



Moroccon Minister of Higher Education, Scientific Research and Training, and Executive Director COMSATS, signing Morocco's Accession Agreement to COMSATS

From the Executive Director's Desk News/Activities/Highlights from COMSATS Secretariat Special Section: Workshop on Repair and Maintenance of Scientific Equipment, Oman S&T Indicators of Member State: Uganda Activities/News of COMSATS' Centres of Excellence **Opinion:** Celebrating the International Year of Light & Light-based Technologies

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From the Executive Director's Desk

There are no signs that the overall gulf of Science and Technology capacity between the North and the South is diminishing in any meaningful way. Of course, some isolated examples indicate otherwise; such as, Iranian headway in nanotechnology, Pakistan's mastery of complete nuclear fuel cycle, India's successful space programme, South Africa's entry into biotechnology club, and Brazil's advances in agricultural and aviation technologies. However, no country of the South, except to some extent China, is expected to offer any challenge to the North's primacy in scientific advancements during the coming several decades. The real action is still taking place in the West with breathtaking advances in genetic engineering, artificial intelligence, Internet of things, robotics and 3D printing. These are concurrent but separate developments, having enormous significance individually. However, if used in integrated systems and employed for projecting power, there will be no escape from the perpetual dominance of the world by their creators. Contrast this with major preoccupations of some of the developing countries; clean water, sufficient food, internal socio-political strife, corruption, crime, terrorism, ebola virus, dengue fever, tsetse flies, and so on. This would not be the

case, had there been strong political will shown by the newly independent countries during the course of the last half century to utilize their human and natural resources for S&T capacity-building. There are no inherent impediments to do so. Unlike in the eras of industrial and electronics revolutions, there is now widespread awareness about the on-going and future technology revolutions, and there are people in the South with intellectual capacity to win Nobel prizes. What is more, a plethora of individuals and organizations have been sounding clarion calls to prepare for the future challenges. To say that opportunities have been floundered by the leaders of the South would be an understatement. The armed conflicts among and within developing countries have been playing havoc with their societies, shattering the dreams of their people to have better lives. Fifty years ago, Pakistan and India fought a bloody war and brought the economies of both countries to their knees, heralding an endless state of hostility in the region that continues to sap creative energies and hinder economic cooperation. The countries in the continent of Africa have been ravaged by a

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NEWS/ACTIVITIES/HIGHLIGHTS FROM COMSATS SECRETARIAT

Morocco Joins COMSATS as Member State

The number of Member States of COMSATS has now increased to twenty-two with the signing of the accession agreement by Kingdom of Morocco to join COMSATS. With Morocco's accession, the geographic representation at COMSATS from Asia and Africa balances off with 10 Member States each. The other two Member States are from Latin America. Morocco would be represented at the 3rd Commission Meeting of COMSATS to be held on 27th and 28th October 2015, in Accra, Ghana.

The agreement was signed by H.E. Mr. Lahcen Daoudi, Minister of Higher Education, Scientific Research and Training, Morocco, on behalf of the Government of Morocco, and the Executive Director COMSATS, Dr. Imtinan Elahi Qureshi, during a ceremony held in Rabat, on July 14, 2015.

The Ambassador of Morocco in Islamabad, H.E. Mr. Mustapha Salahdine and the Ambassador of Pakistan in R a b a t, H.E. Mr. Mohammed Waheed-ul-Hasan, played an important part in the process of Morocco's m e m b e r s h i p o f COMSATS. The latter also witnessed the signing ceremony of the accession agreement.

Speaking on the occasion, H.E. Mr. Daoudi stated that the Kingdom of Morocco is looking forward to playing

a constructive role as COMSATS' Member State. In his short statement on the occasion, Dr. Qureshi, inter alia, noted the unique geo-political importance of Morocco as the doorway to Europe and as a country where the first ever university of the world was established.

Morocco can now benefit from the technical programmes of COMSATS. It is expected that a suitable Moroccan R&D institution will be nominated to join COMSATS' Network of International S&T Centres of Excellence. Apart from scholarships for students from COMSATS' Member States, offered by various nodes of COMSATS' Network, Morocco can now benefit from various other programmes of COMSATS, such as the International Thematic Research Groups (ITRGs), invited lectures from COMSATS' distinguished professors, and capacity building and knowledge sharing activities.

