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PRINCE EL HASSAN BIN TALAL CALLS FOR NATIONAL INVESTMENT IN SCIENTIFIC RESEARCH*

HRH Prince El Hassan Bin Talal, Chairman of the Higher Council for Science and Technology (HCST), and Founding Patron of the Islamic World Academy of Sciences (IAS), urged greater national commitment to scientific research, describing it as a "strategic investment" essential to Jordan's economic resilience and security.

Speaking at a high-level conference titled "The State of Scientific Research and its Impact on the National Economy", held in Amman under the patronage of HCST, Prince El Hassan emphasised that "science is not a luxury nor an added cost; it is a national necessity."

The conference brought together HRH Princess Sumaya, government officials, Prof. Adanan Badran, IAS President, university presidents, researchers, and industry leaders to discuss the findings of a national study evaluating the role of scientific research in driving economic development.

Prince El Hassan also called on policymakers to move beyond short-term budget priorities and instead embrace long-term investment in knowledge and innovation. "Countries that invest in research don't just catch up, they lead," he said, warning that the absence of evidence-based policymaking weakens national resilience and preparedness.

He stressed that research and innovation must be supported by sustainable financing mechanisms, transparent governance, and inclusive engagement across disciplines and sectors.

He also called for a dedicated legal framework to reinforce Jordan's research infrastructure, including direct grants, financial incentives for youth innovators and tax breaks for private sector investment.

The event also marked the official transfer of the Research and Innovation Support Fund to the HCST. Council's Secretary-General Prof. Mashhoor Rifai welcomed the move, saying it would boost efficiency and align research funding with national development priorities.

"Research is not a luxury; it is the engine of economic transformation," Rifai said. "As the challenges we face multiply, advancing the research ecosystem is no longer optional; it is essential."

Industry engagement was a notable feature of the event, with around 20 per cent of participants representing the private sector, a sign of growing momentum to bridge the gap between academia and industry, Petra reported.

The council's latest study, presented by lead researcher Prof. Nabil Heilat, drew on feedback from over 1,500 researchers and incorporated economic data analysis. The findings identified ongoing structural, regulatory, and financial barriers that continue to limit research productivity and the translation of findings into practical solutions.

In response, the HCST pledged to transform the study's recommendations into actionable policies. Announced initiatives include the formation of expert advisory committees, the launch of a digital dashboard for real-time research data, and the organisation of a national conference aimed at narrowing the academia-industry divide.

**News source: The Jordan Times, 02 July 2025.*
https://jordantimes.com/news/local/prince-el-hassan-calls-for-national-investment-in-scientific-research

ARTIFICIAL INTELLIGENCE AND NANOTECHNOLOGY: A POWERFUL CONVERGENCE SHAPING THE FUTURE

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

The rapid advancement of science and technology is ushering in a new era where two of the most transformative fields Artificial Intelligence (AI) and Nanotechnology are converging. Together, they promise breakthroughs that could revolutionize medicine, manufacturing, environmental sustainability, and beyond.

This article explores how AI and nanotechnology intersect, their applications, and the challenges and opportunities of this powerful synergy.

I. Understanding the Fields

1. Artificial Intelligence (AI)

AI refers to the simulation of human intelligence in machines programmed to think, learn, and make decisions. Over the past decade, AI has achieved remarkable success in pattern recognition, prediction, and autonomous operation.

2. Nanotechnology

Nanotechnology involves manipulating matter at the nanoscale (1–100 nanometers) to create materials and devices with novel properties. It has enabled revolutionary advances in drug delivery, materials science, and electronics and it is expected to advance science in the biological and medicinal fields.

II. Why Combine AI and Nanotechnology?

At the nanoscale, data collection, control, and prediction become extremely challenging due to the complexity and massive amounts of information involved. AI's capabilities in data analysis, modeling, and control are ideally suited to address these challenges. Conversely, nanotechnology provides novel sensors, materials, and platforms that enhance AI applications.

III. Key Applications

1. Medicine and Healthcare

- Smart drug delivery systems: AI algorithms can optimize the design of nanoparticles to deliver drugs to specific cells, improving treatment efficacy and reducing side effects.
- Cancer detection: AI-assisted nanosensors can detect biomarkers at ultra-low concentrations, enabling earlier and more accurate cancer diagnoses.
- Personalized medicine: By integrating AI with nanomedicine, treatments can be tailored to a patient's genetic and physiological profile.

2. Materials Discovery

AI accelerates the discovery of new nanomaterials by predicting properties and behaviors of potential materials without lengthy experimental work, saving time and resources.

3. Environmental Applications

Nanotechnology provides sensors for detecting pollutants and materials for water purification, and desalination and renewable

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

energy from nano-solar voltaic, while AI interprets the massive data and optimizes purification processes. All these will form the nexus of water-energy-food security and ecosphere.

4. Electronics and Energy

- Development of AI-designed nanoelectronics that are faster and more efficient.
- AI helps design nanostructured materials for better batteries, fuel cells, and solar panels.

IV. Challenges

While promising, the integration of AI and nanotechnology faces hurdles:

- Data quality and standardization at the nanoscale is difficult.
- Ensuring interpretability of AI models in critical fields like healthcare.
- Addressing ethical and regulatory issues related to nanomedicine and AI-driven decisions.

V. The Road Ahead

The convergence of AI and nanotechnology is still emerging but gaining momentum. With interdisciplinary research and responsible innovation, this synergy can lead to smarter, more sustainable solutions to some of the world's toughest problems.

Conclusion

AI and nanotechnology, each transformative in its own right, become even more powerful together. As research and industry continue to invest in this interdisciplinary frontier, we can expect a future where intelligent nanodevices and materials improve lives in ways we are only beginning to imagine.

But let us remember that basic science is essential for advancement of scientific applied research. If there is no basic science there is no science to apply.

Prof. Adnan Badran is a biologist, his early original research was the discovery of the mechanism of browning catalyzed by Polyphenol-oxidase and the substrate L-Dopamine and inhibited by the polymer Leucodelphinidin-tannin (Nature 206: 622-624). Another was the discovery of extending storage and shelf life of fruits by inhibiting the biogenesis of ethylene responsible of triggering climacteric rise in respiration, the ripening process, through understanding its interaction with O2 and CO2 (Patent, Ser. U.S. 3,450,543). This discovery has allowed shipping fresh food-fruits and vegetables across countries around the world.

Badran was awarded an Honorary Doctorate from Sungkyunkwan University, Seoul (1981); an Honorary Doctorate in Science from Michigan State University, (2007); Honorary Doctorate in Business from Yarmouk University, Jordan (2014); the West Watkins distinguished Lectureship Award (2009) USA; the Hall of Fame Alumni Award from Oklahoma State University, USA; and the Honorary Professorship from L.N. Gumilev Eurasian National University Kazakhstan (2012). Also, he was awarded the Arab Thought Foundation Award for best Arab scientist in higher education research (2005); the TWAS Regional Prize for "Building Scientific Institutions" (2009); the World Education Asia award for Outstanding Contribution to Education (2011) and the Shoman award for Peer review of young Arab scientists.

