2a, then, the observed visual brightness of the star drops by an amount depending on the relative sizes of the star and the planet, as shown in Figure 2b, where the shadow of the planet on the parent star results in a decrease in the local brightness of the star.

As the radial velocity helps to determine the mass of the planet, the transit method provides its diameter, and their combination provides its mass density.

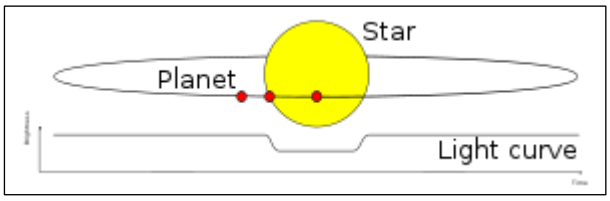


Figure 2a. Planet transiting the parent star along with the resulting light-curve received by the Earth.

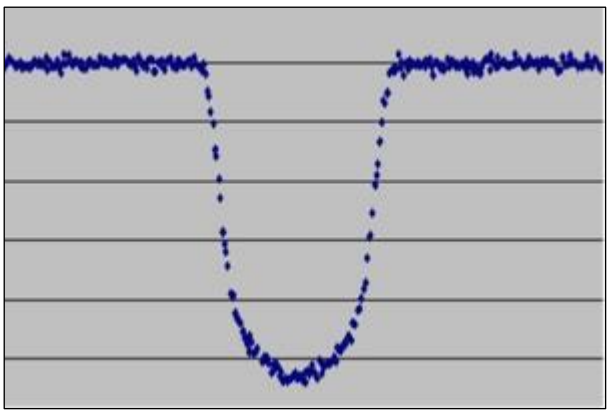


Figure 2b. Kepler-66 photometry with the shadow effect due to the planet transiting Kepler ***(1).***

c. Gravitational microlensing.

Gravitational microlensing happens when the gravitational field of a star acts as a lens that focuses and magnifies the light of a distant background source star as shown in Figure 3, along with the planet and the Earth-based observer. The effect occurs only when the two stars are well aligned. The lensing events are brief in time as the two stars and the Earth are moving relative to each other.

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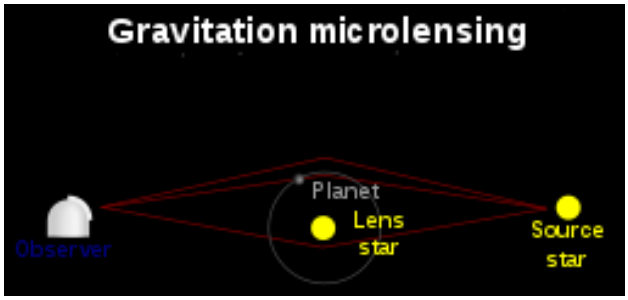

Figure 3. Gravitational lensing set up with source star, lensing star, planet, and observer ***(2).***

If the lensing star has a planet, the planet's gravitational field can make a detectable contribution to the lensing effect. Since this requires a highly improbable alignment, a very large number of distant stars must be continuously monitored to detect planetary microlensing contributions at a reasonable rate. The method is most fruitful for the planets between the Earth and the center of galaxy as the galactic center provides many background stars.

d. Direct imaging.

The general problem with the planets is that they are extremely faint light sources compared to stars, and moreover, this faint light tends to be lost in the glare of the parent star. This handicap renders them very difficult to detect and resolve directly from the parent star. Planets orbiting far enough from parent stars reflect very little starlight and are detected through their thermal emission. Moreover, coronagraphs are used to block light from the parent star. Figure 4, shows the direct image of exoplanets around the star HR799.

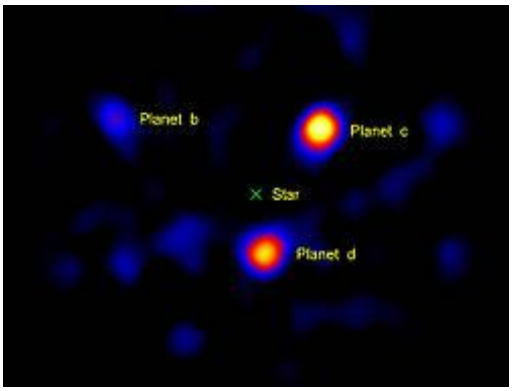

Figure 4. Direct image of exoplanets around the star HR8799 using a Vortex coronagraph on a 1.5m portion of the Hale telescope ***(2).***

e. Astrometry.

This method consists of precisely measuring the star's position in the sky and observing how that position changes over time. If a star has a planet, its gravitational field influence will cause the star to move in a tiny circular or elliptical orbit. Since the star is much more massive, its orbit will be much smaller than that of the planet. Frequently, the mutual center of mass of planet and star binary, will lie within the radius of the larger body. This implies that it is easier to find planets around low mass stars such as brown dwarfs. Fig.5 shows the relative orbital movements of the planet and the star **(2).** Without the presence of the planet, the orbital motion of the star would not exist.

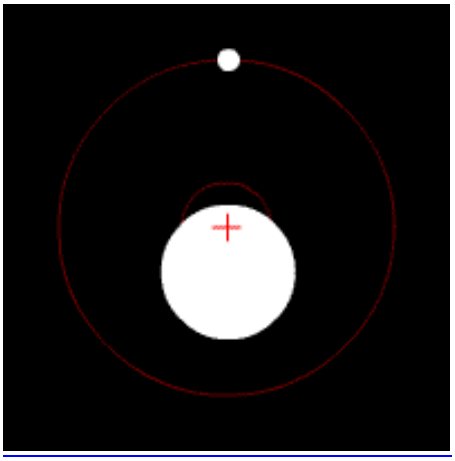

Figure 5. In this diagram a planet (smaller object) orbits a star, which itself moves in a small orbit.
The system's center of mass is shown with a red plus sign.
(In this case, it always lies within the star), ***(2).***

3. Conclusions.

a. Number of exoplanets detected by each detecting method.

