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# Newsletter

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CONTENTS



## THE ANTHROPOCENE

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Since 1950 humanity entered the age of Anthropocene that marked steady increase in the world population and its economic output (GDP). In their effort to increase their living standards, humans adopted a macroeconomic model for growth and development that stressed accumulation of produced and human capitals ignoring the natural capital. It was until 1970 when nature was introduced as an inessential entity in the models. The huge demand for provisioning services (water, food, fiber, timber etc…) has rendered the ability of the biosphere to supply regulating and maintenance and cultural services increasingly compromised.

During the period 1992-2014, the produced capital has doubled, human capital increased by 13% whereas natural capital decreased by 40%. Earth systems and processes indicated in the changes of identified planetary boundaries that include biospheric integrity, climate change, ozone depletion, ocean acidification, land system change, fresh water loss and biochemical flows (N, P) had been followed carefully. At least 2 processes are pushing the earth system outside the convenient operating state. These are the biosphere integrity and the Nitrogen & phosphorous cycle. Climate change is currently in the uncertainty zone with increasing risk to bypass the safe operating boundaries.

Human activity from the onset of Anthropocene has resulted in accelerating the extinction rate 100-1000 times higher than the average over the past several millions of years. The Living Planet Index (LPI) showed an over 60% decline in the population of mammals, birds, fish, reptiles and amphibians over the past four decades.
In addition, $CO_2$ concentration rises from 310 ppm to 409.8 ppm nowadays contributing significantly to climate change.

Climate change economists entertained the thought that climate change is amenable to science and technology solutions and the World Bank adapts and propagates this notion through its financial instruments. It is claimed that with little investment in clean energy, as little as 2% of the world GDP, we can enjoy indefinite, unbounded growth and development and could continuously increase the world output (GDP) of final goods and services as if our economic possibilities are not circumscribed.

The classical economical model of growth and development is based on the idea that our economies are external to the biosphere, that with human ingenuity we can break free from it. However, this contradicts what is known by the biodiversity economists that the ever increasing global output is far beyond reach and we have to acknowledge that our economy is embedded in nature which is intrinsically bounded and limited. As such our economy is inevitably finite as the biosphere which we are part of.

The excessive demand on the biosphere eradicated the modularity of the earth system as it was in the past when societies used to live in confined borders. Any disturbances that may occur in one location remain localized.
Nowadays disturbances in one location find their way all over the globe.

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# WHAT IS THE CORE MISSION OF HIGHER EDUCATION?


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Although the higher-education sector is often described as rigid and resistant to change, the history of higher education points to continuous transformation. At different points of time, the purpose of higher education has taken on a variety of angles. Higher education institutions first targeted a single stratum of society: the elite and the privileged, focusing primarily on religious and theological education, literature and philosophy, mainly designed to nurture the mind as well as preparing students for leading roles in government and learned professions, such as divinity, law and medicine. Then as the number of students increased and higher education institutions expanded, accompanied by a massification in enrollments, staff and faculty recruitments, and institutional infrastructure and disciplines, higher education started its transformation into mass higher education, in order to be able to cater for a broader range of students with a broader age group and range of functions. With this growth, the purpose of higher education shifted from mainly the shaping of character to the preparation of technical elite roles through the transmission of technical knowledge. Today, the higher education sector entered a third phase, described as the universal phase and designed for universal access, which was facilitated by technology, consequently breaking the boundaries of institutions, and increasing diversity and collaborations [1, 2].


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While the higher education sector transformed from the diffusion of bookish knowledge and training to the advancement of knowledge through critical thinking and research, Newman argued that teaching and research should be separated, and that higher education should be about liberal education for "the achievement of a particular expansion of outlook, turn of mind, habit of thought, and capacity for social and civic interaction" [3]. Clearly, the purpose and functions of higher education have been long debated, and one cannot deny that the higher education sector witnessed great transformation. *"This great transformation is regretted by some, accepted by many, gloried in, as yet, by few. But it should be understood by all"* [4].

Nowadays, the definition of the purpose of higher education is a non-compulsory learning stage that occurs beyond high school, with the main aim to prepare students to become professionals and effective citizens. At the core of higher education institutions there are three major missions: (1) to educate, (2) to generate new knowledge through research, and (3) to engage with the community and contribute to the development of society by providing public service [5]. In other words, higher education institutions aim to prepare students to join the workforce by teaching subjects that are required to tackle the society's needs and challenges, ultimately contributing to social mobility and economic growth.

Students become passive and tend of focus on having a degree regardless of learning or their responsibilities towards society. However, with a growing number of students seeking higher education and the addition of non-traditional cohorts such as full-time working adults and part-time students who have different characteristics and educational needs, the student body has become increasingly diverse with consequently diverse needs and purposes. Yet the reality is different. With higher education institutions still mostly geared towards the traditional type students as a "one-size-fits-all" model, offering overcrowded and fragmented curriculum that remiss about the vocational and personal development of students, there is a pressing need to adjust the purpose of higher education to meet the requirements of a growing and diverse student body. A student body that is still seen as a customer, rather than a learner, of an institution-centered provider.

As from the society's perspective, the lack of investment in higher education can have dire consequences, negatively impacting the country's economic growth and participation in the global knowledge economy, mainly due to lack of investment in the country's human capital resulting in loss of talent through brain drain, poor research activity because of limited access to facilities and capacity for solving local problems.

Over the last 50 years, the Arab countries of the Middle East and North Region (MENA), have made great progress in improving enrollment rates and gender parity at all education levels. Until 1953, there were only 14 public and private Arab universities in the Arab world, most of them as very old or foreign institutions. Today there are over 800 universities, associated with an expansion in student enrollments, mainly fueled by an exponentially growing population with a high youth composition and the recognition of the importance of higher education for social and economic development [6, 7]. However the gap between the educational output and labor market demands and development needs is still growing. Young citizens in the region feel that higher education only serves them to get credentials without offering links or relevance to the labor market. While Arab countries vary in the political, economic and social challenges they face, they all suffer from this disconnect and are not conducive of critical thinking. Years of conflict and instability in many countries of the region have further exacerbated this situation, failing to meet the demands of a large growing young population and leading to more and more isolation of the Arab countries from global knowledge and progress. Although the region has witnessed many advances, their education system remains the same and is in dire need to transform in order to be able to create the required change [8-10].

A higher education sector in crisis is not breaking news. Articles, issues and books on higher education in crisis have been calling repeatedly for change. Looking at a past with various challenges, and having survived with relatively little institutional change, will the higher education sector's response to the COVID-19

crisis by any different? During an interview with Forbes magazine in 1997 discussing the escalating cost of education and the rise of the "internet mania", management guru Peter Drucker had said that the current setup for higher education is "doomed" and predicted that "thirty years from now the big university campuses will be relics. Universities won't survive. It's as large a change as when we first got the printed book". Will higher education institutions embrace this opportunity and respond accordingly by making the necessary adjustments and adopting sensible reforms for building an effective educational system that actually meets the needs of students and society? Will higher education embrace change in its purpose to become relevant? Will these changes be coupled with a transformation at the institutional level and improvements in governance structures, curriculum, pedagogical delivery, educational technologies, and interactions between the various stakeholders involved?

Only time will tell.

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# NOTE: FROM NANOTECHNOLOGY TO PICOTECHNOLOGY AND ITS ADVANTAGES

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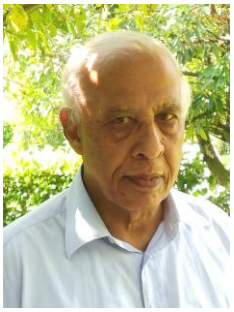

Nanotechnology as a powerful tool is widely used across large areas such as energy, the environment, cosmetics, medicine, health care, means for drugs transport to specific points of interest in the body, agriculture, textiles and information technology **(1).** The size of nanoparticles lies in the range of about 1 nanometer to about 100 nanometers consisting of different shapes such as spheres, rods, triangles and hexagons. Controlling the size and shape of the nanoparticles is the key to make them behave and be effective in a certain desired way. The property that renders these nanoparticles highly valuable is their *large surface-to-volume ratio*, because this relatively large surface-of-contact is *mechanically* involved in their highly effective operations. For a spherical particle of radius r = 0.01 meter, this ratio R = (3/r) = 3. $10^{+2}$, however,for a spherical nanoparticle with r = 1 nanometer, this R= $3.10^{9}$.

These nanoparticles consist of *clusters* of atoms, for example, for gold, a noble metal that does not react or corrode or tarnish, there are around 2000 atoms per cluster, bound together mostly through the van der Waals force.

The next natural step in this nano-field, is picotechnology that operates at the $10^{-12}$ -meter scale. At this scale, the size of the nanoparticle-cluster is reduced mostly to an individual atom with a thousand times higher surface-to-volume ratio R = 3. $10^{+12}$. This bigger surface allows the nanoparticles as encapsulated bodies, to collect and transport much higher quantity of different type of material to the desired target than the nanoparticles. Moreover, since the properties of picoparticles are controlled by rules of *quantum mechanics*, this allows modification in the electrons distribution around the atom and thus, helps to control the *chemical* properties of these picoparticles such as their surface-sticking probability to other materials prepared for transport to a certain location, and electrical conductivity and optical properties that may render the picotechnology products even more valuable and effective than those of nanotechnology. Furthermore, this atomic engineering should help to identify living cell types or in general, chemical and biological surfaces using atomic arrays.

These picoparticles, because of their small size, they can penetrate into the nanometer-size natural cells such as hemoglobin, proteins, DNA or other biosystems, to study them more precisely or to identify, detect and eliminate their desired targets in a more precise manner **(1,2,3).**

One of the interesting applications of the picoparticles is to improve the effect of different *lubricants* used along with the moving components in different mechanical systems by reducing their surface-friction via removing their atomic-scale surface roughness through coating with the appropriate picoparticles. This work should significantly decrease the friction-caused wear-and-tear of the moving parts and increase the fuel consumption efficiency of these systems. At present, there is an intense engineering activity on this problem, particularly, in the automobile industry **(4).**

As there are well-established techniques to produce different types of nanoparticles for nanotechnology **(5)**, one has to set up such techniques for the production of these picoparticles to fully exploit the rich picotechnology field.

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# RE-EMERGENCE OF EDUCATION IN ISLAMIC WORLD

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Education is fundamental for development of any nation and higher education is a powerful tool for the eradication of poverty, boosting shared prosperity and making the society strong enough to face challenges of times. This basic fact was very well known to Muslim Ummah during Middle Ages, a Golden Period in Islamic History. "Seek Knowledge" was the known Commandment of Islam for Muslims and they followed it for almost eight hundred years.

Muslims around the world during the last four century showed great interest in every aspect of life except education. Poetry, music, painting, ceramics, architecture, metal work etc became important activities throughout the Islamic world. But very little interest was shown to the fast developing modern education coming from Europe. Probably the most harmful act was their refusal to allow the use of Printing Press in 15th Century, a turning period for Europe. Through the Printing Presses, scientific revolution was made possible in all the sphere of scientific and industrial activity in Europe.

After a long spell of slumber, Muslims all over the world have started to understand that without modern knowledge and higher literacy their exploitation by the West cannot be checked. This is what Sir Syed told Muslim Ummah in the late 19th century. Fortunately, education is re-emerging in the Islamic World during recent past, say 21st century.

According to the survey by John Miller, 5 Muslim countries namely Azerbaijan, Tajikistan, Kazakhstan, Turkmenistan and Uzbekistan find places amongst 25 countries with highest literacy rates of 100%.World Bank and UNSECO data for 2018 shows that 25 Muslim Majority countries have achieved average literacy above 90 per cent. These include Saudi Arabia (95%), Indonesia (94%), Malaysia (94%), Iran (90%), Jordan (96%), U.A.E. (94%) and Turkey (95%). Nine countries, including Syria (86%), Tunisia (82 %), Iraq (79%), Egypt (75%) Algeria (73) are and Morocco (72%) were reported to be in the bracket of 70% to 89%. Unfortunately fifteen countries including largely populated countries of Bangladesh, Pakistan and Nigeria still lag behind in literacy (Less than 62%). However, compared to the literacy Data of 1980 (Av. 30%), 2018 data is highly satisfactory.
Global literacy rate (2017) is 82% (Men 87%; Women 77%).