Badran was Prime Minister (2005), Minister of Agriculture and Minister of Education (1989) in Jordan. He was Senator and Chair of the Senate Committee on Science, Education and Culture (2006-2010). He served as Assistant Director General for Science and served as Deputy Director-General of UNESCO Paris, (1990-1998). He is the founding President of two public and two private universities. He is a Fellow and former vice-president of TWAS, and he is the president of Arab Academy of Sciences, and president of World Affairs Council, and served as president of the National Center for Curriculum Development and the National Center for Human Rights.

Badran received his B.Sc from Oklahoma State University (1959), and Master then PhD from Michigan State University (1963), USA.

MUNIR NAYFEH

Adnan Badran FIAS, FAAS
President, Islamic World Academy of Sciences
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"Munir Nayfeh is a renowned scientist from the Islamic World. He is a distinguished Professor at the University of Illinois in Physics and he associated himself withy so many scientists from the Islamic world in providing them an opportunity to pursue their doctorate and postdoctorate studies. Munir kept bridges with him home country, Jordan by participating in conferences and lectures in various universities. He introduced Nanoscience with other colleagues to scientists in our region."

Prof. Munir Hasan Nayfeh is a Palestinian-American physicist whose career spans over five decades and reflects an extraordinary blend of scientific achievement, global collaboration, and social purpose. Internationally regarded as a pioneer in both atomic physics and nanotechnology, he is also a prolific inventor, educator, and advocate for science that serves the public good particularly in underserved communities. Known affectionately as "Dr. Nano," Nayfeh is a rare figure in modern science: someone equally at home in the laboratory, the classroom, and the entrepreneurial space, all while keeping one eye on the needs of the wider world.

Born in Jerusalem in 1945, Nayfeh's early life was shaped by displacement and uncertainty. He grew up amid regional conflict, but also amid a strong cultural emphasis on education and intellectual development. He pursued his undergraduate and master's studies in physics at the American University of Beirut, an institution known for cultivating critical thinkers and leaders across the Arab world. From there, he earned admission to Stanford University, where he completed his PhD in physics in 1974. At Stanford, he began exploring the frontier of laser-atom interactions, a field that was then in its infancy but destined to become a cornerstone of modern physical science.

Following his doctorate, Nayfeh launched his research career at Oak Ridge National Laboratory, one of the United States' leading government research institutions. His time at Oak Ridge allowed him to further develop expertise in atomic and molecular dynamics, particularly under the influence of intense laser fields. After a brief academic post at Yale University, he accepted a faculty position at the University of Illinois at Urbana-Champaign in 1978, where he would go on to build a distinguished career as a physicist, mentor, and research leader.

In his early research, Nayfeh investigated how molecules respond to high-intensity laser exposure, work that led to the discovery of *molecular Coulomb explosions*. This phenomenon, in which molecules disintegrate violently under strong electromagnetic fields, provided insight into fundamental physical processes and opened new doors in isotope separation technologies. His use of multiphoton dissociation for isotope separation was particularly innovative, offering greater precision and efficiency than traditional methods. These discoveries positioned him among a small group of physicists globally who were redefining how matter behaves under extreme conditions.

By the 1990s, Nayfeh had turned his attention toward the emerging field of nanotechnology. Recognizing the potential of manipulating materials at the atomic and molecular scale, he led groundbreaking research into the creation and tuning of silicon nanoparticles. His group at

UIUC was among the first to develop nanoparticles that could emit light in controlled colors, an innovation with immediate relevance to biomedical imaging, optoelectronics, and solar energy. His work demonstrated that silicon, a widely available and inexpensive element, could be engineered to behave in novel and useful ways at the nanoscale.

One of his most imaginative achievements was the development of a hybrid technique combining scanning tunneling microscopy (STM) with laser excitation. This allowed for atomic-level manipulation of surfaces, enabling researchers to create intricate nanoscale patterns. In one memorable experiment, Nayfeh's team used this method to etch a logo on a silicon chip smaller than a single cell-earning international media coverage and capturing the public's imagination. Featured in *New Scientist*, the project demonstrated both the technical capabilities and artistic potential of nanoscience.

Nayfeh is the author of over 130 scientific papers and several influential textbooks, including *Electricity and Magnetism* and *Fundamentals and Applications of Nano Silicon*. These works have educated generations of students and researchers, both in the United States and abroad. Known for his clarity and rigor, Nayfeh has long emphasized teaching not just facts but modes of scientific thinking like how to ask the right questions, how to analyze, and how to apply knowledge meaningfully.

Nayfeh has founded multiple nanotechnology companies, including **NanoSi Advanced Technologies** and **Nano Silicon Solar**, with the mission of translating academic research into real-world solutions. His companies focus on the production of cost-effective nanomaterials for use in solar panels, medical diagnostic tools, and energy-efficient lighting. These technologies are specifically designed to be accessible for low-resource environments, reflecting Nayfeh's belief that science must be inclusive and socially responsive.

As a fellow of the Islamic World Academy of Sciences and an active member of international scientific networks, Nayfeh has also worked to strengthen ties between Arab scientists in the diaspora and their counterparts in the Middle East and North Africa. He has mentored dozens of students from across the globe, many of whom have gone on to lead their own labs and companies. In a field that often struggles with representation and access, Nayfeh has served as both a role model and a connector, bringing together researchers from different backgrounds to collaborate on shared challenges.

Over the years, he has received numerous accolades for his work, including the prestigious Beckman Award and an IR 100 recognition for one of the year's top 100 technological innovations. Yet, those who know him say that his true measure lies not in awards but in his relentless curiosity, integrity, and generosity with his time and knowledge. Even today, he continues to publish new research, including recent studies on quantum chaos in hydrogen atoms and the environmental applications of silicon nanostructures.

As the world faces increasingly complex challenges, from climate change to global health inequities, the example set by Nayfeh becomes even more relevant. His work reminds us that the most profound technological advances often begin at the smallest scale, and that the true value of science lies not just in discovery, but in its application for the common good.

Nayfeh continues to inspire with a message that is both timeless and urgent: that rigorous science and social responsibility are not opposing forces but natural partners. Through his research, teaching, and outreach, he has shown what it means to be a scientist in service to humanity, a legacy that will continue to shape the nano world, and the wider one, for years to come.

Prof. Munir Nayfeh with Prof. Adnan Badran at the 23rd IAS Conference in Rabat, Morocco

ENHANCING ESSENTIAL GRAINS YIELD FOR SUSTAINABLE FOOD SECURITY AND BIO-SAFE AGRICULTURE THROUGH LATEST INNOVATIVE APPROACHES*

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Abstract

A key concern in agriculture is how to feed the expanding population and safeguard the environment from the ill effects of climate change. To feed a growing global population, food production and security are significant problems, as food output may need to double by 2050. Thus, more innovative and effective approaches for increasing agricultural productivity (hence, food production) are required to meet the rising demand for food. The world's most widely cultivated grains include corn, wheat, and rice, which serve as the foundation for basic foods. This review focuses on some of the key most up-to-date approaches that boost wheat, rice, corn, barley, and oat yields with insight into how molecular technology and genetics may raise the production and resource-efficient use of these important grains. Although red light management and genetic manipulation show maximal grain yield enhancement, other covered strategies including bacterial-nutrient management, solar brightening, facing abiotic stress through innovative agricultural systems, fertilizer management, harmful gas emissions reduction, photosynthesis enhancement, stress tolerance, disease resistance, and varietal improvement also enhance grain production and increase plant resistance to harmful environmental circumstances. This study also discusses the potential challenges of the addressed approaches and possible future perspectives.

