



PCST

STI Voice

Quarterly Newsletter

Volume 1

No. 1, Jan-Mar, 2015

No. 2, Mar-Jun, 2015



Pakistan Council for Science & Technology

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Volume 1
No. 1, Jan-Mar, 2015
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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

"My message to you all is of hope, courage and confidence. Let us mobilize all our resources in a systematic and organized way and tackle the grave issues that confront us with grim determination and discipline worthy of a great nation."

Eid-ul-Azha Message to the Nation
October 24, 1947

Chairman's Voice



The well-known secret of success of the developed nations is the effective industrial and societal applications of the advancements in science and technology (S&T). Developments in S & T has had a great impact on the

national interests, enriching many countries innovative technologies and making contributions to the health, food security, poverty alleviation, public welfare, comfort and territorial security of nations. However, to derive these benefits from the advances in different fields of science and technology, it is important to develop well-established institutions and mechanisms to harmonize S&T efforts with different sectors of the economy. In developed and emerging industrialized countries, science, technology and innovation (STI) policies have been used effectively to create a vital link between science and the society.

Pakistan Council for Science and Technology (PCST), established in 1961, is the oldest organization in Pakistan which was assigned the important task of advising the government on S&T policies and programs for socio-economic development and national security. It has played instrumental role in shaping S&T landscape of Pakistan

through its central role in establishment of many important S&T organizations of the country which even includes the Federal Ministry of Science and Technology and formulation of national Science and Technology Policies.

With the main mandate of advising the Government on S&T policies and the celebrated past, it was rather surprising on the part of the Council, not to have yet its own newsletter to reach its cliental. I am pleased to see the enthusiastic response of PCST team with leading role of Dr. Farzana Latif Ansari, to my call for the PCST Newsletter, namely *STI Voice*, which would be used not only to disseminate information about various activities of PCST but also bringing the STI policy issues, critical for the country, at the forefront.

Although Pakistan has been a highly blessed country in terms of its talented youth and natural resources, be it its flora, fauna, marine or natural resources, it is rather unfortunate that it has not yet been able to enlist itself in the countries that have excelled in science and technology with focus on value addition, as we export raw material on throw away price (for example indigenous herbs) and import finished products by paying fortune. Take the example of Japan which, without any natural resources, is leading the world in technology while the economic growth of China is linked with advancement in S & T reflecting

highest growth rate of publishing their research findings. In the era of highly competitive world, it is only the innovation and creativity which can help to compete with the world.

The era of Muslim Scientists when they ruled the world encompassed their significant contributions in the field of science and technology. The column on Muslim scholars' voice will highlight the contribution of Muslim scientists of the past in different disciplines of science and technology and will be a regular feature of the STI voice.

Alongside the general format, this newsletter is unique in that a column for young Scientists (Youth's voice) has been included wherein the innovative ideas from their research and/or PhD thesis will be included in the form of an abstract. Being the past awardee (currently Scientific Advisor) of International Foundation for Science (IFS), which presents the model of success stories (identifying young talent from developing countries and supporting them in the development of distinguished career), the PCST leadership is committed to promote young talent. Through this newsletter and website, PCST being a designated focal organization Pakistan, will facilitate interaction of our talented young scientists with IFS, a role which remained ignored in the past.

The STI Voice will also cover information on various national and international funding sources and will conduct workshops for young scholars encouraging and enabling them to avail extramural funding. Even in the developed countries like USA, a significant portion of research funding comes from private section, such as Industry and community (currently 2/3 share from private sector, while in 1960s, it was 1/3); such model is almost non-existent in Pakistan partly because of lack of clear policy and incentive to bring scientists and industry/community closer. The STI voice along with PCST website will provide a forum to attempt developing partnerships by exploiting the existing role of PCST to maintain updated record of research profile of productive scientists, in addition to using this platform in guiding the Government in formulating proper policy.

I wish this effort of the council every success and hope that this first newsletter will lay the foundation for future issues of its kind and would continue to be a regular feature of PCST with significant component of innovation.

Prof. Dr. Anwar-ul-Hassan Gilani (SI)
Chairman, PCST

Editor's Voice



The idea of launching PCST newsletter would have come to the minds of many but the first step, rather the bottle-neck step, would have hindered them to take a start because it seemed to be a momentous job. Organizing and giving shape to the huge amount of data, information and events that took place since the inception of the Council was indeed an uphill task. Hats off to the Chairman and the staff PCST, who mustered up the courage to take off and set out to gather the data and important news items for the newsletter.

Our goal to bring you this newsletter namely Science, Technology, Innovation, **STI Voice** is to share with you the latest happenings in the field of science and technology at national level. While there, certainly, is news on the following pages, this first issue of the newsletter is unique in that you will find the firsthand account of how PCST came into being through an article titled Pakistan Council for Science and Technology (PCST)-Historical Perspective, Current Activities and Future Goals. An effort has been made to dig out the data about the Council presented here from available resources and the happenings during Jan-Jun, 2015. Some unique features of STI Voice are the inclusion of columns namely Muslim Scholar's Voice, Scientists' Voice for society and Young Scientist's Voice that will appear as regular contents of the newsletter.

Have a good news time with STI Voice

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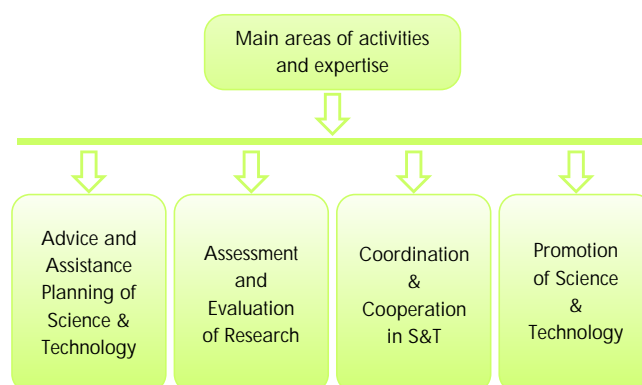
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Pakistan Council for Science and Technology (PCST)-Historical Perspective, Current Activities and Future Goals

The National Science Council (NSC) was established in 1962 and was placed under the Ministry of Education and Scientific Research, well before the establishment of the Ministry of Science & Technology, to propose national science policy for the approval of the government, to coordinate the work of various research councils, and to advise on all matters relating to the promotion of scientific efforts in the country. National Science Council (NCS) was renamed as Pakistan Council for Science & Technology (PCST) in 1984. The charter of PCST was revised initially in 1973 and then in 1982, 1984 & 1987, with a view to making it more independent and effective in advising the government, based on studies and surveys, on matters and issues relating to science & technology (S&T).

Objectives of the Council

- Advising the Government on S&T policy and plans.
- Regular evaluation of scientific research through bibliometric and peer review techniques.
- Strategic planning of R&D through expert committees/think tanks.
- Scientometric and futuristic studies.
- Promotion of R&D and encouragement of consultancy services for scientists and technologists.



Functions of the Council

The Council is working on the following lines:

- To discuss all policy matters, proposals and issues on the overall development of science and



technology in the country and provide recommendations and advice to the NCST for facilitating their decision-making.

- To identify priority areas of research and development keeping in view the futuristic developments of science and technology especially those of the disciplines falling in the high technology fields.
- To act as an independent forum of senior and eminent scientists and technologists of the country and to act as a "Think Tank" to the Federal Government on policies and problems of national importance in respect of science and technology.
- To collect science and technology statistics and maintain a data bank of the research and development institutions of the country.
- To provide a forum for co-ordination of S&T activities with national and international agencies.
- To enter into contracts, agreements with national agencies for undertaking development projects in fields relevant to the functions of the Council.
- To organize study groups and task forces for dealing with the following issues.
 - Scientometric studies and analysis of science and technology data.
 - Assessment and innovation of impact of science and technology policies and programs on the overall development of the country.
 - Preparation of state of art reports on certain important scientific and technological issues.
 - Identification of priority subjects with reference to their bearing on socio-economic development and national security.
 - Encouragement of consultancy services for scientists and technologists in various important fields

PCST is also the secretariat of National Commission of Science and Technology (NCST), headed by the Prime Minister. National Commission for Science and Technology, constituted in 1984, is the apex body on Science and Technology matters. It has 27 members including Federal Ministers of various Ministries and representatives from private sector. The first meeting of NCST was held on 22nd March, 1989, under the Chairmanship of Mohtarma Benazir Bhutto, the then Prime Minister of Pakistan. The main emphasis was on coordination of S&T research and development and the factors affecting achievements and impact of R&D.

Following were the deliberations of the first meeting:

- To coordinate all matters pertaining to S&T and the coordination of R&D policies initiated by various Ministries/Divisions of the Federal Government.
- Overseeing the implementation of policy decisions taken by NCST
- To review from time to time the S&T Policy and its effect on production and development sectors.
- To identify the measures for gradual self-reliance in the field of S&T, to lay down priorities for R&D programs and guidelines for programs of R&D activities.
- To evaluate the performance of various S&T ministries and R&D organizations.
- To review annual reports of all major S&T organizations and R&D Institutions.

The second meeting of NCST was held on 2nd May, 2000 under the Chairmanship of Gen. Pervez Musharaf, the then Chief Executive of Pakistan. The proposals submitted for consideration included human resource development, up-gradation of R&D infrastructure and launching of R&D programs, developing information technology, restructuring of R&D organizations, technology development and industrialization, strengthening of policy, coordination and management structure and the funding and project-implementation mechanism. It was emphasized that a strong alliance between government, industry and research institutions should be established in order to integrate indigenous R&D efforts with technology-development and industrialization, without which a quantum jump and sustained development was difficult to achieve.

The third meeting of the NCST was held on 1st December 2001 also, under the Chairmanship of Gen. Pervez Musharaf to discuss the following main items of the agenda.

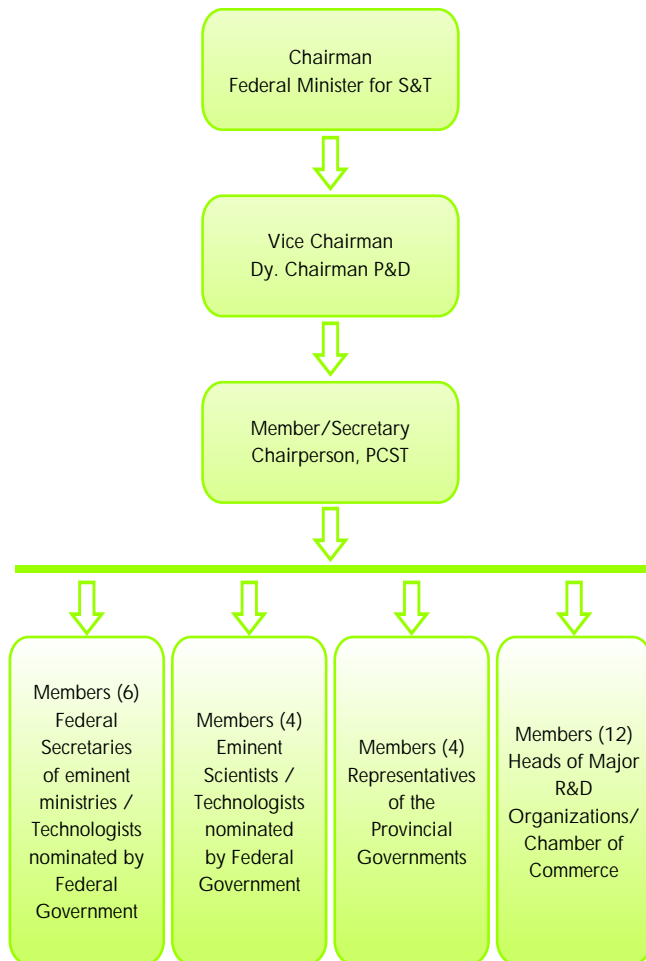
- Status of Implementation of the decisions of NCST.
- Constitutional amendments regarding the status and role of S&T in Pakistan.
- Corrections in the budget allocations for S&T in the Ten Year perspective Development Plan.
- Technology Venture Capital Companies.
- Acquisition of a vessel for Multidisciplinary Oceanographic research.
- Development of critical telecommunication infrastructure.

- Frequency spectrum management and e-government program for Pakistan.

