



PCST

# STI Voice

*Quarterly Newsletter*

**Volume 2**

**No. 1, Jan-Mar, 2016**

**No. 2, Apr-Jun, 2016**



**Science**



**Technology**

**STI**

**Innovation**



**Pakistan Council for Science & Technology**

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# STI Voice

## Quarterly Newsletter

Volume 2  
No. 1, Jan-Mar, 2016  
No. 2, Apr-Jun, 2016

### Editor in-Chief

Prof. Dr. Anwar-ul-Hassan Gilani (SI)  
Chairman  
Pakistan Council for Science and Technology (PCST)

### Editor

Prof. Dr. Farzana Latif Ansari (TI)



## Quaid's Voice

*"You have asked me to give you a message. What message can I give you? We have got the great message in the Quran for our guidance and enlightenment".*

*Message to NWFP Muslim Students Federation  
April 1943*

## Chairman's Voice



The importance of Science, Technology and Innovation (STI) for economic growth is well recognized and is evident from the fact that the countries which have achieved significant progress have given due consideration to STI. In the era of knowledge-based economy, innovation plays a key role as a driver of economic growth and prosperity and is gaining prominence in whole sphere of economic and social development activities. The countries which are higher in the innovation ladder are more prosperous than those which are at the lower end. Switzerland, which is the top ranked country in the Global Innovation Index 2015, has per capita income of 85,616 US\$. To embrace similar economic progress, we are bound to give due diligence to growth in scientific and technological infrastructure of the country, particularly when Pakistan finds itself at the 131<sup>st</sup> position; even behind African countries like Ethiopia and Nigeria, in the list of 141 countries which are included in the Global Innovation Index 2015. The Ministry of Science & Technology (MoST) together with Ministry of Planning and Reforms has realized the value of Innovation and approved the project, National Innovation Award, which

will be launched shortly by Pakistan Council for Science & Technology (PCST). It is expected that this initiative of the Government will have huge impact.

Last few months have been very productive for PCST, in achieving some historical milestones, which include organizing the 6<sup>th</sup> Meeting of the Executive Committee of the National Commission for Science and Technology (ECNCST), held on Mar 9, 2016 after a gap period of 14 years. It was a productive meeting as the forum was able to recommend concrete proposals for the next meeting of the National Commission for Science and Technology (NCST) to be chaired by the Prime Minister shortly. The efforts of PCST team that worked day and night to make this happen are appreciable in this regard. The team is now carrying out necessary spade work for the next meeting.

Another milestone achieved during this period was the approval of the Act by the Standing Committee on Science & Technology. The support of the Chairman, Chaudhary Tariq Bashir Cheema, along with members of the Committee is highly appreciated. The guidance and patronage of both the Federal Secretary (Fazal Abbas Maken) and Federal Minister (Rana Tanveer Hussain) of Science & Technology throughout these processes are greatly appreciated.

S&T and R&D can play an important role to realize almost all the goals and targets of the document "Vision 2025" of the Government, while some of the goals require direct interventions of science and technology. A National Research Agenda has been developed by PCST under the supervision of MoST, with the aim to align the national R&D and innovation activities with the Vision 2025 and to provide a direction to the national R&D efforts so that they adequately support achievement of the goals under the seven pillars set in the said document.

Health is of primary concern of everyone. In view of the importance and our expertise in this area, a national level workshop on "Organic Food and Health Avenues of Innovation and Entrepreneurship" was organized by PCST on Jun 2, 2016 in Islamabad. Based on the high success and keen interest of different stakeholders and public, PCST has decided to organize a series of such workshops in different cities of the country, next being in Lahore on Aug,29, 2016.

Regular columns on Quran & Science, Muslim Scholars of the past, Young Scientists column along with Nobel Laureates, 2015 and health tips will continue.

At the end, I would like to express my sincere appreciation to Prof. Farzana Latif Ansari, Editor, STI Voice for her creativity and dedicated efforts along with the efforts of other team members in making STI Voice an effective platform of communication for the community of science and technology as well as for public.

**Prof. Dr. Anwar-ul-Hassan Gilani (SI)**

Chairman, PCST  
Editor in Chief

## Editor's Voice



Welcome to the first issue of the STI Voice, 2016. From this platform, I appreciate your interest in our newsletter and hope you find it useful and of value to your professional activities. I welcome additional feedback from as many members of our community, as possible. To help me stay relevant to your changing needs, I would be grateful if you'd share the science/technology news which are of particular interest to you, as well as any features you'd like to see added to STI Voice. Please e-mail your thoughts to us at [www.pcst.org.pk](http://www.pcst.org.pk)  
In this issue, we will recount various news and activities which the members of our S&T community were actively involved in during the 1st two quarters of 2016 which had to be combined.

In the current issue, apart from institutional reports, the newsletter highlights the successful holding of the ECNCST meeting on Mar 9,2016. This was a national mega event of the scientific community organized by PCST in Islamabad.

Regarding the activities of scientific community at international level, you will find the highlights of the OIC General Assembly which was held during May 31 to June 1, 2016 at COMSTECH, Islamabad. During this General Assembly which was attended by dignitaries from 53 countries, a Ten Year Action Plan was presented by COMSTECH, the details of which are presented for our readership.

A huge thank you to all the persons who contributed writing the wonderful and inspiring articles, without which there wouldn't have been this newsletter issue.

Last but not least, I would like to thank the Chairman, PCST and the staff for their everlasting support throughout the creation of this edition.

May Allah shower His blessings on Muslim Ummah during the sacred month of Ramadan and wishing our readers a happy and peaceful Eid-ul-Fitr.

Enjoy reading STIV.

**Prof. Dr. Farzana Latif Ansari (TI)**

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## The Quran's and Science Voice

Allah Almighty is the Creator of this cosmic world that includes huge heavens, earth, time and space. At the same time, He has also created very small creatures that appear quite insignificant to human beings. In the holy Quran, He talks about six small insects namely ant, honey bee, spider, house fly, termite and mosquito. However, the importance of these small creatures can be estimated from the fact that three surah in the Holy Quran are named after three of them: Surah 16, Al Nahl (honey bee), Surah 27, Al Naml (ant) and Surah 29, Al Ankabut (spider). In the previous two issues of STI Voice, we had discussed, under the same column, the magnificence in the two small creatures namely house fly and mosquito and the technological lessons learnt from them. This column is devoted to another marvelous creation of Allah namely honeybee, and the lessons therein.

ثُمَّ كُلِي مِن كُلِّ الثَّمَرَاتِ فَاسْلُكِي سُبُلَ رَبِّكِ ذُلُلًا يَخْرُجُ مِنْ  
بُطُونِهَا شَرَابٌ مُّخْتَلِفٌ أَلْوَانُهُ فِيهِ شِفَاءٌ لِّلنَّاسِ إِنَّ فِي ذَٰلِكَ لَآيَةً لِّقَوْمٍ  
يَتَفَكَّرُونَ ﴿١٦﴾



**“And your Lord (Allah) revealed to the bees: Build your hives in mountains, trees and in what people build. Then eat from every fruit and follow your Lord's enslaved paths, from their bellies exits drink of different colors, in it is healing for men. These are signs for those who contemplate”.**

**Al Qura'n 16.68-69**

The most surprising fact about the bees that gather pollen and make honey is that they are actually all female. The male bees do not make honey. This was only known recently. However, 1500 years ago the Quran refers to bees that generate the honey as females (the Arabic grammar is in the female mode).

□ For the word "eat": "Kuli" is for females; "Kul" is for males. The Quran used "Kuli" (females).

□ For the word "follow a path": "Usluki" is for females; "Usluk" is for males. The Quran used "Usluki" (females).

For the word "their bellies": "butuniha" is for females; "butunihim" is for males. The Quran used "butuniha" (females)..

This is quite amazing that a man who lived 1500 years ago knew that those honey making bees are females? Following are some important aspects of the life of a honeybee.

□ There are three types of bees in a beehive Queen, Worker and Drone. Larger than the worker bees, the male honey bees (also called drones), have no stings and do no work at all; all they do is mating.



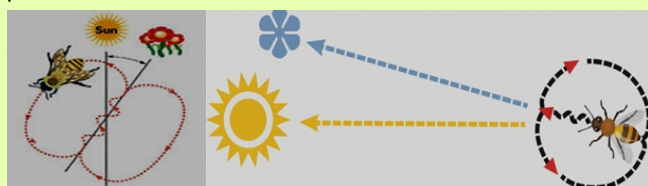
□ Honey bees are not aggressive by nature, and will not sting unless protecting their hives from an intruder or are unduly provoked and they are the only insects that die after they sting.

□ They represent a highly organized society, with various bees having very specific roles during their lifetime e.g. nurses, guards, grocers, housekeepers, construction workers, royal attendants, undertakers, foragers, etc.

Honeybees are the only insect that produces food for humans for which they work round the clock and never sleep.

A honeybee is inspired by Allah to eat from different flowers of varying colors. These flowers have nectarines that produce sugary nectar. Worker bees suck up the nectar and water and store it in a special honey stomach. When the stomach is full the bee returns to the hive and puts the nectar in an empty honeycomb. Natural chemicals from the bee's head glands and the evaporation of water from the nectar change the nectar into honey.

Another important part of the verse is "Follow your Lord's enslaved paths" **فَأَتْلُكِي سُبُلَ رَبِّكِ ذُلُلًا** What is this Lord's enslaved path? This path is in fact is a particular figure-eight dance (waggle dance) that a worker honeybee performs. This dance involves running through a small figure-eight pattern: a waggle run followed by a turn to the right to circle back to the starting point, another waggle run, followed by a turn and circle to the left, and so on in a regular alternation between right and left turns after waggle runs. By performing this dance, a bee communicates and shares, with other members of the colony, information about the direction and distance to patches of flowers yielding nectar with pheromones.



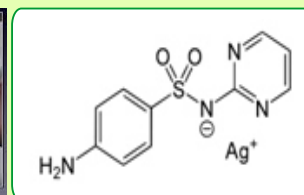
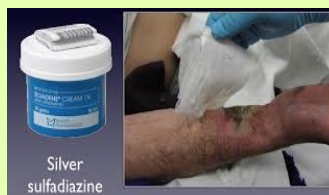
What is so special about the honey that the bees produce? Allah says "Therein is healing for mankind"

**فِيهِ شِفَاءٌ لِلنَّاسِ** Also, more than 1400 years ago, narrated Jabir bin Abdullah: I heard the Prophet saying, "If there is any healing in your medicines, then it is in cupping, a gulp of honey or branding with fire (cauterization) that suits the ailment, but I don't like to be (cauterized) branded with fire."