A redeeming feature is the fact that the Gender Difference (Men and Women) in literacy in many Islamic countries has also fallen sharply. At least 21 countries have the difference only 0 to 7% only.

Tertiary Education (Higher education in all the disciplines of knowledge) in Islamic world needs serious attention. Yes it is true that scientific awakening is under way in Muslim World. Research spending in many countries, like Saudi Arabia, Iran, Qatar, Turkey etc has been raised substantially.

Tertiary Education in Western countries is generally above 40% whereas barring few countries likes Turkey, Saudi Arabia and Indonesia, it is between 2 to 6%. Research spending in Muslim countries also needs serious attention. Only countries like Turkey, Saudi Arabia, Iran and Qatar have substantially raised funds for this purpose. Qatar is reported to have proposed the raise of the Science budget from 0.8% to 2.8% of its GDP.

Many Muslim countries have already established centers of higher learning (Universities) with emphasis on the modern sciences. According to The Times Higher Education World University Rankings 2018, ninety six universities from Muslim countries have been listed amongst the top 1102 Universities of the world. 22 belong to Turkey followed by Iran 18; Pakistan, 10; Malaysia and Egypt 9 each; Saudi Arabia, 5; U.A.E. and Indonesia 4 each; Jordan and Morocco 3 each; Tunisia 2 and Algeria, Bangladesh, Kuwait, Lebanon, Nigeria, Oman and Qatar 1 each.

Another redeeming feature in the rankings is the fact that in forty one universities, female students are higher in numbers than male students. Eleven Universities have more than 65:35 female: male ratio with Imam Abdulrahman Bin Faisal University (22,257 students) of Saudi Arabia having the highest ratio of 81:19, followed by United Arab Emirates Univ. (7,492 students) 79:21, Qatar Univ., (13,342 students) 73:27 and Kuwait Univ., (37,752 students) with the ratio of 72:28.

*(Note: 2019 and 2020 reports have not been taken into account because of uncertain situation around the world).*

The following table gives an idea of Re-emergence of Education in the Islamic World.

**Literacy in Muslim Majority Countries - UNESCO/World Bank Reports**

*Source: U.N. Agencies & World Factbook.*

| Country | Literacy 1980/2018 | Gender Difference % 2007/2018 |
|---|---|---|
| Afghanistan | 12/32 | 30/27.9 |
| Albania | NA/98 | 13/1.5 |
| Algeria | 37/73 | 20/14.0 |
| Azerbaijan | NA/100 | 1.3/0.0 |
| Bahrain | 73/96 | 7/0.5 |
| Bangladesh | 26/62 | 22/6.1 |
| Bosnia | NA/99 | 7/2.1 |
| Brunei | 63.2/96 | 5/2.6 |
| Burkina Faso | 12/36 | 20/13.7 |
| Chad | 15/38 | 17/16.6 |
| Comoros | NA/78 | NA/8.1 |
| Djibouti | 32/67 | 20/20.0 |
| Egypt | 44/75 | 21/16.0 |
| Eritrea | 52.5/74 | 21/15 |
| Gambia | 16/55 | NA/16.3 |
| Guinea | 25/30 | 27/15.3 |
| Guinea Bissau | NA/60 | 30/23.5 |
| Indonesia | 62/94 | 10/4.7 |
| Iran | 50/89 | 12/8.7 |
| Iraq | 50/79 | 31/11.9 |
| Jordan | 80/96 | 10/3.0 |
| Kazakhstan | NA/100 | 1.2/0.0 |
| Kosovo | NA/92 | NA/9.1 |
| Kuwait | 60/78/96 | 4/1.9 |
| Kyrgyzstan | NA/99 | 1.2/0.2 |
| Lebanon | 74/94 | 11/4.1 |
| Libya | 50/91 | 20/11.1 |
| Malaysia | 60/94 | 6/3.0 |
| Maldives | NA//99 | NA/2.0 |
| Mali | 10/39 | NA/19.0 |
| Mauritania | 17/52 | 21/21.0 |
| Morocco | 28/72 | 25/20.2 |
| Niger | 8/19 | 17/16.3 |
| Nigeria | NA/59 | 15/19.5 |
| Oman | N.A/94 | 16/6.9 |
| Pakistan | 31/59 | 27/26.2 |
| Palestine | NA/97 | NA/ 3.7 |
| Qatar | 76/98 | 1/0.6 |
| S. Arabia | 50/95 | 14/5.9 |
| Senegal | l0/56 | 25/24.6 |
| Sierra lone | 15/48 | 20/21.1 |
| Somalia | 20/39 | 25/ 24.4 |
| Sudan | 20/76 | 20/14.6 |
| Syria | 53/86 | 26/10.7 |
| Tajikistan | NA/100 | 0.5/0.0 |
| Tunisia | 55/82 | 18/15.4 |
| Turkey | 60/95 | 17/6.0 |
| Turkmenistan | NA/100 | 1/0.0 |
| U. A. E | 65/94 | NA/-2.6 |
| Uzbekistan | NA/100 | 0.6/0.0 |
| Yemen | 27/70 | 23/30.1 |

# AXIS OF EVIL IN COSMOLOGY

*M. Asghar FIAS*

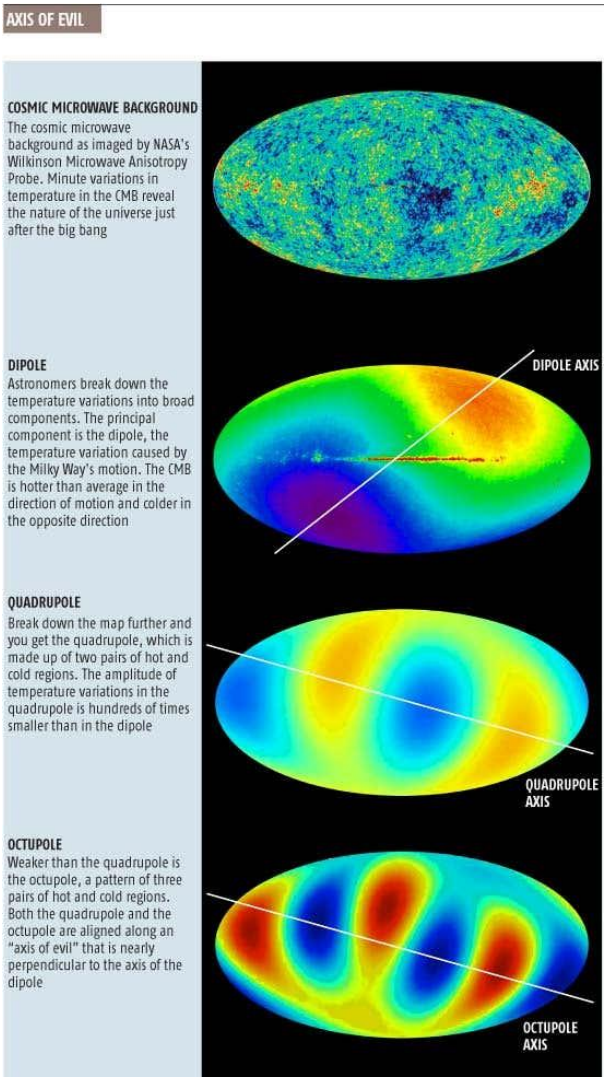
**Abstract**: Here one discusses the anomalies in the CMB distribution.

In cosmology, Einstein's General Theory of Relativity (GTR) of the expanding universe is based on the cosmological principle which lays down that the universe in terms of its contents is homogeneous and isotropic at a very large scale implying that it is the same everywhere and in every direction. This is idea is expressed as the Copernican principle that states that we have no special place in this directionless universe. This principle excludes a rotating universe around a point that will become a privileged point in the universe, and it does not have preferred directions such a diamond crystal which has special directions in which the atoms line up in rows nor it expands differently in different directions.

In this context, the Cosmic Microwave Background (CMB) radiation is important. The presence of this EM radiation came up 380,000 years after the Big Bang event caused by the combination of protons and electrons present in the cosmic plasma into hydrogen atoms and thus decoupling the radiation from matter with a temperature of 3000°K, because this temperature is too low to ionize and set free the electrons. Due to the continued expansion of the universe aged 13.8 billion years at present, its temperature has gone down to 2.725°K, because the wavelength of the radiation increased due to space expansion. This T=2.725°K is the mean value of a perfect blackbody spectrum representing the CMB radiation. However, there are temperature fluctuations around the CMB blackbody spectrum of about 10 μK amplitude. These fluctuations on the lower negative side represent relatively cold regions, while the upper positive side correspond to relatively hot regions. These temperature fluctuations reflect the density variations in space.

Over time, the satellite-based detectors COBE (1989 - 1993), WMAP (2001 - 2010) and Planck (2009 - 2013) measured these CMB temperature fluctuations filling the space with a higher and higher sensitivity and angular resolution. The CMB data from WMAP are shown in Fig.1. These CMB data have been subjected to spherical multipole analysis expecting that the

hot and cold regions of different poles would be randomly oriented in space as required by the cosmological principle /Copernican principle. The alignment of the hot and cold regions for the dipole (second image in Fig.1.) is caused by the motion of the Milky Way galaxy relative to CMB. However, the alignment of the hot and cold regions for the quadrupole and octupole components (third and fourth images in Fig.1.) present in both the WMAP and Planck data, is unexpected and violates the cosmological principle of randomness. Their axes are parallel within a few degrees, to each other and they are almost perpendicular to the dipole axis. This result has been called the *axis of evil* light heartedly. It should be underlined that there is no problem with the data of higher poles with their acoustic peaks that have been analyzed with the standard model of cosmology: the ΛCDM model, to determine the different cosmological components for a flat universe.




The motion of the solar system and the plane of the Earth around the Sun called the *ecliptic* are aligned with the microwave sky, and are believed to be caused by a structure at the edge of the observable universe (1, 2). Specifically, relative to the ecliptic plane, the "top half" of the CMB is slightly cooler than the "bottom half ". Furthermore, the quadrupole and octupole axes are aligned with the top/bottom divide (3).
Although this anisotropy has be contested (4), it has been confirmed later by a different measurement dealing with different galaxies from that by WMAP and Planck (5).

**Conclusions**: This document discusses the quadrupole and octupole distribution anisotropies observed in the CMB distribution and their alignment with the solar system and the plane of the Earth around the Sun - the ecliptic. These results contradict the cosmological principle of randomness for all the multipoles of the CMB distribution.

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*02.02.2021*

# COSMIC MICROWAVE BACKGROUND (CMB) RADIATION AND THE SHAPE OF THE UNIVERSE

*M. Asghar FIAS*

**Abstract**: This document analyses the genesis of the CMB radiation and its role in fixing the geometric shape of the universe resulting from the Einstein's General Theory of Relativity.

The early universe just after the inflation period consisted of a high temperature primordial baryon (protons and neutrons) and electron plasma coupled to the electro-magnetic field radiation through Thomson scattering. Because of a short mean free path, the plasma has been considered as a fluid. Due to the normal-matter density fluctuations, the baryonic matter is compressed by the increased gravitational field, when the density is high. This leads to an increase in the radiation pressure, opposing the baryonic compression. When the density is low, the radiation pressure is low. The repetition of this operation leads to the excitation of longitudinal acoustic wave in the plasma, and the fluctuations in the radiation pressure manifest as temperature fluctuations.

With the passage of time accompanied by the expansion of the universe, the radiation's temperature decreased and after 379,000 years from the Big Bang, it fell to around 30,000 °K. At this temperature, the Thomson electron scattering probability becomes negligible and protons and electrons recombined into neutral hydrogen atoms decoupling the radiation from matter. As the universe expanded its wavelength was stretched further leading to a decrease in its temperature. At present, its temperature is 2.752°K and it has been called the Cosmic Microwave Background (CMB) undergoing a mean temperature fluctuation of around 10 parts per million. As time passes, this temperature will continue to go down and ultimately it may get lost in the background of the general EM radiation in the universe.