Keywords: essential grains yield; effective approaches; food security; sustainable agriculture

* *Link to the whole publication: https://www.mdpi.com/2073-4395/13/7/1709*

STUDY OF THE ANTIOXIDANT AND ANTI-PANCREATIC CANCER ACTIVITIES OF *ANCHUSA STRIGOSA* AQUEOUS EXTRACTS OBTAINED BY MACERATION AND ULTRASONIC EXTRACTION TECHNIQUES[1]

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Abstract

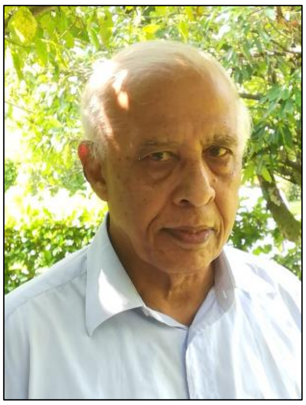
Pancreatic cancer is a highly aggressive malignancy and a leading cause of cancer related deaths worldwide. Moreover, the incidence and mortality rates for pancreatic cancer are projected to keep increasing. A major challenge in the treatment of pancreatic cancer is the lack of effective screening approaches, which contributes to its poor prognosis, indicating the need for new treatment regimens and alternative therapies, such as herbal medicine. The medicinal plant A. strigosa, which is widely distributed in the Eastern Mediterranean region, is a short prickly plant from the Boraginaceae family that has been widely used in traditional medicine for treating various diseases. Nevertheless, its effect on human pancreatic cancer remains poorly investigated. In the present study, we screened the phytochemical content of *Anchusa strigosa* aqueous extracts obtained by maceration and ultrasound-assisted methods (ASM and ASU, respectively) and evaluated their antioxidant effects. We also investigated their anticancer effects and possible underlying mechanisms. The results show that both extracts were rich in bioactive molecules, with slight differences in their composition. Both extracts exhibited remarkable antioxidant potential and potent radical-scavenging activity in vitro. Additionally, non-cytotoxic concentrations of both extracts attenuated cell proliferation in a time- and concentration dependent manner, which was associated with a decrease in the proliferation marker Ki67 and an induction of the intrinsic apoptotic pathway. Furthermore, the extracts increased the aggregation of pancreatic cancer cells and reduced their migratory potential, with a concomitant downregulation of integrin β1. Finally, we showed that the ASM extract caused a significant decrease in the levels of COX-2, an enzyme that has been linked to inflammation, carcinogenesis, tumor progression, and metastasis. Taken together, our findings provide evidence that A. strigosa extracts, particularly the extract obtained using the maceration method, have a potential anticancer effect and may represent a new resource for the design of novel drugs against pancreatic cancer.

Keywords *Anchusa strigosa*, pancreatic cancer, herbal medicine, bioactive compounds, conventional extraction, ultrasound-assisted extraction, apoptosis, COX-2

[1] *Link to the whole publication:* https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2023.1201969/full

ELECTRONIC TOOLS OF CONDUCTORS, INSULATORS AND SEMICONDUCTORS

Mohammed Asghar FIAS



Abstract:
This text treats the basic properties of electronic tools of conductors, insulators and semiconductors.

Conductors, insulators and semiconductors are basic tools in the electronic domain.

Their basic characteristics and properties are:

1. Conductors
Electrical conductors are metals that have free electrons in their outer atomic shells that form a sea of free electrons around the closely packed positive ions. These free electrons can move freely throughout the metallic structure and constitute the electrical current in a circuit, Fig. 1.

Examples of conductors: silver, copper, gold, aluminum, brass and mercury.

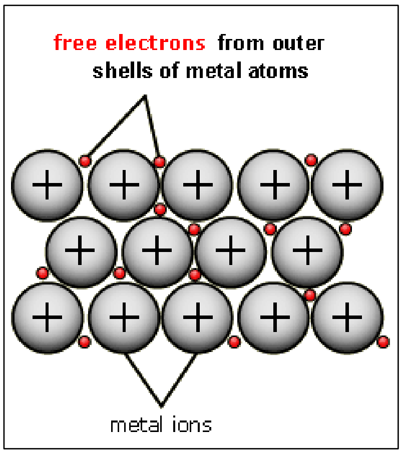


Fig. 1. Structure of an electrical conductor with free electrons and closely packed positive ions, (1).

2. Insulators
Electrical insulators are materials in which electronic current does not flow freely. The atoms of the insulators have tightly bound electrons which cannot easily move. The insulators have higher resistivity than that of conductors and semiconductors, Fig. 2. Insulators are non-metals.
Examples of insulators: glass, nylon, porcelain, hard rubber and wax.

Fig. 2. Insulator used in electrified railways (1).

2. Semiconductors
Electrical semiconductors are solid substances that have conductivity between that of an insulator and that of a conductor either due to the addition of n-type or p-type impurity (called the process of doping) to the material or because of temperature effects. Devices made from semiconductors, notably from silicon, are the essential components of most electronic circuits, Fig. 3**.**

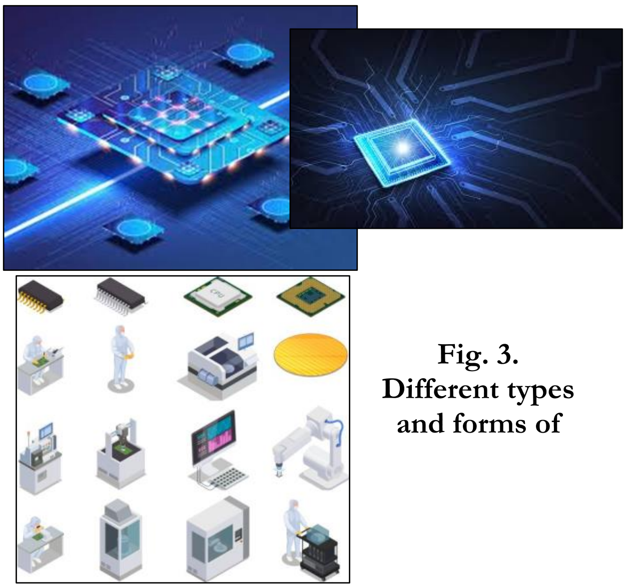


Fig. 3. Different types and forms of semiconductors (1).

4. Conclusions
This contribution presents the pertinent details on the electronic tools of conductors, insulators and semiconductors.

References
1. Courtesy Wikipedia and Google.

IAS President Prof. Adnan Badran Receives Distinguished IAS Fellows at IAS Headquarters in Amman

On Sunday, 1 June 2025, the Islamic World Academy of Sciences (IAS) hosted a high-level meeting at its headquarters in Amman. Prof. Adnan Badran, President of IAS received IAS Fellows Prof. M. Iqbal Choudhary, Secretary General of COMSTECH, Pakistan, Prof. Elias Baydoun, IAS Treasurer and Professor at the American University of Beirut, Lebanon, Prof. Muhammad Ashraf, Rector, University of Lahore, Pakistan and Prof. Shaher Momani, Professor at the University of Jordan. The meeting, brought together distinguished scientists and academics to explore new avenues for collaboration between the two organizations.