*Sahih Bukhari Volume 7, Book 71, Number 587*

Confirmed by the scientists today, honey possesses antibacterial, antifungal, anti-inflammatory, wound healing and anti-diarrhoeal properties. It supports blood formation and is a cough medicine that helps relieving the lungs from mucus. Gupta et al in a retrospective study reported a

comparison of honey dressing with silver sulfadiazene dressing (SSD)- atypical antibacterial used primarily on second-and third-degree burns.



Honey was found to have better healing properties of infected surgical wounds and bedsores as it made wound sterile in lesser duration. Honey dressings have also better outcome in terms of incidence of hypertrophic scars and post-burn contractures. Its viscous nature enables it to absorb water from surrounding inflamed tissues.

Prof. Molan, a leading researcher into honey, at New Zealand's University of Waikato, says this about the antimicrobial properties of honey: "Randomized trials have shown that honey is more effective in controlling infection in burn wounds than silver sulphadiazine, the antibacterial ointment most widely used on burns in hospitals".

*(Anal of Burns and Fire Disasters, 2014, Mar 31, 27 (1), 22-30, J CutanAesthetSurg, 2011, 4, 1831-87). ("Honey Against Infected Skin Lesions," Http://www.apitherapy.com/honeysk.htm.)*

The following honey-made products, being used as medicines, are available in the market today.

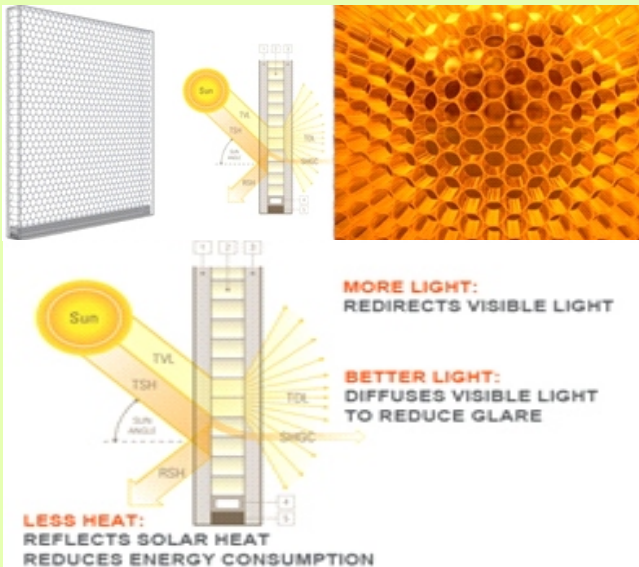


While the life and work of the honey bee is a fascinating subject to study, the focus of this column is on the bee's architectural genius in designing its home - the hive, and in particular the "comb" part of the hive. Bees make their home in the hive using wax they produce. The honeycomb is used to store their food - honey and pollen and to house the developing bee larvae. With hundreds of bees inhabiting a hive, and with the weight of the honey they produce, it is necessary for their hives to be strong, light-weight and efficiently designed. The look of the "honey comb" structure



is fairly well recognized, but knowledge of the brilliance of its hexagonal design pattern fully utilizing a three-dimensional space is probably relatively scarce.

This Allah's given capability of the bee to design such a strong, efficient and spectacular home and storage space has been replicated by humans in a wide variety of applications. The New York based company Panelite has modeled its biomimetic Clear Shade insulating glass on the hexagonal structure of honeycombs. ClearShade controls the amount of sun's heat that's admitted to a building, while still letting in plenty of light besides giving the glass an interesting visual effect. Installed in the new terminal at Kennedy Airport as well as a number of university campuses and other buildings, it is able to control heat gains and significantly reduces air-conditioning costs.



Examining the intricacies of the natural system of honeycomb structures designed by a honey bee, MAD Sino steel company of China constructed a Skyscraper in which a hexagonal façade multiplies and evolves across the building. This facade is made up of five standardized units of hexagonal windows. An external honeycomb structure incorporates hexagonal windows in five different sizes, arranged according to wind and solar direction on the site in order to regulate the internal temperature of the towers.

The field of "copying nature" is technically called "biomimicry" i.e. mimicking living things. However, the reality is that these scientists and engineers are not "copying nature," rather they are demonstrating that the entire natural world was designed, purposefully, and thoughtfully by the wonderful Creator. The honeybee's wonderful design abilities seen in the honeycomb structure and in the production of honey are not a "stroke of chance," but rather a testament to the awesome fore knowledge of Almighty Allah.

## Meeting of ECNCST

The 6<sup>th</sup> Meeting of the Executive Committee of the National Commission for Science and Technology (ECNCST) was held on Mar 9, 2016 at PCST. Rana Tanveer Hussain, Federal Minister for Science and Technology chaired the meeting which was also co-chaired by Prof. Ahsan Iqbal, Federal Minister for Planning, Development and Reforms.



Prof. Dr. Anwar-ul-Hassan Gilani, Chairman PCST, in his capacity as Secretary, ECNCST while presenting the Agenda of the meeting informed that the Agenda has been prepared in consultation with the relevant stakeholders including relevant Federal Ministries, provincial departments, Federal R&D / S&T organizations etc. After a brief introduction of NCST and ECNCST, the Agenda items were discussed at length. A brief summary of various items discussed follows.



The ECNCST unanimously recommended that the Government should raise the national R&D spending gradually up to 1% of the GDP by the year 2018 and 2% of the GDP by the year 2023. This was recommended when a clear evidence was presented to the house that R&D spending is an important indicator of competitiveness of a country's economy. It was informed that many countries have set targets of investing at least one percent of their GDPs on R&D. Realizing the importance of R&D, most of the countries are either spending or have set targets of investing between 1-4 % of their GDPs on R&D, while countries like South Korea and Israel spend over 4% of their GDPs on R&D (Figure 1).



COMPARISON OF R&D EXPENDITURE

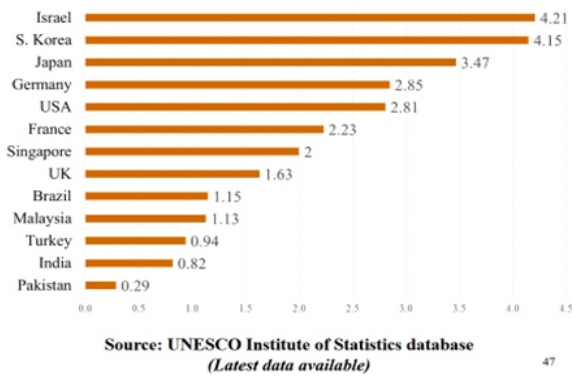


Figure 1: Comparison of R&D expenditure as percent of GDP of Pakistan with some selected countries

In contrast, Pakistan's R&D spending has declined significantly during the past few years after touching its peak of 0.67 percent of GDP in 2006-07 (Figure 2) and, at present, it is just 0.29% of GDP. The figure of 0.67% of GDP was even quite short of the world average spending on R&D (0.82% of GDP) and the minimum recommended by UNESCO for developing countries (1% of GDP). In contrast, India's national R&D expenditure has consistently increased during last 15 years or so (Figure 2). This also correlates with its economic growth during that period.

TREND IN R&D EXPENDITURE- Comparison with India

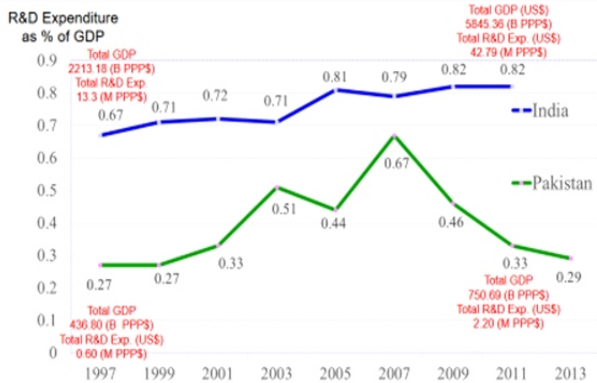


Figure 2: Trend of R&D expenditure as percentage of GDP in Pakistan and India

However, clear evidence of correlation between R&D expenditure and GDP can be observed in case of China (Figure 3). China's R&D expenditure was 0.57% of its GDP in 1996 which was nearly doubled (1.13% of GDP) in 2003. Although, the GDP did not grow with the same pace; it increased from US\$ 1.04 trillion to US\$ 1.854 trillion during the same period, China continued to increase its R&D expenditure which ultimately resulted in an increased rate of growth of its GDP. In 2003, after 11 years of sustained increase in R&D expenditure, its GDP growth rate surpassed the growth rate of R&D expenditure. After 17 years of sustained increase in R&D expenditure, the growth rate of

GDP became much higher; GDP increased almost five times up to 2013 (US\$ 4.91 trillion) than the growth rate of R&D expenditure which increased almost four times (2.01% of GDP) till 2013.

It was, therefore, proposed that the Pakistan Government should gradually increase the national R&D spending up to 2% of the GDP by the year 2023 and provide appropriate tax incentives for enhancing R&D activities in the private sector. Pakistan's R&D System that is mostly in the public sector has poor linkages with the public and private sector industry/firms. Therefore, it was proposed that measures may be taken for ensuring that the R&D activities are planned and executed in consultation and collaboration with the industrial sector. Thus engaging private sector to share R&D funds, as it exists in the developed countries, was also proposed. Furthermore, the government was requested to consider incentives to promote R&D at the industrial level and adopt different approaches to encourage and engage industry and civil society in patronage of R&D activities in the country.

R&D Expenditure Vs GDP China



Figure 3: Correlation between R&D expenditure and GDP in China.

While discussing the agenda item "Devising a Communication Strategy for Enabling Environment for Promoting Scientific Mindset and Culture in the Society", it was told that Pakistan needs to evolve a social environment where people are inclined to have a scientific approach. This is not only essential to create conducive conditions for scientific research, discovery and innovation with the aim of fostering home driven technological and industrial development, it is also imperative for creating a society based on a rationale and forward looking value system. It is clear that our current socio-cultural milieu is quite contrary to these requirements. Hence, the need for a comprehensive communication strategy, to build a strong narrative for transforming our worldview in this respect, is of utmost



necessity. The proposed communication strategy would need to be built on the pillars of political ownership, involvement of the print & electronic media and use of social media, highlighting the spirit of inquiry and the practical benefits of such approach, engagement of public, making science education interesting, training scientists and science teachers to become good communicators, and recognizing both international as well as indigenous scientific discoveries and technological innovations and presenting achievers in these fields as role models.