Table 1 presents the number of exoplanets found via each of the five methods discussed in the text, out of a total of more than 5000 exoplanets already discovered. The data show that the Transit Method has been the most successful method **(2)**.

Table 1.

1	Radial velocity method. Watching for wobble	1036 exoplanets discovered.
2	Transit method. Searching for shadows.	3988 exoplanets discovered.
3	Gravitational microlensing. Light in a gravity lens.	193 exoplanets discovered.
4	Direct imaging. Taking pictures.	67 exoplanets discovered.
5	Astrometry. Minuscule movements	2 exoplanets discovered.

b. Potentially habitable exoplanets.

As of March 2020, a total of 55 potentially habitable exoplanets have been found. One of those is believed to be Sub-Terran (Mars-size), 20 Terran (Earth-size) and 34 Super Terran (Super-Earths), **(2).**

c. Rogue planets.

As of Jan.10, 2022, 70 rogue planets have been discovered in the Milky Way galaxy. These rogue planets are planets that move through space without orbiting a star. They are supposed to be formed by the collapse of a gas (dust) cloud too small to form a star **(2).**

References

1. *"Kepler High-Level Science Products."*
2. *"Courtesy Wikipedia."*

USING GS-MS GAS CHROMATOGRAPHY MASS SPECTROSCOPY SEPARATION AND IDENTIFICATION OF FATTY ACIDS FROM SEED OIL IRAQI DATES

Mahdi Hanoon Nwaedh Alkinani
Republic of Iraq – Governorate Maysan - Ministry of Agriculture – Directorate Agriculture of Maysan

Nutritional Date Palm Iraqi *Phoenix dactylifera* L.

Dates are the most important fruit crops in Iraq and the Arabian Peninsula, and there is rarely a house without dates; they are fruit, medicine, drink and sweets for rich and poor, being an exemplary and sufficient food for humans. Dates take the fifth place in the list of tropical and subtropical fruits after citrus fruits, mangoes, bananas and pineapple, and is also at the top of the list of dried fruits, along with raisins, figs and plums [10]. The fruit consists of two main parts: the fleshy part, which is the edible part, which makes up 85-87% of the weight of the fruit, and the second part is the seeds, making up 13-15% of the mass of the whole date, but at the same time the optimum date seeds are not used way. Seeds of dates contain proteins, fats, fiber, mineral salts and carbohydrates in percentages from 5-7.7 to 10-20, 1-2.80-75%, respectively. Date seeds are also called pits, stones, kernels, seeds (pits, stones, kernels, seeds) and are waste products from many industries based on the technical processing of dates. A large number of seeds (seeds) can be collected from the production of dates or from production residues and waste. Few studies have been done on the bones of dates and especially on the chemical composition, which according to them turned out to be as follows: humidity 5-10%, protein 5-7%, oils 7-10%, raw fibers 10-20%, carbohydrates 55-65%, ash 1-2%.

Health Date Palm Iraqi *Phoenix dactylifera* L.

1. Develop comprehensive strategic plans to advance the agricultural situation in Iraq, which falls primarily on the shoulders of the ministries of planning, agriculture and water resources, in cooperation with local governments.
2. Conducting a comprehensive field survey of all agricultural lands, identifying those arable lands, and identifying the areas to be reformed for the purpose of developing scientific plans to properly advance them and raise their productivity.
3. Introducing modern technology widely in all episodes of the agricultural field and introducing modern agricultural mechanization to save effort, manpower and time, in addition to ensuring the quality of the agricultural crop produced and increasing its quantity.
4. Working effectively to solve all problems related to Iraqi water resources with neighboring countries, whether through bilateral agreements or through international conventions and the United Nations, and this requires modern efforts, especially at the diplomatic level.
5. The introduction of modern programs for the use of water in agriculture through modern drip, which preserves the waste of water and ensures the proper delivery of water to the cultivated plants.
6. Establishing some dams and modern irrigation projects in order to store water and not make it waste water because it represents the sustainability of agriculture.
7. Expedite the resolution of all problems related to expropriation of disputed agricultural lands by the Iraqi judiciary and the Property Dispute Commission.
8. That the government work to provide and support grains and chemical fertilizers of good quality and all that the farmer needs to reclaim the land and increase its productivity.
9. Supporting agricultural associations in a real way and opening the way for them to take their required role in embracing and caring for the farmer and attracting all the farmers who left their profession and turned to other professions.
10. Enact laws and legislation to ensure the protection of local agricultural products from competition with their counterparts by imposing customs duties and applying the globally applicable quota system to encourage the Iraqi farmer to increase production, and crops that are not available in the country or whose production is not sufficient for the local need can be excluded.
11. Develop a strategic agricultural atlas after a complete survey of agricultural lands and inventory of the actual need for agricultural crops and directing farmers to plant according to well-studied plans, not qualitatively and randomly.
12. Providing basic services in a fair manner between the villages in order to make the farmer and farmer hold on to his land without abandoning it because of the lack of these services.
13. Activating the agricultural credit system and forming a committee to follow up on that for the purpose of guiding the farmer about the projects that can be benefited from, according to each region and according to the actual need.
14. Paying attention to strategic agricultural crops such as wheat, rice, corn, sugar cane and other important crops and giving priority to them, paying attention to palm trees and increasing their numbers due to the abundance of their giving and their contribution to providing a clean and beautiful environment at the same time and working to purchase these crops at prices subsidized by the state to ensure the permanence of the farmer's work And ensuring that the Iraqi consumer needs them.
15. Attracting local and foreign investment projects in the agricultural sector, especially in the field of land reclamation, to increase the area of arable land.
16. Establishing research centers specialized in the use of advanced technologies in agriculture, such as (the use of genetic engineering and genetic modification of some crops) to help develop and improve agricultural crops.

17. Setting up a mechanism by the relevant ministries, especially the Ministry of Oil and the Ministry of Transport, to provide support to facilitate the transfer of agricultural products from their places of production to wholesale markets and to provide the necessary support in fuel prices.