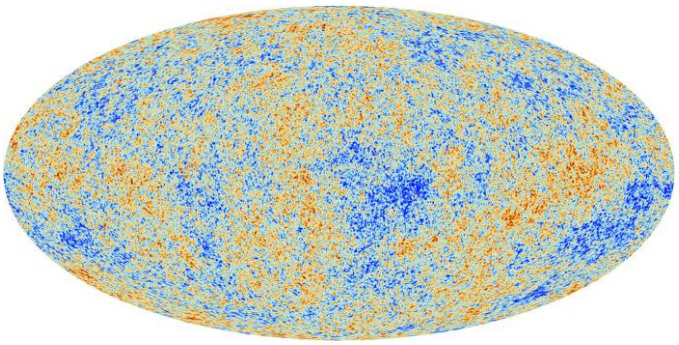

**Figure. 1. Cosmic microwave background seen by Planck system.**

Over the last many years, a consistent effort has been made to study the structure and temperature fluctuations of this CMB. The Satellite-based Wilkinson Microwave Anisotropy Probe (WMAP) (2001), and the Planck Telescope (2009) were the latest operations in this effort. Fig. 1 shows the scan-data of the CMB from the Planck Telescope that worked with a better resolution than the WMAP system.

Since the CMB data are projection of the sound waves onto the sky, they can be analyzed in terms of Legendre multipoles $P\ell(\cos\theta)$. The order of the multipole $\ell$ plays a similar role as the wavenumber k for the Fourier decomposition. The wavelength of a particular mode $\lambda$ subtends an angle $\theta$ on the sky and the $\ell$ and $\theta$ are related via the relation: $\ell = \pi/\theta$. The coefficients of the multipole expansion of the CMB provide useful information on the dynamics of the universe controlled by the different cosmological parameters.

The temperature fluctuations are analyzed in pairs in directions of unit vectors n and n' separated by an angle $\theta$, such that $n.n' = \cos\theta$ **(1)**. This analysis leads to the CMB angular power spectrum that represents the two-point correlation function of temperature fluctuations on the sky as a function of the multipole $\ell$ and angle $\theta$. Fig.2. shows the Planck's power spectrum of temperature fluctuations in the CMB with the acoustic peak centered at $\ell \sim 220$ with $\theta = O.82°$, along with its harmonics. These data have been analyzed via the standard Cosmological Model $\Lambda$CDM **(2).**

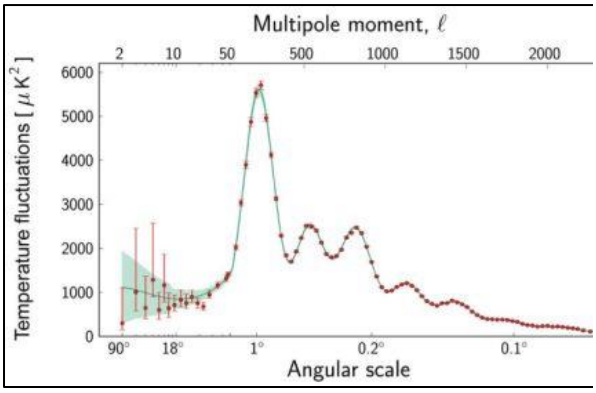


**Figure 2. Planck's power spectrum of temperature fluctuations in the cosmic microwave background. The fluctuations are shown at different angular scales on the sky. Red dots with error bars are the Planck data. The green curve represents the standard model of cosmology, ΛCDM. The peak at 1 degree is consistent with a flat geometry of the universe, the height of the second peak with 5%, and the second and third peaks with 26% dark matter (2).**

The different parameters of the Model are expressed in terms of the density parameter Ω representing the average energy density of the universe relative to the critical energy density $\Omega_0 = {}_3H^2/8\pi G$ with the present value of 9.47. $10^{-27}$ kg/ $m^3$, derived for a flat universe resulting from the Friedmann's solutions of the Einstein's General Theory of Relativity equations. The Model's fit to the Planck data for the **year 2013** also shown in Fig.2, leads to its different components:

$\Omega_{mass} = 0.315. + - 0.18$, $\Omega_{relativistic} = 9.24.10^{-5}$

$\Omega_\Lambda = 0.6817 +-0.020$ ( Here, Λ is the cosmological constant representing the universe's dark energy).

The $\Omega_{total} = \Omega_{mass} + \Omega_{relativistic} + \Omega_\Lambda = 1.00 +- 0.02$, indicates that the universe seems to be flat within the experimental error. In this context, Planck 2018 results lead to a curvature density $\Omega_k = 0.001 + - 0.002$ **(4).**

Another method independent of the Cosmological Model ΛCDM and its different parameters, for determining the shape of the universe is to use the Gauss' triangle on the largest possible scale imposed on the CMB landscape. If the universe is flat, the sum of the three angles of the triangle has to be180 degrees, but if the universe is deformed, this sum will be more than 180 degrees, if the curvature is positive, and it will be less than 180 degrees, if the curvature is negative.

One can set up the triangle using the Hubble radius $R_{H0} = c / H_0^{-1}$ at the time of the last scatter, but updated to its present value $\mathbf{L_H}$ after taking into account the expansion of the universe over time. The distance from Earth equal to the radius of the surface of last scatter $\mathbf{R_{sls}}$ is determined following a photon's trajectory in the FLRW spacetime between the last scatter **(3).** The $L_H$ and two values of the radius $R_{sls}$ lead to a triangle whose internal angles θ, α, α are determined through the law of cosines. The experimental work indicates that the sum of the three angles is close to 180 degrees within the experimental errors corresponding to an $\Omega_{total} = 1.00 +- 0.12$, for a flat universe **(5).**

**Conclusions:** The present document deals with the origin of the Cosmic Microwave Background radiation (CMB) and its use to determine the geometric shape of the universe as foreseen by Einstein's General Theory of Relativity.

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# FINE-TUNING OF UNIVERSE

*M. Asghar FIAS*

**Abstract:** This write-up attempts to treat the fine tuning of the Universe through the different forces of Nature fundamentally anchored on its fundamental constants.

In everyday life, one often deals with different cooking recipes. A cooking recipe is a sum of different ingredients chosen precisely in terms of their amounts to ensure optimally the coherence and structure of the composition leading to the desired taste. Making this choice can be called fine-tuning operation. The same rule holds for a medicine prescribed for a certain malady. Similarly, an algebraic equation consisting of certain number of variables helps to fine -tune their values, when analyzing a problem under study.

In the case of fine-tuning of Universe, the relevant parameters are the different forces of Nature, fundamentally based on its *different fundamental constants*. These forces and their relative strengths and other details are shown in Table 1. It is clear from the table, that the strong force is the strongest while the gravitational force is the weakest one. The well-defined values of these forces determine through their interaction, the contents and structure in terms of planets, stars, black holes, galaxies and all forms of matter and energies of the Universe.

| Name | Relative Strength | Carrier Name | Symbol | Range (fm) | Mass (MeV/$c^2$) |
|---|---|---|---|---|---|
| strong force | 1 | gluon | $g$ | 2 | 0? |
| electromagnetic force | $10^{-3}$ | photon | $\gamma^0$ | $\infty$ | 0 |
| weak force | $10^{-16}$ | intermediate vector boson | $W^{\pm}, Z^0$ | $10^{-3}$ | $10^5$ |
| gravitational force | $10^{-41}$ | graviton | $g^0$ | $\infty$ | 0 |

**Table 1. Shows different forces of Nature along with their relative strengths.**

If these forces and their values are the cause of Universe's fine tuning, then just small changes in their values should strongly disturb its structure, contents and dynamics. In fact, this may be the case. Let us take some examples:

**- Formation of diproton.**

Paul Davies **(1)** claims that a mere 2 % change in the strong interaction should make the diproton system stable effectively eliminating the formation of Deuton (D-2) and Helium (He-4) nuclei through nuclear fusion. This blocking of He-4 formation will result in blocking the fusion chain necessary for star formation and stellar evolution. Furthermore, the diproton formation may lead to a quick burn up of all the hydrogen present right at the beginning.

**- Hoyle C-12 resonance.**

Fig.1. Shows the formation of the Hoyle C-12 resonance at energy of 7.65 MeV through three alpha particles: 3 α's (the nuclei of He-4) passing through the unstable Be-8 plus α system. The 99.96 % of this excited state decays by α- decay back to the unstable Be-8 that decays into 2 α's and *only 0.04 % of this state decays through EM-radiation to the ground state of stable C-12*. Here, if the value of the dimensionless fine-structure constant which is only a function of the fundamental constants and which acts as the coupling constant for the EM interaction, changes by 4 % **(2)**, the 7.65 MeV resonance will decay back completely via 3 α's, without the emission of EM-radiation leading to stable C-12, and, thus, the stellar nuclear fusion will not produce stable C-12. In this situation, none of the elements heavier than He-4 will be produced in the stellar nuclear fusion and the composition and structure of the Universe will be limited to He-4 and will be very different from the present elements rich, fine-tuned one, that allows the C-12 based matrix of life that abundantly uses its

*elemental riches* for its sustenance. Is this apparently intimate relationship between the fine-tuned Universe and the existence of life just a*n accident* or is there a deeper metaphysical significance such as the presence of an *arbitrating intelligent design*? There have been ample philosophical efforts in this direction such as through the much discussed "Anthropic Principle" **(3).** This principle implies that the present finely tuned Universe very likely appeared just to allow the existence of life with its evolutionary capacity, particularly, in the form of the human life. The accidental nature of the appearance of the finely tuned Universe is emphasized through the concept of a *"multiverse*" **(4).** This concept implies that there is a series of parallel universes, all of which are finely tuned to different values of these forces, but ours is the one fit for the present C-12 based life. However, there is no testable argument for any of these choices and, moreover, in the case of the Anthropic Principle, it may not be unreasonable to consider that the genesis of this concept could have been strongly influenced by the human history with its rich and varied existential myths.

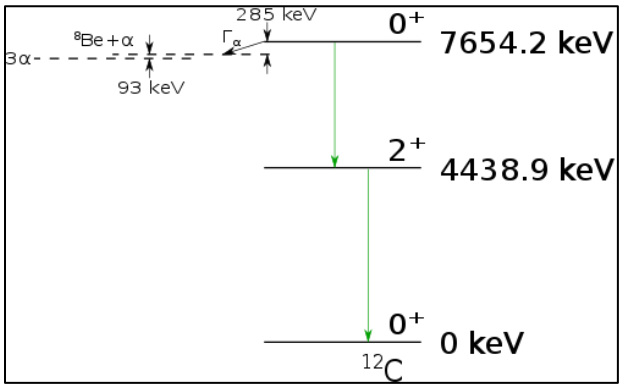


**Figure. 1. Shows the first two excited states of C-12. The state at 7.654.2 MeV is the Hoyle state along with its formation from 3 α's.**

**Conclusions**: The present document is an effort to treat the fine-tuning of the Universe in terms of Natures different forces fundamentally based on its different fundamental constants.