Prof. Badran welcomed the guests and expressed IAS's commitment to enhancing regional scientific cooperation. He noted IAS's vision to host upcoming conferences in Amman and emphasized the strong and growing relationship with COMSTECH.

Prof. Choudhary acknowledged Prof. Badran's influential role in the Muslim scientific community and proposed a series of joint initiatives.

Prof. Ashraf highlighted the role of the University of Lahore in providing fully funded fellowships, enhancing opportunities for young researchers.

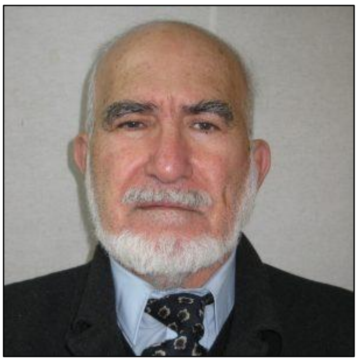
Prof. Adan Badran took the guests on a tour of the IAS Headquarters.

Left to right: Prof. Momani, Prof. Badran, Prof. Choudhary, Prof. Baydoun & Prof. Ashraf.

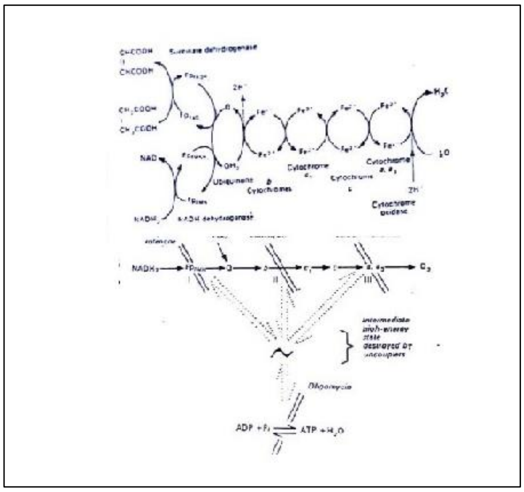
Prof. Badran presents the guests with IAS shields.

Mitochondrial Interactions of Ubiquinone

Muthana Shanshal FIAS



The Hueckel-type molecular orbital treatment for the ubiquinone molecule, not considering the σ-electrons, yielded the following electronic energies: for the highest occupied molecular orbital **(**HOMO**)** +0.68β and for the lowest unoccupied molecular orbital (LUMO) +0.22β. The positive value of the LUMO energy coefficient (+0.22β) indicates the strong electron affinity of the molecule. The reduction electron should proceed to this energetically favored molecular orbital. Accordingly, the ubiquinone molecule should act as electron acceptor in the formed molecular complexes. The MO calculation results indicate too the considerably higher electron densities at the oxygen atoms of the molecule (Figure1). Such atoms should be capable to form hydrogen bridges with other, hydrogen donating molecules.



Sketch (1): Mitochondria of a living cell.

Table (1): Ubiquinones isolated from cells of different living organisms

Ub,6	Sacharomyces severisia
Ub,6	Sacharomyces cavalieri
Ub,7	Candida utilis
Ub,9	Leishmania donovani
Ub,9	Penicillium brevicompactum
Ub,8	Mycoderma monosa
Ub,9	Musca domestica
Ub,9	Pieris rapae
Ub,10	Chicken heart, kidney, leg muscle
Ub,10	Human heart
Ub,10	Human heart

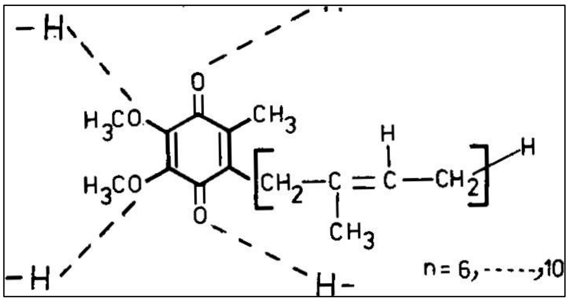
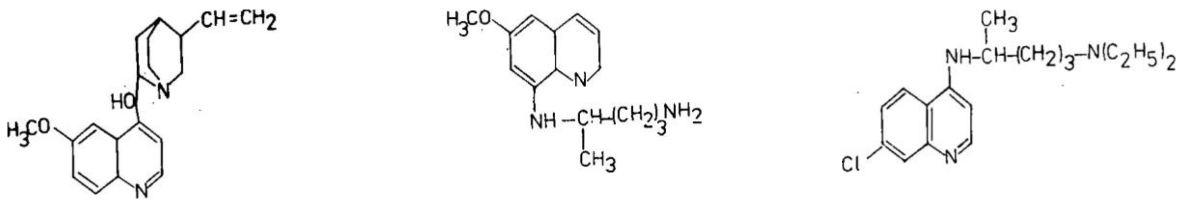


Figure (1): The ubiquinone molecule.

Since it is known that all cytochromes are chemically bonded to the mitochondrial wall, the ubiquinone being the only exception, should act as an electron shuttle enabling the facilitation of the redox reactions in the mitochondria.

Interaction of antimalarials with ubiquinone (Coenzyme,Q)

It was found by Folkers et.al. [1] that antimalarials inhibit the mitochondrial respiration of the plasmodium parasite. The inhibition could be removed through introduction of ubiquinone,10 to the parasite. They concluded that these drugs interfere with the respiration process through interaction with its ubiquinone,10 (CoQ,10). The antimalarials are mostly composed of a heteroaromatic ring attached to an aliphatic chain (Figure 2). Their interaction with the ubiquinone is expected to proceed through face to face orientation of both heteroaromatic rings. Such interactions are known to favor the formation of molecular complexes. Their influence on the electronic structure of the interaction partners could be studied applying the Coulson's quantum mechanical perturbation molecular orbital (PMO) method [2]. The application of such a treatment to the face-face interaction of the antimalarials and quinoline derivatives with the ubiquinone showed that the energy of the lowest unoccupied molecular orbital (LUMO) of the ubiquinone molecule decreases as a result of the complex formation).



quinine chloroquine primaquine

Figure (2): Structures of some common antimalarial quinine drugs.

The change in the LUMO energy of ubiquinone suggested an increase in the electric potential required for the reduction of its oxidized form, which could be proved experimentally applying the electrochemical polarographic technique (Table 2).

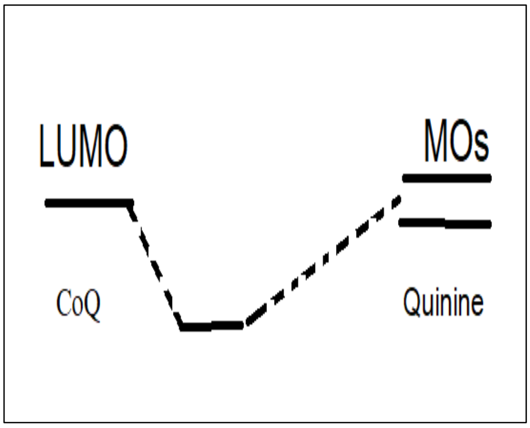


Figure (3): Sketch of the PMO calculated change in the LUMO energy of Ub,10, caused by its interaction with quinine molecule.