Executive Committee of NCST (ECNCST)

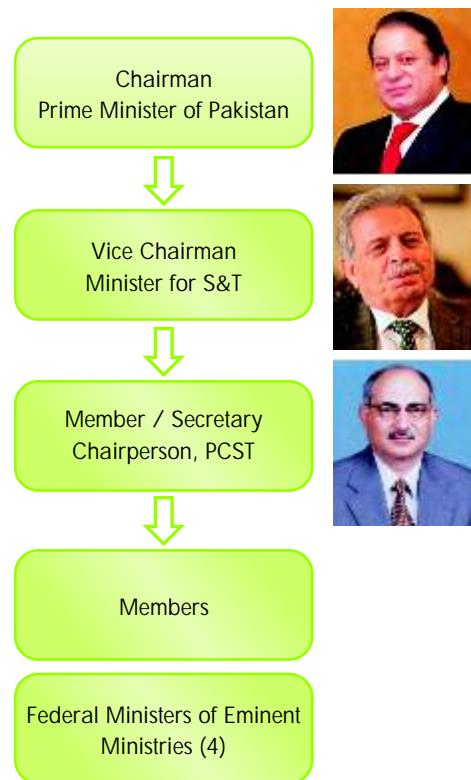
The Executive Committee of the NCST (ECNCST) was established in 1989 in order to coordinate, oversee and review the S&T policies and R&D programs and implementation of the Policy-Decisions taken by NCST and the Ministry of Science & Technology (MoST) was designated as the Secretariat of ECNCST. The composition of ECNCST was approved, with the addition of the Director General, AWC, Secretary Education and two Industrialists from the private sector.

Composition of ECNCST



Pakistan Council for Science and Technology is in the process of preparing the agenda for the next meeting of the Executive Committee of National Commission of Science and Technology (ECNCST). This draft agenda has been prepared with the consultation of all stakeholders. The meeting of ECNCST will be held after approval of the agenda.

Composition of NCST



- ⇒ Provincial Members for S&T (4)
- ⇒ Deputy Chairman, Planning Commission
- ⇒ Secretary, Ministry of Science and Technology
- ⇒ Secretary, Ministry of IT & Telecom
- ⇒ Secretary, Ministry of Education
- ⇒ President, Pakistan Academy of Sciences
- ⇒ Chairman, Pakistan Engineering Council
- ⇒ Chairman, Higher Education Commission
- ⇒ Chairman, Pakistan Atomic Energy Commission
- ⇒ Chairman, Pakistan Council for Scientific and Industrial Research
- ⇒ Chairman, Pakistan Agricultural Research Council
- ⇒ President, Federation of Pakistan Chambers of Commerce & Industry
- ⇒ Scientists/ Technologists nominated by Prime Minister (3)
- ⇒ Industrialists nominated by Prime Minister (2)

Major Achievements

1. Establishment of different organizations

PCST played a key role in the establishment of Ministry of Science and Technology (MoST), Higher Education Commission (HEC), Pakistan Science Foundation (PSF), S&T Cell, Planning Commission, Intellectual Property Organization (IPO), Council for Works and Housing Research (CWHR), Pakistan Council of Research in Water Resources (PCRWR), National Commission on Biotechnology (NCB)

2. National Science, Technology and Innovation (STI) Policy, 2012

The National ST&I policy 2012 has been a major achievement of PCST. It describes principal aims and objectives under the broader areas of socio-economic development, human resource development, R&D infrastructure, promotion of ST&I in the society and S&T management system. It envisages the achievement of these aims and helps to realize the vision of the policy as stated “to achieve the security, prosperity and social cohesion of Pakistan through equitable and sustainable socio-economic progress using science, technology and innovation as the central pillar of development in all sectors of economic activity.”

The main focus of the policy is on ST&I Planning and Management structure, Human Resource Development, Indigenous Technology Development, Technology Transfer and Creation of Absorptive Capacity and International Cooperation as well as R&D thrust areas. The STI strategy Science, Technology & Innovative Strategy (2014-18), was launched in 2014 during a ceremony chaired by the Minister of Science and Technology Mir Changez Khan Jamali. Once implemented, the ST&I Policy will lead to new dimensions in improving R&D institutions, development of research and engineering sector, effective collaboration between academia, R&D organizations and industry leading to an overall economic development of the country.

3. Research Productivity Award (RPA)

Considering the fact that the Universities, as well as the R&D organizations, are experiencing problems of retaining a high quality S&T manpower, NCST, in its 2nd meeting, decided, inter alia, that the salaries of highly qualified scientists and technologists should be brought at par with those prevailing in the industry, in order to attract the brightest students to opt for careers in various scientific and technological fields.



The then Prime Minister of Pakistan presenting RPA to one of the award winners (happened to be current Chairman, PCST) at the last ceremony held in May 2012.

The Ministry of Science and Technology (MoST), in consultation with PCST, decided to grant “Research Productivity Allowance” to active scientists on the basis of their publications in impact factor ISI-index journals and their performance, as evaluated empirically by Journal Impact Factor (IF), Citation Index (CI) and other parameters.

This scheme for the award of RPA to productive scientists and engineers was introduced in the year 2001-2002. The first criteria approved by the Finance Division for disbursement of the RPA was the journal impact factor (JIF) and National Citation Index (NCI).

In order to broaden the scope and to include applied research in the scheme, a committee was constituted by MoST in the year 2009 to revise the criteria for the award of RPA. The committee was headed by Prof. Dr. Qasim Jan and the criteria was approved by the Federal Minister for Science and Technology. The scheme was renamed as Research Productivity Award, as it is an award by an independent agency and not an allowance paid by the parent organization. The approved crop varieties and the output of applied research in the form of products and processes that were patented (nationally or internationally) were also included in the revised criteria. Moreover, the researchers working in universities and institutions in the private sector and the Foreign Faculty working in Pakistani universities, both in private and public sector, were also considered eligible for the award of RPA.

The scheme of RPA was evaluated and reviewed again by a committee constituted by the MoST under the Chairmanship of Prof. Atta-ur-Rahman and the criteria for RPA was revised in May 2013 that included international books, patents granted, research supervision, research grants won, publications in impact factor journals and applied research output. The revised criterion was implemented for RPA of 2013-14. Fig. 1 shows the total number of scientists who applied for RPA and number of eligible scientists.

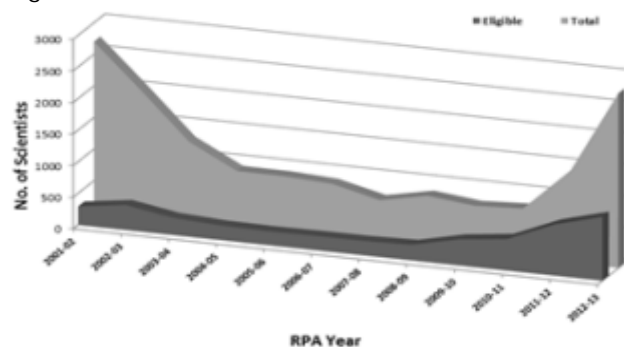


Fig 1: Total number of scientists who applied for RPA vs number of eligible scientists.

The numerical rating of scientists conducted by PCST is widely used by R&D organizations and universities for the assessment of candidates for appointments, promotions and awards. Moreover, there has been a significant increase in the publication of research papers in journals with impact factor following the initiation of RPA by PCST, thus leading to around ten-fold increase in publication since last one decade. (Fig. 2)



Fig 2: Impact of RPA on research publications in IF journals



Members of the RPA & PSP teams



The dedicated efforts of Ms. Shireen Taj, ex-employee of PCST, for initiating the work on RPA & PSP directories are highly acknowledged and appreciated.

4. Productive Scientists of Pakistan

Regular qualitative and quantitative evaluation of publicly funded scientific endeavor is desirable throughout the world in order to gauge the efficacy of the exploitation of public funds.

PCST has regularly been conducting studies which provide information about the Productive Scientists of Pakistan based on eight research related parameters including authorship of books, MPhil/PhD level research papers, cumulative impact factor, international citation of publications, national/international patents registered and

winning of competitive national/international grants. Additional parameters such as execution of international projects related to design of physical structures and urban planning are also taken into account for scientists and engineers involved in the applied research. Development of new crop varieties, new prototypes of agricultural machinery and equipment are considered in the field of agricultural research. The first directory of the scientists of Pakistan was published in 1999 under the name of Leading Scientists of Pakistan, while the second such directory namely Scientific Research in Pakistan was published the following year. Afterwards similar directories were published under the name of Productive Scientists of Pakistan in the years 2003, 2005, 2007, 2011 and 2013.



Directories of Productive Scientists of Pakistan

5. Technology Foresight Exercise in Pakistan

The term Technology Foresight is defined as the process that involves systematic attempts to look into a long-term future of science, technology and economy with the aim of identifying the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits during the next 10-25 years. The purpose of the Technology Foresight Exercise (TFE) has been to assist in developing a policy for science and technology and to address wider concerns that involve economic and social aspirations. However, TFE should not be mistaken for predicting either the future or the impact of future technology on the current day life, rather it provides an overview of future risks and potentials of the technology and enables a better preparedness.

The TFE in Pakistan originated with a proposal submitted by PCST to the MoST offering its support for a collaborative exercise to explore the applications of foresight tools. Goals of the Exercise were to help stimulate long term thinking, and to build shared R&D awareness and capacity for engaging broad challenges for which the federal S&T ministry should be better prepared.

A country-wide survey was carried out to identify the potential areas on which foresight studies should be carried out. Keeping in view the response of the experts, the Technology Foresight expert panels were constituted in 11 areas. Each panel was represented by the experts from public sector R&D organizations, academia, industries, private sector and NGO's. At-least 3-4 panel meetings involving deliberations and brainstorming sessions were carried out in each sector. The panel chair together with its team prepared a comprehensive report at the end of the exercise.

Different tools were used by the panels during the foresight studies. Most of the panels selected the STEEPV approach to identify the issues and drivers. STEEPV approach identifies the Social, Technical, Economic, Environmental, Political and Value related issues/aspects of any technology; both the challenges and opportunities. Other approaches used by the panel included SWOT analysis and scenario planning. The outcomes of the Foresight studies were identification of policies, priority areas, emerging technologies, key areas of technological intervention and most viable projects on the horizon of next 10-15 years. A comprehensive report and the recommendation was submitted by each panel at the end of the session.



Prof. Dr. Mudassar Asrar chairing Technology Foresight panel meeting on Nanotechnology held in February, 2014

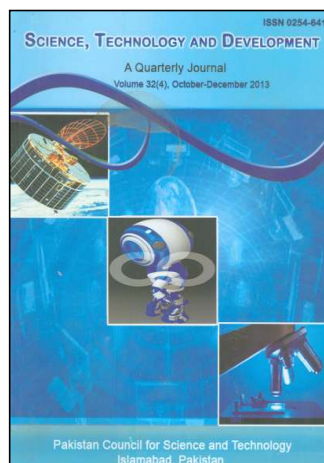
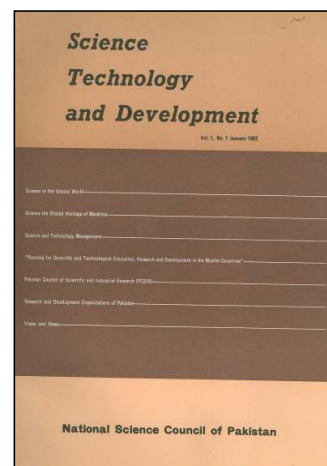
So far technology foresight studies have been conducted in the fields of Agriculture, Energy, ICT, Education, Industry, Environment, Health, Biotechnology, Water, Nanotechnology, Electronics, Public Health & Sanitation and Marine Resources. The recommendations of these TF panels have been published in the form of the Technology Foresight Reports.

6. Publications

6.1 PCST Journal

As early as 1964, shortly after the birth of the council, NCS

was publishing a brief quarterly bulletin namely Science News and continued its publication till 1982, and the same year the council initiated the publication of a journal namely Science Technology and Development (STD). In 1991, STD became a quarterly publication which has now evolved as a peer reviewed, multidisciplinary journal published quarterly by PCST. It aims to target both the policymaking and the academic communities concerned with the impact of science, technology, innovation and development process on industrial, economic, and social growth, particularly in developing economies. It is a unique national forum that brings together people from across the country to discuss key issues relating to science, technology and scientific innovation. The aims of STD are to promote the exchange of knowledge, experience, information and ideas among academicians, scientists, professionals and students to highlight the role of science and technology in achieving sustainable development of the country.



Multidisciplinary in scope, STD encompasses original articles, reviews and case studies in different fields (in alphabetical order) of Agriculture and Agricultural Engineering, Biological Sciences, Chemical Sciences, Computer Sciences, Engineering Sciences, Earth Sciences, Economics, Environmental Sciences, Health Sciences, Information Sciences, Marine Sciences, Mathematical

Sciences, Nutrition & Food Sciences, Pharmaceutical Sciences, Physics, Statistics and any other area related to Science and Technology. The research papers are evaluated, both by international and national reviewers and the Editorial Board comprises distinguished scientists from all over the world. The journal has already been recognized by HEC, recently made available on-line and is expected to be in the list of journals of international repute and with impact factor soon.

The guidance and support recently provided by the Asian Council of Science Editor (ACSE) for online submission system for the journal is highly appreciated and is expected to help in its faster publication. Further information is available on this website www.pcst.org.pk.