COMSATS-ISESCO Cooperation Agreement for 2016-17 signed in Rabat

A cooperation agreement between COMSATS and ISESCO for the biennium 2016-17, entailing collaboration in 17 different activities, was formalized in Rabat, on 15th July 2015. The Executive Director COMSATS, Dr. I. E. Qureshi, and Director-General ISESCO, H. E. Dr. Abdulaziz Othman Altwaijri, signed the agreement on behalf of their organizations at ISESCO Headquarters. Also present on the occasion were: Advisor (Programmes) COMSATS, Mr. Tajammul Hussain, Dr. Amina Obaid Ramadhan Alhajri, Deputy Director-General ISESCO, Dr. Mustapha Ahmed Ali, Supervisor Directorate of External Relations and Cooperation (ISESCO), and senior officials of various Divisions and Sections of ISESCO. Some of the activities agreed upon in the cooperation agreement are continuation

of the already implemented serial workshops related to repair and maintenance of scientific equipment, and Internet security training, as well as those on Science, Technology and Innovation policies.

Before the signing ceremony, Dr. Qureshi briefed the Director-General about the meetings of COMSATS' delegation held earlier with Acting Director (Science) ISESCO, Ms. Aicha Bamoune, and former Director ISESCO Center

D.G. ISESCO and E.D. COMSATS at the Signing Ceremony of the Cooperation Agreement

> for Promotion of Scientific Research (ICPSR), Ms. Wafaa El-Alami, in connection with the upcoming joint activities of COMSATS and ISESCO. Calling COMSATS an efficient and reliable partner, the Director-General expressed confidence in the organization's execution of future joint activities.

In his opening remarks of the signing ceremony, Director-General ISESCO expressed strong commitment to continued collaboration with COMSATS to undertake a variety of capacity-building events in common Member States. In his remarks, Dr. Qureshi recalled that COMSATS' joint activities with ISESCO have been highly appreciated by its Member States, and noted a major expansion of common programmes with the decision by ISESCO to support COMSATS' ITRGs. Dr. Altwaijri congratulated COMSATS on the expansion of its membership with the induction of Morocco, and hoped that the country would now be fully positioned to benefit from future joint events of COMSATS and ISESCO.



Meetings of Planning Committee in Ghana for Holding the 3rd Commission Meeting (27-28 **October 2015**)

On 10th and 14th August 2015, the Advisor (Programmes) COMSATS, Mr. Tajammul Hussain, participated in two meetings of the Planning Committee of the upcoming Commission and Consultative Committee meetings, to be held in Accra, Ghana, from 26th to 28th October 2015. The meetings were chaired by Hon. Rashid Pelpuo, Minister of State for Private Sector Development & Public - Private Partnerships, Government of Ghana. The following members of the Planning Committee participated in the meeting: Dr. Yahuza Mohammed Gomda, Director (Science, Technology and Innovation), MESTI; Dr. Eugene Atiemo, Director, Building and Road Research Institute (BRRI); Prof. Innocent J. K. Aboh, Deputy Director General, Ghana Atomic Energy Commission; Mr. Marcus Addo, State Protocol Department; Ms. Adelaide A. Asante, Deputy Director (STI), MESTI; and Mr. J.K. Arthur, Research Scientist, MESTI.

During the first of the two meetings, the Committee apprised Mr. Hussain regarding the progress made so far and informed that the invitation letters to the Commission Members have been dispatched by the office of the honourable President of Ghana in June 2015. During discussion on various documents to be prepared for the meetings, it was decided that the COMSATS' Ghanaian Centre of Excellence, the Council for Scientific and Industrial Research (CSIR), Ghana, will prepare a document titled 'Information Guide and S&T Panorama of Ghana'. During the meeting held on 14th August 2015, discussions were held

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continuous stream of bloody conflicts, famines and epidemics, since gaining independence. The Middle East is awash with bloodshed and human misery due to political unrest and regional conflicts, while Latin America is worn out with its persistent scourge of crime and corruption. It is time for a Messiah; not yet in the religious sense, but a scientific Messiah who could unite the lost 'tribes of Science' in China, Indian subcontinent, Middle East, Western Africa and Southern Americas.