The change in the LUMO energy of ubiquinone suggested an increase in the electric potential required for the reduction of its oxidized form, which could be proved experimentally applying the electrochemical polarographic technique. Measurements were done against saturated calomel electrode (SCE), in 4:1 (v:v) ethanol: aqueous Britton-Robinson solution, pH 7.5 (10-4 mol/1).

Table 3, results of the polarographic measurements done for uiquinone,10 mixtures with antimalarials against saturated calomel electrode (SCE), in 4:1 (v:v) ethanol: aqueous Britton- Robinson solution, pH 7.5 (10-4 mol/1), (mvolt).

	Quinine	primaquine
chloroquine		
Ub,10 -0.52	-0.60	-0.142 -0.62
Ub,0 - 0.127	-0.128	-0.142 -0.130

It is seen that the polarographic half-wave potential (**E**$_{1/2}$) values for Ub,10 were shifted towards the negative potential on its interaction with the antimalarials. Those for Ub,0 appreciated minor changes only. The different behavior for Ub,10 from that of Ub,0 is obviously due to the steric influence and inductive effect of the isoprenoid side chain.

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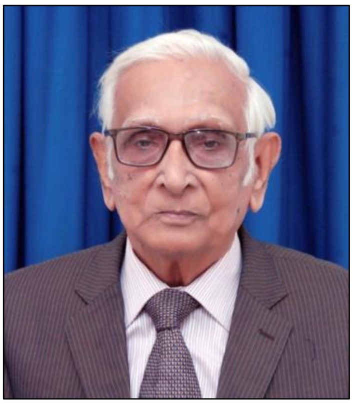
Published in: Mu'tah Journal for Research and Studies Vol. 11 No. 2, 1996.

Sweet Basil in the Quran and Prophetic Traditions (Hadiths)

Mohammed Iqtedar Husain Farooqi
Deputy Director (Retired)
National Botanical Research Institute, India



Quranic Name: Ar-Reihan

Common Names: Rehan-Sulemani, Hook, Shahasfaram, Rehan, Habaq (Arabic), Shahasparam, Nazbo, Raihane Shirin (Persian), Basilic (French), Basilica (Latin), Babui Tulsi, Ban Tulsi (Hindi), Basilico (Italian), Basilien (German), Munjariki, Vishva-tulsi (Sanskrit), Sabja (Bengali, Marathi), Sabza (Hindi, Urdu, Gujarati), Tukmaria (Marathi), Babui Tulsi (Bengali), Tirunitrupachai (Tamil), Rudrajida (Telugu), Niazbu (Kashmiri), Tirunitnu (Malayalam), Basilik (Russian), Albahaca (Spanish), Silasih (Indonesian), Luo le (Chinese), Bosiljak (Croatian, Serbian), Baziel (Dutch), Vasiliko (Greek), Rehan (Hebrew), Bajiru (Japanese), Daun Kemangi (Indonesian, Malay), Basilikum (Norwegian), Alfavaca (Portuguese), Basilica (Swedish), Feslien (Turkish).

Botanical Name: *Ocimum basilicum Linn.*

Family: Lamiaceae

Quranic References

1. **Surah Ar-Rahman (55:12):** "Also corn, with its leaves and stalk for fodder, and **sweet-smelling plants** (Ar-Reihan)."
2. **Surah Al-Waqi'ah (56:89):** "Then (for him is) rest and satisfaction, and a **Garden of Delight** (with Reihan)."

The term **Raihan** is mentioned in these verses, often interpreted as a symbol of divine grace. While some scholars understand it as "food" or "livelihood," others, including Maulana Majid, highlight its meaning as a "fragrant flower." Though major commentators like Maulana Majid, Haqqani, and Usmani recognize **Rehan** as a sweet-smelling plant, none explicitly specify its genus or species. Translators vary in interpretation: Arberry refers to it as "fragrant herb," while Pickthall and Yusuf Ali use "scented herb." Imam Qurtubi writes that this word is used in both meanings: "**sustenance**" (rizq) and "**fragrance**." Ibn Kathir states that "**Raihan**" refers to every fragrant plant. Some exegetes have interpreted "**Raihan**" as the freshness of the soul and the fragrance of Paradise.

Most Islamic scholars have interpreted **Ar-Rehan** variably as "fragrance," "scented plant," or "livelihood." Several Hadiths further confirm the identification of **Rehan** as a fragrant plant. For instance, Abu Hurairah (RA) narrated:

"He who is presented with a **Rehan** (a flower of sweet basil) should not reject it, for it is light in weight and pleasant in odor." (Sahih Muslim)

And Abdur-Rahman bin Abu Nu'm and several others narrated:
"Indeed, Al-Hasan and Al-Husain – they are my two **Raihan** (sweet basils) in this world." (Tirmidhi)

In this Hadith, the use of **Rehan** serves as a metaphor, implying that Hasan and Husain (may Allah be pleased with them both) were a source of joy, love, and comfort for the Prophet Muhammad's heart, just as fragrant plants bring freshness to a person.

Prophet (SAW) also described **Rehan** as "a pleasant fragrance but its taste as bitter." (Sunan an-Nasa'i).

In another Hadith narrated by Abdullah ibn Masʿūd (RA), Paradise is described as:
"Paradise is a shining light, a fragrant basil (**Reḥān**) swaying gently, a lofty palace, a flowing river, ripe fruits,..." (Ibn Mājah)

In this Hadith, the mention of "**Reḥān**" (fragrant basil) symbolizes not only physical beauty and scent but also spiritual joy and purity, fitting into Quranic descriptions of Jannah where **Rehan** is mentioned (e.g., Surah al-Waqiʿah 56:89).

As already stated, **Ar-Rehan** in the Quran and Ahadith Nabvi carries deep symbolic and literal meanings, often linked with beauty, fragrance, and divine grace. While its exact botanical identity was historically ambiguous, modern scholars and traditional healers largely associate it with *Ocimum basilicum*—**Sweet Basil**—a plant celebrated across cultures for its aromatic, culinary, and medicinal qualities.

In **Flora Arabica**, **Raihan** is identified as *Ocimum basilicum* (**Sweet Basil**), which is found both wild and cultivated across Arabia, especially in Yemen. In India, it's known as **Babui Tulsi**, while in Iran, it's referred to as **Shahasparam** (King of Herbs) or **Nazbu** (delicately fragrant). The plant is considered indigenous to Iran's Kirman region, where it is sometimes called **Habaz-Kirman**.

Sweet Basil is a highly aromatic herb used globally as a culinary ingredient and in traditional medicine. The essential oil, extracted via steam distillation from its leaves and flowers, is widely used in food for flavoring soups, sauces, pizzas, egg and cheese dishes, salads, desserts, tomato juice, pickles, and meat products.

Medicinal Uses: It's recognized for its antimicrobial, antispasmodic, and carminative properties. Traditionally, it's used to treat nausea, flatulence, dysentery, insomnia, colds, mental fatigue, skin diseases, and urinary disorders. It's also used in perfumes, oral care products, and skincare due to its refreshing scent and therapeutic properties.