6.2 Other publications

PCST has also published the following reports of different Expert Committees.



1. Human Resource Development in the Higher Education Sector-Basic Sciences, 2006
2. Research and Development in the Health Sector, 2006
3. Technical Education, 2006
4. Development of Pharmaceuticals and Drugs, 2006
5. Environment and Conversation, 2006
6. Development and Management of Water Resources, 2005
7. Biotechnology and Genetic Engineering, 2005
8. Agriculture, 2005
9. Electronics, 2005
10. Engineering and Manufacturing, 2005
11. Material, 2005
12. Energy, 2005

The Proceedings of the Expert Group Meeting titled Strategies for the development and application of biotechnology for economic growth was also published in 1999.

PCST also published a series of following scientific reports.

1. Status of Science & Technology Manpower in Pakistan, 2010
2. Status of Biotechnology Research in Pakistan, 2009
3. Status of Technical and Vocational Education System in Pakistan, 2009
4. Assessment of National R&D Expenditure (Non-Classified) of Pakistan, 2001.
5. A Report on Manpower and Budget Status of R&D Organizations in Agriculture Sector of Pakistan, 2001.
6. R&D-Related Development Projects of Different Organizations of the Federal Ministries -Their Size and Share in the Public Sector Development Programs (PSDP), 2001.
7. Trends in Scientific Research in Pakistan: An Analysis of Research Productivity & Quality, 2001.
8. A Preliminary Survey of Some Technology Related Parameters of Industrial Sector in Pakistan, 2001.
9. Use and Abuse of Impact Factor and Citation Counts, 2001.

The staff of PCST has actively been involved in addressing the contemporary challenges faced by the country by writing books on different topics related to emerging issues of science and technology.

1. Genetically Modified Food and the Islamic Perspective: An Analysis and the Way Forward, 2014
 2. History of Development and Implementation of S&T Policy in Pakistan, 2011
 3. Development of S&T in Pakistan and Muslim Ummah, in the light of its Cultural History & Temperament
 4. 50 Years of R&D in Pakistan, 1997 – 1998
 5. Collected Articles on Food and Nutrition – Malnutrition and Its Prevention (1993)
 6. Energy in the Muslim Countries–A Pan Islamic Approach, 1983
 7. Contributions of Muslim Scientists during the 13th & 14th Centuries Hijri in the Indo-Pakistan Sub-Continent. Vol. 2, 1983,
 8. Agricultural Extension in Islamic Cultural Milieu, 1983,
 9. Energy Resources in Muslim Countries, 1983
 10. Personalities Noble, Glimpses of Renowned Scientists and Thinkers of Muslim Era, 1983
 11. Development of S&T in Pakistan and Muslim Ummah, in the light of its Cultural History & Temperament.
- The Muslim Epoch in Science and Technology, Volume I, 2008
 - Historical Analysis of S&T Decline and Interaction with Islamic Thoughts, Volume II, 2008

- Renaissance of S&T for Development in Pakistan and the Muslim Ummah, Volume III, 2009.

A wealth of information has been compiled in the form of different indicators of science and technology in Pakistan during the past two decades.

- Science, Technology & Innovation Indicators of Pakistan, 2014
- Science and Technology Indicators of Pakistan, 2005

During the past few years, quite a significant number of students had been awarded S&T scholarships in medicine and engineering sciences who came back home after completing their degree from abroad. PCST published the following two volumes of the abstracts of their theses in both medical and engineering fields.

- Abstract of Theses Completed under S&T Scholarship Scheme (Medical Sciences), 1997
- Abstract of Theses Completed under S&T Scholarship Scheme (Engineering Sciences), 1997

Some more compilations, in chronological order, from the Council are the following.

1. NGOs in Science and Technology, 2008
2. A Guide to Foreign Scholarship /Fellowships, 2005
3. Selected Papers on Science and Islam, Vol. I, 1994
4. S&T Development in Pakistan, 1987
5. Post-Graduate Research in the Universities of Pakistan, 1986
6. Non-Governmental Scientific and Professional Institutions and Learned Bodies of Pakistan, 1986
7. Growth of R&D Institutions in Pakistan, 1985
8. Growth of R&D Manpower and Expenditure in Pakistan, 1985
9. Universities- Their Role and Performance in Scientific and Technological Research, 1982.
10. Survey Report, R&D Activities of the Beneficiaries, S&T Scholarships, 1996
11. A Report on Manpower and Budget Status of R&D Organizations in Agriculture Sector of Pakistan, 2001

7. Survey of S&T facilities & valuable scientific Equipment

A survey of S&T facilities and valuable scientific equipment available in various national organizations working under MoST was carried out and made available on the website

of PCST. It is envisaged that this exercise will help in resource sharing and avoid wastage of funds on the purchase of the same (expensive) equipment(s) by different organizations.

8. Gender Mainstreaming in Science and Technology

With a view to attract women scientists to opt science career, the statistics of women scientists is being collected by PCST. To date, the data of about 800 female scientists working in different areas of S&T have been collected and Information has been made available online through PCST website, www.pcst.org.pk.

9. Organization of events

Following is a list of some of the events PCST has organized in different parts of the country.

- Seminar to Establish Academia – Industry Linkage: Application of Nanotechnology in Industrial Sector, 2014
- National Workshop on STI Strategy and Launching of Technology Foresight Reports- 2014
- Technology Foresight and Critical Issues Related to S&T in Pakistan, 2013
- Science & Technology Policies and Planning in SAARC Countries, 2012
- International Workshop on S&T Statistics & Policy Making, 2009

10. Vision

- Revival of the National Commission on Science and Technology (NCST)
- Development of manpower needed to implement the policies for science, technology & Innovation and to carry out comprehensive research work to determine various parameters and directions in which the national efforts should be directed for effective utilization of science, technology and innovation process, in enhancing and improving the economy.
- Development of managers with a cross-disciplinary perspective who can manage technology strategically, in order to ensure organizational competitiveness and growth in a dynamic technological and business environment.
- Development of programs and research management policies and procedures for policy makers to help them

shape research programs in ways that attract researchers and institutions with high potential to initiate path breaking research in the fields of science, technology and innovation.

- Dissemination of research results of the Council among academia, researchers and policy makers, industry, university, R&D organizations and concerned federal and provincial departments.
- Building of human resource that can work towards the development of S&T in the country. Training this manpower both at national and international level will hold the key in this regard.
- Critical and regular surveys of manpower needs of industry, in reference to high-level scientists,

engineers, technicians, tradesmen and skilled workers.

- Developing international liaison and network with other similar institutions of the world and relevant organizations of the United Nations with a view to exchange information and experts, to conduct specialized training and joint collaborative research of specific interest to Pakistan.
- To undertake programs to encourage innovation in the country on the pattern of RPA.
- To carry out Technology Foresight Exercise in the areas of socio-economic importance on regular basis in order to ensure competitiveness.

The Quran's and Science Voice

وَسَخَّرَ لَكُم مَّا فِي السَّمٰوٰتِ وَمَا فِي الْاَرْضِ جَمِيعًا مِّنْهُ اِنَّ فِيْ ذٰلِكَ لَآيٰتٍ لِّقَوْمٍ يَّتَفَكَّرُوْنَ

"And He has subjected to you whatever is in the heavens and whatever is on the earth - all from Him. Indeed in that are signs for a people who give thought" (45:13)

See like a fly, listen like a fly-super vision, super hearing

"O humanity, an example has been made, so listen to it carefully. Those whom you call upon besides Allah are not even able to create a single fly, even if they were to join together to do it. And if a fly steals something from them, they cannot get it back. How feeble are both the seeker and the sought" (Surah al-Hajj, 73)



The house fly (Muscadomeistica)

The house fly is a marvel of Allah's creation; its wings beat 500 times per second and, as a result, it has a glorious flying ability. Even more amazing are its eyes, each one

of which has thousands of extraordinarily complex lenses. A fly has compound eyes on both sides of its head, each of which is divided into 4,000 sections, each of which, in turn, has a lens that perceives an image from a slightly different angle. When a fly looks at a flower, the full image appears separately in each of its 8,000 lenses. When these images reach the brain, they combine together like the components of a jigsaw puzzle. As a result, an image that is highly significant for the fly emerges.



A fly's incredible compound eyes

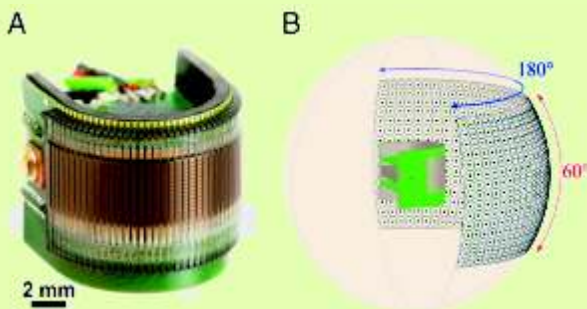
It is extraordinary that such a small creature should have thousands of lenses in its eyes and a cerebral system capable of interpreting what it sees. We can only acquire this information by studying the animal. Yet all flies have had this perfect structure since they were first created, for, like all the other living things, they are miracles created by Allah, matchless marvels of creation that amaze one the

more one researches and studies them. Scientists lack the knowledge and technology to install 8,000 lenses into an area just a few millimeters in size and to enable each one to see. None of them can produce a nervous system that will permit these lenses to perceive light and then make that perception visible in such a perfect way. This is what is the challenge presented in the above mentioned verse of the Holy Quran.

Robots may get compound eye vision

Fly vision is really quite highly developed. The field of view of each photoreceptor overlaps with up to 90 percent overlap with those next to it. The photoreceptors convert light into ionic current which goes to the fly's processors.

The researchers at the Naval Air Warfare Center in China Lake, California, and the University of Wyoming designed their sensor to mimic the fly's overlapping photoreceptors and analog, parallel processing system. The sensor consists of a 1-mm-diameter ball lens that focuses light onto an array of photo detectors, where the field of view overlaps by about 70%. In experiments, the sensor could locate a 1-mm-wide string as the string moved across the field of vision at distances up to 200 mm from the lens, with minimal error.



A freaky and awesome comparison of both the real and artificial eyes offering a horizontal field of view of 180 degrees.

The scientists expect that the house fly's compound eye will be able to provide improvements to unmanned vehicles i.e. Next-Gen Micro Drones and industrial inspection robots.

Listen Like a Fly- Super-Hearing Power

Hearing device that mimics a fly's hearing mechanism

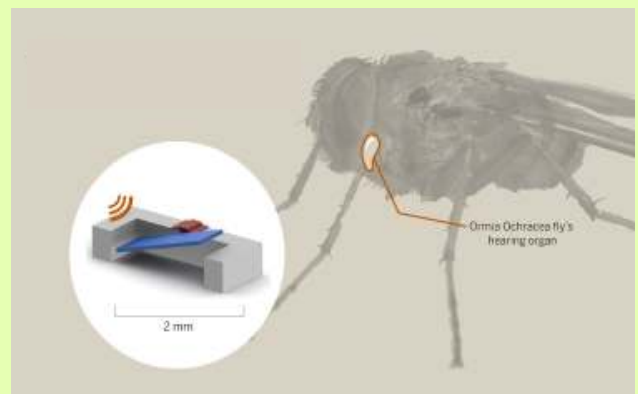
When creating hearing aids, three factors are always taken into consideration: size, battery life, and power.

Recently, researchers at the University of Texas created a device that they claim does that – and more. Neal Hall, Assistant Professor in the Cockrell School's Department of Electrical and Computer Engineering, led a team that used the fly's ear structure as a model and built a silicon miniature pressure-sensitive device that replicates the fly's super-evolved hearing structure. The device is 2 millimeters wide, which is identical in size to the fly's hearing organ.

Although fly-inspired hearing devices have been developed in the past, this is the first time piezoelectric materials were applied. These turn mechanical pressure into electric signals, or voltage, requiring very little power for the device to operate.

“Because hearing aids rely on batteries, minimizing power consumption is a critical consideration in moving hearing-aid device technology forward,” Hall said.

As small as 2mm, the hearing aid, is a wide silicon device that resembles a “teeter-totter” found a children's playground. This tiny pressure-sensitive device uses almost no power, but is able to help people to hear incredibly well. The device could be used in the next generations of hearing aids.