Both S & T and R & D can play an important role in realizing almost all the goals and targets of the Vision 2025, while some of the goals require direct interventions of science and technology. A National Research Agenda was shared with the aim to align the national R&D and innovation activities with the Vision 2025 and to provide a direction to the national R&D efforts so that they adequately support achievement of the goals under the seven pillars set in the Vision 2025.

It is pertinent to mention that the proposals approved by ECNCST will form the basis for Agenda of the next meeting of National Council for Science and Technology (NCST) to be chaired by the Prime Minister in the near future. The Federal Minister, MoST in his closing remarks congratulated PCST and MoST for holding the meeting of ECNCST after a gap of 14 years and appreciated the active participation and keen interest of members.



### Meeting of the National Assembly Standing Committee

A meeting of the National Assembly Standing Committee on Science and Technology (S&T) was held in the Committee Room of Pakistan Council for Science and Technology (PCST), Islamabad on May 27, 2016, under the Chairmanship of Ch. Tariq Bashir Cheema, MNA. Besides other members of the Standing Committee, the meeting was also attended by Rana Tanveer Hussain, Federal Minister for Science and Technology, Prof. Dr. Anwar-ul-Hassan Gilani, Chairman, PCST, Mr. Muhammad Ashraf, Additional Secretary, MoST and officers of MoST & PCST.







The Minister for Science & Technology and Chairman, PCST welcomed the Chairman, Standing Committee on S&T and members of the Standing committee. The meeting started with the recitation of the Holy Quran. After a brief introduction of the officers of MoST & PCST, the Chairman PCST gave a detailed presentation about history, functions and mandate, activities and achievements of PCST. The committee was informed that PCST, with the support of MoST, was able to hold the meeting of the Executive Committee of National Commission for Science and Technology (ECNCST) in March 2016 after a gap of 14 years. The Standing Committee appreciated the efforts of the Federal Minister for S&T, MoST and PCST, in this regards. After chairing the meeting for some time, the Chairman Committee requested Mr. Aftab Shahban Mirani, MNA to chair the meeting in his absence, as he had to leave for an Urgent meeting of Parliamentary Committee in Parliament House, Islamabad.



The Chairman, PCST further reiterated various recommendations presented earlier in the meeting of ECNCST. The Standing Committee was apprised that ECNCST's recommendations include an increase in the national R&D spending up to 1% and 2% of GDP by the years 2018 and 2023 respectively. The committee was also briefed about the issues being faced by the academia and S&T/R&D organizations of the country is the rapid brain-drain primarily due to economic reasons. To address this challenge, implementation of Technical Pay Scales (TPS), based on merit and efficiency, for organizations working under MoST has

been recommended.



A National Research Agenda was also approved by the ECNCST; wherein 12 priority areas had been identified to align with the Pakistan Vision 2025, policy guidelines of Science, Technology and Innovation (STI) Policy-2012 and recommendations of Technology Foresight Studies carried out by PCST. These areas are presumed to be important for national growth and development in the next 10-15 years. Realizing that the development of scientific mindset and culture is not only a strategic intervention for building knowledge-based economy, but also the significance of "tadabbur" and "Tafakkur" as advocated in the Holy Quran; recommendations were made to devise a Communication strategy for enabling environment for promoting scientific mindset and culture in the society. The Standing Committee appreciated the efforts of PCST being made for performance of its functions and recommended to devise a mechanism for its publicity, awareness and benefit of the general public.





## Activities of Chairman

□ **National representative** in 2015-16 International Panel of the United Nations Commission on S&T “Science Technology & Development” (UNCTAD), held in Budapest (Jan 11-13, 2016).

□ As **Plenary Speaker**, delivered a lecture titled “Controlling metabolic/ cardiovascular disorders with dietary supplements” on the Translational study at the 2<sup>nd</sup> Joint Annual International Conference on “Transnational Medicine: From Discovery to Health at Ziauddin University, Karachi (Jan 29, 2016)



Chairman was interviewed by Radio Pakistan, Islamabad for Program Rabta about the Role of PCST to create public awareness regarding S&T (Feb 8, 2016).

□ Participated in an event on **Past, Present and Future of Science: Making Pakistan Science Conscious**, organized by Pakistan Academy of Sciences, Islamabad (Feb 17, 2016).



□ **Chief Guest** in the closing session of International



□ **Guest of Honor** in ACSE Workshop "Research Integrity and Peer Review" organized by Asian Council for Science Editors, Islamabad (Feb 18, 2016).



Conference of Biochemistry, Biotechnology and Biomaterials (ICBBB 2016) and delivered a lecture titled **Controlling Obesity, Diabetes & Cardiovascular Diseases with Nutrition Management and Life Style Approaches**, University of Faisalabad (Feb 24, 2016).

□ **Chief Guest** and delivered a key note lecture titled **Ethics in Toxicology Studies** in the inaugural session of International Symposium on “Nanomedicines: Development, Testing and Application Possibilities, organized by NORI, Islamabad (Mar 1, 2016).





□ Chief Guest in ISESCO Women Conference on Contribution of Pakistani Women in Scientific & Social Development, organized by ISESCO Women in Science Chair, Quaid-i-Azam University, Islamabad (Mar 8, 2016).

□ Meeting with Prof. Dr. Vojislav V of Nis, Serbia, Member, Editorial Board of PCST journal, Science, Technology and Development and Prof. Anwar-ul-Haq, Pro-Rector, Riphah International University of Sciences at PCST.



□ Delivered a Keynote lecture titled **Global Trends in Traditional, Complementary and Alternative Medicine** at One day National Workshop on Practitioners, Educators and manufacturers of Unani System of Medicine at Pakistan at Academy of Sciences (Apr 7, 2016).



□ Chief Guest during Inaugural Ceremony of Launching of Life Sciences Department, University of Central Punjab and delivered lecture **Innovation and Entrepreneurship in Universities and R & D organizations PCST's Efforts & Initiatives and New Trends in Health Care** (Apr 12, 2016).



□ Chief Guest at Preston University, Islamabad during Symposium on Need of Nano-education at College level- PINSAT (Apr 13, 2016).





□ **Guest of Honor** and delivered keynote lecture titled **Functional Foods for Health and Wellness Avenues of Entrepreneurship** at University of Baluchistan, Quetta (May 4, 2016).



One-day Consultative Workshop on “Policies for Research Commercialization at 1<sup>st</sup> Invention to Innovation Summit-2016 at University of Baluchistan, Quetta (May 5, 2016).



□ **Delivered invited Lecture** titled **Healing Power of our Food** at The National Conference on Health and Nutrition- Shaping the Healthier Nation at COMSTECH, Islamabad. (May 11, 2016).



□ **Chief Guest and Keynote speaker** at National Workshop on Patents and Research Paper Writing at Nathiagali, organized by University of Peshawar. Titles of lectures: **Innovation and Entrepreneurship in Universities and R & D Organizations: PCST's Efforts, Initiatives and Emerging Concept of ONE Health** (May 30, 2016).



□ **Chief Organizer** and delivered Keynote lecture titled **Organic Food and Health: Avenues of Innovation and Entrepreneurship** at National Workshop on Functional Foods for Health and Wellness Avenues of Entrepreneurship organized by PCST (Jun 2, 2016).



□ Delivered a lecture titled “Health benefits of Fasting” at PCST (Jun 14, 2016) at PCST.

**Solar cells trigger electricity both from sun and rain**

Scientists in China are developing revolutionary solar cells that could trigger electricity from both the sun and rain. The incredible process could lay the foundation for future all-weather solar panels. Energy, Apr 11 '2016



Graphene solar cell generates electricity from sun and rain.



## Past Eminent Muslim Scholar's Voice Jabir ibn Hayyan (721A.D- 815A.D)

The inspiration for the desire to examine and explore creation was embodied in the very first command of the Qura'n: Read (iqra).

أَقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ۝ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ۝ أَقْرَأْ وَرَبُّكَ الْأَكْرَمُ ۝

الَّذِي عَلَّمَ بِالْقَلَمِ ۝ عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ ۝

Recite with the name of your Lord Who created,  
Recite, for your Lord is the Most Generous, Who taught writing by the pen. Taught man what he knew not”.

For the next five centuries this and some 800 Quranic exhortations on knowledge (ilm) remained the prime movers behind the triumph of the Muslim intellect.

The period during which Europe was shrouded by ignorance is known in history as the Dark Ages. While Europe was plunged into the abyss of obscurity, the torch of learning was kept alive in the world of Islam through the works of its scholars. If modern age is known of specialized knowledge medieval Muslim scientists had an encyclopedic knowledge, for they embarked on research in different fields. The success of the scholars was the greatest in mathematics, astronomy, geography, mechanics and optics, botany, mineralogy, pharmacy, medicine and chemistry. Encompassing all of this was the desire to become educated-for Islam was not an Ummah (nation) of ignorant followers, but of people who were to think and to reflect. The selection of the name of Jabir ibn Hayyan for this column is Just a selection of Muslim Scholars who contributed to the advancement of civilization.



**“He who performs not practical work nor makes experiments will never attain to the least degree of mastery.”**

**Jabir Ibn Hayyan**

Known as Geber in the West, Jabir ibn Hayyan was born in 721 A.D. in the Persian city of Tus and died in 815. Whether he was an Arab who lived in Khorasan or a Perisan who later traveled to Kufa in Iraq remains an unanswered question; ambiguity still surrounds his ethnic origin. His ninety four years life was devoted thoroughly to science and the quest for knowledge. He gained excellence in the fields of Alchemy, Astronomy, Physics, Pharmacy, Philosophy, Astrology, and Geography. He has been found to acknowledge the early works of Plato, Socrates, Aristotle, and Pythagoras, as well as, the prominent Muslim jurist Imam Jafar as-Sadiq's knowledge on alchemy, (chemistry, philosophy, and astronomy. Jabir's interest in alchemy was

Inspired by his teacher Ja'far as-Sadiq. When he used to talk about alchemy, he would say "my master Ja'far as-Sadiq taught me about calcium, evaporation, distillation and crystallization and everything I learned in alchemy was from my master Ja'far as-Sadiq Imam Jafar was famed for his depth and breadth of knowledge. In addition to his knowledge of Islamic sciences, Imam Jafar was well educated in natural sciences, mathematics, philosophy, astronomy, anatomy, chemistry (alchemy), and other subjects. Jabir ibn Hayyan was his most prominent student.