If these solutions and measures had been taken by government institutions specialized in the agricultural field in a planned and deliberate manner, it would have been possible to advance this vital sector and we would have been able to provide our people with the desired food security, and we would have provided great job opportunities that contribute to eliminating the widespread unemployment crisis in Iraq, especially in the regions rural areas, in addition to providing a strong tributary of the Iraqi economy, which makes Iraq a source of agricultural crops, and it was possible to transform the country from an importer of agricultural crops into a producer, and we achieved self-sufficiency in a few years.

Picture 1 - Photographs of Date Palms of the Variety Iraqi Date Varieties Zahdi, Hilawi, Sayer (Phoenix dactylifera,L. Iraq - Maysan City.

Picture 2 - Photo of the seeds preparation for grinding.

Picture 4 - Photo of Iraqi dates powder (Powder of Hilawi date seeds).

Picture 3 - Photo of Iraqi dates powder (Powder of Zahdi date seeds).

Picture 5 - Photo of Iraqi dates powder (Powder of Hilawi date seeds).

Picture 6 - Date seed oil.

Results and Discussion

Physical properties of the studied and studied varieties of date palm. (Table 1) shows the physical characteristics of the date palm fruits (Zahidi, Halawi and Sayer) at the date stage. It was noted that three varieties differed in length characteristics (2.97, 3.38, 3.29 cm), respectively, the diameter reached (2.22, 1.50, 1.70) cm, respectively. As for the dimensional characteristics, they showed a noticeable difference between the varieties and reached (8.98, 5.55, 4.98) cm3, respectively. The results showed that the weight of the whole fruit of the varieties of Zahidi, Halawi and Sayer was (7.97, 5.94, 4.81) g, respectively, with regard to the weight of seed seeds, it was (0.95, 1.09, 0.85) g for three varieties respectively. The weight of the meaty part of the varieties of Zahidi, Halawi and Sayer (7.07, 4.94, 3.93 g), respectively. And this result is approximate to what was obtained [4]. For the variety Zahidi when he reached the weight of the fetus (7.80) grams.

As for the volume, it was (8.91) cm3, the length parameter was (2.92) cm, diameter (2.20) cm, and the results also showed some approximation with what Mohammed et al (1983) found. When he studied 50 varieties of dates at the maturity stage of the variety Zahidi, the bone weight reached (0.90) grams, and the fleshy part weight (7.01) grams. The results showed some approximation with what Al-Idani (1988) found when the results for two varieties of Halawi and Sayer on the parameter of length were (3.73, 3.71) cm and diameters (1.7, 1.94) cm, with regard to volumes, they reached (6.94 6.65) cm^3 respectively.

The results showed approximation with the results that were obtained and [11]. where the following results were obtained for the two varieties of Halawi and Sayer, the paramater of length was (3.12, 3.26) cm and the diameters (1.42, 1.63) cm, with regard to volumes, reached (5.34 , 4.94) cm^3, respectively, the weight of the fruit (5.90, 4.66) grams, and as for the weight of the seeds, they were equal to (1.75, 1.06) grams and reached the fleshy part (4.84, 3.91) grams respectively. In terms of length and diameter, they are close to indications. For Zahidi cultivars at the stage of a mature fetus, where they reached the length (2.81) cm and diameter (91.9) cm in characteristics [7]. Explained the effect of pollination on the qualitative characteristics of palm fruits such as weight, volume, diameter, coupled with a variety of varieties.

Table 1. Physical properties of some date palm Iraqi -varieties.

Properties	Varieties		
	Zahdi	Hilawi	Sayer
Length (cm)	2.97	3.38	3.29
Diameter (cm)	2.22	1.50	1.70
Volume (cm^3)	8.98	5.55	4.98
Fetal Weight (g)	7.97	5.94	4.81
Seed Weight (g)	0.95	1.09	0.85
Weight of fleshy part (gr)	7.07	4.94	3.98

The scatter of results may be due to differences in environmental conditions, type of fertilizer and applied agricultural work [2]. Also,indicated [2]. The fact that the difference in the results of physical characteristics and the properties of the fruits is related to the type of pollination, it in turn affects the natural phytohormones of the fruits.

Knowledge of physical properties is important for determining the shape and quality of fruits, as the results showed that the Halawi variety is superior to other varieties in length and weight of the meaty part of the fruit, and this is important in the food industry based on the processing of dates. This variety also gave the largest seed weight compared to other varieties and, thus, can be used for their processing as fodder and animal feed.

Chemical analysis of the grinding of dates seeds for the varieties of dates fruits studied in the work. (Table 2). explains the chemical analysis of the date seed grinding for the date fruit varieties studied in the work (Zahidi, Halawi, Sayer) for the moisture content, which turned out to be the following (4.80, 4.70, 6.50)%, respectively, among these varieties. We notice an increase in the moisture content in the Al-Sayer cultivar, followed by Zahidi and at the end of Halawi. These results are close to those that have been achieved [10]. (4.67, 4.68)% for Zahidi and Halawi, and also came to them [10]. (6.46%) for Sayer variety. The reason for this difference lies in the physiology of the presence of water in the food product, when there remains an unevaporated part of the water [10]. Either because of the ability of the powders to absorb the amount of moisture

from the outside air when opening the containers during the analysis, or because of the vapor pressure deficiency Vapor Pressure Deficit (VPD), which is the difference between the pressure of water vapor inside and the pressure of water vapor outside and therefore, the spread of water vapor in a vessel. [10].

Before statistical analysis, all data were tested for normality and homogeneity of variance. The results were statistically analyzed using SPSS, Completely Randomized Design (CRD) with three replications, with the studied factors tested for the least significant mean difference (LSD) at a probability level (0.05).

Table 2. Chemical properties of some date palm Iraqi varieties.