**References**

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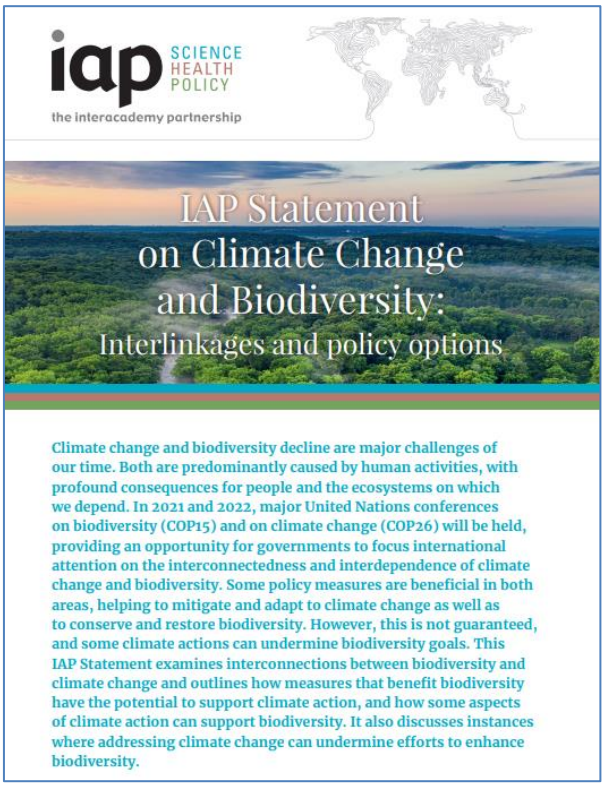
# MISCELLANEOUS NEWS

## WORLD ACADEMIES LAUNCH AN ACTION PLAN TO COMBAT BOTH CLIMATE CHANGE AND BIODIVERSITY DECLINE

The new IAP Statement 'Climate Change and Biodiversity: Interlinkages and policy options' highlights that climate and biodiversity policies are currently insufficiently connected and addressing climate change and biodiversity decline together is central to achieving the Sustainable Development Goals (SDGs).




Climate change and biodiversity decline are major challenges of our time. Both are predominantly caused by human activities, with **profound consequences** for people and the ecosystems on which we depend. In 2021 and 2022, the major United Nations conferences on biodiversity (COP15) and on climate change (COP26) will provide an opportunity for governments to focus international attention on the **interconnectedness** and **interdependence** of climate change and biodiversity.

This is why the InterAcademy Partnership (IAP), a global network whose more than 140 member academies constitute more than 30,000 leading scientists, engineers and health professionals in

over 100 countries, issues today the new Statement‘ Climate Change and Biodiversity: Interlinkages and policy options.’

The Statement examines interconnections between biodiversity and climate change and outlines how measures that benefit biodiversity have the potential to support **climate action** , and how some aspects of climate action can **support biodiversity**. It also discusses instances where some approaches to address climate change can undermine efforts to protect or enhance biodiversity.

“The year 2021 should be one of the **turning points in history**, in which the international community collaborated to make a long-lasting difference by streamlining and integrating climate change and biodiversity policies and embarking on a pathway towards a stable climate and a vibrant biosphere,” says Sir Richard Catlow, IAP co-President and member of the UK Royal Society.

“By better integrating climate and biodiversity policies at international and national levels, the full potential of biodiversity to **support climate action** could be leveraged, whilst at the same time helping to **reverse the ongoing decline in biodiversity** ”,adds Depei Liu, IAP co-President and member of the Chinese Academy of Engineering.

As highlighted in the Statement ,some policy measures are beneficial in both areas, helping to mitigate and adapt to climate change as well as to conserve and restore biodiversity. However, this is not guaranteed, and some climate actions can undermine biodiversity goals.

**Key policy recommendations include:**

- **Build** a sustainable food system with climate- and biodiversity-friendly agricultural practices, responsible food trade, and equitable food distribution.
- **Reduce** rates of natural ecosystem loss and degradation, protect, restore and expand natural ecosystems, and increase landscape connectivity.
- **Ensure** that expansion of renewable energy systems has positive biodiversity benefits built into its design.
- **Recognise**, respect and safeguard the rights and livelihoods of local and traditional users of ecosystems when implementing biodiversity and climate change actions.
- **Discourage** ecosystem-based approaches to climate mitigation that have negative outcomes for biodiversity, such as tree planting in inappropriate ecosystems, tree monocultures, and unsustainable energy crops.

IAP’s principles underpinning biodiversity and climate action are:

- **Transformation**. Mitigation at the scale needed to keep the rise in global temperatures to 1.5°C, or to reverse global biodiversity decline, requires a transformative change in the way our societies consume and produce resources.
- **Collaboration**. Governments alone cannot achieve the transformations needed – coordinated climate and biodiversity actions from multiple stakeholders, including the private sector and civil society, are essential.
- **Integration**. Greater understanding of the biodiversity-climate relationship should help to end the separation between the national and international policy frameworks that currently address climate change and biodiversity decline.
- **Additionality**. Where Nature-based Solutions are implemented to help mitigate climate change, they should not delay or lower any ambition to reduce carbon dioxide emissions from fossil fuels or reduce energy use through more energy efficient technologies.
- **Best practice**. The success or failure of Nature-based Solutions and of other responses to climate change and biodiversity issues is dependent on the adoption of best practice and should be evidence-based and tailored to the location.
- **Equity**. The diversity of environmental and climate policies, from protected areas to payments for ecosystem services, should acknowledge the different dimensions of equity to ensure a sustainable and equitable future that leaves no one behind.

**The Islamic World Academy of Sciences endorsed this Statement**

**The full statement is available at:**

**https://www.interacademies.org/statement/climate-change-and-biodiversity-interlinkages-and-policy-options**

# STATEMENT FROM THE INTERNATIONAL SCIENCE COUNCIL DELEGATION TO THE UNESCO SPECIAL COMMITTEE MEETING ON OPEN SCIENCE, 6-12 MAY 2021

International Science Council
The global voice for science

## Open Science and the UNESCO Initiative

Scientific inquiry has long been a self-organized enterprise. Governments, funders and universities may all, from time to time, have prescribed priorities for scientific inquiry, but scientists themselves have largely determined how inquiries should be conducted. In the process they have created and stewarded their own organizations: learned societies, academies, and centres within the generally flexible framework of their universities. Principles of self-organization have been sustained even as governments have increasingly recognized the value of science in promoting national agendas. Common implicit, and sometimes explicit, premisses have been that whilst governments may articulate their priorities and set research budgets, decisions on how resources are expended, and how research is organized are best left to researchers, and that giving scientists the freedom to follow their inspiration is the best way to maximize the return on society's investment in research. Thus, the social organization of the scientific effort in addressing increasingly complex, interdisciplinary problems or strategic research priorities has been largely left to researchers. This self-organization has developed in a way that maintains a creative tension between, on the one hand, competition for esteem and funding, and on the other hand, cooperation to achieve deeper more widely applicable understanding. It is a balance of drivers that has served the enterprise well, whether at the level of individuals, national science systems or international science collaborations, whilst also serving the interests of multiple stakeholders.

The ongoing digital revolution of recent decades has created a new basis for scientists to access, manipulate and communicate data, metadata, information, and preliminary knowledge, and to hypothesize, debate, reproduce, replicate, validate and refute. It has greatly facilitated globally networked research, efficient data-sharing, and immediate access to the record of science, including by automatic techniques of knowledge discovery, in principle by all, thereby enhancing the rate and dimensions of knowledge creation. Although Open Science is not new, it stems from the publication of the first scientific journals in the late seventeenth century, profound new digital opportunities have inspired scientific communities to progressively mature and crystallize the essentials of a new Open Science movement. It enlarges scientific and social horizons in the pursuit of knowledge, its dissemination and use. Intrinsic to this new paradigm are historic values of scientific self-organization, principles of freedom and responsibility, universal accessibility and sharing, inclusivity and equitability, together with responsibilities for education and capacity development, as reflected in the statutes of the International Science Council (ISC) and in its vision of "science as a global public good"[1]. The expanded social networks of this new openness are exemplified in trends of increased multi-nationally authored scientific papers, the growth of transdisciplinary collaboration and of citizen science.

The shaping of this new paradigm has largely been achieved through the work of the national academies, international scientific unions and associations, and related bodies that are represented in the membership of the ISC, and reflected in its statement on Open Science[2]. National and regional funders of science have increasingly supported the Open Science imperative by investments in supportive infrastructures and promotion of open access publishing as a condition of funding.

[1] https://council.science/actionplan/isc-vision-and-mission
[2] https://council.science/actionplan/open-science/

Now UNESCO has taken a stance. It seeks to formalize these trends at an international level by placing a recommendation on Open Science before its 193 Member States for their endorsement[3]. It has engaged with the scientific community over the last year to generate a long list of draft recommendations for open access to the published record of science, open data, open educational resources, open-source software and code, open hardware and infrastructures, and open engagement with society. The draft's first contact with political reality, in the form of national representatives, took place in early May 2021. Representatives were almost universally supportive, and even added "bite" on some crucial issues. For example, there is an increasing awareness of the moves of some major commercial publishers to evolve into broadly based "science/knowledge platforms", able increasingly to monopolize not only access to scientific knowledge but also to data about science and scientists, their evaluation, scientometrics, management, networking, priorities and funding, with little accountability to the scientific community or its organizations[4]. Indeed, the commercial public sector has been more than effective in monetizing scholarly output, creating an oligopoly of control, and is learning how to take control over additional aspects of the research life cycle, now especially focused on the interaction between publishing, data repositories, and access to data. Awareness of these trends was reflected in a critical insertion in the text by UNESCO Member States that: "The monitoring of Open Science should be explicitly kept under public oversight, including the scientific community, and whenever possible supported by open non-proprietary and transparent infrastructures. This monitoring aspect could include but should not be delegated to the private sector."

The UNESCO recommendation and potential cascading interventions by Member States could develop along two divergent pathways. They could enhance governmental support for the scientific community, and the stakeholder ecosystem of which it is part, as they develop new policies, infrastructures and collaboration strategies that serve the Open Science paradigm as it has progressively evolved over the last two decades. Alternatively, Member States could disregard the tradition whereby the scientific community self-organizes to achieve its purposes, and come to specify, or even regulate, how it should be organized. We are strongly in favour of the former, and concerned about the potential of the latter, which could create a mode of Open Science that opens the door: "to capture of publicly funded research value by commercial platforms, yet more 'metrics' of productivity to 'incentivize' scholars to work harder and a focus on the system-wide progress of science, ignoring costs and benefits to individuals, whether scientists or non-scientists"[5]. Nonetheless, we welcome the draft UNESCO recommendation most strongly, with the comment that awareness of danger is the first step in averting it.

As the G20 Rome Summit takes place, the Sustainable Health Equity Movement (SHEM) urges world leaders to adequately fund a healthy and sustainable recovery. On 5-6 September, the G20 health ministers issued a declaration reaffirming their commitment to global solidarity, equity and a multilateral approach. More specifically, they highlight the need for sustainable, flexible and agile funding systems for health emergencies which should add and complement rather than substitute existing streams for other development goals.

As seen at the 76th United Nations General Assembly, the previous commitment made by the G20 to allocate $75 billion to fund pandemic prevention actions was not fulfilled*. This weekend of 30-31 October 2021, G20 leaders have a new opportunity to show that their statements are not empty, taking concrete steps to fund and implement the actions required to a healthy and sustainable recovery.
Certainly, that's what all the peoples of the world expect.

During COP26 2021, world leaders are gathering to debate key factors for human survival.

[3] https://en.unesco.org/science-sustainable-future/open-science/recommendation

[4] https://infrastructure.sparcopen.org/landscape-analysis and https://council.science/wp-content/uploads/2020/06/2020-02-19-Opening-the-record-of-science.pdf

[5] https://spontaneousgenerations.library.utoronto.ca/index.php/SpontaneousGenerations/article/view/19664

Inequities are more flagrant than ever, whereas the poorest and most vulnerable countries and populations worldwide are the ones paying the highest price. The urgency of "negotiators" is far from synchronized with the actual needs of the people. They are paying with lives instead of carbon credits, despaired by the impacts of the pandemic and by the system rules' lack of compassion from the richest to the most disadvantaged.

The United Nations has defined the four main expected achievements from the COP26:

1. Global net-zero by 2050 and keep 1.5 degrees within reach.
2. Adaptation to protect communities and natural habitats.
3. Financial mobilization of at least $100bn in climate finance per year by 2025 (COP15 target by 2020 was not met), with the participation of international financial institutions, and the private and public sector, aimed at the achievement of goals 1 and 2.
4. Working together to deliver, mainly by finalizing the Paris Rulebook (the detailed rules that make the Paris Agreement operational), and accelerating action to tackle the climate crisis through collaboration between governments, businesses, and civil society.