A Tiny Device Recreates Fly's Super-Hearing Power

فَتَبَارَكَ اللَّهُ أَحْسَنُ الْخَالِقِينَ

Allah is the best Creator

Chairpersons of PCST

Prof. Dr. Salimuzzaman Siddiqui (1961 - 1966)
 Dr. M. Ibrahim (1966 - 1967)
 Dr. M.S.H Siddiqui (1967 - 1970)
 Dr. I.H Usmani (1970 - 1973)
 Dr. M.S.H Siddiqui (1973 - 1975)
 Dr. Z.A Hashmi (1975 - 1980)
 Dr. Mamtaz Ali Kazi (1981-1988)
 Mr. Masihuddin (1988-1989)
 Mr. Tariq Mustafa (1989-1991)
 Dr. Muhammad Arsalan (1991-1991)
 Dr. Abdul Qayyum Ansari (1991-1992)

Dr. Shafiq Ahmad Khan (1992-1995)
 Dr. S.M. Quershi (1995-1996)
 Lt. Gen. (R) Javed Ashraf Qazi (1996-1998)
 Mr. Javed Masud (1998-1999)
 Dr. Saeed M. Qureshi (1999-2000)
 Mr. Khawaja Yaldram (2000-2001)
 Dr. S.T.K. Naim (2001-2004)
 Dr. Tariq-ur-Rahman (2004-2009)
 Prof. Dr. Mudassir Asrar (2011-2015)
 Prof. Dr. Anwar-ul-Hassan Gilani (Jan, 2015 - date)

Legendary Chairmen of PCST

Prof. Dr. Salim-uz-Zaman Siddiqui



Born on October 19, 1897, Dr. Salimuzzaman Siddiqui obtained his PhD in Chemistry from Germany in 1927. On his return, he established the Ayurvedic and Unani Tibbi Research Institute at the Tibbia College Delhi, under the guidance of Hakim Ajmal Khan. He was appointed its first Director. However, soon after the death of Hakim Ajmal Khan, Dr. Siddiqui left the post. In 1940, he joined Indian Council for Scientific and Industrial Research where he worked until 1951 when he migrated to Pakistan on the request of Prime Minister Liaquat Ali Khan. Upon his return to Pakistan in 1951, Dr. Siddiqui played a key role in the founding of Pakistan Council for Scientific and Industrial Research, Pakistan Academy of Sciences and later a postgraduate research institute in chemistry at the University of Karachi that came to be known as Hussain Ibrahim Jamal (HEJ) Research Institute of Chemistry. HEJ has now evolved as one of the best institutes in Asia and Prof. Siddiqui continued working at this institute even at the age of 90.

He had the honor to become the first Chairman of PCST and served the Council from 1961-1966. He published over 140 research papers and about fifty patent specifications mainly from the field of natural product chemistry. He was the first Pakistani scientist, who was conferred FRS (Fellow Royal Society, London) fellowship.

Dr. Siddiqui can rightly be called the last Renaissance man, as he was a polymath of social and natural sciences. Besides being a chemist of international fame, he was a philosopher, artist, critic of literature and a visionary of science. In recognition to his valuable services in the field of science he was awarded the prestigious Hilal-e-Imtiaz, Pride of Performance and Sitara-e-Imtiaz. He breathed his last on April 14, 1994 at the age of 97. May Almighty Allah rest his soul in eternal peace, aameen.

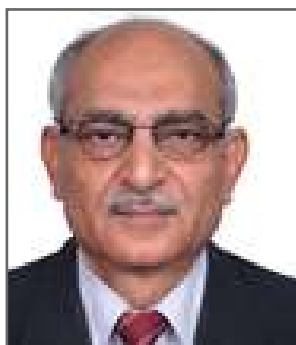
Dr. Ishrat Hussain Usmani



Born on April 15, 1917, Dr. Usmani obtained his Doctorate degree from London at the age of 23. He was an effective Leader, visionary, mentor and a tireless perfectionist. He was among the pioneers of nuclear energy and technology in Pakistan. Dr. Usmani had played a key role in the initial development of Pakistan Atomic Energy Commission (PAEC) and was a major contributor in the establishment of PINSTECH.

He served as the Chairman PCST for a period of 3 years during 1970-1973. He was also the Chairman of PAEC. He was the first Secretary of the Ministry of Science and Technology and served as Chairman of Board of Governors of IAEA, the Secretary General of International Foundation for the New and Emerging Sciences and Technologies (NEST). He was awarded Nishan-i-Imtiaz in 1998. He retired at the age of 74 and left for his eternal abode the next year. May Almighty Allah rest his soul in eternal peace, aameen.

Profile of Current Chairman, PCST



Prof. Dr. Anwar-ul-Hassan Gilani is a distinguished Pharmacologist, who obtained his PhD degree from University of Sydney in 1985 on open merit scholarship. He started his professional career as a Lecturer, at Bahaudin Zakariya University, Multan in 1979.

Afterwards he joined Aga Khan University in 1986 as an Instructor and rose to full Professor in 1997 through accelerated promotions. He served this university on various leadership positions; Vice Chair, Director, PhD program, and Chair-Board of Graduate Studies, in addition to external positions including Tandem Dean, College of Health Sciences, Mekelle University, Ethiopia and the Founding President, Pakistan Chapter of International Society of Pharmaco-economics and Outcome Research. He has been serving as Adviser to the WHO on Essential Medicine and Scientific Adviser to International Foundation for Science. He also occupies the positions of Adjunct Professor at the International Center for Chemical and Biological Sciences, Karachi and HEC Distinguished National Professor. Prof. Gilani is Co-Editor of two WHO Books on Essential Medicines, 3 Patents, published around 350 articles and with cumulative IF around 600. He supervised research of 20 PhDs. His work attracted high citations (over 9,500 with an h-index of 51 based on Google Scholar citation report).

Prof. Gilani occupies 1st National ranking in the field of Health Sciences with the highest total of International

Citations/Impact Factor. He is a Member of the Editorial Boards of 10 journals of international repute and has delivered invited/plenary lectures at 70 international conferences/symposia including two in International Union of Pharmacology (IUPHAR) meetings.

He won several national/international awards including two civil awards namely Pride of Performance and Sitara-i-Imitaz, Salam prize in Biology by TWAS, Italy, Ibn-Al-Hayatham Prize in Science, and Aga Hassan Abidi Gold Medal by Pakistan Academy of Science, Dr. ZA Hashmi Award by Pakistan Science Foundation and Boehringer International Research Award (Germany). The Higher Education Commission of Pakistan awarded him the title of Distinguished National Professor in 2004 and Life-Time Academic Achievements Award in 2011. He is a Fellow, Pakistan Academy of Sciences, Fellow and Scientific Secretary of Pakistan Academy of Medical Sciences and Fellow of TWAS-The World Academy of Sciences for Advancement of Science in Developing countries.



PCST Chairman receiving Dr. Z.A. Hashmi R & D Award and Medal from Mr. Zahid Hamid (The then MST) at the World Science Day, PSF, Islamabad Nov 10, 2014

Activities of Chairman PCST

- As Plenary Speaker, Prof. Gilani delivered a lecture titled "Efficacy and Safety of Bioactive Phytochemicals is influenced by their ability to interact at multiple



Target Sites" during International Conference on Pharmaceutical Sciences, Dubai, Jan 21-22, 2015.



PCST Chairman, as Guest of Honor, is presenting certificate to one of the participants of conference in Dubai

- As Chief Guest of the inaugural session, he delivered a lecture on Entrepreneurship in Universities and R&D organizations: PCST's Efforts & Initiatives" during "DICE 2015" event "Innovation and Entrepreneurship" held at the University of Agriculture, Faisalabad on Jan 29, 2015.



- Attended 29th Meeting of Board of Governors, Baqai Medical University on Feb 20, 2015 in Karachi.
- Ministry of Science & Technology nominated Prof. Anwar H. Gilani, the Chairman PCST, as the Member of the Executive Council fo Pakistan Academy of Sciences for a 3 years term on Feb 25, 2015.
- Participated as Chief Guest, in a thematic seminar on Molecular diagnostics and Translational Cancer Therapeutics, held at PINUM, Faisalabad on Feb 28, 2015.
- As Plenary Speaker, he delivered a lecture titled "Novel developments in natural products pharmacology" in 1st International Conference on Recent Innovations in Pharmaceutical Sciences at RIPHAH University on Mar 03, 2015.
- Delivered a lecture on "Functional Food for Health Care Opportunities and Challenges for Academia and Industry" in National Conference on Academia and Industry Interaction, Punjab University, Lahore Mar 04, 2015.
- ORIC Workshop on Policies for Encouraging problem-Solving Research in Universities Jointly organized by Pakistan Council for Science and Technology, IRP and Lahore Chambers of Commerce, Mar 05, 2015 Lahore.
- Chief Guest in the 18th Annual Prize Distribution Ceremony of Anglo-Oriental School, Islamabad held on Mar 27, 2015. The school was noted to be actively engaged in extra curricular activities and character building with strong emphasis on moral values.



- Participated as Chief Guest in the Workshop on "Advanced Diagnostic Techniques/ Symposium on Developing Scientific Writing Skills" on Mar 31, NORI, Islamabad.



- Participated in the United Nations APCTT held in Bangkok during Apr 8-9, 2015 and delivered lecture titled "NIS Diagnosis and STI Strategy Development Country Presentation – Pakistan" in Third Asia-Pacific NIS Forum Diagnosis of NIS and Development of STI Strategies in the Open Innovation Framework, Apr 8-9, 2015, Bangkok, Thailand.



- As Chief Guest and Plenary Speaker, he delivered a lecture titled "Preventing Illness and Treating Chronic Diseases with Life Style and Dietary Modification" in National Conference on Management of Prevalent diseases in Pakistan-World Health Day, Apr 11, 2015 Lahore.
- As Chief Guest and Keynote Speaker, he delivered a lecture titled "Integrative Medicine for Better Healthcare" in a Seminar on Integrative Medicine, Dow University of Health Sciences, Apr 15, 2015, Karachi.



- Chairman PCST as Guest of Honor, presenting Best Anchor Award to Mr. Nadeem Malik of SAMA TV at "AGAHI Awards – Beyond 2015", Pakistan National Council of the Arts (PNCA) on Apr 25, 2015. The AGAHI Awards have been the best initiative for media and Journalism development in the country.



- Delivered a 1 credit hour talk titled "How fasting can prevent and treat chronic diseases" at Aga Khan University, Karachi on May 14, 2015 in the BBS-Teaching, Learning and Assessment (TLA) forum.



- Guest of Honor during First Symposium "Nanotheranostics 2015: A New Era of Nanotechnology" on May 5, 2015 at NORI, Islamabad.

- PCST Chairman had recently been honored to join the Editorial Board of a well reputed, European origin journal namely Journal of Science and Technology Policy Management (JSTPM).

Scientist's Voice for Society

This column has been dedicated to the innovative scientific contribution of a scientist which has an impact on the society. For the current issue, the following article by Prof. Anwar-ul-Hassan Gilani has been selected.

"Clinical efficacy of the co-administration of turmeric and black seeds (Kalongi) in metabolic syndrome - A double blind randomized controlled trial-TAK-MetS Trial".

"There is a cure for every disease in black seeds except death and black seeds are shooneez" (narration by Hazrat Abu Hurairah, Sahih Bukhari)

It is also stated in the books of Seerat that the Holy Prophet (PBUH) himself used to take the seeds of kalonji for therapeutic purpose but with the syrup of honey. It is proved to be effective for almost all types of diseases and has a great therapeutic value from the era of Islam to this modern scientific era. The scientific importance of kalonji in accordance with Tib-e-Nabvi is well documented for the prevention of many ailments specially high blood pressure, cholesterol, diabetes mellitus, asthma, cancer, arthritis, headache, paralysis, Parkinsonism, depression, acidity, obesity and for the treatment of dandruff and hair fall.

Kalongi is a natural and blessed herb having its botanical

name as *Nigella sativa* (Black Cumin). The plants of Kalonji are found throughout subcontinent in the form of bushes. It was originated from Turkey and Italy. Later on it was brought to Asia by physicians and was cultivated in India. Its Seeds are triangular shape, black in color and possess a pungent smell. Its seeds contain 1.5% volatile oil, 37.5% nonvolatile oil, albumen, sugar, organic acid, glycoside and melanthin. The glycoside is toxic in nature hence the use of kalonji in large doses and/or-prolonged use might be harmful. Kalongi alone as well as its combination specially with honey are reported to be of significant medicinal value.

Based on the significance of Kalongi, Prof.Gilani's group has recently published a study titled Clinical efficacy of the co-administration of Turmeric and Black seeds (Kalongi) in metabolic syndrome (MetS)- A double blind randomized controlled trial-TAK-MetS trial.

In this clinical trial, the efficacy of co-administration of Kalongi and Turmeric was proven among a high risk population with Metabolic syndrome (MetS). The details of the study are the following. Apparently healthy males (n = 250), screened positive for MetS, were randomized to either Black seeds (1.5 g/day), Turmeric (2.4 g/day), its

combination (900 mg Black seeds and 1.5 g Turmeric/day) or placebo for 8 weeks. The main outcome measures were body-mass-index (BMI), body-fat-percent (BF%), waist-circumference (WC), hip-circumference (HC), blood pressure (BP), lipid profile (cholesterol, HDL-cholesterol, LDL-cholesterol and TG), fasting blood glucose (FBG) and C-Reactive Protein (CRP).