Jabir ibn Hayyan prepared chemicals, discovered many acids, and prepared, as well as, improved many chemical processes. He stressed the significance of experimenting one's theory, and this is why we see a lot of inventions and discoveries made by him. In fact, he was the one who introduced experimental techniques in the field of chemistry. He gave a detailed description of acetic acid, tartaric acid, and citric acid. Discovery of hydrochloric acid, sulphuric acid, and nitric acid are few of the greatest contributions made by Jabir ibn Hayyan. He combined nitric acid with the hydrochloric acid and invented another acid termed today as “Aqua Regia” which is strong enough to dissolve gold. He discovered chemical procedures as significant as crystallization, melting, distillation, calcination, reduction, liquidation, and sublimation. Dyeing of cloth and leather, as well as, preparation of steel are also associated with this great Islamic scientist. His division of substance into three different classes worked as the basis for modern day classification of metals and non metals.



He worked hard for devising methods to refine and purify metals. We get to know from his works that he was dedicated towards finding out the individual properties of elements. Preparation of antimony, basic lead carbonate, and arsenic from their respective sulphides also connects back to Jabir ibn Hayyan.

According to historians, Jabir respected his mentor Imam Jafar As-Sadiq a lot. To fulfil his teacher's desire, Jabir ibn Hayyan made revolutionary inventions including;

- A Substance that could rust proof iron surfaces, while waterproof cloth.
- A paper that couldn't catch fire.
- An ink which could be seen and read in the dark (at night time).

□ Around 300 books and treatises are attributed to the name of Jabir ibn Hayyan. The topics are diverse in nature ranging from music, magic, philosophy, logic and metaphysics to chemistry, alchemy, physics, medicine, astrology, geography and astronomy. The book of Seventy, is a collection of his various works like Book of Venus. Other noteworthy works of Jabir ibn Hayyan include Book of stones, Book of 112, Composition of Alchemy, Kitab-ur-Rahmah and Kitab-ul-Tajmee. And just to name a few of chemistry books include "Secrets Chemistry", "The Assets of Chemistry", "Usool Chemistry", Little Book of Balances and Book of Mercury. His work has been translated in many European languages and has been used in western educational institutions for centuries. He was decorated by the titles "Great Teacher", "Sheikh Muslim Chemist", "Father of Chemistry", St. High Mysticism" and "King of India. Some of Jabir's unprecedented achievements made many modern scientists brand him the Father of Modern Chemistry. Muslim scientists moved in complete harmony with the teachings of their religion. They were implementing the Prophet's advice "seek knowledge and science from cradle to grave." Jabir Ibn Hayyan's scientific legacy made him an immortal name and one of the greatest in medieval science. Many Western modern scholars render tribute to their Muslim predecessors and recognize their contribution to modern science, but, unfortunately, what they say and write remains in the realm of academia. Many others, basically orientalist, globalize prejudice and negate the achievements and also the names of these Muslim scientists in an attempt to veil history and falsify it for ideological goals. Prince Charles of Oxford University referred to this dilemma through the following words.

*"If there is much misunderstanding in the West about the nature of Islam, there is so much ignorance about the debt our own culture and civilization owe to the Islamic world. It is a failure which stems, I think, from the straight-jacket of history, which we have inherited. The medieval Islamic world, from central Asia to the shores of the Atlantic, was a world where scholars and men of learning flourished. But because we have tended to see Islam as the enemy of the West, as an alien culture, society, and system of belief, we have tended to ignore or erase its great relevance to our own history."*

*"Creativity is the power to create something new, to reach deep into our subconscious for that "aha" solution. Sometimes it happens in a nano second, and sometimes that solution can take a lifetime to reveal itself."*



Linda Naiman

## Activities of PCST

### COMSTECH General Assembly 2016



15<sup>th</sup> Session of COMSTECH General Assembly was held in Islamabad during May 31 Jun1, 2016. More than 100 delegates, including 22 Ministers of Science and Technology from 57 member countries, participated in the Assembly. All arrangements were made by the Ministry of Science and Technology, through various sub-committees.

Pakistan Council for Science and Technology (PCST) was tasked for Media and Publicity sub-committee. Chairman, PCST was the convener of the committee. The committee was entrusted to arrange wide publicity and media coverage of the event in electronic and print media.

President of Pakistan Mr. Mamnoon Hussain, Chairman COMSTECH, Chief Guest of Inaugural session, highlighted the significant contributions of the Islamic world up till the 16th century, however, despite being endowed with natural resources, Muslims are far behind the contemporary world. He emphasized on the need of stronger mutual cooperation among OIC Member States.

OIC Secretary General, Iyad Amin Madani, reminded that science and technology certainly offer the tools for making the desired changes in a society, however, such endeavors require certain social attitude and capability that is generally missing in OIC countries despite recent improvements in education and science.



The President, Islamic Development Bank, Dr. Ahmed Mohamed Ali, highlighted the need for knowledge based economy that is driven by modern scientific tools and expressed his satisfaction that the 10 years Action Plan could deliver what COMSTECH has been addressing to Federal Minister for Science and Technology, Rana Tanveer Hussain, urged OIC member countries to pool their resources and

potential to create synergies to reduce their dependence on the developed world for their technology needs. He assured all the support and backup in all the efforts being made by COMSTECH.



The Concluding Session presided by the Minister of Finance, Revenue, Economic Affairs, Statistics and Privatization, Mr. Mohammad Ishaq Dar, who stressed on increasing funding, cooperation and networking to support and advance science, technology and innovation in the member states. He announced that Pakistan will award 100 scholarships under the aegis of OIC Education Exchange Program for university students. Pakistan is also awarding 30 scholarships to students of OIC member states to study at National University of Sciences and technology through OIC Education Exchange Program. It was further decided to facilitate enhancement of education and skills in the member states, with the target of 50 universities of member states to be included in the rank of the top 500 universities.

The session concluded in Islamabad on Jun 1, 2016 with the adoption of resolutions that included a document on Science and Technology in the OIC Countries: Goals, Priorities and Actions, which identified specific goals and objectives. In addition to the ranking of universities, the document also identified alleviating the effects of the looming crisis in water

and food security in OIC member states as a goal, establishing an OIC task force on climate change, and facilitating programs and resources to manage the unfolding crisis in human health. This document will be further enriched by incorporating recommendations of the member states for consideration of the OIC Summit on Science and Technology to be held in Kazakhstan in 2017. COMSTECH will also submit to the Summit the finalized OIC Green Technology Blue Print for OIC member states.

Another important document endorsed by the Conference was COMSTECH's Ten-Year Plan for the development of S&T in Member States and its implementation that was presented by Dr. Shaukat Hameed Khan, the Coordinator General, COMSTECH. COMSTECH has prepared a Ten Year Plan of action for S&T in OIC Member States, through extensive consultations and discussions with 157 leading scientists from 20 countries of the OIC region, as well as from the advanced countries. It lays stress on the basic sciences in addition to some 'Big' science programs which can and should be implemented through multinational efforts for reducing costs and strengthening collaboration. The latter related include space, astronomy, oceanography, high performance computing facilities, climate change and other activities. Apart from societal benefits, they offer major collaborative opportunities in frontier research and systems design and manufacture, in addition to offering cost sharing benefits. Details are available on the COMSTECH website.

The conference elected Pakistan as Chair of its Bureau; Palestine, Azerbaijan and Morocco as Vice Chair; and Gambia as Rapporteur. The two-day event was attended by ministers, several deputy ministers and high-level officials from OIC member states, OIC institutions, and international organizations.

## National Workshop on Organic Food and Health: Avenues of Innovation and Entrepreneurship

Health is wealth, but we realize it when we lose it. Challenges of modern life include, rapidly growing chronic non-communicable diseases (NCDs), such as diabetes, cancer, and heart diseases. Knowing that the modern pharmaceuticals cannot offer complete cure of many such chronic diseases (require life-long use to offer symptomatic control, with multiple side effects), there is a greater realization today that we need a holistic approach including life-style and dietary modification to address the challenge. Choosing wholesome food and avoiding the unwholesome is essential to good health. Allah says in the Holy Quran (20:81) *“Eat of the good and wholesome things but indulge in NO excess therein”*

Practices involved in the agricultural production highly impact our health and environment and bring us to basic Question of importance of organic method of food production over the conventional methods.

Organic farming or method of food cultivation is not a new concept for the country but this was the normal practice followed by our farmers traditionally such as relying on natural fertilizers and pest controls.

During the recent past, there is a renewal of demand for the organic products. This is evident from the fact that the global sale in organic food during last twenty years has noticed 600% increase while the production in organic products has only doubled during this period. This entails that there will continue to widening of gap between demand and supply of the organic products, providing opportunities for entrepreneurs to cater this increased demand. This is wonderful opportunity for Pakistan which is mostly an Agro-Based economy to tap its due share in the global economy and earn billions in terms of foreign exchange through the export of organic products, in addition to addressing health challenges of people.



Realizing the importance of organic food, PCST has planned to organize a series of workshops in different cities for creating awareness regarding organic food, and its importance for a healthy life.

The first workshop of the series on “Organic Food and Health: Avenues of Innovation and Entrepreneurship” was organized by PCST on Jun 2, 2016 at auditorium of Pakistan Academy of Sciences, Islamabad. Mr. Fazal Abbas Maken, Secretary for Ministry of Science and Technology, graced the inaugural ceremony as the Chief Guest. The ceremony was attended by a number of dignitaries including Heads of R&D organizations, VC's of Universities, eminent scientists, representatives of foreign missions, international donors, representatives of private sector/industry, civil society and others.

Speaking on the occasion, the Chief Guest, stressed on the significance of organic food and its positive impact on human health thus to address health challenges posed by changing lifestyle and growing stress of modern competitive life. He assured firm commitment of MoST in exploring all potential areas which would ensure economic development and prosperity for our future generations.

He opined that our organic food sector needs inter-alia, an efficient R&D system, trained manpower and marketing system. Pakistan should make concerted efforts to create innovative environment in the organic food sector following the pattern of China and India. The chief guest lauded the efforts & the initiative of leadership of PCST and the dedicated efforts of his team for organizing workshop on this very important issue & providing a platform to discuss the challenges faced & to explore the possible solutions and opportunities.

Speaking at the occasion, Prof. Dr. Anwar-ul-Hassan Gilani, Chairman, PCST, the organizer of the workshop, shared his research experience of the Agha Khan University in his keynote lecture on functional foods as effective and safe remedy for chronic diseases, like diabetes, Gut and Heart Disease in terms of organic farming.

He emphasized that it is proven by research that diet rich in fruits and vegetables along with nuts, fish and olives prevent the onset of many chronic diseases. He further said that the workshop brought together scientists, researchers, entrepreneurs, organic farmers and members of civil society to share ideas and knowledge about various aspects of organic food and health & for exploring potential funding



opportunities & the way forward for rapid growth of organic



Guest of Honor, Dr. Muhammad Hashim Popalzai, Additional Secretary, Ministry of National Food Security & Reforms appreciated the initiative of PCST for creating awareness regarding food security and encouraged the researchers to Explore more in the field of organic farming.