The leaves are often used fresh but can also be dried. Seeds, known as **Tukhmaria**, become mucilaginous when soaked and are used in cooling drinks like sherbet. These seeds are exported from India under the name of **Tukhmaria**.

Chemical Constituents: Caffeic acid, Cineole, Coumaric acid, Cymene, Limonene, Linalool, and Methyl chavicol.

Leaves: Used in tea to relieve nausea, flatulence, and digestive issues. Applied externally for acne, stings, and skin infections. **Seeds:** Astringent and used in bowel flux and urinary disorders (gonorrhea, painful urination).

Whole Plant: Helps treat colds, spasms, mental fatigue, insomnia, sinus problems, muscle aches, and hysteria. **Sweet Basil** is widely accepted in folk medicine and is even recognized in formal pharmacopoeias in several countries.

It's important to understand the difference between **Sweet Basil** of Arabian Peninsula and Western World and **Holy Basil** of India. While both belong to the same mint family (Lamiaceae) and share some similarities in appearance, they are distinct species with different characteristics, culinary uses, and traditional applications. After all both these basils are well known plants in Plant Kingdom.

Sweet Basil: *Ocimum basilicum* is the common annual basil used in Western cuisine. It has a slightly peppery and often anise-like flavor, with a fresh and sweet aroma. Important in Islamic Culture. Sweet Basil (for Leaves) is widely cultivated throughout Europe, especially in Mediterranean regions (Italy, France, Greece) for cuisines. In Eastern Orthodox Church it is sometimes referred to as "Holy Basil", and used in Church rituals. Muslim world in general, Arabs and Iran in particular, use Rehan in cuisines. It is most popular in North African countries.

Holy Basil (Tulsi): *Ocimum tenuiflorum* (also known as *Ocimum sanctum*) is a perennial plant with a pungent, peppery, and often clove-like flavor with notes of lemon and peppermint. It holds deep cultural and spiritual significance in Hinduism, where it is considered a sacred plant. It's a cornerstone of Ayurvedic medicine and is revered for its adaptogenic properties. Ocimum sanctum L. is a well-known synonym, still widely used in literature and traditional texts. Tulsi is also widely cultivated in Thailand, and is commonly used in cooking.

International Science Council Statement on International scientific collaboration: Vital yet vulnerable

As global challenges grow more complex, the foundations of international scientific collaboration are increasingly under threat. In this statement, the International Science Council's Governing Board underscores the urgent need to protect and strengthen global cooperation in science - essential not only for advancing knowledge and innovation, but for safeguarding the wellbeing of people and planet alike.

International Science Council

Science is a special form of globally shared knowledge which the world needs more than ever in addressing the challenges that all face. The international collaboration that is at its heart has been created over many decades, but is now vulnerable and fragile. Given the enormous importance of science to national and global wellbeing, the International Science Council appeals to all decision makers to ensure that the principles of science and its institutions are protected, and that international scientific cooperation is maintained and ideally strengthened.

Over the past 200 years, science has played a major role in improving the quality of human life, fostering economic growth, and deepening broader understanding of nature and society. All nations use science to advance their interests - through health, social progress and economic development. Much of this national benefit is achieved through significant investments in research, including by the private sector and philanthropies, and via collaborations within the global scientific community - for knowledge transcends national boundaries. This collective approach has become more critical given existential threats to planetary and societal health that we now face.

Science also plays an important role in nations advancing their economic, security, and geostrategic goals. The increasingly used policy mantra of science being "as open as possible and as closed as necessary" must not be extended beyond legitimate need.

Science has both contributed to, and exposed, the issues of the impact of humans and their technologies on the planet at every level, from local to global. Over the last few decades, nations and their scientists have collaborated to identify, seek to mitigate, and adapt to these risks. That collaboration has often transcended geostrategic tensions because it is in every nation's own vested interest to protect the global commons.

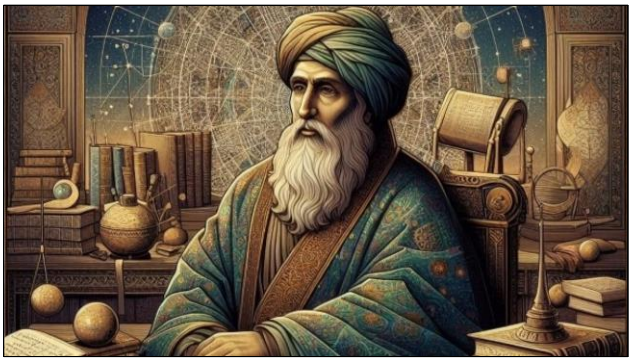
What underpins all sciences is a set of principles based on empiricism, transparency, quality assurance and openness that allow science to be a universal system of knowledge. However, the application of scientific knowledge is rightfully determined by the societies in which it is embedded. Scientific communities are right to be concerned about the forces that are challenging them. International scientific collaboration must continue; the responsibility for sustaining research must be more equitably shared - not only to safeguard scientific outcomes, but because nations that invest in and support science also grow from its many benefits. Ignoring science increases the risks to the global commons. Scientific cooperation promotes peaceful dialogue among countries.

For its part, the scientific community must remain true to its core principles but must be more closely and meaningfully connected to society. The contract between science and society must be continually renewed allowing science to make essential contributions to peace, security and well-being.

As the global NGO mainly comprising scientific unions, associations and academies, the ISC is committed to our vision of science as a global public good. We call upon all sectors of society to recognize that the free and responsible practice of science is a community endeavour crucial to the advancement of all humanity.

Qutb al-Din al-Shirazi
A Pioneering Scholar of the Islamic Golden Age

Prepared by: International Relations Office of the Iran Academy of Sciences



Qutb al-Din al-Shirazi (1236–1311) stands as one of the most distinguished figures in the history of Islamic science and philosophy. A prolific polymath, his contributions span a wide array of disciplines, including astronomy, philosophy, mathematics, medicine, and theology. His innovative ideas and deep scholarly insights not only enriched the Islamic intellectual tradition but also laid groundwork that would influence both Eastern and Western scientific thought for centuries to come.

Early Life and Education

Born in Shiraz, Iran, during a vibrant era of cultural and scientific flourishing. Qutb al-Din was immersed early in the rich intellectual traditions of the region. His education encompassed various fields, with a particular emphasis on astronomy and philosophy, areas in which he would eventually achieve exceptional mastery. His environment, characterized by a confluence of scientific inquiry and theological reflection, provided fertile ground for his multifaceted pursuits.

Contributions to Astronomy

Al-Shirazi's most notable achievements are rooted in astronomy, where he challenged prevailing Ptolemaic models that had dominated Islamic and European astronomy for centuries. Recognizing the inaccuracies in the astronomical tables and planetary models of his time, he devoted himself to refining celestial calculations and proposing alternative models. His most significant work, *Tadhkirat al-Awamm* ("Memoirs for the General"), served as a comprehensive astronomical treatise that sought to reconcile empirical observations with mathematical models.