At 4 weeks, compared to baseline, Black seed and Turmeric alone showed improvement in BMI, WC and BF% while the Combination improved all parameters except HDL-cholesterol with lower FBG and LDL-cholesterol as compared to placebo. At 8 weeks, compared to placebo, Black seeds reduced lipids and FBG, while Turmeric reduced LDL-cholesterol and CRP. Interestingly, combination group with 60% dose of the individual herbs showed an improvement in all parameters from baseline. When compared to placebo, it reduced BF%, FBG, cholesterol, TG, LDL-cholesterol, CRP and raised HDL-cholesterol.

These results revealed a significant beneficial effect of intervention on all parameters of MetS, with negligible adverse effects, when prescribed with advice on lifestyle modification. The combination of Black seeds and Turmeric can, therefore, be recommended for regular use along with advice on dietary modification and physical activity as a starting point for patients at risk of metabolic syndrome to halt the future complications and progression of this syndrome. Future studies to validate the long term preventive role of these medicinal herbs in metabolic syndrome are warranted.

Hence the Holy Quran, Hadith and science are in complete conformity in their contents.

This study is published in *Complementary Therapies in Medicine*, F. Amin, N. Islam, NfnAnila, A.H. Gilani (2015) 23, 165—174).

STI Policy Voice

Innovation Requires Collaboration and Networking



The simplest definition of innovation is the ability to add value to an activity by finding new ways or inventing something new for social and economic well-being of human kind.

Innovation is essential not only for competitiveness and survival of national economies but for meeting challenges of poverty, hunger, disease and natural disasters. The development of innovation economy requires a thorough understanding of the dynamic interplay between research, invention, innovation, and economic growth. Such an understanding allows STI policies to be modulated according to national needs and challenges.

Policies on Education, Science, Technology, Innovation and Entrepreneurship are all intricately interrelated. Entrepreneurship, its growth, survival and competitiveness are dependent on innovation and in a developing country context on incremental innovation. Incremental innovation is about sourcing, absorbing, adapting and diffusing already available international technologies and related knowledge. Incremental innovation depends on the absorptive capacity of firms and according to Cohen and Levinthal only firms with advanced human skills and prior relevant accumulated knowledge can successfully convert

external knowledge into incremental innovations. Prior related knowledge helps local firms recognize the value of new information, assimilate it and apply it for commercial benefits.

The World Economic Forum, based on Porter's classification, has categorized the developmental stages of economies across countries in three distinct categories: i) factor based, where the production and services sector are dominated by low cost labor and resource based inputs. Innovation contributes less than 5% ii) the efficiency driven stage, which requires modern machinery, better technical and managerial skills and promotion of a culture of firm level learning, iii) innovation and knowledge driven stage; this further advancement needs heavy investment in human resource development, training of a critical number of scientists and engineers, promotion of firm level R&D and lifelong learning practices. At this stage innovation contributes at least 30% to the economy. Pakistan with several other developing countries has been placed in the category of factor-based economy, characterized by high unemployment rates and huge shadow economies where large numbers of businesses operate in the informal sector. The global innovation landscape is not static; it has moved across geographical borders and has shifted from one civilization to another. In the past three decades only we have witnessed nation after nation achieve economic and social development through structural adjustments of their

economies and adopting a path of promoting education, in particular higher education, acquiring and adopting foreign technology for production of high value goods and services and promoting firm level learning to bridge the innovation gap between their nations and a lead country. STI policies in these countries concentrated on three important factors; i) setting priorities, ii) strengthening institutions for skill development, research and regulatory institutions that promote quality and standards, iii) incentives for private firms to produce value added goods and services, and promotion of firm level technology learning. Public- incentives for encouraging partnerships between local and international firms, between local

businesses and universities have played a key role in achieving transition from resource base to knowledge based economy.

Almost all developed countries have realized the benefits of what has come to be known as collaborative advantage. In USA, for example, the best management schools are moving towards teaching students about collaborative rather than comparative or competitive advantage.

Dr. S.T.K. Naim
Consultant, COMSTECH

Assessment of Technological Capabilities of OIC Countries



A study titled "Assessment of Technological Capabilities of OIC Countries" was published in the impact factor journal "Science, Technology and Society" [20:1 (2015)114-131]. The study was co-authored by Tariq Mahmood Ali & Tariq Bashir from PCST and Adiq Kausar Kiani from FUUAST

School of Economic Sciences, Federal Urdu University of Arts, Science and Technology, Islamabad. The study reveals that most of the OIC countries are not only far behind scientifically and technologically but are also weak economically although, most of them are enriched with natural resources. The results also indicate that the level of technological readiness/preparedness to participate in the global knowledge based economy of most of OIC countries is very low leading to a gap broadening between OIC and OECD countries This incapability of OIC countries is the result of lack of interest of political leadership in education, R&D as well as in S&T and the efforts made in this direction even by most OIC countries are not adequate. The study

also reflects that the gap within OIC countries for different indicators is also gigantic. For instance, Tajikistan has made 1005 publications during the period 1996 to 2013 which are about 350 times less than Turkey's 348,836 publications. Malaysia spends 5.94% of GDP on education which is more than double of Pakistan which spends only 2.22% of GDP on education. Saudi Arabia spends 0.07% of GDP on R&D which is 15 times less than 1.07% of GDP of Malaysia.

Hence OIC countries should learn the lesson from some fast-emerging developed countries like Korea, Singapore, Hong Kong and Taiwan that have been spending huge budget on basic and applied research, and education. The TAI index provides basic information for the policy makers in the OIC countries to help them decide from where to take a start in the long journey of building sufficient scientific and technological capabilities which are corresponding to the socioeconomic needs of their societies.

Dr. Tariq Bashir
Principal Research Officer, PCST

Learning from Korean Experience



A two weeks' training program titled "Policy Making and Implementation for Science and Technology" was held at Seongnam, Seoul, South Korea from Oct 19 to Nov. 1, 2014. Dr.Tariq Bashir and Mr.Shakeel Ahmed from PCST participated in this program.

The role of Science and Technology in the economic transformation of the countries is well recognized.

However, it can play this role only if scientific advancement and technological development is governed by well-thought out and smartly planned guidelines in the form of Science, Technology and Innovation policies. The transformation of Korea from a stagnant agrarian society into one of the most dynamic industrial economies of the world within a few decades is a prime example in this regard.

The Korean model of industrial development was based initially on its strategy to import mature foreign technology for small industries followed by catching up emerging

foreign technologies in the second phase. During both these phases, the technology was acquired, assimilated and improved. During the third stage creative innovation was initiated and the results of indigenous R&D were applied. Following this plan, Korea was able to start OEM (Original Equipment Manufacture) from 1960 to 1970, ODM (Own Design Manufacturing) in 1980's and OBM (Own Brand Manufacturing) in 1990's. Currently, it is striving hard for new growth engines through creative R&D that will lead to creative economy.

In this context Pakistan is facing following major problems: It is not well prepared to accept and adapt new technologies. Another ancillary problem is the lack of public private partnership. The R&D exercise in Pakistan is being carried out at an extremely small scale with poor investment by the Government and negligible contribution by the industries. Moreover, Pakistan has too few people engaged in R&D i.e. 162 researchers against 2000 to 5000 in developed countries. National Innovation System (NIS) in Pakistan is not fully developed. A fragmented NIS tends to impede the country's indigenous technological capability (ITC). There are hardly any incentives for bridging institutions such as technology incubators, risk capital, technology brokers, technology parks and so forth. There is negligible R&D activity in the industrial sector which is in complete contrast with the industrialized countries.

The remedial suggestions in the light of Korean model are as follows:

At least 60% of public R&D expenditure should be spent for stimulating industrial R&D through incentives and the linkages among Academia, R&D organizations and Industry. The Public Private Partnership program should be launched where researchers may provide technical assistance to private sector. Once mutual trust is established, the industry would be willing to approach R&D organizations rather than looking towards the foreign sources of technology. Institutional mechanism for promoting linkages and coordination among the ministries, universities, R&D institutes and industry should be established. Incentives such as tax exemptions, duty free import of machinery may be offered to local and foreign investors to discourage imports and increase exports. Further, instead of depending on the public budget, new avenues should be explored, nationally and internationally, to generate the funds and the young scientists from universities can be incentivized to show their talent in this field. In order to achieve the above targets strong political will alongwith bureaucratic support is necessary and a huge investment in R&D sector is the need of the hour.

This is how the experience and knowledge of Korea's development may be applied to improve S&T status of Pakistan.

Shakeel Ahmed
Deputy Chief (Publication), PCST

Past Muslim Scholar's Voice

IbnSina (980-1037 AD)

What is special about this postal stamp?



This postal stamp was issued by Pakistan Post in 1966, which projects the herbal wealth and an image of IbnSina (981-1037 C.E.), known as Avicenna in the West. IbnSina has been very popular at a global level and is covered in different books on History of Medicine. British Pharmacology Society (BPS) decided to publish regularly in its Bulletin the postage stamps that portray the images of famous physicians and scholars of the past. Interestingly, this postal stamp occupied the first place in this series (BPS Bulletin Spring issue 2001, www.bps.ac.uk). Later this was covered in a popular article titled Trends in Ethnopharmacology (J.Ethnopharmacol, 2005, 100, 43-49) by Prof. Anwar Gilani (Chairperson, PCST) which has attracted over 330 citations so far.

IbnSina authored one of the most famous books, al-Qanun fi al-Tibb, known as "Canon" in the west, which is considered an immense encyclopedia of medicine and remained supreme for over six centuries because of its

systematic approach, formal perfection and intrinsic value. He laid the foundation of the Greco-Arab system of herbal medicine (UnaniTibb), based on the philosophy of individualized treatment considering the genetic variations amongst the individuals, similar to the concept of Pharmacogenetics in conventional medicine. Another distinguishing feature of IbnSina's philosophy was "treating body as a whole" taking also into consideration of emotions and including spirituality as a part of treatment modalities.



Abu Ali al-Hussain Ibn Abdullah IbnSina was a Persian polymath who is regarded as one of the most significant thinkers writers of the . Born in 980 A.D. at Afshana near Bukhara, the

young Bu Ali received his early education in Bukhara, and by the age of ten he had become well versed in the study of the Qur'an and various sciences. While still young, he earned repute for his expertise in medicine and at the age of 17, he was fortunate in curing NoohIbn Mansoor, the King of Bukhhara, of an illness in which all the well-known physicians had given up hope. On his recovery, the King wished to reward him, but the young physician only desired permission to use his uniquely stocked library.

Of the 450 works he is known to have written, only around 240 have survived, including 150 on philosophy and 40 on medicine. His most famous books are Kitab al-Shifa (The Book of Healing)-a philosophical and scientific

encyclopedia, and The Qanun fi al-Tibb, known as Canon in the West, a medical encyclopedia which became a standard medical text at many medieval universities remained in use as late as 1650.

He was the most famous Physician, Philosopher, Encyclopaedist, Mathematician and Astronomer.



To mark the 1,000th birth anniversary of the most influential of Muslim philosopher-scientists, UNESCO minted this commemorative medal in 1980. Designed by sculptor-medallist Victor Douek, the obverse depicts a scene showing Avicenna surrounded by his disciples, inspired by a miniature in a 17th-century Turkish manuscript.

"The enduring respect in the 21st century for a book written a millenium earlier is a testimony to IbnSina's achievement"-

Mona N. Tibi and Emilie Savage-Smi

Directory of Productive Scientists of Pakistan (PSP)

The quality, volume, impact and utility of scientific research are the four main aspects which are considered while evaluating any scientific work.

The latest available directory of Productive Scientists of Pakistan includes the data of 2737 scientists from various fields of natural and applied sciences, who have contributed in scientific research from the beginning of their career up to 2011. It incorporates a wide range of

indicators for assessment of both quantity and quality of research and its impact. However, due to limited logistic and human resources available, one of the most important indicators i.e. citations of scientists, could not be included in the last directory published in 2013. PCST is now putting vigorous efforts to complete the data for the directory of "Productive Scientists of Pakistan" up to 2014. These data will also include the citations and may also have the h-index of the scientists.

STD Voice

PCST has been publishing a quarterly journal namely Science, Technology and Development (STD) since 1982 without break as a part of its mandate. The aim of publishing this journal is to make available policy analysis in all disciplines of science including science education. This journal serves as a forum for researchers for presenting their research findings and sharing the knowledge with the scientific community. Although the journal has a broad scope, however its potential has not yet been fully explored. In the recent past, efforts were made to improve the journal and as a result thereof, the journal has been recognized by HEC and is placed in "Z" category. However, its standing in the international scientific community is still limited. It is pertinent to mention here that at present only 104 science journals are recognized by HEC in different categories out of which only 14 journals published from Pakistan are ISI Indexed.