Mr. Esam Alqararah, UNIDO Representative in Pakistan shared that workshops of this kind can play a vital role in exploring new avenues of innovation and entrepreneurship for startups.

The speakers from academia, R&D organizations & industry covered diverse aspects of the topic ranging from functional foods for health to food security & organic food certification. The speakers covered topics on organic egg production, blue revolution, benefits of organic grazing in dairy cows and others that greatly attracted the interest of audience. Participants showed keen interests in presentations on exploring funding opportunities for organic agriculture and kitchen gardening. Success stories of entrepreneurs also attracted the interest of participants. Based on the enthusiastic response from participants and demands for such events all across the country, it was decided to organize a series of such workshop with expanded scope with proper dissemination of knowledge to the masses.

## Research Productivity Award (RPA)

### Over 300 Scientists Awarded RPA

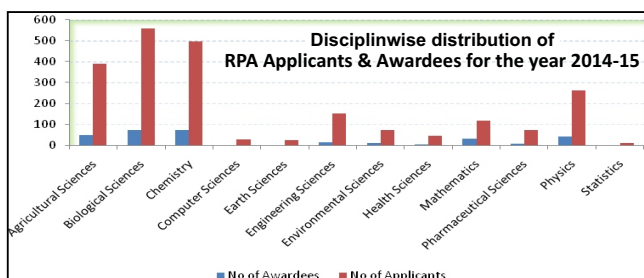
About 18 million rupees in the form of Research Productivity Award (RPA) was distributed by PCST amongst more than 300 scientists.

Research Productivity Award (RPA) is a regular activity of PCST since 2001 wherein Scientists working in Pakistan are awarded on the basis of their research contributions. Promoting quality research in the universities and R&D organizations of the country, enhancing research publications from Pakistan in ISI Thompson Indexed impact factor Journals, attracting young students towards a research career, encouraging younger scientists and recognition & improving visibility of Pakistani scientists in international research community are some of the important objectives of this award.

The criteria for award of RPA have evolved over the years and revision of criteria is a regular and ongoing process. For the first few years after its inception, RPA was awarded on the



basis of Journal Impact Factor and Citation Index. In 2010, the applied research output was added to the criteria to encourage applied research in the country. Subsequently Patents, PhD supervision, Books published/edited and external research grants were also given weight age in the criteria. More recently in October 2015, the criteria was again reviewed by a National level Review committee and besides making other amendments on the basis of inputs from the scientific community, the element of commercialization of patents was introduced in the criteria to encourage scientists toward demand oriented research. PCST invited applications for the RPA for the fiscal year 2015-16 through advertisement in the national newspapers in December, 2015. More than 2,300 applications were received within due date and were evaluated based on the approved criteria. Three hundred and ten scientists were awarded in four different categories i.e. A to D based on their cumulative score.



A graphical representation of RPA Applicants and Awardees for the year 2014-15 has been shown above. There were maximum number of RPA applicants in Biological Sciences, followed by Chemical Sciences, Agriculture Sciences and Physics. In Engineering Science the numbers of applicants are less than 200. Obviously the number of Awardees in each discipline are in the same ratio as the number of applicants in that discipline i.e. there are maximum number of Awardees in Biological Sciences, followed by Chemical Sciences, Agriculture Sciences and Physics. Interestingly the applicants in Engineering Sciences are more than that in Mathematics; whereas the numbers of awardees in Mathematics are almost double than that of Engineering. The number of Applicants and Awardees are minimum in Computer Sciences, Earth Sciences and Statistics disciplines.

### Directory of Productive Scientists of Pakistan (PSP)

Pakistan Council for Science and Technology conducts regular studies which provide information about the productive scientists of Pakistan based on research related parameters including authorship of books, PhD research supervision, cumulative impact factor and citations for the papers published in impact factor journals, patents granted, awards won and winning of competitive grants. Additional parameters under applied research output i.e. Crop Varieties / Engineering Process / Medical Devices etc are also taken

into account for scientists and engineers involved in the applied research. PCST compiles and analyzes these data of individual scientists as Directory of Productive Scientists of Pakistan (PSP). So far seven directories on the subject "Productive Scientists of Pakistan" have been published in the last 17 years and the latest available directory includes the data of 2,737 scientists from various fields of natural and applied sciences. These data and numerical rating of scientists, conducted by PCST is a referral point and is used by R&D organizations and Universities for assessment of candidates for appointments and promotions, as well as used for medals, awards including civil awards and nomination of prestigious scientific bodies on request of MoST and other concerned agencies like Pakistan Academy of Sciences.

PCST is now in the process of updating the data for the directory of "Productive Scientists of Pakistan upto 2015. The directory will be available in the next few months. It will include the citations and h-index of the scientists in addition to the impact factor. The most unique feature of this directory will be listing of research expertise of productive scientists which will help to strengthen linkage of industry and farmers with academia and will provide a platform to them for identification of experts for solving their problems.

### National Innovation Awards (to be launched by PCST)

Ministry of Science and Technology (MoST) in its meeting of DDWP held on Apr 4, 2016 under the Chairmanship of Mr. Fazal Abbas Mekan, Federal Secretary, Science and Technology, has approved PCST's "National Innovation Award" project proposal that is likely to be implemented in the financial year 2016-17.

The "National Innovation Award" is an effort to augment initiatives of Government of Pakistan, MoST and the Planning Commission to foster a culture of Innovation in the country. Pakistan Council for Science and Technology has the expertise to evaluating the research output of the individual scientists and has been publishing numerical rating of the scientists for the past 15 years. PCST is also a collaborating partner of various national and international organizations involved in various innovation-related activities. PCST is engaged with UNIDO as part of the project Steering Committee of The Global Cleantech Innovation Program (GCIP), currently running in 6 countries, including Pakistan. Pakistan's Vision 2025 is based on building a competitive knowledge based economy through value addition, enhancing competitiveness and innovation. Realizing the critical role the innovation can play in achieving the objectives of Vision 2025 and the fact that, Introduction of new disruptive technologies are not possible without Innovation; the Planning Commission of Pakistan has branded the year 2016 as the "Year of Quality Productivity

and Innovation (QPI)". Pakistan's National ST&I Policy 2012 prepared and owned by MoST also recognize Innovation as a driver of economic activity alongside a buildup of S&T capacity.

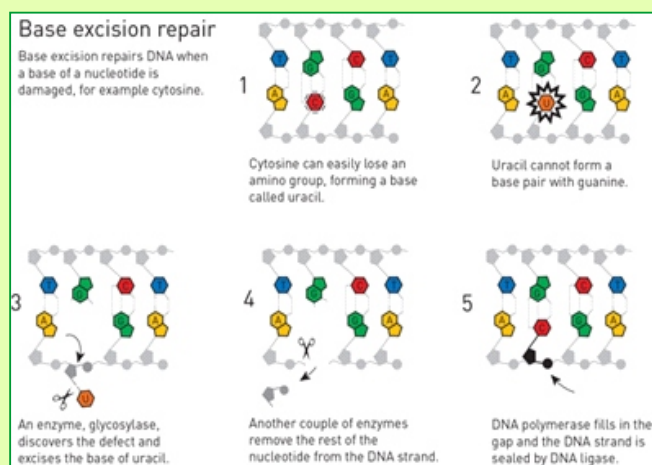
PCST, by virtue of its mandate, has been entrusted the task of starting the "National Innovation Awards" by the Planning Commission and MoST. The following are the major objectives of this award.

- Promote scientific mind set and catalyze a culture of innovation in the country.
- Encourage innovations for achieving goals set in Vision 2025.
- Acknowledging contributions of innovators in solving industrial, economic, social & environmental problems.
- To encourage scientists and researchers to develop closer linkages with the industry to solve their problems.

A maximum of nine Awards amounting to Rs. 4.5 million in three different categories will be given on annual basis. The amount for the top category award will be Rs. 0.7 million with a maximum of three number of awards in this category. A high level "National Innovation Award Committee" to be headed by Secretary MoST and comprising eminent scientists, academicians and industrialists will be constituted to finalize decisions on the awards.

The contest is anticipated to open in the first half of the new financial year (2016-17) after release of funds from MoST and will run for the next five years. Information about opening of the award and other details will soon be made available on [www.pcst.org.pk](http://www.pcst.org.pk).

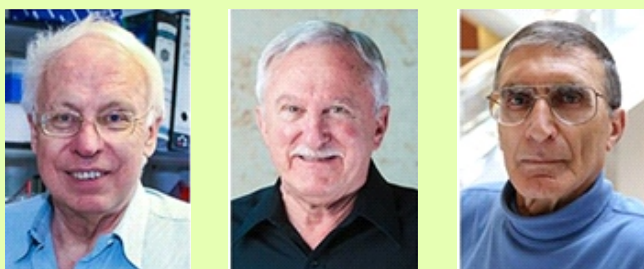
Smoke. Most of the resulting errors in DNA are fixed by repair processes such as those discovered by this year's Laureates. If these mechanisms fail, the cell's genetic information changes, and the risk of developing cancer rises. 'It turns out that the DNA molecule, which encodes the genetic information in our cells is frequently damaged,' 'What these three prize laureates this year have done is that they have investigated and described in chemical detail important processes that can correct these mistakes when they arise.



But it has been a long road, one which the laureates started down at the end of the decade that had seen Watson and Crick awarded the Nobel Prize in medicine for uncovering DNA's structure in 1962. Lindahl, now based at the Francis Crick Institute, UK, dedicated his career to investigating the stability of bacterial DNA, correctly identifying that it decays over time and that there must be some form of repair occurring in the cell to prevent it.

## Nobel Laureates' Voice 2015

### Nobel Prize for Chemistry



The Nobel Prize in Chemistry for 2015 has been awarded jointly to Tomas Lindahl (left), UK, Paul Modrich (middle), USA, and Aziz Sanchar (right), USA, "for the mechanistic studies of DNA repair" for unraveling how cells deal with DNA damage, be it from within the cell itself or from exposure to radiation. The work has been instrumental in developing the field's understanding of how cancers and other hereditary diseases develop.

Our genetic material, encoded in DNA, is damaged every day: randomly upon replication, caused by UV radiation, or prompted by chemical substances like those in cigarette

### Nobel Prize for Physics



Kajita and McDonald win Nobel Prize for Physics for a discovery about the properties of neutrino particles that has saved us from worrying that Earth might end in an icy death. The discovery of neutrino oscillations solved a mystery about the sun's ability to continue to warm Earth. Astronomers called it the solar neutrino problem. It was much more than a problem. Upon its discovery in the late 1960s, it meant that the sun could be dying. And if the sun died, so would life on earth. Thankfully the latest winners of the Nobel Prize for physics, Takaaki Kajita and Arthur B McDonald, have been addressing such concerns to great success.