One of al-Shirazi's most innovative contributions was his critique of Ptolemaic astronomy and his development of alternative geocentric models that explained planetary motions with greater accuracy. His meticulous observations and mathematical formulations aimed to improve the predictive power of celestial calculations, reflecting a pragmatic approach that emphasized empirical evidence.

Philosophical and Scientific Thought

Beyond astronomy, Qutb al-Din was deeply engaged in philosophical discourse, actively participating in debates concerning the nature of existence, divine creation, and the human soul. His philosophical perspectives were influenced by the rich tradition of Islamic philosophy, yet he maintained a critical stance toward some idealist tendencies, advocating for a synthesis of rationalism and empirical observation.

In his medical pursuits, al-Shirazi authored medical texts that underscored the importance of empirical diagnosis and holistic approaches to health, aligning with his scientific outlook. His writings reflect an integrated worldview where science, philosophy, and theology coexist harmoniously, emphasizing the unity of knowledge.

Architectural and Mathematical Works

Al-Shirazi also made contributions to mathematics and architectural sciences. He applied mathematical rigor to astronomical calculations and explored geometric principles underlying construction and design. His insights into geometry and optics influenced architectural practices and scientific tools, demonstrating his versatile expertise.

Legacy and Impact

Qutb al-Din al-Shirazi's work significantly impacted the course of Islamic science, especially in refining astronomical models and promoting empirical investigation. His critiques stimulated subsequent scholars, including Nasir al-Din al-Tusi, whose own astronomical theories further advanced the discipline. Al-Shirazi's insistence on observational precision and skepticism of unverified dogma embodied the scientific spirit that characterized the Islamic Golden Age.

Furthermore, his philosophical writings advocated for a rational understanding of divine revelation, highlighting the importance of intellectual inquiry within Islamic tradition. His approach harmonized faith and reason, inspiring later efforts to integrate scientific methods within religious frameworks.

Conclusion

Qutb al-Din al-Shirazi remains an emblem of scholarly devotion and intellectual curiosity in the Islamic world. His multidisciplinary achievements exemplify the spirit of inquiry that characterized the Islamic Golden Age, emphasizing empirical evidence, philosophical rigor, and scientific innovation. As a pioneering thinker whose ideas transcended borders and centuries, al-Shirazi's legacy continues to inspire contemporary scholars and scientists. Recognizing his contributions fosters a deeper appreciation for the rich heritage of Islamic sciences and underscores the enduring value of knowledge as a universal pursuit. The ongoing relevance of his work affirms the importance of fostering scientific inquiry rooted in rationality and faith– a harmony that remains essential to progress in the modern era.

Tomb of Qutb al-Din al-Shirazi in the Charandab cemetery in Tabriz, Iran.

THE TOP 10 EMERGING TECHNOLOGIES OF 2025*
ACCORDING TO THE WORLD ECONOMIC FORUM

1. Structural Battery Composites

Where lithium-ion batteries are solid structures that need their own space, structural battery composites (SBCs) are a weight-bearing material – like carbon fibre or epoxy resin – that can also store electrical energy. This technology could make electric vehicles lighter and more efficient and could also be applied to aircraft, as potential applications include fuselages.
SBCs are yet to achieve widespread adoption for a number of reasons, but if safety regulations and standards can be developed to support widespread use, they could have a significant impact environmentally and economically.

2. Osmotic Power Systems

What if you could generate power from the difference in saltiness of two water sources? That's what osmotic power systems promise with the potential to generate clean, renewable, low-impact electricity.
Although first proposed in 1975, recent advances in materials and system designs have brought the idea closer to reality. There are two types of osmotic power systems: Pressure Retarded Osmosis, which uses a semipermeable membrane to enable water to move from low to high salinity; and Reverse Electrodialysis which uses ion-exchange membranes to move positive and negative charges between the two sides of the membrane, creating a charge in the process.
Bernard Meyerson, CIO Emeritus at IBM, put it more simply: "Naturally, the Earth tries to reach equilibrium, which is a fancy way of saying, if you've got a lot of excess water on one side and a lot of excess salt water on the other side, the water will migrate over to the side with the salt to dilute it, until we get equal amounts on both sides - equal salinity. In doing so, it generates pressure because water is moving across the membrane."

3. Advanced Nuclear Technologies

"A renewed wave of technological innovation of nuclear energy is now underway," write the authors explaining this technology. After a period of relative inactivity in terms of the construction of new nuclear power plants, production is ramping up.
From alternative cooling fuels to Small Modular Reactors (SMRs), there are a number of technological advances aiming to lower costs, simplify designs and boost power generation from nuclear in countries around the world.
The ultimate goal is to achieve nuclear fusion - fusing hydrogen atoms to release huge amounts of energy - something the international ITER project in France has been working on for years. If achieved, it will provide "a transformative solution to our global energy challenges".

4. Engineered Living Therapeutics

Scientists hope that by turning helpful bacteria into tiny medicine factories they can treat disease from inside the body. The impact? Cheaper and more effective long-term care.
This is done by introducing genetic code, which contains instructions for producing therapeutics, into living probiotic systems, such as microbes, cells and fungi. The systems could also be programmed with switches to control production on demand.
Bypassing the need for producing drugs in a laboratory means a 70% reduction in production costs. What's more, the approach provides a stable and prolonged supply of treatment for patients who would normally need a regular injection – as in the case of diabetes treatment.
"Imagine if you had engineered living therapeutics, these little bio-factories inside of you, and they could supply that glucose as needed by the body," says Mariette DiChristina, a dean at Boston University. "It would be more like what your body would do naturally if you didn't have that illness."

5. GLP-1s for Neurodegenerative Disease

A recently developed class of drugs, that were originally made to manage type 2 diabetes and

* *Source: https://www.weforum.org/stories/2025/06/top-10-emerging-technologies-of-2025/*

obesity - technically known as Glucagon-like peptide-1 receptor agonists or GLP-1 RAs – are showing promise in the treatment of brain-related diseases, like Alzheimer's or Parkinson's.
GLP-1 RAs have been shown to reduce inflammation in the brain and encourage the removal of toxic proteins. Left untreated, both are related to the development of the above conditions. More than 55 million people globally live with dementia, so there are significant social, as well as economic benefits, for such drugs. For instance, as DiChristina says: "Think about the caregivers and the time they need to spend [on care] that maybe they could also be spending on other kinds of life-affirming work."

6. Autonomous Biochemical Sensing

These devices detect and quantify specific biochemical parameters – consider for example disease markers or chemical changes in water to detect pollution - autonomously and continuously. With wireless communication and self-sustaining power sources, they enable real-time, ongoing monitoring.
The technology has already seen some success with specific applications, most notably a wearable glucose monitor for diabetes management. However, thanks to advances across a number of fields, the technology is now starting to address other targets and applications, such as menopause care and food safety.

7. Green Nitrogen Fixation

Nitrogen fixation converts nitrogen from the atmosphere into ammonia at scale. This is needed for fertilizer production, which in turn supports some 50% of the world's food production. New green nitrogen fixation aims to cut the enormous environmental impact of the process, which currently consumes about 2% of global energy.
These new methods would see existing systems replaced with bio-based or bio-inspired systems, such as the use of engineered bacteria and enzymes to fix nitrogen, as well as sunlight or green forms of electricity to provide energy.