Volume 34, Number 1, 2015

The current Chairman of the Council-an accomplished scientist with sound scientific background, has taken important steps to improve the quality and visibility of the journal by making use of his strong linkages with the scientific community. We are pleased to announce that his efforts, together with other members of the Editorial Board, have led to the development of our own Content Management System (CMS) i.e. online submission, publishing, editing and modification of contents of the journal. The first online issue of STD, volume 34, issue1, 2015 is already available on PCST website. In this regard, the support of Asian Council for Science Editors (ACSE) is highly commendable.

Cases for Indexing/Abstracting of the journal with CABI, Zoological Record, Chemical Abstract Services, Cambridge Scientific Abstract, ASCI etc. are already under way. It is anticipated that the journal of Science, Technology and Development will very soon be an ISI Indexed journal and it will assertively be among the top indigenous journals in next few years.



Members of the Editorial Committee of STD

Events Organized

- One-day National Workshop on Potential of Value Addition and Health Benefits of Indigenous Herbal Wealth and Functional Foods, Jun 17, 2015 – Islamabad

Pakistan has a rich history on the folk use of plants. There are more than 6,000 species of plants, over 12% of which are used medicinally, which means we have enormous opportunities for agro-based, and more importantly for herbal-based industrialization. However, despite

resurgence of herbal medicine at the global level, unfortunately we are not capitalizing our herbal wealth.

Realizing the Value of Health Benefits of Indigenous Herbal Wealth, PCST, organized a workshop titled Potential of Value Addition and Health Benefits of Indigenous Herbal Wealth and Functional Foodson 17th June, 2015 in Islamabad. This event provided a very useful platform to bring together experts from R&D organizations, academia, industry and from government bodies to explore different

avenues of indigenous herbal wealth. The participants of the workshop were a notable number of eminent scientists, academicians, pharmacologists, industrial experts and professionals.

The inaugural ceremony was graced by the Federal Minister for Science and Technology, H.E Rana Tanveer Hussain who, while addressing the audience, said that this is an extremely important subject that requires thorough deliberations to chalk out clear strategies to utilize intelligently and efficiently our indigenous knowledge base

for economic uplift as well as to properly preserve and document our centuries old wisdom for future generations of Pakistan. The Guests of Honor included Prof. Dr. Anwar Nasim, President, PAS and Prof. Dr. Muhammad Ashraf, Chairman PSF. Chairman PCST, Prof. Dr. Anwar-ul-Hassan Gilani, in his welcome address emphasized that it is the need of time to properly channelize this sector and to establish R&D institutes on oriental medicine without further delay, as is the case in our neighboring countries, like China and India.



The inaugural session was followed by the technical sessions and panel discussions in which experts from academia, industry and government, highlighted the problems and issues in the development of the sector, as well as shared wisdom on the way forward. About 80 participants representing 40 organizations (universities, R&D organizations and industry) attended the workshop for exploring full potential of our herbal wealth.

workshops in different major cities of Pakistan in order to inspire and encourage R&D directed towards solving problems of the industry and society. At the end of this series of workshops, policy recommendations about different aspects of the subject matter would be presented to the government for implementation.

In the closing address Chairman PCST thanked the speakers, panelists and participants for their active contribution and vowed to take this initiative forward with the support of all stakeholders. The workshop concluded by certificate distribution ceremony.

- **One-day Consultative Workshop on Policies for Creating Enabling Environment for Encouraging Problem-Solving Research, Jun 11, 2015, Islamabad**

PCST, in collaboration with the Institute of Research Promotion (IRP), has planned to organize a series of



The 8th workshop of the series was held with the cooperation of the Pakistan Academy of Sciences on June 11, 2015 in Islamabad. About 80 participants representing 40 organizations (universities, R&D organizations and industry) attended the workshop. In the Inaugural Session of the workshop Mr. Kamran Ali Queshi, Federal Secretary, Ministry of Science and Technology, Prof. Dr. Anwar-ul-Hassan Gilani, Chairman PCST and Prof. Dr. Tariq Mahmood, Adviser (R&D), Higher

Education Commission addressed the audience and shared their views on this very important issue.

The inaugural session was followed by the technical sessions, in which Dr. Tariq Bashir, Principal Research Officer, PCST and Mr. Rahmat Ullah, Chief Coordinator, IRP made presentations to set the scenario for group discussion.



In the consultative and brainstorming session, participants were divided into different groups. Each group was required to deliberate on different aspects of the subject matter.

At the end of the consultative and brainstorming session, the leader of each group made a short presentation about the suggestions his group had made on the topic. The workshop concluded by certificate distribution ceremony.

- “ORIC Conference” on Take measures for effective collaboration among academia, research and development organizations and industry for development of indigenous products or technologies” Mar 5, 2015 in Lahore.

collaboration among academia, research and development organizations and industry for development of indigenous products or technologies”, PCST, in collaboration with the Institute of Research Promotion and Lahore Chamber of Commerce and Industry, organized “ORIC Conference” on 2015 in Lahore.

The event was hosted by Lahore Chamber of Commerce and Industry. About 60 participants, representing 45 universities from different parts of the country attended the event. Industry representatives, including President, LCCI, were also present at the event.

In the conference, the following participants made presentations/speeches on various aspects and dimensions of strengthening linkages between academia and industry and, creating enabling environment for encouraging problem-solving research in higher education institutions.

In line with its mandate “Take measures for effective



ORIC Conference at Lahore Chamber of Commerce

The following were some of the eminent participants of the conference:-

1. Prof. Dr. Anwar-ul-Hassan Gilani, Chairman, PCST
2. Mr. Ijaz A Mumtaz, President, Lahore Chamber of Commerce and Industry
3. Dr. Amjad Saqib, Chairman, Akhuwat
4. Mr. Abrar Ahmed, Convener, LCCI Standing Committee on Education
5. Dr. Tariq Bashir, Principal Research Officer, PCST
6. Dr. Arabella Bhutto, Co-Director, Mehran University Institute of Science, Technology and Development, Jamshoro
3. Mr. Rahmat Ullah, Chief Coordinator, Institute of Research Promotion, Lahore

In the consultative and brainstorming session, participants were divided into different groups. Each group was required to deliberate on different aspects of the subject. At the end of the session, the leader of each group made a short presentation about the suggestions him group had made on the topic.

- A Workshop on Encouraging Problem-Solving Research was organized by ORIC, University of Karachi in collaboration with PCST on Apr 9, 2015.
- One-day Consultative Workshop on Policies for Creating Enabling Environment for Encouraging Problem-Solving Research, Apr 7, 2015, Jamshoro



Dr. Tariq Bashir during the ORIC workshop held at University of Karachi

- ACSE Workshop for Journal Editors

Pakistan Council for Science and Technology in collaboration with Higher Education Commission Pakistan and Asian Network for Scientific Information organized a one-day ACSE workshop on "Publication Ethics and

Journal Policies" on Feb 4, 2015 in Islamabad. The participants of the workshop were editor-in-chiefs of peer-reviewed journals, editorial board members, journal publishers, authors and early career researchers. The workshop was led by Dr. Elizabeth Wager, a recognized expert in publication ethics, former Chair of the Committee on Publication Ethics (COPE), and author of several COPE guidelines. The inaugural session included thoughtful speeches by different recognized experts including Prof. Dr. Anwar-ul-Hassan Gilani, Chairperson PCST and Dr. Mansoor Akbar Kundi, Executive Director, HEC. Dr. Gazi Mahabubul Alam, Vice President of ACSE thanked the collaborators in his welcome speech and also gave a brief introduction of the council activities to all the participants. Prof. Dr. Farzana Latif Ansari, Dr. Saima Nasir, Ms. Hafza Safdar, Ms Aqsa Iqtidar, from PCST, participated in the workshop.



Participants from PCST attending the Workshop

This full day workshop included lectures, small group interactions, and lively discussions with the participants. Dr. Wager suggested that it is helpful to have a written policy document, detailed procedures, and information for authors, reviewers, and editorial board members. These documents should cover topics such as plagiarism, redundant publication, dispute submissions, conflicts of interest, authorship, research misconduct (fabrication and falsification), and, where relevant, unethical research.



Mr. Faisal Baig, SRO, PCST, receiving the shield from Dr. Wager.

She also suggested practical steps that journals may take to encourage ethical behavior and detect possible misconduct by authors, reviewers or editors.

The event ended with certificate and souvenirs distribution ceremony among the participants and collaborators.

Staff's Voice

- Prof Dr. Farzana Latif Ansari, Adviser, delivered Keynote lectures in the following conferences/workshops.
 - i. Exploring New Avenues in Medicinal Chemistry: Opportunities and Challenges" FCC University, Lahore (Jan 24-26, 2015), lecture titled "Evolution of 4D".



- ii. Keynote lecture titled "From Magic Bullet to Magic Shotgun-a Paradigm Shift in 4D" at International Conference on Recent Innovations in Pharmaceutical Sciences, Riphah Institute of Pharmaceutical Sciences, ICRIPS(Mar 3-5, 2015).
- iii. Workshop on Bioinformatics during ICRIPS, "Various Approaches of Drug Designing—from Serendipity to Rationality".
- iv. Invited Speaker at Meeting of Experts for "Establishing an Advance Computational Facility in COMSTECH" on Apr 27, 2015
- v. 1st Hands on workshop on Bio-molecular Simulations (BioMoS-1), National University of Sciences and Technology, Islamabad, May 4-7, 2015.

- Mrs. Jamila Ahmad received a training titled "Monitoring at Evaluation/RBM (tools, techniques

- Inaugural lecture titled "On the Road to CADD".
- Guest of Honour at Closing Ceremony and delivered a lecture titled "On the road to computational chemistry-A Travelogue".



- vi. 3rd National Computational Science Conference (NCSC 2015), Institute of Space Technology, Islamabad, May 13-15, 2015, Plenary lecture, Evolution of computational chemistry in Pakistan.



and approaches)" at Pakistan Planning and Management Institute during Feb 17-20, 2015

Women's Voice

"There are two powers in the world; one is the sword and the other is the pen. There is a great competition and rivalry between the two. There is a third power stronger than both, that of the women"

Quaid-i-Azam

Gender Mainstreaming in Science, Technology and Innovation

The gender dimension of science and technology (S&T) has become an increasingly important issue worldwide. In the drive to strengthen knowledge-based societies and

technological advancements, policy-makers are looking to ensure that their countries have an adequate supply of researchers. In Pakistan, the percentage of female researchers jumped from 23% in 2002 to 27% in 2008 that exceeds Asian average (17%) and equals to international average. But there is still a long way to achieve gender equity.

Realizing the widening gender gap and the obscured status of women in socio-economic development, especially focusing on the gender dimension of science and technology has taken a lead to foster women in scientific community and to improve visibility of women scientists by maintaining a website and starting a project on collecting data on statistics of women representation in science and technology. So far the detailed data of more than 300 productive women scientists are available online at http://pcst.org.pk/wst/wst_cv.php. The data and materials from this web resource would hopefully serve as a reference material for the scientific community and for the professionals working in the field of women's empowerment, as well.

Reference to this initiative, a study titled "Gender Mainstreaming in Science, Technology and Innovation" authored by Saima Nasir, Jamila Ahmed and Mudassar Asrar was published in the journal *Science, Technology and Development* (Nasir et al., 2014. *Sci. Tech. and Dev.* 33 (4): 143-152). The paper discusses gender parity in relation to science and technology situation in Pakistan. The ratio of women in science has been reviewed in comparison to men by considering their number and ratio at different levels of education, science and technology manpower of the country and contribution to research and development (R&D) activities. The study also considered the contribution of women scientists and engineers in terms of patents, impact factor and citations.

The paper concludes that better female contribution in science and technology should no longer be looked at only from the viewpoint of gender equality but as a prospective asset for national socio-economic development. It is the need of time to make educational institutes more responsive to the needs of the women by establishing cells/units in colleges and universities to oversee the effective implementation of gender based government policies and programs and to provide guidance and counseling in academic, financial, social and other matters to women. Policies are needed to ensure that women's education gives them the tools they need to be competitive in the job market. Thus the focus of these policies should be on achieving "gender equity" that can only be realized by the outcome of

more equal representation, rather than on merely promoting the study of science. Another important factor in achieving these reforms will be a greater presence of women in decision-making bodies of science. Initiatives are required to increase the recruitment, retention and success of women in science and technology. Keeping in view, the religious, social and cultural barriers that may hinder the education and careers, an adequate social infrastructure and policy environment should be provided by the government to facilitate women's entry into the fields of science and technology.