Although we recognize these as essential commitments to be made, we must highlight that, once again, relevance of public health threats for the planet's sustainability is being neglected. Avoiding the worsening of the current climate crisis must include the principles inherent to the essence of health equity: human rights.

The right to health principle is embedded in the fundamental notion of equity and in the unavoidable need to address planetary health, which includes care for the planet and humans.

Considering health equity a fundamental concept to guide all actions taken by companies, governments, and the civil society, SHEM urges Glasgow 2021 COP26 participants to take concrete measures to achieve rapid, large-scale emission reductions to maintain the goal of limiting global warming to 1.5 °C. For example, keen attention should be paid to reducing indoor air pollution associated with cooking in millions of low-income families.

The Sustainable Health Equity Movement urgently calls on governments, economic actors and all of us, citizens, to drastically change our ways of production, consumption and relations, so as to reduce the collective emissions by half in this decade and towards net-zero emissions by 2050, the only way to prevent catastrophic heating, unprecedented inequity between ours and coming generations, and profound damage to nature.

## COMPELLING STORIES, CURIOUS SCIENCE

International Science Council
The global voice for science

*Paris, 9 November 2021* - In an online series, the International Science Council presents fascinating insights behind the science of sustainability.

Produced by BBC StoryWorks Commercial Productions, this dynamic online series uncovers the innovative global stories of scientists and how they are addressing inequalities, engaging policymakers and the public, and pioneering a more sustainable future.

With all eyes on COP26, and a chance for the world's leaders, policymakers and community activists to put the planet on a sustainable path, this series meets the scientists who are finding solutions to some of humanity's most pressing issues. Unlocking Science, a new online series looks at how the global collaborative effort by international science is rising to the challenge of finding pathways to living within planetary boundaries.

Produced for the International Science Council by BBC StoryWorks Commercial Productions, Unlocking Science addresses the need for accessible science – through compelling and innovative storytelling for the public. This new series of films, articles and podcasts explores the ever-changing face of science culture, where diversity of thought and creative approaches to our most immediate and complex concerns are championed. *"We want communities to realize that science creating solutions for our planet is certainly not*

*taking place in a so-called ivory tower. It is open, multinational, participatory and fuelled with urgency"*, Mathieu Denis, ISC Science Director said.

From innovators working to protect vital ecological biomes like the Great Barrier Reef and the Amazon rainforest, to scientists seeking stability after being displaced by conflict, to ordinary citizens discovering our galaxy and our place in it through community-led tourism, Unlocking Science tells the human stories and new discoveries created by science.

*You can explore the series on: www.unlockingscienceseries.com. Additional films and articles will be joining the Unlocking Science series in early 2022.*

## IAS - TÜBA WEBINAR ON BIODIVERSITY*

The IAS signed a bilateral cooperation agreement with The Turkish Academy of Sciences (TÜBA**)** and carries out various mutual activities within the scope of this agreement. One of these activities was a webinar on Biodiversity that took place on 25 September 2021 via Zoom. Scientists from different countries attended the webinar and discussions were made. Prof. Ilkay Orhan FIAS moderated the sessions.

Prof. Abdullah Al Musa, Director General, IAS stated in the opening speech of the program, that it was a pleasure to work in cooperation with TÜBA and emphasized that biodiversity is actually directly related to the existence of human beings.

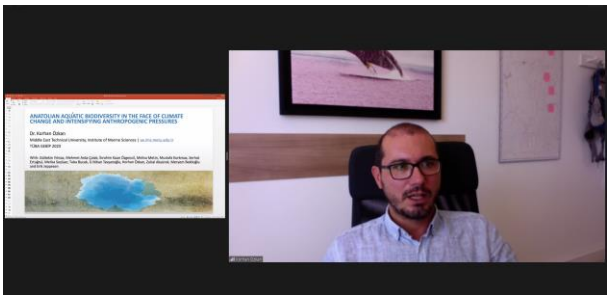

The first presentation of the conference was made by TÜBA Principal Member and ITU Rector Prof. **İsmail Koyuncu** on "**The Importance of the Circular Economy for Biodiversity**" and said, "Many disciplines are shifting towards technologies that enable resource recycling and circular economy. In the Environmental Engineering discipline, resource-generating processes such as water recovery, recovery of chemicals and rare elements, minimum energy consumption and maximum energy production have gained importance and become indispensable in addition to traditional treatment methods. The importance of this situation will be felt much more in terms of biodiversity in the coming period. In this respect, it is very important to research, develop and implement technologies and new processes. Training programs should be revised accordingly," he added.

Prof. Musa said the circular economy can pose a threat to biodiversity and that biodiversity is declining. "For all these reasons, we attach great importance to this webinar as one of the efforts to put an end to this trend" he said. In a comment he also stressed the limited ability to develop recycling technology to curb the extensive externalities on the biosphere. Thus it is rather more important to uphold institutional arrangements and practices to protect biodiversity.


Atatürk University Faculty of Agriculture Lecturer Prof. **Sezai Ercişli** gave the information that Turkey is considered as one of the richest countries in terms of edible wild fruits in his speech titled "**Wild Edible Fruit Biodiversity in Turkey**" he said that due to its properties, its importance for health was once again confirmed. Prof. Ercişli continued as follows: "In addition to fresh consumption, edible wild fruits are widely used in beverages and ice cream. A number of wild edible fruits are a

* *News source: http://tuba.gov.tr/tr/haberler/akademiden-haberler/iastuba-biyocesitlilik-konferansi-1*

source of income for people. There is now a greater awareness that products from edible wild fruits can support the livelihood of households and also generate income from their sale in raw or processed forms. This awareness triggered a study on the diversity of species used and their relationship to the socio-economic status of those who use them. Wild edible fruits are important components of biodiversity. With our study, we aim to compare the morphological, biochemical and molecular biodiversity between wild and edible fruits grown in Turkey."



TÜBA Young Academy Member from the Middle East Technical University Marine Sciences Institute. Faculty Member **Korhan Özkan** talked about **"Anatolian Aquatic Biological Diversity in the Face of Climate Change and Intensifying Anthropogenic Pressures"**. Stating that Anatolia hosted the biological diversity shaped during the glacial cycles of the Quaternary period, Özkan said that the hot and arid nature of the Mediterranean Climate makes this region particularly vulnerable to pressures on water resources. "The growing human population and the demand for water resources in the region are putting complex pressures on aquatic ecosystems and biodiversity. Our latest research on the Konya Closed Basin has revealed the dramatic consequences of uncontrolled water use on these sensitive ecosystems. Konya Closed Basin upstream of Turkey is home to Beyşehir Lake, the largest freshwater lake in Turkey, and the iconic salty Salt Lake downstream of the basin. Using our data, we explained changes in land use, crop production, groundwater/surface water levels and climate, and the consequent deterioration of the lake water surface, salinity. Three globally threatened waterfowl species in the basin are at risk of extinction, while 18 of the 62 breeding species have already disappeared. Similarly, there are 38 fish species in the Konya Closed Basin, 74% of which are endemic, of which 61% are currently considered threatened or endangered. Modeling projections using various climate and land use scenarios, It points to serious additional drops in water levels due to climate change in the future, which is likely to cause serious damage to lake ecosystems and the services they provide," he said.

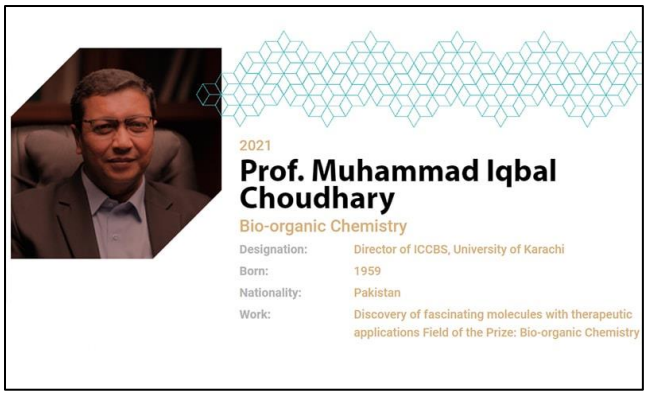
*The presentations delivered in the webinars can be found on the IAS YouTube Channel: https://www.youtube.com/user/TheIASworld/videos*

## PROF. MUHAMMAD IQBAL CHOUDHARY FIAS (PAKISTAN) AWARDED THE 2021 MUSTAFA PRIZE

Prof. Dr. M. Iqbal Choudhary has been named the 2021 winner of the Mustafa (PBUH) Prize for his services in the field of bio-organic chemistry.

As a top science and technology award, the Mustafa Prize is granted biennially to the top researchers and scientists from the Islamic world in four categories: Life and Medical Science and Technology, Nanoscience and Nanotechnology, Information and Communication Science and Technology, and all areas of science and technology.

The Mustafa Prize was established in 2012 as a symbol of scientific excellence at the international level, and it is regarded as the Nobel Prize of the Muslim world. Five scientists each from Pakistan, Iran, Bangladesh, Lebanon and Morocco have been awarded The Mustafa Prize in their respective fields of study.




Prof Iqbal Choudhary is a world-renowned medicinal chemist. He has published 1,175 research papers in the fields of organic and bio-organic chemistry in international journals, 76 books, and 40 chapters in books published by major US and European press. He has secured 40 US patents so far.

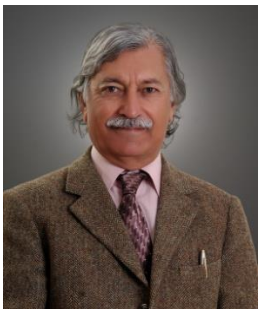
Dr. Iqbal's work has been cited by researchers from around the world — 27,407 times in total — and his h-index is 70. As many as 94 local and international scholars have completed their Ph.D. degrees under his supervision so far.

Dr. Iqbal, who holds DSc, Ph.D., and CChem degrees, has been awarded by different Pakistani governments with the Hilal-e-Imtiaz, Sitara-e-Imtiaz, and Tamgha-e-Imtiaz. He has been elected a fellow by renowned academies including the Academy of Sciences for the Developing World, Islamic World Academy of Sciences, Pakistan Academy of Sciences, Royal Society of Chemistry, and Chemical Society of Pakistan.

Prof Iqbal has previously been honored by the president of Iran with the Khwarizmi International Award; president of Azerbaijan with the ECO Award in Education; and the prime minister of Pakistan with COMSTECH Award in Chemistry.

He was given the prestigious title of distinguished national professor by the Higher Education Commission in 2004 and meritorious professor by the University of Karachi in 2013.

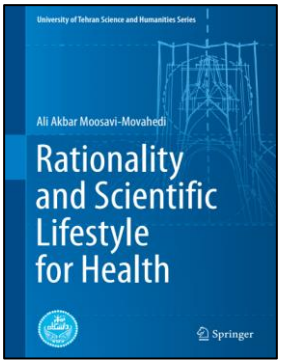
## PROF. QASIM JAN FIAS (PAKISTAN) AN EXPERT IN IAP WORKING GROUP



Upon the nomination of Prof. Abdullah Al Musa, DG, IAS, Prof. Qasim Jan FIAS, Pakistan was invited to serve on the Working Group tasked with developing a statement on **Urbanization in Low and Middle-Income Countries** and develop a revised version of the Statement that responds to all the points raised concerning the version that was sent out to IAP member academies for endorsement.

The scale and pace of current urbanization are widely recognized as being unprecedented in human history. In 2012, IAP placed population growth coupled with unplanned urbanization among the ten most serious global concerns. That statement identified the necessity to develop and implement urban planning policies that internalize consumption needs and demographic trends to reap the benefits of sustainable urban living.
By developing a statement on Urbanization in LMICs, IAP can play a central role in advocacy and research worldwide, to promote the greater implementation of effective, affordable, and sustainable programs on this issue globally.