The sun was theorized to be powered by nuclear reactions in



its core and these produced neutrino particles. Theoretical models of the sun's interior had predicted the number of neutrinos that were being produced & by the mid-1960s, two American physicists had taken up the challenge of trying to detect them: Raymond Davis Jr, and John Bahcall. Neutrinos are incredibly unreactive particles. Davis and Bahcall calculated that they might catch one neutrino per day out of the 10m bn that were expected to be coming from the sun. It had been assumed that neutrinos were essentially massless particles, like the photon particles that carry light. However, if neutrinos did possess a small mass it was theoretically possible that they could change into one of three guises, only one of which would be detectable by Bahcall and Davis's experiment. Could this be the explanation for the mysterious one-third smaller detection rate, that the neutrinos leaving the sun were "oscillating" between these three different states? Yes it could, and this is what Kajita and McDonald have just been awarded the 2015 Nobel prize in physics for confirming, by using advanced neutrino detectors in Japan and Canada. And by proving that there was nothing wrong with the nuclear reactions inside the sun, they saved the world from (sort of) an icy death.

### Nobel Prize in Physiology/Medicine

The Nobel Prize in Physiology or Medicine 2015 was divided, one half jointly to William C. Campbell and Satoshi Ōmura "for their discoveries concerning a novel therapy against infections caused by roundworm parasites" and the other half to Youyou Tu "for her discoveries concerning a novel therapy against Malaria". William C. Campbell and Satoshi Ōmura discovered a new drug, Ivermectin, the derivatives of which have radically lowered the incidence of River Blindness and Lymphatic Filariasis, as well as showing efficacy against an expanding number of other parasitic diseases. Youyou Tu discovered Artemisinin, a drug that has significantly reduced the mortality rates for patients suffering from Malaria.

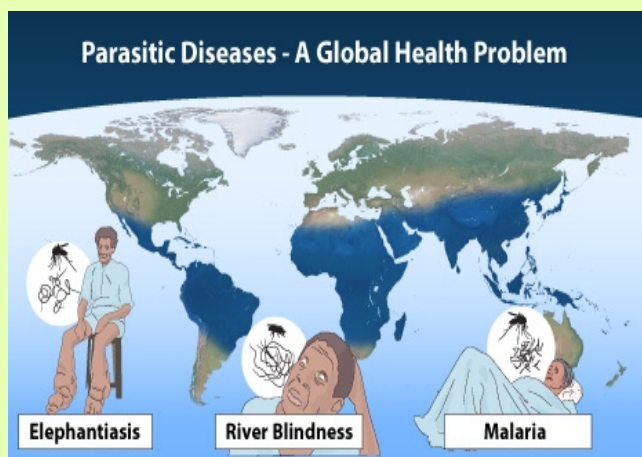


**William C. Campbell   Satoshi Ōmura   Youyou Tu**

Diseases caused by parasites have plagued humankind for millennia and constitute a major global health problem. In particular, parasitic diseases affect the world's poorest populations and represent a huge barrier to improving human health and well being. This year's Nobel Laureates

have developed therapies that have revolutionized the treatment of some of the most devastating parasitic diseases.

A variety of parasitic worms (helminths) afflict one third of the world's population particularly in sub-Saharan Africa, South Asia and Central and South America. River Blindness and Lymphatic Filariasis are two diseases caused by these worms. The former leads to blindness due to inflammation of cornea while the latter causes chronic swelling leading to life-long stigmatization.



Satoshi Ōmura, a Japanese microbiologist, equipped with extraordinary skills in developing unique methods for large-scale culturing and characterization of bacteria, isolated new strains of Streptomyces from soil samples and cultured them in the laboratory.

William C. Campbell, a Research Fellow Emeritus at Drew University, USA acquired Ōmura's Streptomyces cultures and showed that a component from one of the cultures named Ivermectin was remarkably efficient against parasites in domestic and farm animals. The bioactive agent was later chemically modified to a more effective compound called Ivermectin which effectively killed parasite larvae (microfilaria) in humans. Collectively, Ōmura and Campbell's contributions led to the discovery of a new class of drugs with extraordinary efficacy against parasitic diseases.

Malaria was traditionally treated by chloroquine or quinine, but with declining success. By the late 1960s, efforts to eradicate Malaria had failed and the disease was on the rise. At that time, Youyou Tu in China turned to traditional herbal medicine to tackle the challenge of developing novel Malaria therapies. She was the first to show that Artemisinin extracted from the plant Artemisia annua was highly effective against the Malaria parasite, both in infected animals and in humans.

These two breakthrough discoveries have provided humankind with powerful new means to combat these debilitating diseases that affect hundreds of millions of people annually.

## Careful Selection of Drinking Water Filtration and Treatment Technologies in Pakistan

Access to safe drinking water is a basic right irrespective of the social status. However, safe drinking water coverage is very less in Pakistan mainly due to outdated infrastructure of water supply schemes, leakage in distribution system, intermittent supply, inadequate technical capacity of water supply agencies, absence of surveillance agency for execution of Drinking Water Quality Standards, lack of awareness on water quality issues and implementation of National Environmental Quality Standards for proper disposal of municipal, industrial and drainage effluents as well as hospital and solid wastes. Deteriorated water quality due to contamination of surface and groundwater has resulted in increased waterborne diseases and severe health

impacts. This has been authenticated by various national level water quality programmes launched by Pakistan Council of Research in Water Resources. These programmes have indicated the microbial contamination (Table-1) as the most prevalent contaminant in the drinking water sources and possibly have adverse effects on the quality of human life due to cholera, diarrhea, typhoid, hepatitis A & E, etc. Other major water quality tribulations indicated by these programmes are Arsenic in the groundwater of Central Sindh and Southern Punjab, Nitrate and Fluoride in some places of Punjab, Baluchistan and Khyber Pakhtunkhwa (KPK). It may be concluded from the Table 1 that microbiological contamination is a major issue throughout the country.

**Table1 Major Water Quality Contaminants**

Sr. No.	Program	Sampling Sites/Schemes (No.)	Contaminant	%age of contamination
1.	National Water Quality Monitoring in Major Cities (2002-2007)	357	Microbial	69
			Excessive Turbidity	11
2.	Assessment Survey of water supply schemes (2007-2013)	10,128	Microbial	77 – 86 (urban - rural)
3.	Clean Drinking Water for All (water quality survey of sources for installation of filtration plants)	6095	Microbial and Turbidity	72

A variety of treatment processes/technologies exist to remove microbial contamination from drinking water. The following are the most common technologies in practice.

1. Simple Chlorination or Chlorination with filtration
2. UV Disinfection
3. Ozonation
4. Ultra-Filtration (Membrane Filtration)



There are various competing factors that influence the selection of the most appropriate water technologies include treatment of microbial and/or chemical contaminants, cost effectiveness, ease of deployment, ease of use,

maintenance, energy requirement, training needs for O&M, pre-treatment, germicidal residues, in-country availability, life, etc. A detailed comparison of these technologies is enlisted in Table2.



Table 2 Comparison of Water Filtration and Treatment Technologies

Sr. No.	Characteristics	Chlorination	Ultra-filtration	UV Disinfection	Ozonation
1.	<b>Treatment of Microbial contaminant</b>	Chlorine inactivates a microorganism by damaging its cell membrane and thus after entering the cell, it disrupts the cell respiration and DNA activity	Ultra-filtration membrane is a micro porous membrane filter, only removes (not kill) micro-particles of 0.1-1.0 micron (bacteria, viruses, algae and precipitates etc.)	UV light has a wavelength above the violet end of the light spectrum, in the range of 10 nanometers to 400 nanometers. UV light is very energetic and tends to break chemical bonds of microorganism.	Ozone's germicidal properties are associated with its high oxidation potential. Disinfection by ozone is a direct result of bacterial cell wall disintegration. Ozone is less soluble in water compared to chlorine and therefore, special techniques for mixing are needed.
2.	<b>Treatment of Chemical contaminant</b>	Chlorine oxidizes iron and manganese which can be filtered out and also oxidizes hydrogen sulfide to reduce nuisance odors.	Ultra-filtration cannot remove dissolved substances unless they are first adsorbed (with activated carbon or coagulated with alum or iron salts).	No effect on chemical contaminants	Ozone oxidizes manganese, sulfur and iron into insoluble metal oxides or elemental sulfur, which can be later removed by filtration.
3.	<b>Cost Effectiveness</b>	Cheap	Very expensive	Expensive	Very expensive
4.	<b>Ease of deployment</b>	Simple	Complicated	Complicated	Complicated
5.	<b>Ease of use</b>	Easy	Require specialized skills.	Require specialized skills.	Require specialized skills.
6.	<b>Key factors for performance</b>	Precise dose, contact time, controlled pH and Turbidity of the water	Blockage of membrane caused by presence of organic matter, results in "membrane fouling". This shortens the life and increases the cost of the treatment.	Depends on UV lamp's intensity, wavelength, exposure time, quality of water to be treated, flow rate and microorganism's type etc.	Performance depends on the susceptibility of bacteria, virus and other microorganisms to ozone, concentration of ozone and the contact time.
7.	<b>Training Need for O &amp; M</b>	Minimal training focused on dose and contact time will be required for chlorination of the water supplies.	Well trained operator is required for system back washing, chemical cleaning and pressure test of ultra filtration technology.	Training required for checking the disinfection efficiency, life of the UV lamp using UV light meter and clean up of sleeve.	Proper training required to operate the system and on application of strong oxidant disinfectant for effective water treatment to ensure the safety of people in the vicinity.
8.	<b>Required Pre-treatment</b>	For turbidity in combination with microbial contamination, pre-treatment (rapid sand filtration) is required to disinfect drinking water supplies.	Effective pre treatment system is required with turbid free water to prevent membrane clogging	UV radiation is not suitable with high levels of suspended solids, turbidity, color, or soluble organic matter as these can react with UV radiation and	Effective pre treatment is required. The process can generate harmful by-products like bromates, aldehydes, and ketones. To combat these, post filtration system including activated carbon filter may also be required.

				reduce disinfection performance. Therefore, effective pre treatment is required.	
9.	<b>Germicidal Residual properties</b>	The chlorine that does not combine with other components in the water is free residual chlorine, which is safeguard for any kind of environmental contamination due to consumer's practices.	Ultra-filtration does not guarantee the degree of fitness of drinking water which is possibly deteriorated by unhygienic environment, water distribution infrastructure and consumer practices for household water storage.	UV treatment is non-chemical, there are no chemicals added to the treated water and no residuals remain in the water after treatment. Exposure to UV rays is a one-time process that kills microorganisms—but does not prevent them from returning again.	The Ozonation process also provide germicidal or disinfection residual for short time to inhibit or prevent re-growth.
		<b>(Germicidal or disinfection residual properties)</b>	<b>(No germicidal or disinfection residual properties)</b>	<b>(No germicidal or disinfection residual properties)</b>	<b>(Germicidal or disinfection residual properties)</b>
10.	<b>In-country availability and cost</b>	Chlorination chemicals are available in the country at reasonable cost and thus, it is economical, feasible, easy to use and scalable water treatment option.	UF units are imported from other countries and thus, it is an expensive option.	Operational and maintenance costs are comparatively higher than chlorination	Ozone systems are imported from other countries and may be difficult to find professional proficient in ozone treatment and system maintenance. Potential fire hazards and toxicity issues associated with ozone generation also increase the risks.
11.	<b>Electricity Requirement</b>	Low electricity requirement	Requires continuous electric supply for operation of the technology.	Requires continuous electric supply for operation of the technology.	The formation of oxygen into ozone occurs with the use of energy. Thus, requires continuous electric supply for operation of the technology.
12.	<b>Life</b>	Long life	Limited (depend on operation and UF membrane)	Limited (10,000 hrs).	Depends on operation.