Properties	Varieties		
	Zahidi	Halawi	Sayer
	4.80	4.70	6.50
Humidity	1.20	1.18	1.14
Ash content	5.31	6.70	5.30
Proteins	8.17	8.13	8.50
Oil	80.70	80.22	79.80
Carbohydrates			

The percentage of ash in the grinding of seeds of varieties of Zahidi, Halawi and Sayer was (1.20, 1.19, 1.14)%, respectively, among each of the grindings of Zahidi and Halawi on one side and grinding of Sayer on the other hand. The percentage of ash in the crushed varieties of the above date's seeds depends on the degree of its content in minerals and the results gave similarities with those that were found [10]. Where it was found that the ash content in the grinding of Zahidi varieties is (1.17%), in the grinding of Halawi varieties (1.17%), Sayer time with grinding of Al-Majdul seeds is close to the results of seed grinding which reached (1.12%) [10]. when it reached (5.31, 6.70 5.30%) for grinding seeds of varieties Zahidi, Halawi, Sayer, respectively, and this difference is related to the difference in chemical components of the above varieties. [10]. attributed the difference in results to the dependence on the fetal content of proteins (proteins) and which varies in accordance with changes in genetic and environmental factors, also indicated [2]. On the influence of pollination types on the difference in results among varieties according to the content of proteins (proteins) [2]. that the protein content decreases with a gradual progression of growth in fetal maturity and the reason for this is that the protein content is synchronized to a large extent with changes in the fetal respiration rate. And that the average rate of the creation of new protein constructs is slightly lower before the onset of the climacteric period (Climacteric), and then the formation of new proteins is accelerated and increased at the beginning of the entry into the phase of the mature fetus and during the clemetric peak, the formation of new proteins decreases, which indicates that the role of proteins ended only because the fruits reach maturity. These results are approximate with the results obtained [10]. Where it was mentioned that the protein content of grinding of seeds of Zahidi is equal to (5.28%), and the grinding of seeds of Halawi (6.66%) is approximately similar to the results of grinding of seeds of Sayer variety with the results for grinding of seeds of Al-Majdul variety and which reached (5.22%) [10], statistical analysis shows that there are significant differences between the studied varieties with respect to the oil content (8.17, 8.13, 8.50)% for grinding seeds of varieties Zahidi, Halawi and Sayer, respectively, the results were obtained approximately with those defined [10] where it was mentioned that the ratio w ditch of grinding seeds of Zahidi variety (8.13%), grinding of Halawi seeds (8.10%) and the indicator for grinding seeds Al-Sayer with the indicator for grinding seeds (seeds) of al-Majdul variety, which had the indicator (8.49%) [10]. . The results fit into those that have been achieved [10]. where they found that the oil content in the grinding of seeds of the Iranian grade Sayer is equal to (6.9%). As for the percentage of carbohydrates, it is equal to (80.70, 80.22, 79.80)% for grinding seeds of varieties Zahidi, Halawi and Sayer, respectively, where the results of statistical analysis showed that there were significant differences between the studied varieties in terms of carbohydrate content and that the proportion of carbohydrates in the crushed kernels of the Saier variety is less than in the grinding of the seeds of Zahidi and Halawi because of the high concentration of moisture in the powdered grindings of seeds of the Al-Saier variety. The carbohydrate content in the grinding of seeds of Zahidi and Halawi is consistent with those achieved [10], which had the following parameters (80.4. 80.64%) and the grinding rate of seeds (seeds) of Sayer variety is close to the result for grinding seeds of the Al-Mvdzhul and grade, which had an indicator (78.71%) and which was available in [10]. The difference in proportions may be due to the difference in varieties and environmental conditions prevailing in the areas of agricultural cultivation of dates [10]. Finally, Sayer can be considered the best variety in terms of the content of a large number of oils compared to other varieties.

Conclusions and Recommendations

Conclusions: Knowledge of physical properties is important for determining the shape and quality of fruits, as the results showed that Halawi is superior to other varieties in length and weight of the meaty part of the fruit, and this is important in the food industry based on processing dates. This variety also gave the largest seed weight compared to other varieties and, thus, can be used for their processing as fodder and animal feed. Al-Sayer's seed varieties produced the highest percentage of oil compared to Zahidi and Halawi. Three varieties also contained a high percentage of

certain mineral elements.we notice an increase in moisture content in the Sayer variety, followed by Zahidi and at the end of Halawi.we notice an increase in the ash content in the variety Zahidi, followed by Halawi and at the end of Sayer.we notice an increase in the protein content (proteins) in the variety Zahidi, followed by Halawi and at the end of Sayer.The results of statistical analysis showed that there were significant differences between the studied varieties in terms of carbohydrate content and that the proportion of carbohydrates in the crushed kernels of Al-Saier varieties is less than in the grinding of seeds of Zahidi and Halawi varieties due to the high concentration.

Study Fatty acid composition of date seed oil

Forms 2 contain fatty acid chromatograms of date seed samples (Zahidi variety) obtained from Gas Chromatography/Mass Spectrometry (GC/MS). As for forms 3, 4, 5 and 6, they illustrate mass-energy ranges for the analysis of fatty acids of date seed oil (from Zahidi variety). The specific diagnostics of separate fatty acids were performed through the integration of separate maximum values and obtaining of relevant data like delay time, square, growth and percentage ratio of maximum values, with further Similarity Search using existing tools via software linked with the device, as shown in Table 2, which explain the contents of date seed oil which was obtained (Zahidi variety) and which includes nine acids, of which seven are saturated acids (caprylic, capric, lauric, myristic, palmic, stearic, arachidonic acids). As for the oleic and linolic fatty acids, these are unsaturated fatty acids which have significant importance. Oleic acid is represented as one of monounsaturated fatty acids called omega-9, which is necessary for the body, yet it is not the most important one, because the body can generate it, too. Oleic acid has many features useful for health, it reduces the cholesterol level by decreasing the amount of low-density lipoproteins (LDL) and this type of protein contains 25% of protein and 45% of cholesterol and it distributes across different parts of the body and sometimes it deposits itself on the blood vessel walls. Although it does not affect the number of high-density lipoproteins (HDL), this type of protein contains about 50% of protein and 20% of cholesterol. HDL contributes to the removal of the excessive amounts of cholesterol from the body (Alvarez& Rodriguez, 2000). Table 2 shows the content of fatty acids in the Zahidi variety date seed oil, and it was noted that it contains nice fatty acids, of which seven are saturated acids (caprylic 0.62%, capric 0.75%, lauric 31.62%, myristic 14.65%, palmic 12.59%, stearic 3.93%, arachidonic 0.37%, respectively). It was noted that the content of lauric acid is higher that the content of other saturated fatty acids. As for the unsaturated fatty acids, the oleic and linolic acids are one of the most important unsaturated fatty acids examined by Gas Chromatography/Mass Spectrometry (GC/MS), their percentage content in the oil was 46.12% and 6.96%, respectively.