## NEW BOOK BY PROF. ALI A. MOOSAVI-MOVAHEDI FIAS




**Rationality and Scientific Lifestyle for Health**
*Edited by: Ali A. Moosavi-Movahedi*
*Publisher: Springer*
*Language: English*
*ISBN 978-3-030-74326-0*
*Published date: 2021*

Technologies strongly influence lifestyle behaviors; therefore, knowledge, rationality, and behavior are more important in healthy living. Today, many artificial technologies are abnormal and create pollutants that produce stress (unbalanced free radicals) for humans and creatures. Molecular stress generates a variety of

unbalanced free radicals from which many diseases originate, like cancer and diabetes. Our scientific evidence shows that diabetes type 2 is not just a disease of sugar but also a stress disease. Stress avoidance is one of the most important criteria of a healthy lifestyle, and one of the highest wealth in the world today is tranquility. In this book, an attempt has been made to link science with reason and lifestyle so that the anomalies of technology branching out from science are under the control of rationality.

This book is written for the health and well-being of people to lead everyone to true prosperity. The best and healthiest for human beings is to have a balance between life and nature. Therefore, this book introduces useful nutritious, functional foods, nutraceuticals, antioxidants, and how natural molecules which are from the generosity of nature, can be the best medicine for human beings. Besides, it expresses a healthier lifestyle by considering the psycho-emotional dimension of wellness. And finally states that good sleep is the principle of health and happiness for humanity and how it removes stress from humanity and how unbalanced free radicals in good sleep are expelled from human beings.

In this book, the scientific and research achievements of the authors and other worldwide researchers have been written and for this purpose, the following chapters are written:

**Chapter one:** Philosophy Virtue of Nature, Mankind and Natural Health.
**Chapter two:** Bioinspiration and Biomimicry in Lifestyle.
**Chapter three:** Nature's Generosity in Protecting Human Health.
**Chapter four:** Biodiversity and Drug Discovery Approach to Natural Medicine.
**Chapter five:** Nutraceuticals and Superfoods.
**Chapter six:** Spices as Traditional Remedies: Scientifically Proven Benefits.
**Chapter seven:** Halal Products and Healthy Lifestyle.
**Chapter eight**: Lifestyle in the Regulation of Diabetic Disorders.
**Chapter nine:** Healthier Lifestyle by Considering Psychoemotional Dimension of Wellness.
**Chapter ten:** Good Sleep as an Important Pillar for a Healthy Life.

*Ali A. Moosavi-Movahedi is Professor of Biophysics at the Institute of Biochemistry and Biophysics, University of Tehran. His research career has mostmostly marked on protstructure-functiontion relationship. He is already the fellow of The World Academy of Sciences (TWAS), fellow of Islamic World Academy of Sciences (IAS) and the Chairman of UNESCO Chair on Interdisciplinary Research in Diabetes at the University of Tehran, Head of National Member Committee of the International Science Council (ISC) (Previous name, ICSU) at the University of Tehran. Web: ibb.ut.ac.ir/~moosavi*

## PROF. MÜNIR ÖZTÜRK VICE PRESIDENT, IAS RANKED BY AD SCIENTIFIC INDEX

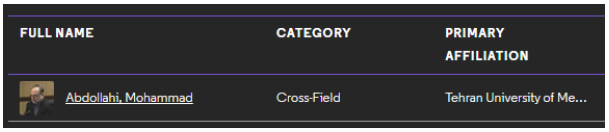
The data from 10,000 Universities covering 1 million scientists has been evaluated comparatively. The AD Scientific Index (Alper-Doger Scientific Index), unlike other systems that provide evaluations of journals and universities, is a ranking and analysis system based on the scientific performance and the added value of the scientific productivity of individual scientists. Furthermore, it provides rankings of institutions based on the scientific characteristics of affiliated scientists. The criteria used are: H index, i10 index, citations during the last 5 years. The numbering has been done according to the universities, country, region, and the world. From Turkey 44 names of Academicians are present in the list. Out of these 8 academicians are from EGE University, Izmir, Turkey.

| AD Scientific Index - Scientist Rankings - 2022 | | | | | | | | H INDEX | | | i10 INDEX | | | CITATION | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| University | Country | Region | World | Name | Country | University | Subject | Total | Last 5 year | Last 5 year / total | Total | Last 5 year | Last 5 year / total | Total | Last 5 year | Last 5 year / total |
| 2 | 74 | 7398 | 25048 | Münir Öztürk | Turkey | Ege University | Natural Sciences / Biological Science<br>Ecophysiology\|Ethnobotany\|Bio-monitoring\| | 61 | 45 | 0.738 | 557 | 371 | 0.666 | 22750 | 13917 | 0.612 |

**Prof. Münir Öztürk** is Professor (Emer.) of Ecology & Environmental Sciences, Chairman Botany Department, Faculty of Science, Ege University, Izmir, Turkey; Founder Director Centre for Environmental Studies, Ege University,Turkey; Professor of Ecology & Environmental Sciences (1980) from Ege University; D.Sc Ecology & Environ. Sciences (1975), Ege University; Ph.D Plant Ecology (1971) Ege University; M.Sc. Botany (1964), Jammu and Kashmir University, KASHMIR; B.Sc.(1962), Biology-Chhemistry, Sri Partap College, Kashmir.
**Total Citations: 15043; h-index:051; i-index: 376**
**Fields of Scientific Interest**: Eco-Physiology, Biodiversity Conservation, Medicinal and Aromatic Plants, Biosaline Agriculture, Pollution, Biomonitoring and Wastewater Renovation.
**Membership of Institutions and Professional Bodies:** Member Editorial Board, The Malaysian Forester, Member Jour. of Environmental Engineering & Landscape Management (Taylor & Francis), Member Editorial Board, International Journal of Phytocosmetics, Member Editorial Board, International Journal of Phytomedicine, Member International Society for Applied Life Sciences, Member Editorial Board, Journal of Environmental Biology, Member Editorial Board, Pakistan Journal of Botany, Member Editorial Board, Journal of Science & Engineering, Peshawar-Pakistan (2001 onwards),.Pakistan Botanical Society, Turkish Correspondant, Journal of the Trace and Microprobe Technologies, Member Aerobiologists Association, Member National Committee on Biology, Interdisciplinary Committee of the World Cultural Council-Albert Einstein Award of Science., Member of Honour Russian Ecological Academy, Moscow, Member Bryologists Association, Member Turkish Ecological Society, National Delegate (FESPP) Fed. of European Soc. of Plant Physiologists, Member Mediterranean Society of Plant Physiologists (MPP), Member INTECOL, Member Turkish Biological Society and Member OPTIMA.
**Fellowships, Honours, Awards received:** Newly recorded plant species from Turkey in my name: *Sideritis ozturkii; Verbascum ozturkii*; Certificates and Sheilds, over 50-Turkey & Abroad; Consultant Fellow, Faculty of Forestry, Univ. of Putra Malaysia, Selangor-Malaysia, Distinguished Visiting Scientist, ICCBS, Karachi Univ., Pakistan, TUBITAK Scientific Publication Awards (15),National Science Foundation Researcher-USA, JSPS-Japanese Society for the Promotion of Science Fellowship, AvH-Alexander von Humboldt Fellowship, Turkish Biological Society 30 Years Services Award, Certificates of Honour-in Pollution Control Studies and Biodiversity Municipalities of Kusadası, Soke, Izmir, Urla; Certificates of Honour-Environmental Protection & Res. Foundation, Izmir, Turkey, OLEYİS Labour Foundation for Social Security & Assistance Award-Tourism and Environment Competition, Ankara, Turkey, American National Science Foundation (NSF), *and* Izmir Governorate Awards for Assistan*ce* to Foreign Students *(5)*.
**Experience in teaching:** 30 years, **Experience in research:** 56 years, **Books** in English 45; Springer, Elsevier, Cambridge Scholars; Bilingual (English & Turkish) (3 Books); Turkish (7 Books), **Guest Editorship of Journnal:** 12 journals; 2008. "The Malaysian Forester"; 2009 Environmental Geology, Special Issue; Springer Nature; 2010 Journal of Environmental Biology Special Issue-Forests-Forestry-Environment; 2011 Procedia Social and Behavioral Sciences, Elsevier; 2012. Environment and Geography in the Mediterranean, Special Issue-Journal of Environmental Biology; 2013 (Guest editors). Ecosystem Biodiversity-Prospects and Challenges. Sains Malaysiana; 2014 Procedia Social and Behavioral Science,Elsevier; 2015 Ecology, Geography and Environment in the Mediterranean, Journal of Environmental Biology, Special Issue; 2016 Applied Botanical Thematic Issue of Applied Ecology and Environmental Research-AEER; 2017 Journal of Environmental Biology, Special Issue; 2020 Journal of Environmental Biology, Special Issue "Molecular Signalling During Communicable and Non-communicable Diseases", Current Pharmaceutical Design. **Book Chapters:** 85, **Papers/Articles:** (International Journals) 160 (ISI and International Journals), **Papers in National Journals:** 55, **Papers Presented at International Meetings:** 120; **Papers Presented at National Meetings:** (Turkish) 91.

## PROF. MOHAMMAD ABDOLLAHI FIAS
## HIGHLY CITED RESEARCHER 2021

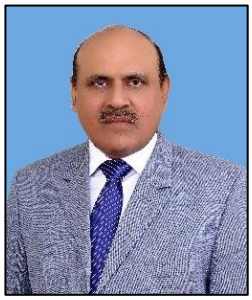
Dr Mohammad Abdollahi acquired a PharmD in 1988 from the University of Tehran and then finished a PhD in Toxicology and Pharmacology in 1994 from the Tehran University of Medical Sciences (TUMS). He earned a postdoctoral training in Mechanistic and Clinical Toxicopharmacology at the University of Toronto in 2001.


Dr Abdollahi earned the honor of the full professorship of TUMS since the second half of 2002. Since 1997, he contributed in the establishment of Tehran Drug and Poison Information Center for 8 years. He chaired the Department of Toxicology and Pharmacology since the second half of 2005 until mid of 2016. Also he has been the Director of National Board of Toxicology for 9 years and Chair of National Society of Toxicology for 8 years. Dr Abdollahi has been involved in establishment of Pharmaceutical Sciences Research Center (PSRC) of TUMS, as a Cofounder Vice-Chair, and Manager of the Ethics Board since 2003; from August 2016, he chairs the PSRC. He chaired the Central Library of TUMS between 2004 and 2006. During 2014-2016, he established and chaired the Drug Discovery and Evaluation Department at the National Institute of Medical Research Development. He was the Vice-Chair for International Affairs of the Faculty of Pharmacy, TUMS, between 2015 and 2016. Between mid-2015 and mid-2017, he directed the Secretariat of the Council of Pharmaceutical Sciences Education and did an excellent job in reforming the Pharmacy education curriculum. In 2013, he founded a Knowledge-Based Company to uncover the critical mechanistic connections between the toxicity of chemicals and the etiology of human diseases, as well as the introduction of new medicines to protect humans and the environment. Since February 2018, Dr Abdollahi chairs the Institute of Pharmaceutical Sciences.