8. Nanozymes

Nanozymes are lab-produced and manufactured nanomaterials with enzyme-like properties. However, compared to enzymes, which are either produced by living organisms or synthetically produced at substantial cost and complexity, nanozymes are much more stable, as well as being cheaper and simpler to produce.
They act like catalysts, supporting the same chemical reactions as enzymes, but because they're more robust, could be used in a far wider set of conditions. Applications range from therapeutics to water purification and food safety, and clinical trials are already underway for cancer and neurodegenerative disease treatment. But there are still technical and ethical hurdles to overcome before nanozymes can reach widespread adoption.

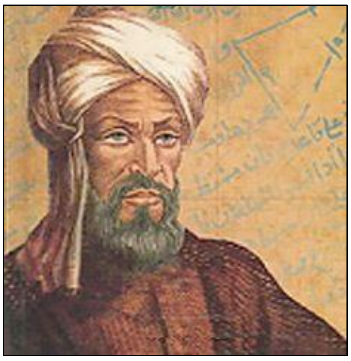
9. Collaborative Sensing

Individual sensors are already widespread in our lives, but advances in technology – for example, AI – offers new, networked, opportunities. These connected sensors could change how cities operate and how organizations use data to make decisions.
Consider urban mobility. Connected traffic lights could adjust themselves based on traffic cameras and environmental sensors, allowing them to help manage congestion and cut pollution. Other use cases include mapping in mines, environmental monitoring and the analysis of storm systems.

10. Generative Watermarking

In an era of deepfakes and synthetic media, this technology is a welcome addition. It adds invisible tags to AI-generated content, which makes it easier to identify what's real and what isn't, and as a result will help fight misinformation and improve trust online.
Meyerson describes how the process can work with images. "At the level of pixels, which human eyes can't resolve, but computers can ... you write a signature into the image that says 'Hi, I'm from AI'."
A number of leading tech companies are increasingly integrating watermarking. However, the tech faces challenges, including uneven adoption and users attempting to remove or forge watermarks. Ethical concerns also abound, such as falsely labelling real content as AI-generated.

ALI IBN RABBAN AL-TABARI*
(838 - 870 AD)



This Hakim was the tutor of the physician al-Razi. Luck favoured the disciple more than the teacher in terms of celebrity. As it seems, compared to Razi, people know very little about his teacher Al-Tabari.

Ali Bin Rabban's forename was Abu al-Hassan, the full name being Abu al-Hassan Ali Ibn Sahl Ibn Rabban al-Tabari. His father Sahl hailed from a respectable Jewish family. The nobility and sympathy inherent in his very nature soon endeared him to his countrymen that they used to call him *Rabban* which implies "my leader."

Professionally Sahl was an extremely successful physician. He had command over the art of calligraphy too. Besides, he had a deep insight into the disciplines of Astronomy, Philosophy, Mathematics and Literature. Some complicated articles of Batlemus's book al-Mijasti came to be resolved by way of Sahl's scholarly expertise. Translators preceding him had failed to solve the mystery.

Ali received his education in the disciplines of Medical science and calligraphy from his able father Sahl and attained perfection in these fields. He had also mastered Syriac and Greek languages to a high degree of proficiency.

The fame acquired by Ali Ibn Rabban did not simply account for the reason that a physician of the stature of Zakariya al-Razi was amongst his disciples. In fact, the main cause behind his exaltation lies in his world-renowned treatise Firdous al-Hikmat.

Spread over seven parts, Firdous al-Hikmat is the first ever medical encyclopaedia which incorporates all the branches of medical science in its folds. This work has been published in the twentieth century only. Prior to that, it used to be found scattered in libraries the world over. Dr. Mohammed Zubair Siddiqui compared and edited the manuscripts. In his preface he has provided extremely useful information regarding the book and the author and, wherever necessary, explanatory notes have been written to facilitate publication of this work on modern publishing standards.

Later on, this unique work was published with the cooperation of English and German institutions. Following are the details of its seven parts:

Part one: Kulliyat-e-Tibb. This part sheds light on contemporary ideology of medical science. In that era, these principles formed the basis of medical science.

Part two: Elucidation of the organs of the human body, rules for keeping good health and comprehensive account of certain muscular diseases.

Part three: Description of diet to be taken in conditions of health and disease.

Part four: All diseases right from head to toe. This part is of profound significance in the whole book and comprises twelve papers:

General causes relating to eruption of diseases. ii) Diseases of the head and the brain. iii) Diseases relating to the eye, nose, ear, mouth and the teeth. iv) Muscular diseases (paralysis and spasm). v) Diseases of the regions of the chest, throat and the lungs. vi) Diseases of the abdomen. vii) Diseases of the liver. viii) Diseases of gallbladder and spleen. ix) Intestinal diseases. x) Different kinds of fever. xi) Miscellaneous diseases-Brief explanation of organs of the body. xii) Examination of pulse and urine. This part is the largest in the book and is almost half the size of the whole book.

Part five: Description of flavour, taste & colour.

Part six: Drugs and poison.

Part seven: Deals with diverse topics. Discusses climate and astronomy. Also contains a brief mention of Indian medicine. Though he wrote Firdous al-Hikmat in Arabic but he simultaneously translated it into Syriac. He has two more compilations, namely Deen-wa-Dawlat and Hifz al-Seha. The latter is available in manuscript-form in the library of Oxford University. He was also a master of Philosophy, Mathematics and Astronomy.

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

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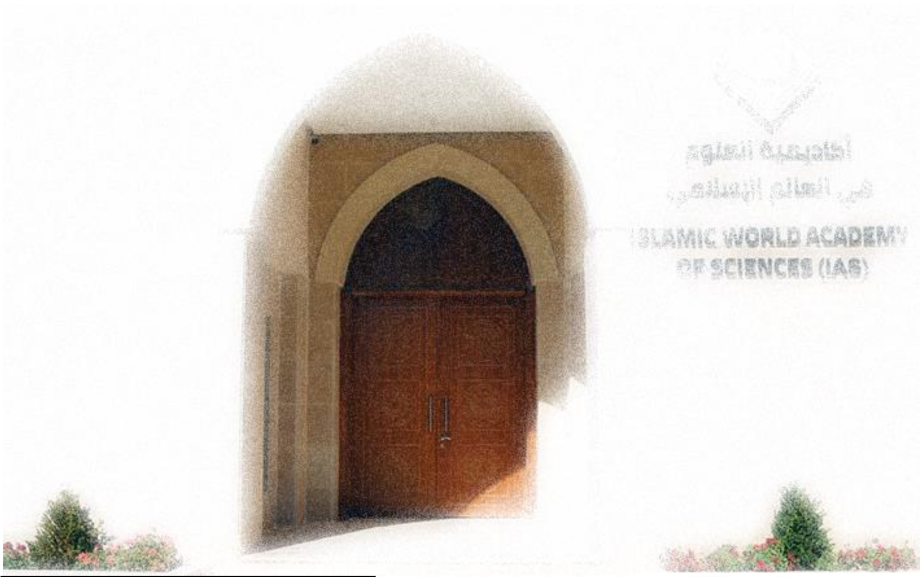

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