Recommendations: Studying the possibility of using date seed oil in some scientific practices and its use, as well as continuing scientific research from the point of view of food - medical (pharmaceutical industry) and detergents. The possibility of using date palm oil in the manufacture of dates to improve the appearance, such as giving gloss. The possibility of creating plants for the production of crushed seeds of dates and putting it into fodder production. Conducting such research is very important, as it opens the way for further research in order to learn about the secrets of the blessed date palm, of which almost no part is of great benefit. Development of practical and inexpensive methods for extracting dates seed oil with high quality characteristics. Use of local Iraqi dates as a food source by extracting from the Nutritional value of the main varieties of dates exported from Iraq to the Russian Federation.

Table 3 - Specific analysis of fatty acids contained in Zahidi date variety seed oil, Using Gas Chromatography/Mass Spectrometry (GC/MS)

Peak	R.Time\min	Area	Area%	Height	Height%	Scientific name	Trivial name
2	5.113	260244	0.29	0.29	0.62	Octanoic acid	Caprylic acid
3	6.462	325358	0.36	0.36	0.75	Docanoic acid	Capric acid
4	8.510	18019821	19.94	19.94	31.62	Dodecanoic acid	Lauric acid
5	11.241	11329457	12.54	12.54	14.65	Tetradecanoic acid	Myristic acid
6	14.269	10553973	11.68	11.68	12.59	Hexadecanoic acid	Palmic acid
10	17.276	3073686	3.40	3.40	3.93	Octadecanoic acid	Stearic acid
12	19.712	264852	0.29	0.29	0.37	11-Eiosenoic acid	Arachidonic acid
Unsaturated acids with one conjugated double bond							
8	16.850	33823764	37.43	13973851	46.12	9-Octadecenoic acid	Linolic acid
Unsaturated acids with several conjugated double bonds							
7	16.702	5840953	6.46	2399073	6.96	9,12-Octadecadienoic acid	Linolenic acid

NOTE: SIZE AND SHAPE OF THE OBSERVABLE UNIVERSE

Muhammad Asghar FIAS

Abstract: This Note presents the contents of the observable universe, its age, its present size, and its geometric shape.

1. Observable universe, its age and size.

The observable universe consists of all the matter that can be observed directly or through the different instruments operating in space. This matter is in the form of galaxies, galaxy-clusters, stars, planets, exo-planets, connecting ribbons and cosmic dust from which the EM-radiation as light has reached the Solar System and the Earth. This matter interacts with the universe's strong, weak, electro-magnetic (EM) and gravitational forces through their specific "interaction bosons" for different effects and operates according to the Nature's symmetry laws of space parity, charge and time including their occasional violation with significant consequences.

The 2.725 K cosmic microwave background (CMB) data obtained through the different space-based detection systems such as the latest Planck satellite **(1)**, and analyzed with the expanding **flat** universe-based cosmological ΛCDM model, leads to the relative values (relative to the flat universe's energy-matter critical density) of the different components of energy - mass in the universe:

Ordinary or baryonic matter	4.56 %
Dark matter	22.8 %
Dark energy	72.6 %

The dark matter in the universe does not interact with the EM-field, so it is invisible, but it does create its gravitational field that plays a significant role in the universe's structure and dynamics. The presence of dark energy accelerates the normal expansion of the universe.

The age of the universe resulting from the analysis of the CMB data through the ΛCDM cosmological model comes out to be **13.7 billion** years **(1).**

The **present size** of the observable universe considering its accelerating expansion is ~ **94 billion** years which represents the diameter of a sphere centered at the Big Bang explosion point. This size of the universe consists both of causally connected and non-connected regions of space that have been homogenized by the proposed rapid process of cosmic inflation soon after the Big Bang explosion, when the universe was still very small and causally connected. Moreover, as the age of the universe increases, the size of the observable universe will go up, also.

2. Shape of the observable universe.

The Friedmann's solution of the Einstein's equations of general relativity leads to:

$$((da/dt)^2 + k\,c^{2)} / a^2 = (8\,\pi\,G\,\rho + \Lambda\,c^2) / 3, \qquad \textbf{(1)}$$

where k is the space curvature; Λ, the cosmological constant; the ratio of the scaling factor (da/dt) / a= H, the Hubble constant; G, the gravitational constant; ρ ρ, the universe's mass-energy density; and c, the speed of light.

For k = 0 and Λ = 0, the universe is flat with a density ρ_c, called the critical density:

$$\rho_c = 3\,H^2 / 8\,\pi\,G = 0.86 \times 10^{-25}\ \mathrm{kg / m^3} \qquad \textbf{(2)}$$

for $H = H_0 = 67.66$ km/ per second per megaparsec, as the present H_0 value from the analysis of the Planck satellite CMB data.

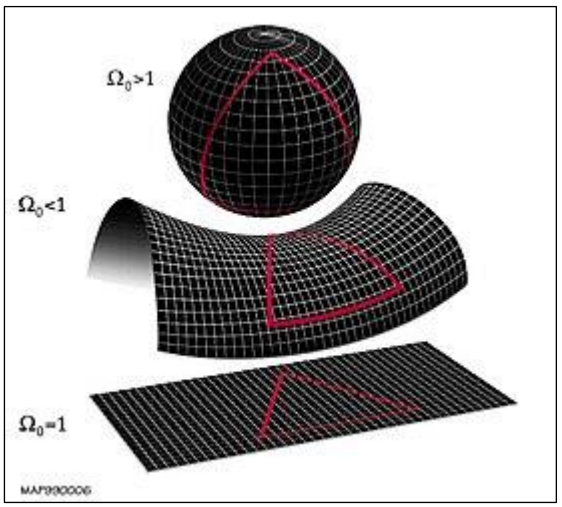

Figure 1. The different possible shapes of the universe represented by the different values of the density parameter Ω_0 ***(2).***

The three possible shapes of the universe are defined by the density parameter Ω_0 which is the average density of the universe divided by the critical density ρ_c:

$\Omega_{0\,=\,1}$ corresponds to a flat universe with a triangle whose sum of three angles = 180 degrees, red triangle in Figure 1;

$\Omega_{0\,<\,1}$ represents a saddle-shaped universe with a triangle whose sum of three angles is < 180 degrees, red triangle in Figure 1;

$\Omega_{0\,>\,1}$ represents a spherical universe with a triangle whose sum of three angles > 180 degrees, red triangle in Figure 1.