So far, Dr Abdollahi has contributed to authoring more than 900 papers in prestigious journals and authoring more than 50 book chapters and editing 12 books. He has been listed among top scientists of ESI/ISI and OIC Member States. According to Google Scholar, current H-index, total citations, and i10 index of Dr Abdollahi are 78, >23500, and 463, respectively. Since 2004, he received recognition by the ESI of the Clarivate as one of the top 1% scientists in the field of Pharmacology and Toxicology currently with a world rank of 180. Besides having the position of DARU Editor-in-Chief (EiC), a journal of TUMS published by BMC, followed up by Springer Nature series since 2012, he has been a member of the BMC Editors Advisory Group in the UK started from 2013. Dr Abdollahi was one of the Founders and the EiC to another journal titled "Journal of Medical Hypotheses & Ideas" published by the Elsevier (Netherlands). He has also served on the editorial board of many other journals and is an individual member of many academic societies such as EUROTOX and SOT of USA (full member). He has cooperated with some key international organizations such as the OPCW (Organization for Prohibition of Chemical Weapons) as a member of Scientific Advisory Board in the Netherlands (since 2012), WHO (World Health Organization) as a Member of the Group for Prevention of Lead Poisoning in Switzerland (since 2011), COPE (Committee on Publication Ethics) as a Council Member in the UK (2013-2017) , as a Fellow of the Islamic World Academy of Sciences (IAS) since 2007, and International Society of Pharmacoeconomics and Outcomes Research (ISPOR) Iran Chapter as a Co-Founder and Board of Directors (since 2013). In addition to more than 15 prestigious national awards, he has received the prominent award of IAS-COMSTECH in 2005 in the field of Pharmacology and Toxicology. The main research interests of Dr Abdollahi are Mechanistic and Environmental Toxicology, Evidence-Based Medicine, and Pharmacology. Dr Abdollahi's contributions to this field are attested to by an extensive array of citations in papers and books. He has been credited with uncovered the critical mechanistic connections between the toxicity of chemicals and the etiology of human diseases.

## PROF. MUHAMMAD ASHRAF FIAS
## HIGHLY CITED RESEARCHER 2021



Prof. Ashraf did his PhD from the University of Liverpool, UK in 1986. Soon after completing his PhD work there, he was offered a post-doctoral position for a period of 8 months. In 1993, he earned US Fulbright Award and proceeded to University of Arizona Tucson (USA) for postdoctoral work. Owing to his considerable scientific attainment in the field of "Improvement of stress tolerance in plants" he was awarded **D.Sc** (a substantive degree) in **2011** by the University of Liverpool UK, which is really a sound milestone in the career of Prof. Ashraf and hence an international recognition of his excellent work on plant stress tolerance.

| FULL NAME | CATEGORY |
|---|---|
| MA Ashraf, Muhammad | Plant and Animal Science |

For the successful achievement of his research objective, Dr. Ashraf devised a number of new techniques for screening large numbers of individuals (20,000 - 30,000) at high selection pressure after just 2-3 weeks growth, because the greater the number of genotypes screened, the greater would be the possibility of selecting some highly salt-tolerant individuals. The selection lines of various crops such as canola, cotton, maize, pearl millet, different pulse crops, different forage grasses, oil-seed crops, developed so far are highly salt-tolerant in comparison with their respective base populations, and most thrived well on salt-affected soils after substantial amendments. It is imperative to note that a selection line of spring wheat "S-24" in 2010 (USDA-ARS National Centre for Genetic Resources Preservation PI No. 652453; Plant Genetic Resource Institute, National Agricultural Research Centre, Islamabad, Pakistan Acc-22864; recently published in Journal of Plant Registration USA) developed by Dr. Ashraf after rigorous selection procedure using physiological, molecular and genetic means, is currently being used as a promising salt tolerant line at different national and international institutions. This line was also tested by a group of scientists at CIMMYT, Mexico, as well as those of Oman, England, and many local centers. He and his team also got a high yielding cotton variety "988" registered with the Government of Pakistan in 2017. It is currently under wide cultivation at farmers' fields.

**Administrative Experience:**

1. Vice Chancellor (President), University of Agriculture Faisalabad, Pakistan (A premier and oldest agricultural university of Asia) from 16th April 2016 to September 2020.
2. Pro-Rector, The University of Lahore, Lahore, Pakistan from 18th October 2018 to 15th April 2019
3. Chairman (President), Pakistan Science Foundation, Islamabad, Pakistan from 24th February 2015 to 23rd February 2018.
4. Vice Chancellor (President), Founding Vice Chancellor of Muhamamd Nawaz Shareef University of Agriculture, Multan, Pakistan (A public sector university) from 15 August 2014 to 23rd February, 2015.
5. Adjunct Professor at International Centre for Chemical and Biological Sciences (ICCBS), HEJ, University of Karachi, Karachi 2017 to date
6. Chairman, Department of Agronomy, University of Sargodha, Sargodha, from 9th September, 2013 to 14 August, 2014.
7. Director, Quality Enhancement Cell, University of Sargodha, Sargodha, from 30th July, 2013 to 14 August, 2014.
8. *Dean,* Faculty of Sciences, University of Agriculture, Faisalabad, from 15th September, 2006 to 20th Nov 2012.
9. Director, Quality Enhancement Cell, established by Quality Assurance Agency, Higher Education Commission in University of Agriculture, Faisalabad from 21 July 2006 to 23 January 2008.
10. Chairman, Department of Botany, University of Agriculture, Faisalabad from 12th October 2002 to 18th September, 2006.
11. Head/Convener, Quality Enhancement Cell, established by Quality Assurance Agency, Higher Education Commission in University of Agriculture, Faisalabad from 4 January 2005 to 20 June 2006.
12. Principal Investigator of about 25 research projects funded by various international and national organizations during the last 20 years.
13. Convener of a number of committees meant for devising rules and regulations for uplifting the quality of higher education in the university.

**Teaching and Research Experience:**

1. Professor, Agronomy Department, University College of Agriculture, University of Sargodha, Sargodha, Pakistan (26.08.2013 to 14 August, 2014)
2. Professor, Botany Department, University of Agriculture, Faisalabad, Pakistan (30.03.2002 to 14th July 2013)
3. Associate Professor, Botany Department, University of Agriculture, Faisalabad, Pakistan (26.05.1999 to 29.03.2002)
4. Associate Professor, Botany Department, Bahauddin Zakariya University, Multan, Pakistan (11.3.1997 to 25.5.1999)

5. Assistant Professor, Botany Department, Bahauddin Zakariya University, Multan, Pakistan (19.10.1989 to 10.3.1997)
6. Part-Time Teacher in the University College of Agriculture from 1989 – June 1993.
7. Lecturer, Botany Department, Bahauddin Zakariya University, Multan, Pakistan (22.11.1986 to 18.10.1989)
8. Demonstrator, Botany Department, University of Liverpool, UK (1985-86).
9. Lecturer in Botany, Government Degree College, Shorkot City, Pakistan (28.3.1981 to Sept. 1983)

**Academic Excellence:**

Highly Cited Researcher declared by the **Clarivate Analytics (Thomson Reuters USA)** for the Years 2018 and 2020.

Stanford University UAS has ranked the world scientists using Scopus citation data in November 2020. Prof. Ashraf is listed among the top 2% scientists of the world.

Attained third position in the world in the field of Plant Physiology during 2020 based on Google Citations (over 54500 accessed on 8th Dec 2020).https://scholar.google.com/citations?view_op=search_authors&hl=en&mauthors=label:plant_physiology

Ranked the top scientist of the OIC countries (57 countries) by securing 4306 points in Biological Sciences in 2007 by the COMSTECH of the OIC countries.

Ranked the top Scientist in Biological Sciences in 2004, 2005, 2007, and 2010 by the Pakistan Council for Science and Technology.

Attained 3rd position among the scientists from all disciplines in Pakistan during 2017 by the Pakistan Council for Science and Technology.

**Awards and Honours:**

1. Earned Honorary Doctorate degree from the Lanzhou University China in 2018
2. Hilal-e-Imtiaz (One of the highest Civil Awards) by the President of Pakistan in 2016
3. Sitara-e-Imtiaz (Next to the former civil award) by the President of Pakistan conferred on 14th August, 2006.
4. Pride of Performance (Third civil award) by the President of Pakistan in 2000.
5. Presidential Award –Izaz-e-Fazeelat for 1997.
6. Earned HEC Life-time Achievement Award in 2013
7. Earned PAS Distinguished Scientist in Botany 2013
8. Earned a medal from the United Nations Food and Agriculture Organization (FAO) in February 2013 on the basis of excellent research on stress biology
9. Earned Khwarizmi International Award from the President of Iran in February 2013
10. Appointed as Honorary Professor in Lanzhou University China
11. Earned D.Sc degree (a titled degree based on excellent research performed after attaining the PhD degree) from the University of Liverpool, UK in 2011 – A very rare achievement by the Pakistani scientists
12. Appointed as a Scientific Advisor for the Green Technology Program, Rural Development Administration, Government of the Republic of Korea for a period of 3 years from January 2010 to Dec. 2012.
13. Research Productivity Allowance for the year 2002, 2003, 2004, 2005, 2007, 2008, 2010, 2011, 2012, and 2013, 2014, 2015, 2016 (Placed in Category A in most cases)
14. A shield by the University of Agriculture Faisalabad given away by the President of Pakistan, General Pervez Musharraf, in the inaugural ceremony of the Centenary Celebrations of the University on 14 March 2006.
15. Appointed as a Distinguished National Professor by the Higher Education Commission from 25th Nov. 2005 to 24th Nov. 2007.
16. Appointed as an Honorary Scientist for Rural Development Administration, Government of the Republic of Korea for a period of 3 years from Ist July 2005 to 30 June 2008.
17. Dr. Agha G.D. Ahmad Medal by the University of Agriculture Faisalabad, Pakistan (2003).
18. Best University Teacher Award by Higher Education Commission Islamabad (2002).
19. Open Gold Medal in Botany (1997) by the Pakistan Academy of Sciences, Islamabad.
20. First Award in Biology by the National Book Foundation of Pakistan in 1994.
21. Fulbright Research Award for 1993/94 by the U.S. Educational Foundation.
22. A Cash Prize (2nd Prize) by the National Book Council (Ministry of Education Pakistan).
23. Salam Prize (established by the Nobel Laureate Dr. Salam) in Science (Biology), in 1992.
24. Earned a Gold Medal from the Pakistan Academy of Sciences in the field of Biology, in 1990 (under 40).
25. Earned a Golden Star in 1988 from the National Farm Guide Council of Pakistan on the basis of excellent research in Agriculture.
26. Earned a Medal in 1980 and 1st position in the University in M.Sc.

## IAS 43RD COUNCIL MEETING HELD VIRTUALLY

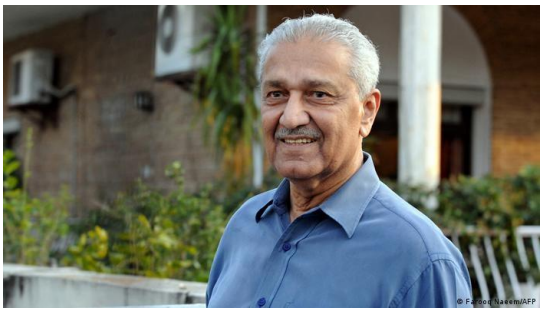
The IAS held its 43rd Council Meeting virtually on Zoom platform on 6 December 2021.
Many issues pertinent to IAS were discussed among the attending council members.

Council members that attended the meeting are:
Prof. Abdel Salam Majal, President (Jordan).
Prof. N. M. Butt, Vice President (Pakistan).
Prof. Khatijah Yusoff, Vice President (Malaysia).
Prof. Adnan Badran, Treasurer (Jordan).
Prof. Ahmad Azad, Member (Australia).
Prof. Muthana Shanshal, Member (Iraq).
Prof. M. Shamsher Ali (Bangladesh).



## FELLOWS NO LONGER WITH US

### THE LATE PROF. ABDUL QADEER KHAN (PAKISTAN)



It is with a sense of sadness and sorrow that the President and the Director General of the Islamic World Academy of Sciences (IAS) in Amman, Jordan, announce the passing away of the eminent Pakistani scientist Prof. Abdul Qadeer Khan FIAS.

Dr. Abdul Qadeer Khan was born in Bhopal (British India) on April 1, 1936. He earned a BSc degree from the University of Karachi in 1960. Subsequently, he went to Germany and studied in Berlin before moving to Holland, where he earned an MSc (Technology) degree from Delft Technological University in 1967. Dr. Khan received his Doctor of Engineering Degree from the University of Leuven, Belgium in 1972.