Governments need to provide an appropriate policy environment which can help women to balance family and professional responsibilities. This support may be for the professional, personal and family needs of women through their education, career development and their employment. Policies should focus the areas including a childcare subsidy for working mothers, and accommodating their needs as wives and mothers. A program of establishing re-entry scholarships and bridging courses will provide "second chance" opportunities for women to re-enter their chosen profession, to recommence study even after getting married and child bearing. Also, a fellowship scheme can be introduced for women who have children, thereby enabling them to come back, work and re-establish themselves in their field. This will save a large potential from getting wasted.

Women's empowerment through science and technology requires changes both at the individual level and that of society. It is, therefore, not only the responsibility of the government to provide appropriate policy environment fostering women in scientific community, but also civil society organizations need to share the process of change by the initiation of the public awareness campaigns. These campaigns will help in achieving the goal of gender parity by helping to improve understanding of the effects of gender harassment and by developing strategies to remove the impediments to women in S&T education, training and employment.

Immediate steps may be required to bridge the gender gap in science and technology as leaving all the problems to women or their employers will only worsen the situation. Understanding the informal obstacles, which women face in scientific endeavors can help to improve the situation, however the underlying causes for gender differences in science and technology require an in-depth study.

Dr. Saima Nasir
Senior Research Officer, PCST

Nobel Laureates' Voice



Ability to See Single Molecules Gets Chemistry Nobel, 2014

The Nobel Prize in Chemistry 2014 was awarded jointly to Eric Betzig, Stefan W. Hell and William E. Moerner "for the development of super-resolved fluorescence microscopy".

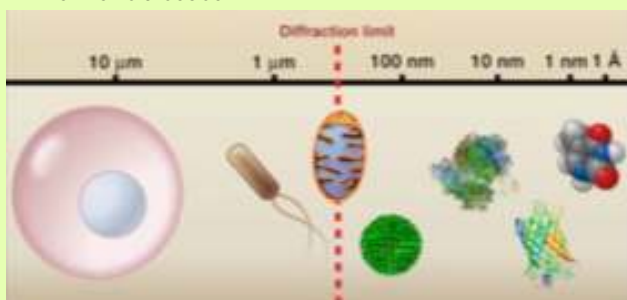


Eric Betzig

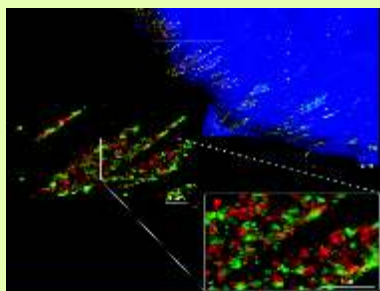
Stefan W. Hell

William E. Moerner

These scientists figured out a way to see things that most scientists thought could never do before. These three scientists developed two different techniques for increasing the power of light microscopy, allowing scientists to see molecules in action within a living cell, watch DNA being put together, and follow the actions of proteins involved in Huntington's disease and Alzheimer's disease.



Sizes of various biological entities and the diffraction limits.



Proteins within a cell as seen with techniques developed by Chemistry Laureates.

For a long time optical microscopy was held back by a presumed limitation: that it would never obtain a better resolution than half the wavelength of light. Helped by fluorescent molecules the Nobel Laureates in Chemistry 2014 ingeniously circumvented this limitation. Their ground-breaking work has brought optical microscopy into the nanodimension.

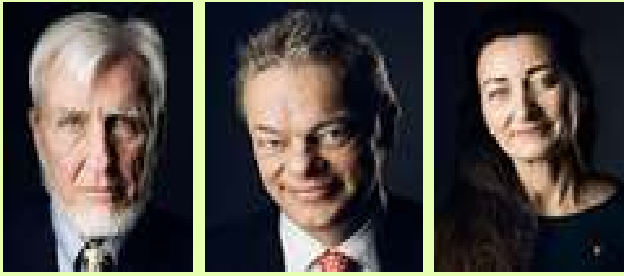
In what has become known as nanoscopy, scientists visualize the pathways of individual molecules inside living cells. They can see how molecules create synapses between nerve cells in the brain; they can track proteins involved in Parkinson's, Alzheimer's and Huntington's diseases as they aggregate; they follow individual proteins in fertilized eggs as these divide into embryos. These three scientists are awarded the Nobel Prize in Chemistry 2014 for having bypassed this limit. Due to their achievements the optical microscope can now peer into the nano world.

Two separate principles are rewarded. One enables the method Stimulated Emission Depletion (STED) microscopy, developed by Stefan Hell in 2000. Two laser beams are utilized; one stimulates fluorescent molecules to glow, another cancels out all fluorescence except for that in a nano metre-sized volume. Scanning over the sample, nanometre for nanometre, yields an image with a resolution better than Abbe's stipulated limit. Betzig and Moerner, working separately, laid the foundation for the second method, Single-molecule Microscopy. The method relies upon the possibility to turn the fluorescence of individual molecules on and off. Scientists image the same area multiple times, letting just a few interspersed molecules glow each time. Superimposing these images yields a dense super-image resolved at the nano level. This novel development is expected to revolutionize biology and medicine by allowing a realistic and quantitative description at nano molecular biological processes that define the phenotype of all life forms.

Nobel Prize in Physiology or Medicine, 2014

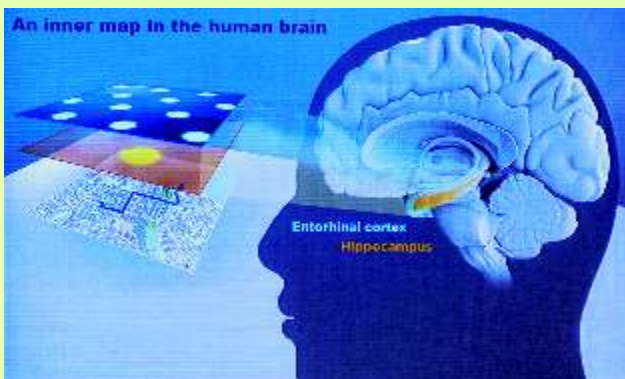
The 2014 Nobel Prize in Physiology or Medicine has been awarded to Dr. John M. O'Keefe, Dr. May-Britt Moser and Dr. Edvard I. Moser for their discoveries of nerve cells in the brain that enable a sense of place and navigation. These discoveries are ground breaking and provide insights into how mental functions are

represented in the brain and how the brain can compute complex cognitive functions and behavior.



John O'Keefe Edvard I. Moser May-Britt Moser

An internal map of the environment and a sense of place are needed for recognizing and remembering our environment and for navigation. This navigational ability, which requires integration of multi-modal sensory information, movement execution and memory capacities, is one of the most complex of brain functions. The work of the 2014 Laureates has radically altered our understanding of these functions. John O'Keefe discovered place cells in the hippocampus that signal position and provide the brain with spatial memory capacity. May-Britt Moser and Edvard I. Moser discovered in the medial entorhinal cortex, a region of the brain next to hippocampus, grid cells that provide the brain with an internal coordinate system essential for navigation. Together, the hippocampal place cells and the entorhinal grid cells form interconnected nerve cell networks that are critical for the computation of spatial maps and navigational tasks. The work by these scientists has dramatically changed our understanding of how fundamental cognitive functions are performed by neural circuits in the brain and shed new light onto how spatial memory might be created.



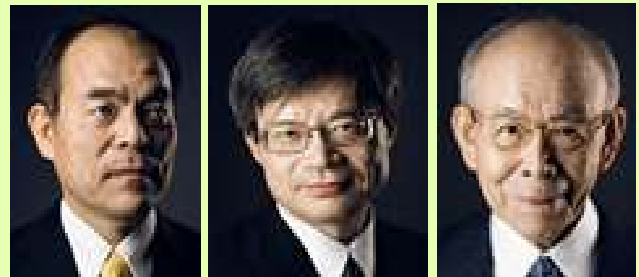
A schematic showing grid cells (blue) and place cells (yellow) in the entorhinal cortex and hippocampus, respectively.

The discoveries of place and grid cells by these three present a paradigm shift in our understanding of how ensembles of specialized cells work together to execute

higher cognitive functions. The discoveries have profoundly promoted new research with grid and place cell systems now found in many mammals, including humans. Studies of the navigation system have opened new avenues for studying how cognitive processes are computed in the brain. Brain disorders are the most common cause of disability and despite the major impact on people's life and on the society, there is no effective way to prevent or cure most of these disorders. The episodic memory is affected in several brain disorders, including dementia and Alzheimer's disease. A better understanding of neural mechanisms underlying spatial memory is therefore important, and the discoveries of place and grid cells have been a major leap forward to advance this endeavor.

Your Phone Screen Just Won the Nobel Prize in Physics, 2014

The 2014 Nobel Prize in physics has been awarded jointly to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura for their pioneering work on blue LEDs, or light-emitting diodes. Blue LEDs are important for two reasons: first, the blue light has specific applications of its own and second, because it's a vital component of the white light which makes white LEDs, and therefore LED computer and phone screens, possible.



Shuji Nakamura Hiroshi Amano Isamu Akasaki

Fundamentally, the simplest LEDs are two pieces of a semiconductor material sandwiched together. Semiconductors, as their name suggests, are materials that don't conduct electricity all that well.

This property might seem to demarcate them as thoroughly unremarkable, but in fact this propensity for unimpressive transmission of electrical currents has a huge advantage to technologists: its flexibility. If you take a semiconductor – silicon, for example – and mix in tiny amounts of impurities during manufacture, you can radically alter its electrical properties. The two broad types of semiconductor you can make are called n-type

and p-type. To make an n-type semiconductor, the impurity you add needs to be something which has lots of electrons. This gives the semiconductor an excess of electrons, and makes it a slightly better conductor of electricity. A p-type semiconductor is the opposite: you add a chemical element which has a deficiency of electrons compared to the semiconductor around it, and you end up with an excess of "holes" – missing electrons, stolen from the semiconductor by the impurities you've added. (Counter-intuitively, this also increases the conductivity, because these holes can carry current too) But it's when you stick n-type and p-type together that the real magic happens.



Blue LEDs – Filling the world with new light

The LED lamp holds great promise for increasing the quality of life for over 1.5 billion people around the world who lack access to electricity grids: due to low power requirements it can be powered by cheap local solar power. The invention of the efficient blue LED is just twenty years old, but it has already contributed to create white light in an entirely new manner to the benefit of us all.

Technology Foresight Meetings

Technology Foresight Panel Meetings on Marine Resources

The 2nd Technology Foresight Expert Panel Meeting on Marine Resources was held on Feb. 26, 2015 at PCST. Prof. Dr. Anwar-ul-Hassan Gilani addressed the opening session of the meeting. The meeting was attended by distinguished members from public sector R&D organizations, academia and private sector.

Dr. A. R Tabrez chaired the technical session of the meeting. A brainstorming session was held to identify the emerging issues in the area of Marine Resources and how can we overcome the challenges that are lying on the horizon. Priority areas, areas of technological intervention, key technologies and policy recommendations were provided by the Panel. Moreover, the format of the Technology Foresight Report was also discussed during the meeting.

The 3rd expert panel meeting on Marine Resources was held on 18th May 2015.

Technology Foresight Panel Meetings on Public Health and Sanitation

A number of Expert Panel Meetings and brainstorming

sessions were organized at PCST to finalize the recommendations of the panel.

- 1st Technology Foresight Expert Panel Meeting held on April 14, 2015
- 2nd Technology Foresight Expert Panel Meeting held on May 5, 2015
- 3rd Technology Foresight Expert Panel Meeting held on May 19, 2015
- 4th Technology Foresight Expert Panel Meeting held on May 29, 2015



Chairman, PCST chairing Technology Foresight Expert Panel Meeting on Public Health and Sanitation.

Speaker's Voice

In continuations to the lectures organized at PCST, the following two speakers delivered lectures during the month of Ramadan.

1. Prof. Anwar-ul-Hassan Gilani delivered a lecture titled

"Effect of fasting on human health" on Jun 18, 2015.

2. Prof. Farzana Latif Ansari delivered a lecture titled "Linguistic miracles in the Miracle" on Jun 24, 2015.

Young Scientist's Voice



STI Voice includes a designated place for young Scientists in each issue, which will cover contribution of a young scientist towards any important scientific study in basic and/or applied research with potential for application/commercialization.

For this issue, PhD thesis of a recently graduated PhD scholar has been selected which presents common interest topic with important finding and impact on human health as detailed below:

Title of thesis: Effect of the combination of Turmeric and Kalongi in metabolic syndrome in fructose-fed rats and a double-blind randomized-controlled clinical trial

Name of Scientist: Faridah Amin, MBBS, FCPS, MRCGP, MCR, PhD (Pharmacology) Aga Khan University

Research Supervisor: Prof. Dr. Anwar-ul-Hassan Gilani

Degree awarded: PhD in Health Sciences 2015

Current position: Director, ORIC, Ziauddin Medical University, Karachi.