There are reasonable indications from different experimental results such as the CMB data analysis, showing that the **universe is flat in shape**.

References

1. Planck Collaboration Aghanim, N, et al. (2018) "Planck 2018 Results V1Cosmolgical parameters."

2. "Courtesy Wikipedia."

DISTANCING FROM SCIENCE DEVASTATING DEPRIVATION FOR MUSLIMS

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Muslim World is passing through most difficult times in its history of fifteen hundred years. There was a time during long years of Middle Ages when Muslims ruled two-thirds of the old civilized world but afterwards their ignorance of what was going on around them caused their civilization to decline. They developed, unnecessarily, a superiority complex based on their past victories and achievements and abandoned the path of progress in the field of science and technology. They distanced themselves from Science as if acquiring knowledge of Science was not part of their religious duty. This was the real devastating deprivation for Muslims around the world.

Many Muslim intellectuals of the world have expressed their opinion on the rise and fall of their *Ummah* and most of them believe that the closeness and then distancing from science and technology, is the real story of their rise and fall. Historically, it is very obvious that the main reason for the decline of Muslims is their carelessness to science and closeness to all other activities that was all but not Science. The reason for the humiliation of Muslims for the past several centuries is very obvious. They got rid of the science and technology that they had acquired in the Middle Ages and due to which they had gained their prestige and economic superiority in the whole world. Western civilization continues to create its huge influence in the Islamic society like a flood. If Muslims wish to move towards renaissance, they must be fully accountable. Aligning Islam with the new scientific trend is the call of times (Urdu:*Waqt ki Pukar*). Islam is actually a religion of rationalism and is in accordance with nature. Not allowing Islam to adapt to the new world order and keeping itself away from Western sciences is a practice that is highly deplorable. In this era of the 21st century, there is no need for any conflict between the Islamic and Western society, but to stop the exploitation of Muslims by the Western powers, Islamic society should come back to its previous ways of scientific and technological activities.

In his book *What Went Wrong?* historian Bernard Lewis notes that "for many centuries the world of Islam was in the forefront of human civilization and achievement. "He further adds "The relationship between Christendom and Islam in the sciences was now reversed. Those who had been disciples now became teachers; those who had been masters became pupils, often reluctant and resentful pupils."

As science in the Islamic world declined and retrogressed, Europe absorbed and translated classical and scientific works, mainly Science centers of Islamic World. After its Renaissance, Europe started making great advances in science, which it had borrowed from Islamic civilization. Europe became world power and colonized almost entire Muslim world and humiliated them for centuries by their ruthless Rule. Except in a few semi-independent states (Afghanistan, Turkey, Yemen and Arab Peninsula), the Muslim might and political authority - the symbols of Muslim *Ummah's* dignity - was totally eliminated from around the globe. The fall of Turks in 1920 was the last big insult meted out to them. Ironically some Muslims thought that this was the wrath of God since they disobeyed Him during recent past. However, the fact is that Islamic world lacked in Science and Technology after the 15th century. Presently, Muslim nations are no match with the West in economic and military power. They were once known for new inventions and ideas for almost seven to eight hundred years to the world. After that they could only repeat their ideas as RECYCLERS.

What Islamic world needs today is the scientific and technological advancement so that its presence on the international stage is distinct and effective. Without such an accomplishment, Muslim countries cannot serve the *Ummah's* interests, fulfill its aspirations and safeguard its rights. Absence of ideas, both scientific and philosophical, freedom of thought, creativity, and intellectual self-determination, are the main causes that the Muslim World is not in a position to fulfill God given mandate of universal leadership. Intellectuals rightly assert that Muslim world will never be able to improve the lot of its people unless the Muslims around the world realize the importance of upgrading the status of science and technology.

At present the Muslim *Ummah* is confused. Their Past was shining, the Present is gloomy and Future uncertain. In the following passages, self-appraisal of well-known Muslim scholars is recorded. These thought-provoking views on tolerance, scientific temper, pluralism and global peace may help the *Ummah* to know their past, asses the present and also to determine their future based on Science Renaissance.

Turkey. Malaysia and Qatar etc. have decided to triple their spending on (R&D) soon which is certainly a welcome announcement. Despite the humiliation of the nineteenth century, the Muslim *Ummah* remained in a deep slumber in the twentieth century and was lagging behind other nations even in basic literacy. In 1980 the average literacy of the Muslim world was less than 30 %. Fortunately, in the 21st century, adequate steps have been taken by many Muslim Countries towards education (Literacy). In a global survey of 2022, it has been reported that 23 countries of the Muslim world have achieved more than 90 percent literacy. They Spend 4 to 9 percent of their DGP. The top among them is Azerbaijan (100 percent). Saudi Arabia (98 %) - Turkey (98 %), Jordan (98 %), U.A.E. (98 %), Brunei (98 %) and Indonesia (96 %). However, because of some poor countries and some highly populated countries, average literacy of Muslim World is still less than the World average.

Unfortunately, apart from basic Literacy, scientific research (R&D) has not been given much emphasis. The entire Islamic world (population: 180 Crores) spends a total of $75 billion on scientific research, while the U.S. (Population.32 Crores) spends $660 billion on scientific research (R&D). Japan (population: 13 Crores) $194 billion. Germany (population 8 Crores) spends $148 billion and South Korea (population 5 Crores) spends $105 billion. These figures illustrate the gap between Islamic countries and scientifically developed countries.
Muslim nations have to change their attitude towards science and return towards the scientific and intellectual era of the past which we consider Golden Period and are proud of.