After completing his formal education he worked as an expert in metallurgical and nuclear engineering. This included working in the Uranium Enrichment Plant in Holland, which provided him with state-of-the-art experience in nuclear technology. In 1976, he returned to Pakistan and set up the Engineering Research Laboratories (ERL) for enriching uranium. As a tribute to his services to the country, the President of Pakistan, General Muhammad Ziaul Haq, renamed the Laboratories as "Dr A.Q. Khan Research Laboratories" (KRL) in 1981. Over the years, the Laboratories became a focal point for a large number of scientists, engineers and technologists. Dr Khan guided them through the tasks that have led to unparalleled advances in uranium enrichment and missile technologies. This breakthrough eventually resulted in the historic explosion of six nuclear devices on 28th and 30th May, 1998 and the successful test firing of an intermediate range ballistic missile named "Ghauri" on 6th April, 1998 and 14th April, 1999. He was Chief Coordinator of Pakistan's Ballistic Missile Programme from 1990 to 2000. Dr Khan remained Chairman of KRL until his retirement in 2001, after which, until 2004, he was Special Advisor (Federal Minister) to the President and Prime Minister of Pakistan.

Dr. Khan's research areas are metallurgy, materials science and nuclear engineering. As an active scientist and technologist, he published 200 research papers in reputable national and international journals and two patents are registered in his name in the UK. He also edited a large number of books on metallurgy and nuclear engineering and given lectures at reputed universities and institutions, some of which have been published in book form.

Dr Khan had received 8 honorary degrees of Doctor of Science from the University of Karachi (25th July, 1993), Baqai Medical University, Karachi (11th December, 1998), Hamdard University, Karachi (6th March, 1999), Gomal University, Dera Ismail Khan, KPK (6th April, 1999), University of Engineering and Technology, Lahore (9th December, 2000), Sir Syed University,

Karachi (25th March, 2001), Balochistan University, Quetta (21st October, 2003) and M.A. Jinnah University, Karachi (15th March, 2012). For his important and eminent contributions in the field of science and technology, the President of the Islamic Republic of Pakistan conferred upon him the award of Nishan-i-Imtiaz on 14th August, 1996 and 14th August, 1998. He is the only Pakistani to have ever received the highest civil award, Nishan-i-Imtiaz, twice over. He is also a recipient of the award of Hilal-i-Imtiaz. He was nationally acclaimed as "Mohsin-e-Pakistan" (Benefactor of Pakistan) and is revered by the whole nation.

Dr. Khan had received 66 gold medals and 3 gold crowns from various national institutions and organizations. He was a Fellow of the Kazakh National Academy of Sciences, the first Asian scientist with this honour, a Fellow of the Korean Academy of Sciences and a Fellow of the Islamic World Academy of Sciences (IAS). Being a Fellow of the Pakistan Academy of Sciences, he was elected as President three times in succession. He was also a Member of a large number of national and international professional organizations, which include the Pakistan Institute of Metallurgical Engineers, the Pakistan Institute of Engineers, Fellow of the chemical society of Pakistan, the Institute of Central and West Asian Studies, the Institute of Materials, London, the American Society of Metal (ASM), the Metallurgical Society of the American Institute of Metallurgical, Mining and Petroleum Engineers (TMS), the Canadian Institute of Metals (CIM) and the Japan Institute of Metals (JIM). A number of colleges, institutes, auditoriums, roads, etc. have been named after him.

Dr. Khan was an ardent supporter of higher education. As the Project Director of the Ghulam Ishaq Khan Institute of Science and Technology he invested his energies into developing it into an exemplary Institution. He has contributed immensely to the establishment of educational institutions in Pakistan. These include several colleges, schools, institutions and academies. So wide are his community services that his contributions extend to the construction of mosques, tombs, dispensaries and community health centres to alleviate the plight of the poor. A large number of educational institutions and auditoriums all over the country and abroad have been named after him.

## ABU RAIHAN AL-BIRUNI (973-1048 AD)*

**A**bu Raihan Mohammad Ibn Ahmad al-Biruni was one of the well-known figures associated with the court of King Mahmood Ghaznawi, who was one of the famous Muslim kings of the eleventh century AD. Al-Biruni was a versatile scholar and scientist who had equal facility in physics, metaphysics, mathematics, geography and history. Born in the town of Khewa near Khawarizm (present-day Uzbekistan) in 973 AD, he was a contemporary of the well-known physician Ibn Sina. At an early age, the fame of his scholarship went around and when Sultan Mahmood Ghaznawi conquered his homeland, he took al-Biruni along with him in his journeys to India several times and thus he had the opportunity to travel all over India during a period of 20 years. He learnt Hindi philosophy, mathematics, geography and religion from the Pandits to whom he taught Greek, Arabic science and philosophy. He died in 1048 AD at the age of 75, after having spent 40 years in gathering knowledge and making his own original contributions to it.

He recorded observations of his travels through India in his well-known book Kitab al-Hind which gives a graphic account of the historical and social conditions of the sub-continent. At the end of this book he makes a mention of having translated two Sanskrit books into Arabic, one called Sakaya, which deals with the creation of things and their types, and the second, Patanjal dealing with what happens after the spirit leaves

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

the body. His descriptions of India were so complete that even the Aein-i-Akbari written by Abu-Al-Fadl during the reign of Akbar, 600 years later, owes a great deal to al-Biruni's book. He observed that the Indus valley must be considered as an ancient sea basin filled with alluvials.

On his return from India, al-Biruni wrote his famous book Qanun-i-Masoodi (al-Qanun al-Mas'udi, fi al-Hai'a wa al-Nujum), which he dedicated to Sultan Masood. The book discusses several theorems of astronomy, trigonometry, solar, lunar, and planetary motions and relative topics. In another well-known book al-Athar al-Baqia, he has attempted a connected account of ancient history of nations and the related geographical knowledge. In this book, he has discussed the rotation of the earth and has given correct values of latitudes and longitudes of various places. He has also made considerable contribution to several aspects of physical and economic geography in this book.

His other scientific contributions include the accurate determination of the densities of 18 different stones. He also wrote the Kitab-al-Saidana, which is an extensive Materia Medica that combines the then existing Arabic knowledge on the subject with Indian medicine. His book the Kitab-al-Jamahir deals with the properties of various precious stones. He was also an astrologer and is reputed to have astonished people by the accuracy of his predictions. He gave a clear account of Hindu numerals, elaborating the principle of position. Summation of a geometric progression apropos of the chess game led to the number:

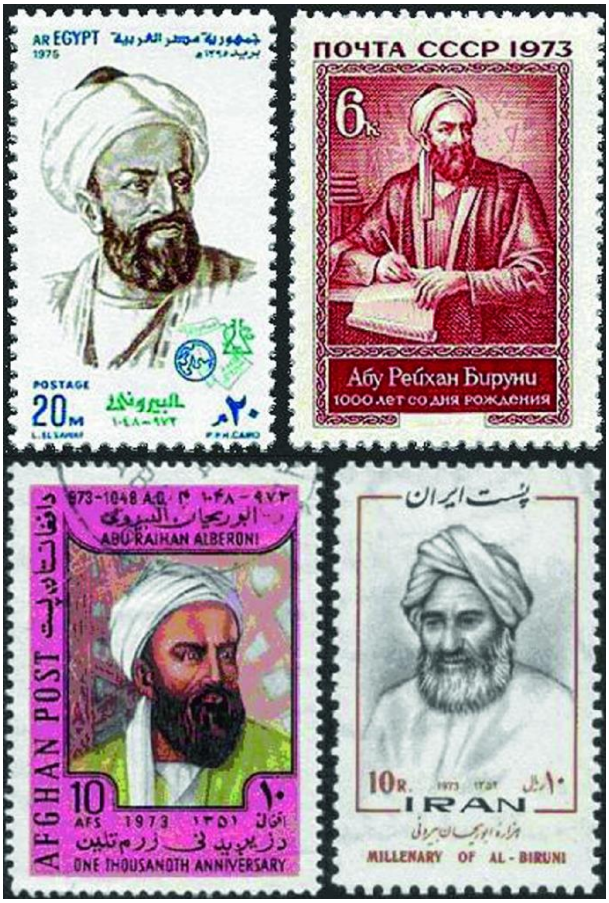
**1616-1=18,44,6,744,073,709,551,619**.**

He developed a method for trisection of angle and other problems that cannot be solved with a ruler and a compass alone. Al-Biruni discussed, centuries before the rest of the world, the question whether the earth rotates around its axis or not. He was the first to undertake experiments related to astronomical phenomena. His scientific method, taken together with that of other Muslim scientists, such as Ibn al-Haitham, laid down the early foundation of modern science. He ascertained that as compared with the speed of sound the speed of light is immense.

He explained the working of natural springs and artesian wells by the hydrostatic principle of communicating vessels. His investigations included description of various monstrosities, including that known as "Siamese" twins. He observed that flowers have 3,4,5,6, or 18 petals, but never 7 or 9.

He wrote a number of books and treatises. Apart from Kitab-al-Hind (History and Geography of India), al-Qanun al-Masudi (Astronomy, Trigonometry), al-Athar al-Baqia (Ancient History and Geography), Kitab al-Saidana (Materia Medica) and Kitab al-Jamahir (Precious Stones) as mentioned above, his book al-Tafhim-li-Awail Sina'at al-Tanjim gives a summary of mathematics and astronomy.

He has been considered as one of the very greatest of all times. His critical spirit, love of truth, and scientific approach were combined with a sense of toleration. His enthusiasm for knowledge may be judged from his claim that the phrase *Allah is Omniscient does not justify ignorance.*




*** The actual number obtained using a computer is 18,44,6,744,073,709,551,615 - Editor.*

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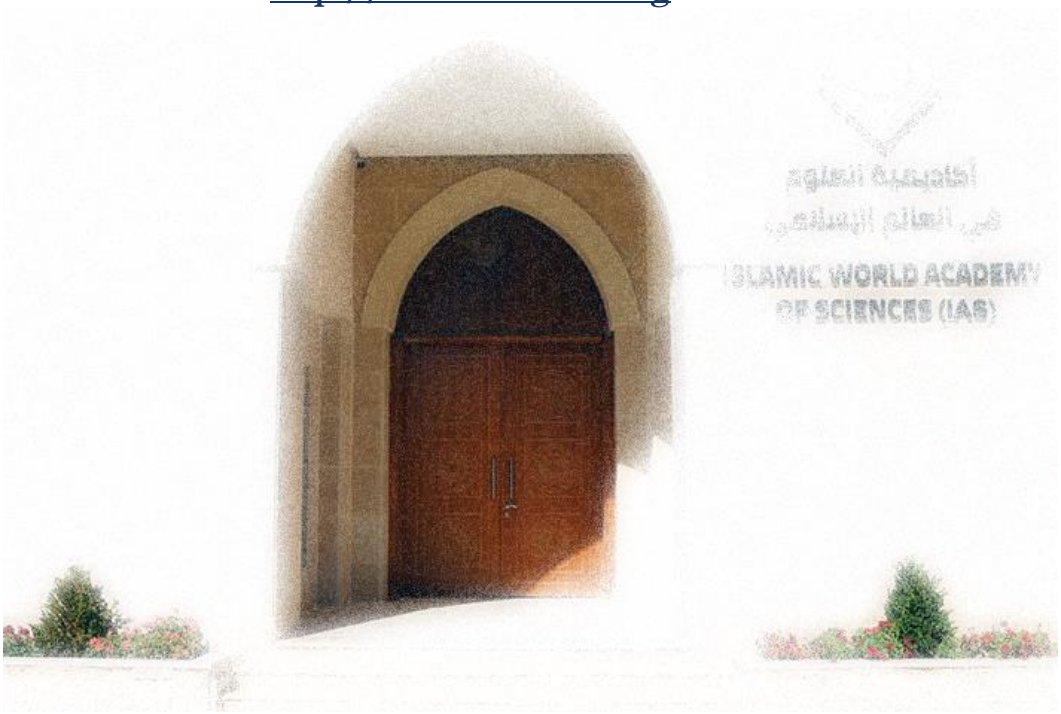


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*Najwa Daghestani*