The comparative analysis of Ultra-Filtration, Chlorination, UV Disinfection and Ozonation has indicated that chlorination is the most suitable option to resolve problem of microbial contaminant in water under existing socio-economic and socio-technical situation of the country. Past experiences with various types of water treatment technologies used in the country to achieve the sustainability challenges are not very pleasant. The history of water treatment technologies other than chlorination installed in the country is not very satisfactory due to sustainability, operation and maintenance challenges. PCRWR evaluations of ultra-filtration technology in 2008 has also indicated that polymer chemistry of membrane even in highly improved system can cause unexpected problems in membrane life and to

mitigate such problem periodic chemical cleaning with chlorine is required by the operator having working knowledge of control panel and ability to prepare a 200 mg/l of chlorine solution. Moreover, all hollow fiber UF membranes are required to be tested for "pressure-hold test" by manufacturers' to confirm integrity and damage of the membrane. Keeping in mind these technical issues, full time qualified trained operators will be required to install and operate the Ultra-Filtration (UF) units effectively.

**Conclusions**

Due to alarming situation of drinking water quality in the country, Government of Pakistan launched water quality treatment initiatives opting ultra-filtration technology, which couldn't achieve the desired goals, mainly due to



Sustainability issues, selection of inappropriate technologies, lack of strategies for post installation maintenance and operation, lack of participatory strategies for ownership, etc. Now the Provincial Governments are planning to install water filtration/treatment units for the provision of safe drinking water at public places adopting the same unsuccessful option. Therefore, following solutions are suggested in the light of prevailing conditions:

1. Adoption of chlorination system for disinfection of microbial contamination. Online chlorination should be encouraged to save money as well as increase in safe drinking water coverage in the country. Chlorine is present in most disinfected drinking-water at concentrations of 0.21

Mg/litre. Most individuals are able to taste or smell of chlorine in drinking-water at concentrations well below as 0.3 mg/l or even less. The health-based guideline value of chlorine is 5 mg/l.

2. Use of filtration technology (Slow or Rapid Sand Filtration) in combination with chlorination system for removal of turbidity as well as bacterial contamination.

3. Consideration of Reverse Osmosis, Ion-Exchange and other appropriate technologies for removal of excessive Arsenic, Nitrate or Fluoride in case only where no alternative source of safe drinking water is available.

Dr. Muhammad Aslam Tahir  
Scientific Secretary/CRO, PCST

### Academia-Industry Interaction

This column has been introduced in STI Voice to bring both academia and industry closer for mutual interaction by inviting questions from the industry/farmers and identifying expertise in the scientific community for match making. PCST is already working on the inclusion of few key words in the profile of each scientist that describe the expertise of the scientist, in the forthcoming volume of Productive Scientists of Pakistan (PSP). This initiative, besides bringing the two groups together, will also ensure Government of Pakistan in implementing Vision 2020. The questions identified by the industry will be acknowledged and the scientists who pick up any question to pursue research in this direction are requested to please inform PCST for its record. Please feel free to participate in this activity from any of the two platforms.

IRP partner industry has put forth the following issues for academia to address.

1. IRP partner industry is looking for products having HCL and Caustic soda as major raw material. These products must have viable demand size and price in Pakistan. Technology could be a formulation or a process. Chemicals will be provided for viable products to be targeted for research. Scientists will get good money if technology succeeds pilot level trials.

2. IRP partner industry is looking for the following technologies. A good proposal will be supported and technology will be purchased if pilot level trails and viable are successful.

- White Oil used for lubrication of knitwear machines in textile sector.
- ABS Resin Technology.
- silos for food and grain storage.
- welding flux used on welding rod for MS and SS.

Furthermore, the following two questions had been earlier identified by Prof. Anwar-ul-Hassan Gilani, Chairman, PCST in previous volume of STIV and are repeated for the perusal of

Academia & industry. The questions are open to academia for further perusal.

□ **Cotton** is one of the most important cash crop for Pakistan, which earns more than 50 % of our total foreign exchange through export. Unfortunately, cotton is the most vulnerable crop to pesticide attack, consuming nearly 80% of the pesticide in Pakistan and cotton growers are compelled switching to alternate crops. Hence, one of the major challenges for Agri scientists is to come up with new pesticides and/or new cotton varieties, which are resistant to pests. Neem (*Azadirachta indica*) is well known to be insect/pest repellent, while the solution/juice of Neem is being used in some organic farmers with some success to keep the pests away. Can this be experimented scientifically?

□ Pakistan is amongst top 10 countries producing Almonds, which are known to possess multiple medicinal benefits including cardio-protection (value in heart diseases as detailed in Scientists' Voice for Society, yet imported almonds are flooded in Pakistan market. Question arises why we spend huge foreign exchange on import of almonds when there is no shortage of indigenous almonds, which are as good as imported American almonds in their cardio-protective effect (study conducted at Aga Khan University).

□ A small project for a Master degree thesis can be to know the reason for preference of buying imported almonds by the public. A survey from customers at different dried fruit shops using questionnaire with following options can be arranged:

- Perception- Imported almonds are of better Quality than local almonds
- Convenience Imported almonds are available in shelled form
- Cost- Imported almonds are cheaper
- 4. Any other reason (please specify)

Information derived from this questionnaire would help to plan discouraging import of almonds. Further query regarding above two suggested studies can be addressed to Prof. Gilani at [ahgilani5@gmail.com](mailto:ahgilani5@gmail.com)

## Women's Voice

### ISESCO Women in Science Conference on Contributions of Pakistani Women in Scientific and Social Development International Women day celebrated at Quaid-i-Azam University.



A one-day conference was organized on the International Women's Day, Tuesday, Mar 8, 2016, by the Islamic Educational, Scientific and Cultural Organization (ISESCO) Women in Science Chair at Quaid-i-Azam University, Islamabad. The conference was organized in collaboration with HEC and PCST. Speaking at the occasion, Prof. Dr. Anwar-ul-Hassan Gilani (SI), Chairman, PCST, applauded the organizers on arranging this conference and bringing together researchers from very broad categories: Biological Sciences, Natural Sciences and Social Sciences. He also gave a brief introduction about PCST and the role PCST is playing in up-bringing the science and technology in Pakistan. Speaking at the occasion, Prof. Dr. Rabia Hussain, Agha Khan University, Karachi, highlighted the contribution of Pakistani female researchers in scientific and social development of the country.

More than two hundred delegates from all over Pakistan participated in the event. Female researchers showcased their work in the form of oral as well as poster presentations. Prof. Dr. Bushra Mirza, the ISESCO Women in Science Chair, briefed the delegates about the objectives of ISESCO Women Science Chair, and the idea of highlighting the achievements of female researchers.

Important features of an international research program on infectious diseases, with a special focus on tuberculosis and leprosy. Prof. Dr. Bina Siddiqui, University of Karachi, discussed her achievements on identifying and patenting natural products obtained from plant sources.

Dr. Rubina Saigol deliberated the role that women researchers have played in developing the discipline of social sciences.



Since the establishment of ISESCO Women in Science Chair at Quaid-i-Azam University in 2013, several initiatives have been taken through this forum. A number of activities have been organized. Recently, a dedicated website (<http://isesco.qau.edu.pk/>); linked to the Quaid-i-Azam University website, has been developed having a number of



features including short profiles of female fellows of Pakistan Academy of Sciences and the most productive female scientists of Pakistan. The site has been designed to facilitate interaction among the female scientists of the country. To achieve the same objective, a group named "Women in Science, Pakistan" has also been developed on the face book.





## Young Scientist's voice



Dr. Saeed Khan is currently working as Associate Professor of Pathology, Dow International Medical College and Additional Director of Dow Diagnostic Reference and Research Lab (DDRRL), Institute of Basic

Medical Sciences (IBMS) & Dow Research Institute of Biotechnology & Biomedical Sciences (DRIBBS).

He completed his PhD in Microbiology from Karachi University in collaboration with Aga Khan University, Karachi, Pakistan in 2010 and Postdoc from University of Washington at Mullins Molecular Retro virology Laboratory, Seattle WA, USA.

Dr. Khan received training working in BSL3 and BSL2 Labs in Molecular virology and different Immunological and molecular techniques (HIV whole genome PCR, gene cloning, sequencing, Elispot) and bioinformatics tools (ClustalW/X, MacClade, PAUP) at the Mullins lab Microbiology Department, University of Washington, Seattle, USA. He has also been trained in different techniques including DNA/RNA extraction, PCR, rt-PCR, Real Time PCR, ELISPOT, T Cell Assays, Western Blotting, ELISA, Cell culture, transfection, Immunostaining, microbiological techniques etc. He has more than 15 publications to his credit in well reputed International journals including Lancet Infectious Disease, BMC Infectious Diseases, International Journal of Infectious Diseases, AIDS and PLoS one with cumulative impact factor of more than 84.72.