Summary: Amongst non-communicable diseases, metabolic syndrome (MS), a cluster of metabolic disorders including obesity, hyperglycemia, hyperlipidemia and hypertension, is highly prevalent in modern society. Due to its rising incidence and demanding life-long use of multiple drugs, there is a growing interest in testing and developing safe alternative remedies. First Animal studies resulting in a better rat model of MS with low HDL were conducted, thus allowing studying the enhanced effect of combination of

Turmeric and Kalonji. Study conducted on human revealed that around 30 % were overweight with nearly 60 with central (abdominal) obesity and when Kalonji and Turmeric given in combination with 60% dose of the individual herbs, showed an improvement in all studied parameters of MS including body fat, cholesterol (also HDL) and blood glucose. The results therefore, for the first time, revealed enhanced effect of a low dose combination of Turmeric and Kalongi on parameters of MS among animals as well as humans and this study has huge impact on public health offering relatively safe and cost-effective remedy for some chronic diseases. Details of the study can be found in the following publications resulted from the thesis.

1. Amin F, Islam N, Anila N, Gilani AH. 2015. [Clinical efficacy of the co-administration of turmeric and black seeds \(Kalongi\) in metabolic syndrome - A double blind randomized controlled trial- TAK-MetS Trial](#). *Complementary Therapies in Medicine* 23: 165-174;
2. AminF, Gilani AH, Mehmood MH, Siddiqui BS, Khatoon N, 2015. [Co-administration of Black seeds and Turmeric shows enhanced efficacy in preventing metabolic syndrome in fructose-fed rats](#). *Journal of Cardiovascular Pharmacology* 65 (2): 176-83.
3. Amin F, Fatima SS, Islam N, Gilani AH. [Prevalence of obesity, clinical markers and associated factors in a sub-urban community of Karachi, Pakistan](#). *BMC Obesity* 2015.2:16; doi:10.1186/s40608-015-0044-6
4. Amin F, Gilani AH. [Fiber-free white flour with fructose offers a better model of metabolic syndrome](#). *Lipids in Health and Disease* 2013, 12:44; doi:10.1186/1476-511X-12-44

Funding Opportunities

IFS Individual Research Grant

We live today in a world that faces many interlinked crises. Some of the greatest challenges are in the developing world where the scientists of tomorrow strive to secure their career in research today and to contribute to a global research community that is reducing poverty and supporting sustainable development. The mission of International Science Foundation (IFS) is that Young men and women

scientists in developing countries conduct relevant and high quality research and put it into use.

In order to contribute to this goal, IFS invite proposals from young scientists in biological and water resources in low income countries. These proposals are rigorously assessed by international experts, to enable best early career scientists to work in their own country and tackle research issues related to local needs. IFS shall identify, through a

Careful selection process, promising young scientists from developing countries with potential to become future lead scientists and science leaders thereby helping them to become established and recognized nationally and internationally. The IFS grant is intended for the purchase of the basic tools needed to conduct a research project: equipment, expendable supplies, and literature.

So far, IFS has awarded over 7,000 small grants, in over 100 countries, building capability of tens of thousands of young developing world researchers. An individual IFS Research Grant amounts to USD 12,000. One person can receive no more than two individual grants.

The applicant must be a citizen of an eligible country and carry out their research in an eligible country (this does not have to be the country of citizenship). » Eligible countries list 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

DEADLINE: Dec. 31, 2015

Further information is available on www.ifs.se/ifs-programme

PCST happens to be the focal organization representing Pakistan in IFS

Talented Young Scientists Visiting Program (TYSP), China.

Chinese Ministry of Science and Technology has launched "Talented Young Scientists Visiting Program". Under this program, Young Scientists under the age 45 may apply for funding upto 2000 US Dollars, For the duration of 6-12 months. The program is purely on merit based and selection of candidates is by Ministry of Science and Technology, China only. The Program is very much attractive and beneficial for Pakistan. Interested candidates may contact directly to www.tysp.org/english website.

Worldwide Cancer Research grants are awarded for novel research proposals that are entirely the original work of the applicants. Awards grants to support fundamental or translation research into the causes, mechanisms, diagnosis, treatment or prevention of cancer. The maximum budget allowed is £250,000. Worldwide

Cancer Research accepts grant applications twice a year in April and October. The deadline to submit application is **Oct 1, 2015**

<http://www.worldwidecancerresearch.org/funding/make-an-application>

Dr. S. J. Zuberi Research Grant:

Pakistan Medical Research Council invites research projects for funding under Dr. S.J. Zuberi Research Grant. The maximum limit for the grant is Rs. 0.5 Million. The Theme for the year 2015 for submission of Research Project, to be funded under this grant, is "Reduction/clearance of Viraemia in HBV and HIV co-infected patents". The deadline for submission is **Dec31, 2015**, www.pmrc.org.pk

Funding opportunities in Germany

- DAAD-Leibniz Fellowship

The German Academic Exchange Service (DAAD) invites applications to the joint DAAD-Leibniz fellowship program that is open for young postdocs from the fields of Humanities / Educational Research / Life Sciences / Mathematics / Natural Sciences / Engineering Sciences and Environmental Sciences. Applications are invited from young postdocs who have completed their PhD not longer than two years ago. For more information see attached information sheet. The fellowships can be completed at one of the listed Leibniz institutes. www.ic.daad.de/islamabad, director@daad.org.pk.

- Energy research

Germany is a leading country both in energy research and in the development of energy technologies. The German Government as well as the European Union in recent years have allocated considerable funds for the research on renewable energy systems.

Qualified Pakistan researchers of all academic levels are welcome to join German research institutes for PhD, Post-doc or advanced research in order to cooperate in fighting a global problem.

- Finding a research institute

Please find attached a list of research institute that may match your research interest. To search for more addresses, use the platforms

www.research-in-germany.de;
 www.bmwi.de/EN/root.html;
 www.research-explorer.de .
 www.mpg.de
 www.helmholtz.de/en/research/energy/
 www.zef.de

- **Funding of PhD research**

Some university and non university research institutes run their own funding programmes or offer paid PhD positions. Otherwise, PhD candidates may apply for a DAAD research grant. For more information, see www.funding-guide.de or contact our office (info@daad.org.pk) . HEC scholarships are also a very good option.

- **Funding of postdoc and advanced research**

If the German research institute does not offer funding or employment, postdocs and advanced researchers may apply to Alexander von Humboldt Foundation (www.avh.de). The DAAD together with the Leibniz Association offer fellowships for young postdocs at one of the leibniz institutes (see www.daad.de/leibniz). In addition, Pakistani researchers and their German counterparts may check out the funding possibilities of the Marie Sklodowsky Curie Actions within the European framework programme “Horizon 2020”.

- **Masters degree courses for young Professionals**

Young professionals in the field of energy, holding a first degree (16 years of education) in a related subject and with at least two years of professional experience (in industry, administration, organizations – not at universities), may apply to one of the following DAAD funded Masters degree courses:

- a) “Master of Engineering in Energy and Environmental Management on Developing Countries” at Flensburg University (iim.uni-flensburg.de/index.php?id=3679)
- b) “Postgraduate Programme Renewable Energy” at University Oldenburg (www.uni-oldenburg.de/nc/en/ppre/)
- c) Masters Program “Infrastructure Planning” at Stuttgart University (www.mip.uni-stuttgart.de)
- d) Masters Program “Renewable Energy Management (REM)” at Cologne University of Applied Sciences

(www.rem-master.info)

- **Research in Agriculture and Ecology**

The “Exploitation of full potential of livestock and Agriculture sectors for ensuring national food security” is one of the goals set by the Pakistan Council for Science and Technology in its Sciences Technology and Innovation Strategy 2014-18.

Likewise, in its National Research Strategy “Bio Economy 2030”, the German Government has set itself the goal of “supporting global nutrition, securing biomass-based raw materials and energy supplies, and protecting the climate and environment” (www.bmbf.de/pub/National_Research_Strategy_BioEconomy_2030.pdf) and thus promotes related projects in research and industry. Funding opportunities PhD research, postdoc and advanced research and Masters degree courses for young professionals may be found on the above websites

HEC Research grants (NRPU)

To meet the current challenges of researchers working in local universities/DAIs of Pakistan and to promote the R&D in the country, HEC has initiated National Research Program for Universities (NRPU) to provide research grants, in all disciplines of Science, Engineering and Technology, Social Sciences, and Humanities, to a maximum of Rs. 20.00 million. The amount to which a researcher is eligible is conditional with his impact factor. The applicant should be a full time faculty member of a university and should have an advanced academic degree and relevant research experience. For further details, visit, www.hec.gov.pk/InsideHEC/Divisions/RND/ResearchGrants/NRPU/Pages/NRPU.aspx

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.

Announcements

- **ECNCST and NCST Meetings**

Pakistan Council for Science and Technology is in the process of holding the next meeting of the Executive Committee of National Commission of Science and Technology (ECNCST) to be headed by the Minister for Science and Technology, which will be followed by meeting of the National Commission of Science and Technology (NCST), headed by the Prime Minister of Pakistan.

- **1st National Conference on Agri-Tourism: Challenges and Opportunities, to be held on Sep 23, Islamabad**

Jointly by the PCST and Agri-Tourism Development of Pakistan, the above title conference is being organized. For further details, visit the websites of the respective organizations, www.pcst.org.pk; www.atdcpakistan.com

- **PAMS Young Scientist Awards-2014-15**

The Pakistan Academy of Medical Sciences (PAMS) presents Awards and Gold Medals for the outstanding original research paper(s) published by young professionals in one of the fields of Medicine, or other Biological/Biomedical Sciences. In addition to a Gold Medal, each recipient will receive a Certificate and a Bursary of Rs. 100,000/-. Three aspects receive maximum attention in making the decision: the quality of the execution of the study, the literary presentation of the material, and the usefulness of the study's conclusions. Up to 4 awards will be given this year. The award winners will be invited to present their research findings at the scientific session of the Academy's convocation likely to be held in October at the University of Health Sciences, Lahore.

This PAMS Award is strictly for young professionals, and neither any Fellow of PAMS nor anyone above the age of 40 is allowed to compete. Only work done in Pakistan is considered, and the nominee must be a principal author (First Author or Corresponding Author). Two hard copies of the selected research paper(s) published during the year 2014-2015 along with a copy of CV with list of publications and copy of NIC may please be submitted to the undersigned by August 30, 2015 as well as electronic copies of paper and CV at pams.sci.secretary@gmail.com

Annual Summit on Youth in the United Nations

- Applications are invited to attend The Annual Summit on Youth in the United Nations to commemorate the

70th anniversary of establishment of UN which is being organized in New York during Sep 21-26, 2015 (www.cross-continental-youth-summit.org).

- **STI Policy Voice**

Researchers/policy makers/all stakeholders are welcome to contribute their suggestions on existing STI policy.

- **Articles of common interest**

Scientists are requested to share their research findings of common interest through a 300 words summary that may find a place in the column of Scientists' Voice, of the forthcoming issue of the newsletter, after review by a local review committee.

- **Highlight your research**

STI Voice intends to highlight the contributions of young scientists who have recently completed their PhD in Basic and/or Applied Research with potential for application/commercialization of their innovative findings. They are requested to send a 500 words' abstract of their research or PhD thesis for possible inclusion in the column Young Scientists' voice for the forthcoming issue of the newsletter. The age limit is <40 years.

- **PSP Directory**

Work is being carried out on the compilation of the Directory of Productive Scientists of Pakistan (PSP) which is expected to be published in Dec, 2015. Scientists are requested to update their profile on the prescribed proforma available on the following web link. www.pcst.org.pk.

- **RPA**

Review of criteria for the RPA is an ongoing process and presently we are in the process of reviewing the existing criteria for the forthcoming RPA. In this regard, we will appreciate positive suggestions from the scientific community to improve the criteria which will be duly forwarded to National Review Committee to be constituted for the purpose. Suggestions/feedbacks may be emailed at rpa.feedback@gmail.com

Category wise presentation of total eligible scientists in each RPA year (2001-2013)

Category Wise RPA Awardees in each Year									
Year*	Number of Scientists							Total Scientists	Total Amount (Rs. Million)
	A	B	C	D	E	F	G		
2001	6	6	9	5	35	75	157	293	45.39
2003	-	1	4	9	23	67	168	272	29.49
2004	-	1	2	13	26	44	146	232	26.28
2005	-	2	2	3	21	48	145	221	23.01
2006	-	-	3	3	17	50	155	228	21.75
2007	-	-	3	4	15	50	157	229	21.81
2008	-	1	1	5	10	47	184	248	21.308
2010	26	16	8	12	38	103	299	502	32.231
2011	45	11	16	31	52	136	522	813	22.119
2012	47	10	21	36	66	196	637	1013	22.073
2013	32	65	96	128	-	-	-	321	11.34
2014	33	65	98	129	-	-	-	325	11.8
Total	189	178	263	378	303	816	2570	4697	

* RPA is based on previous year data