However, it is somewhat satisfactory situation that recently Saudi Arabia, Qatar, UAE and few other countries have decided to raise their expenditure three-fold on R & Din their countries.

PROF. EROL GELENBE HON FIAS RECEIVES THE HONOUR OF COMMANDER OF THE ORDER OF THE CROWN OF BELGIUM

Professor Erol Gelenbe, Honorary Fellow of the IAS, received the Honour of Commander of the Order of the Crown of Belgium from Madame Veronique Halloin, Secretary General of the Fonds de la Recherche Scientifique and President of the European Science Foundation, on 23rd January 2024 at the Delegation of Wallonia-Brussels in Paris.

The Order of the Crown (*French: Ordre de la Couronne, Dutch: Kroonorde*) is a national order of the Kingdom of Belgium. The Order is one of Belgium's highest honors.

PROF. DILFUZA EGAMBERDIEVA FIAS, WINS UNESCO–CARLOS J. FINLAY PRIZE FOR MICROBIOLOGY

Dilfuza Egamberdieva from Uzbekistan wins the UNESCO–Carlos J. Finlay Prize for Microbiology. She received the prize on 14 November 2023 at a ceremony organized at UNESCO headquarters.

Dr Egamberdieva is recognized for developing technologies which allow micro-organisms to interact with crops, in order to improve the latter's productivity and mitigate environmental damage caused by agricultural practices. These detrimental practices include the use of chemical fertilizers, which pollute the water and soil, as well as monoculture farming, in which large areas are dedicated to a single crop, thereby reducing biodiversity.

Dr Egamberdieva works with a range of crops, namely wheat, cotton, legumes, cucumber and tomato. She has identified beneficial micro-organisms that interact with these plants in ways that make them more robust while accelerating their growth. This interaction between plant and microbe has led to the development of "super-crops" capable of withstanding drought, salinity, heat and even soils polluted with heavy metals. Thanks to her research, crops can not only grow in degraded environments but also help to restore them.

Dilfuza Egamberdieva, winner of the UNESCO Carlos J. Finlay Prize for Microbiology

Dr Egamberdieva has used various techniques, in order to understand how plants and microbes interact and adapt to changing environmental conditions. She has isolated and identified microbes that are beneficial for plants and developed ways of keeping them alive in storage, before applying them to seeds and soil. Much like a doctor watching over their patient, Dr Egamberdieva has established techniques which allow her to monitor the growth of her plants, their level of nutrition, their susceptibility to disease and their tolerance to stress factors like drought and salinity. In fact, the microbes that she introduces into crops act much like the vaccine with which a doctor inoculates a patient, in order to build the patient's resistance to pathogens. To this extent, Dr Egamberdieva could be described as a "plant physician."

Dr Egamberdieva has been undertaking this research from the National Research University (TIAME) in Tashkent, where she heads the Department of Biological Research and Food Safety at the Institute of Fundamental and Applied Research – but her work will be beneficial for agriculture not only in Uzbekistan but around the world.

She is a true pioneer and, as such, a fitting laureate for the UNESCO-Carlos J. Finlay Prize for Microbiology. The prize is named after Cuban scientist Carlos J. Finlay, the man who discovered over a century ago that it was mosquitoes which infected people with yellow fever. UNESCO and the Government of Cuba established the biennial prize some 40 years ago.

This is not the first award for Dr Egamberdieva. In 2019, Elsevier named her Top Scientist of the Year through its Scopus Regional Award. In 2006, she was awarded a L'Oreal-UNESCO for Women in Science research fellowship and was distinguished by the American Society of Microbiology Award. In 2013, she received an Award in Agricultural Sciences from the Academy of Science for the Developing World (TWAS), a UNESCO program unit.

News source: https://www.unesco.org/en/articles/dilfuza-egamberdieva-uzbek-scientist-behind-super-crops-wins-unesco-carlos-j-finlay-prize

Rashid Bashir elected to the National Academy of Medicine University of Illinois at Urbana-Champaign

Pakistan-born, Rashid Bashir, dean of The Grainger College of Engineering and professor of bioengineering at the University of Illinois Urbana-Champaign, has been elected to the National Academy of Medicine (NAM). A pioneer at the intersection of engineering and medicine, Bashir was elected "for seminal contributions and visionary leadership in micro and nanoscale biosensors and diagnostics, bioengineering early detection of infection and sepsis, and education in engineering-based medicine with helping to establish the world's first engineering-based medical school at UIUC."

Election to NAM "is considered one of the highest honors in the fields of health and medicine and recognizes individuals who have demonstrated outstanding professional achievement and commitment to service," according to the academy.

Bashir's research focuses on integrating engineering and technology with biology, from the molecular scale to tissues and systems. Among other innovations, his group has developed various lab-on-a-chip technologies and point-of-care diagnostic devices, leading to the creation of three startup companies. His micro and nanoscale technologies have driven the development of biodevices for rapid tests that can detect disease from bodily fluids – even early signs of sepsis, notoriously difficult to monitor – as well as miniature biological robots for applications in medicine and engineering.

"Dean Bashir's career is a highlight reel of innovations, inventions and ideas that are reshaping and reimagining medicine and health care in our society," Chancellor Robert Jones said. "His election to the National Academy of Medicine is well-deserved and all of us at Illinois are excited to celebrate this latest milestone with him".

In addition to his research, Bashir has held several key administrative roles at the university, including serving as the director of the Holonyak Micro and Nanotechnology Laboratory ,head of the department of bioengineering, executive associate dean of the Carle Illinois College of Medicine and, currently, dean of Grainger Engineering.

Bashir was integral in the formation, curriculum development and early leadership of the Carle Illinois College of Medicine, the nation's first engineering-based college of medicine. A partnership between the U. of I. and Carle Health Systems, CI MED has established a new paradigm for educating physician-innovators.