Dr. Khan is involved in teaching and mentoring students at the graduate (MBBS, BDS) and postgraduate (M.Phil., PhD, DMJ, MS and MDS) levels having more than 13 years teaching and research experience in Microbiology, Molecular Biology, Infectious Diseases, Immunology and Cancer. His research interest includes Infectious Diseases, Immunology,

Molecular Virology (HIV, HBV, HCV, HPV, and EBV), Bioinformatics, Virus Mediated Cancer, screening and development of new Antimicrobial drugs. He is supervising more than 10 M.Phil and PhD students, reviewed more than 5 M.Phil and PhD dissertations and has reviewed many manuscripts of national and international research journals as reviewer and editor.

Dr. Saeed has received several competitive travel grants from various international funding bodies to participate in many conferences and different training courses and workshops. He presented his work at more than 20 different international forums including ASM General Meetings in Toronto (2007), Philadelphia, PA (2009), San Diego, CA (2010), Denver Colorado (2013) Boston, MA (2014), New Orleans, LA (2015), Institute of Technology Bandung (ITB) in Bandung, Indonesia (2007), University of Tokushima Japan (2010), Annual HUPO conferences in Raleigh, NC-USA (2011), Boston, MA (2012), IAP conference (2014) in Bangkok, Thailand (2014), 18th EBSA meeting in Vienna, Austria (2015), ICAAC/ICC meeting in San Diego, CA (2015), ISBT in Indonesia (2015), Arab Health Conference 2016 in Dubai (2016) and ASM Biodefense & Emerging Diseases Research Meeting in Arlington, VA, USA (2016), European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) Amsterdam, Netherlands (2016) and 19th Annual Meeting of European Biosafety Association (EBSA) in Lille, France (2016). He is actively participating in different research projects approved by Higher Education Commission, Pakistan. He has several awards to his credit including writing a book entitled "Human Immunodeficiency Virus and Human Papilloma Virus in Pakistan" and Research Productivity Award 2011 from Pakistan Council for Science and Technology, Pakistan.

[saeed.khan@duhs.edu.pk](mailto:saeed.khan@duhs.edu.pk), [saeedkhn@gmail.com](mailto:saeedkhn@gmail.com)

Website: <http://sc.hec.gov.pk/aphds/submit.asp?supid=5166>

## Staff's Voice

Prof. Dr. Farzana Latif Ansari, Adviser delivered 2 Plenary lectures at a three day Workshop "Computational Chemistry: A New Approach to Understanding & Solving Chemical Problems", organized by the Department of Chemistry, FC University, Lahore (Jan 20-22, 2016).



- Pakistan on the road to computational chemistry
- Pharma cophore based designing of different enzyme inhibitors



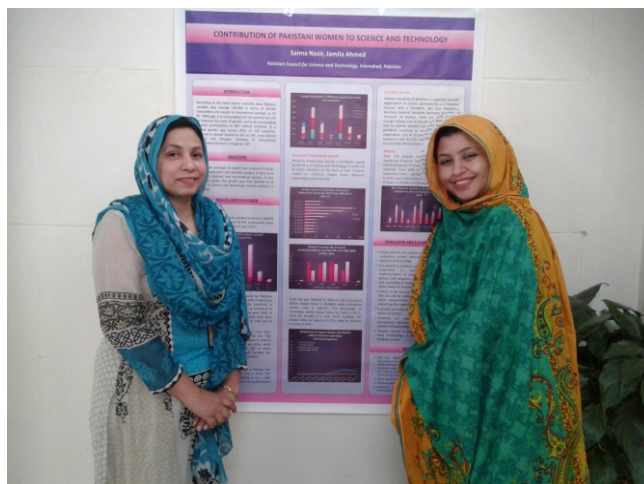


Participated in ACSE Workshop "Research Integrity & Peer Review" organized by Asian Council for Science Editors, Islamabad (Feb 18, 2016).

- Participated in "ISESCO Women in Science Conference on Contributions of Pakistani Women in Scientific and Social Development" on International Women day celebrated at Quaid-i-Azam University (Mar 8, 2016).
- Delivered a lecture titled The Holy Quran and Biomimicry at University of Wah (May 26, 2016).



- Dr. Tariq Bashir, PRO, coordinated a one day consultative workshop on policy for research commercialization as a part of "1st Invention to Innovation summit 2016" at University of Balochistan, Quetta (May 5, 2016).
- Dr. Saima Nasir, SRO/Editor of PCST journal Science, Technology and Development and Ms. Jamila Ahmed, RO PCST presented a poster titled "Contribution of Pakistani women in relation to science and technology". in "ISESCO Women in Science Conference on Contributions of Pakistani Women in Scientific and Social Development" on International Women day celebrated at Quaid-i-Azam University (Mar 8, 2016)



□ Dr. Saima Nasir, Senior Research Officer/Editor of PCST Journal of Science, Technology and Development was invited by American Society for Microbiology (ASM) to attend the training course Publishing Life Science Research (May 2-5, 2016, Bangkok, Thailand). The training provided an opportunity for the participants from PCST in achieving organizational objective of bringing the journal at par with International standards by providing the opening to knit together different elements of the scientific publishing landscape and to identify different paths for how to improve quality, linkages and access of the journal.



## Announcements

### IFS Individual Research Grant

Applications are invited by International Science foundation (IFS) from young scientists in biological and water resources in low income countries to enable early career scientists to work in their own country and tackle research issues related to their local needs. The IFS grant is intended for the purchase of basic tools needed to conduct a research project: equipment, expendable supplies, and literature. The applicant must be a citizen of an eligible country and carry out his research in an eligible country. Researchers, who are already IFS grantees, are eligible to apply for renewal grant irrespective of age.

Qualification: MSc, MA or equivalent academic degree.

Age limit: for men, younger than 35 years and for women 40 years Application deadline Dec 31, 2016.

### Funding opportunities in Germany

The German Academic Exchange Service (DAAD) offers you a scholarship database that covers funding of DAAD as well as of other funding organizations: [www.funding-guide.de](http://www.funding-guide.de). You may also find the funding database of the Research in Germany Portal useful: <http://www.research-in-germany.org/en/research-funding/funding-Programmes.html>

Some universities and non university research institutes run



their own funding programs or offer paid PhD positions. For further details, visit the "DAAD Pakistan" Facebook Page for regular updates. HEC scholarships are also very good options. The following database helps you in finding a research institute matching your own research interest: [www.research-explorer.de](http://www.research-explorer.de), [www.mpg.de](http://www.mpg.de), [www.helmholtz.de](http://www.helmholtz.de), [www.avh.de](http://www.avh.de)

### PSF Research Support Program

The promotion of scientific research and related activities is the major objective of Pakistan Science Foundation, which provides funding for research projects in all areas of Natural and Social Sciences, Engineering and Medical Sciences. The Foundation provides grants to universities and other R&D organizations for projects undertaken by individuals or groups of scientists. Projects proposals, submitted to the Foundation, are evaluated initially by Subject Experts in the relevant fields and then by the PSF Technical Committees which recommend the projects for approval on the basis of technical merit and relevance to the socio-economic needs of the country. For further details, visit [www.psf.gov.pk/researchSupport.aspx](http://www.psf.gov.pk/researchSupport.aspx).

## Forthcoming Event

### • National Science, Technology & Innovation (STI) Strategy and Action Plan

PCST organized the launching ceremony of National Science, Technology and Innovation (ST&I) Policy-2012 (approved by the cabinet) to make the policy public, and subsequently circulated among high level S&T policy experts, Vice Chancellors and Heads of S&T organizations. To achieve the goals and targets of the policy, National Science, technology and Innovation Strategy 2013-18 was prepared by PCST with the consultation of all relevant stakeholders. However, to make it more meaningful and precise, it was decided to review carefully. In this regard, a number of consultative meetings were held in the Ministry of Science & Technology (MoST) headed by the Federal Secretary, MoST. On advice of the Federal Secretary, MoST, the STI Strategy has been revisited in details and policy actions divided into short, medium and long-terms. For each policy action, implementing agency, major stakeholders, estimated cost & duration, milestones, key outcomes along-with deliverables have also been given in clarity. The draft National Science, Technology and Innovation (STI) Strategy and Action Plan will be finalized on the basis of inputs received from all relevant stakeholders and then a stakeholders workshop will be organized for final fine-tune before presenting it for approval in upcoming meeting of National Commission on Science & Technology (NCST), to be chaired by Prime Minister soon.

## International Year of Pulses 2016

The 68th UN General Assembly declared 2016 the International Year of Pulses (IYP). The Food and Agriculture Organization of the United Nations (FAO) has been nominated to facilitate the implementation of the Year in collaboration with Governments, relevant organizations, non-governmental organizations and all other relevant stakeholders. The IYP 2016 aims to heighten public awareness of the nutritional benefits of pulses as part of sustainable food production. The Year will create a unique opportunity to address the challenges in the trade of pulses. Pulses provide an easy, delicious way to sneak some extra health into your diet, as they are packed with vitamins and minerals besides being a valuable source of iron, potassium, magnesium, zinc, vitamin B and thiamin. Pulses aid in lowering blood cholesterol and blood glucose levels, and can be eaten as an animal protein replacement, resulting in lower saturated fat intake. Pulses are not only beneficial to the human body, but also to the health of the environment. According to the Global Pulse Confederation, it takes only 43 gallons of water to produce one pound of pulses, as opposed to the 216 gallons required for one pound of soybeans or 368 gallons necessary for one pound of peanuts. Moreover, 1 Kg of legumes only emits 0.5 kg of CO<sub>2</sub> equivalent, whereas one Kg of beef produces 9.5 kg of CO<sub>2</sub> equivalent. Additionally, pulses help to maintain soil health with nitrogen-fixing properties by pulling nitrogen from the air for use, severely decreasing the need for fertilizers. The International Year of Pulses is aimed at raising awareness of this highly beneficial and delicious grain crop and its contribution to food security and in combating malnutrition and improved environmental sustainability.

## Effect of Oral Aloe Vera on Diabetes



A meta-analysis of studies in people with diabetes and pre-diabetes has shown that oral aloe vera use was associated with significant decreases in both fasting blood glucose (FBG) & hemoglobin A1c (HbA1c). The data indicate that people with a FBG >200 mg/dL may benefit the most, according to an article in *The Journal of Alternative & Complementary Medicine*, a peer-reviewed publication from Mary Ann Liebert, Inc., publishers.

In the article "Reduction of Fasting Blood Glucose and Hemoglobin A1c using oral Aloe Vera: A Meta-Analysis," the authors reported significant reductions in FBG and HbA1c of 46.6 mg/dL and 1.05%, respectively, and reviewed the proposed mechanisms that could account for these anti-diabetic effects. (<http://click.liebertpubmail.Com/?qs=f7b638c19a22b0d402aea7215b6cd661eb8ef7f5e58d6b51d128205a3a31fc93>)

New Rochelle, NY, Jun 28, 2016