"Rashid Bashir has devoted his career to finding innovations at the intersection of engineering and medicine. He has advanced medicine through this important lens, both in his research as well as in his leadership roles by helping launch CI MED and leading Grainger Engineering, one of the top engineering schools in the world," said Mark Cohen, the dean of CI MED.

Bashir earned a Ph.D. in electrical engineering from Purdue University in 1992. He worked in the semiconductor industry before starting his academic career at Purdue, then held visiting positions at Massachusetts General Hospital and Harvard Medical School before joining the Illinois faculty in 2007. Among other honors, he is a fellow of the National Academy of Inventors, the American Association for the Advancement of Science, the American Institute of Medical and Biological Engineering, and the Institute of Electrical and Electronics Engineers.

At Illinois, he has led National Institutes of Health and National Science Foundation training grants merging engineering and biology. He also played a foundational role in launching the Mayo-Illinois Alliance for Technology Based Healthcare, as well as the Healthcare Engineering Systems Center and Jump ARCHES partnerships with OSF Healthcare in Grainger Engineering.

"Professor Bashir has been a true pioneer in the field of bioengineering and medicine. His research on bio-nanotechnologies at the interface of biology and engineering has been highly impactful and addressed important biomedical problems that involve infectious disease, diagnostics and cancer," said Mark Anastasio, head of the bioengineering department at Illinois. "We are honored and grateful to call him one of our own".

Source: https://news.illinois.edu/view/6367/489995721

IBN AN-NAFIS*
(1213 - 1288 AD)

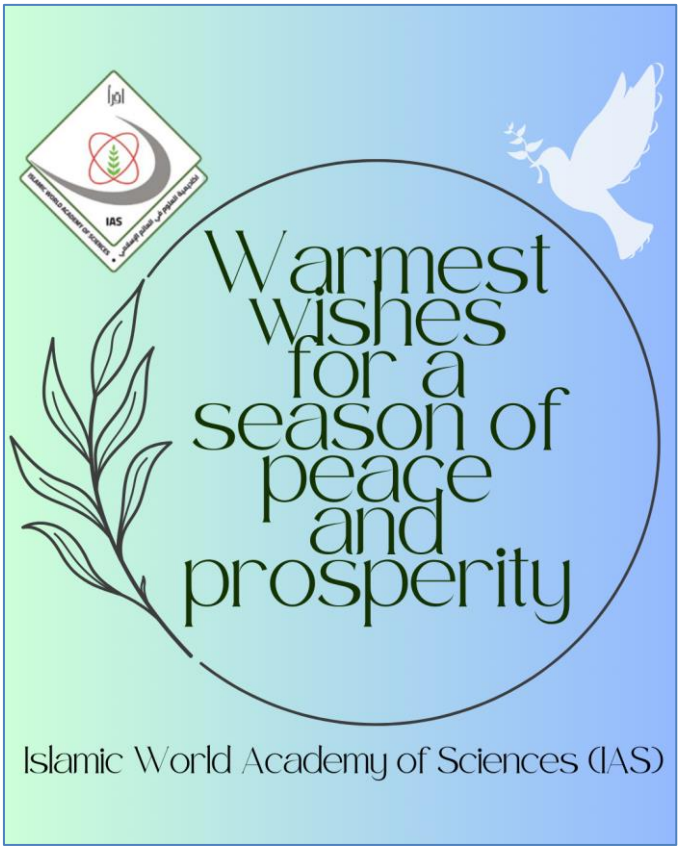
Ala-al-Din Abu al-Hassan Ali Ibn Abi al-Hazm al-Qurashi al-Damashqi al-Misri was born in 607 AH at Damascus. He was educated at the Medical College cum Hospital founded by Nur al-Din Zinki. In medicine, his teacher was Muhathab al-Din Abd al-Rahim. Apart from medicine, Ibn al-Nafis learnt jurisprudence, literature and theology. He thus became a renowned expert on Shafi'i School of Jurisprudence as well as a reputed physician.

After acquiring his expertise in medicine and jurisprudence, he moved to Cairo where he was appointed as the principal at the famous Nasri Hospital. Here he imparted training to a large number of medical specialists, including Ibn al-Quff al-Masihi, the famous surgeon. He also served at the Mansuriya School at Cairo. When he died in 678 AH. He donated his house, library and clinic to the Mansuriya Hospital.

His major contribution lies in medicine. His approach comprised writing detailed commentaries on early works, critically evaluating them and adding his own original contribution. His major original contribution of great significance was his discovery of the blood's circulatory system, which was re-discovered by modern science after a lapse of three centuries. He was the first to correctly describe the constitution of the lungs and gave a description of the bronchi and the interaction between the human body's vessels for air and blood. Also, elaborated the function of the coronary arteries as feeding the cardiac muscle.

The most voluminous of his books in *Al-Shamil fi al-Tibb,* which was designed to be an encyclopaedia comprising 300 volumes, but it could not be completed due to his death. The manuscript is available at Damascus. His book on ophthalmology is largely an original contribution and is also extant. However, his book that became most famous was *Mujaz al-Qanun* and a number of commentaries were written on this. He wrote several volumes on Ibn Sina's *Qanun,* that are still extant. Likewise, he wrote a commentary on Hunayn Ibn Ishaq's book. Another famous book embodying his original contribution was on the effects of diet of health, entitled *Kitab al-Mukhtar fi al-Aghdhiya.*

Ibn Al-Nafis' works integrated the then existing medical knowledge and enriched it, thus exerting great influence on the development of medical science, both in the East and the West. However, only one of his books was translated into Latin at early stages and, therefore, a part of his work remained unknown to Europe for a long time.



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

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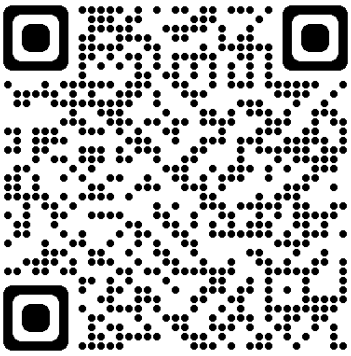

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