In the Capital of Ghana, the representatives of the Heads of Government/State of 22 developing countries would be gathering during the last week of October (page 16). Could it be that these countries resolve to declare a state of emergency to improve their weak educational systems, and minimal scientific and technological infrastructure? Could the Chairperson of COMSATS, lead this revolution politically and the scientific community of COMSATS Network of Centres of Excellence take the challenge of turning the tide of history to bridge the gap of S&T capacity between the North and the

South? One can only hope so, but the writing on the wall is unmistakable. Research scientists have a dictum about their activities; it reads, 'publish or perish', which means that their academic survival depends on the publication of their research articles. In the context of broader human endeavor, it would be equally sapient to say, 'acquire S&T capacity or perish'. The perishing in this case is not in the sense of academics; it means physical obliteration.

COMSATS is gratified to be the exponent of positive change in the South with respect to centrality of Science and Technology, and to be one of the agents of bringing about such a change. The joining of the Kingdom of Morocco as COMSATS' Member States is a matter of honour and satisfaction for COMSATS' community. It is a manifestation of the trust in COMSATS posed by this progressive country, which has been a world leader in education and scientific learning 12 centuries ago. It is hoped that Morocco will play a leading role in the affairs of COMSATS. The comments, criticism, or advice from the readers would be considered as their commitment to COMSATS' mission and would be given space on the pages of this Newsletter.



Meeting of Planning Committee for 3rd Commission Meeting in progress

on matters related to the venue, budget and other administrative arrangements for the meetings. It was agreed that necessary actions will be taken to follow-up the invitation letters sent to the Commission Members by the relevant departments of the Government of Ghana as well as COMSATS Secretariat.

New Chairman Consultative Committee Briefed

With the preparations of the 3rd Consultative Committee reaching their final stages, a briefing for the Chairman of the Committee was organized by COMSATS Secretariat on 26th August 2015. Mr. Fazal Abbas Maken, who recently assumed charge as the Federal Secretary, Ministry of Science and Technology (MoST), Government of Pakistan, has become the ex-officio Chairman of the Committee. Mr.

Maken was accompanied by Joint Scientific Advisor MoST, Mr. Amjad Hussain. The briefing was given by the Executive Director COMSATS, Dr. I.E. Qureshi, while senior officials of COMSATS were also present on the occasion.

Dr. Qureshi introduced COMSATS as an intergovernmental organization with several unique features, especially an affiliated International Network of 20 Centres of Excellence. Mr. Maken was informed that the Coordinating Council meetings, comprising the Heads of these Centres, serve as a real-time South-South cooperation, because of direct scientific consultations and exchange of information. Key roles and functions of other statutory bodies of COMSATS were also highlighted. Mr. Maken was informed that the present Chairperson of the Commission is the President of Ghana, H.E. Dr. John Dramani Mahama, who has convened the 3rd Commission Meeting in October 2015. Dr. Qureshi recounted a few outcomes of the 2nd Commission Meeting (Islamabad, 2012), which included an announcement, by the then Prime Minister of Pakistan, of creating an Endowment Fund with US\$1 Million as contribution of Pakistan. The status of establishment of the Fund was also shared. He informed Mr. Maken about the preparations for the 3rd Commission Meeting, and related meetings of the Advisor (Programmes) held in Ghana. With regard to the 3rd Consultative Committee meeting to be chaired by Mr. Maken on 26th October 2015, Dr. Qureshi shared minutes of the 2nd meeting of the Committee held in (Accra, 2013).

Dr. Qureshi highlighted the key role of MoST-Pakistan in COMSATS' operations, especially of its Federal Secretary in his capacity as the Chairperson of COMSATS' Consultative Committee. The Committee, it was noted, comprises of high officials of COMSATS' focal ministries/departments in Member States. He also appreciated the support provided by the Government of Pakistan for the operations of COMSATS Secretariat with a generous grant of Rs. 42 Million annually, which includes Annual Membership Contribution of US\$ 20,000. It was informed that the Member States make financial contributions towards COMSATS on voluntary basis.

The Federal Secretary was informed about COMSATS' collaboration with the international organizations, such as UNESCO, ISESCO and TWAS. Mr. Maken was apprised about the number of capacity-building events organized and important themes of those organized in collaboration with ISESCO during the previous year. Other programmes of COMSATS presented to Mr. Maken included: ITRGs; International Panel of Experts on Science, Technology and Innovation (ST&I) Policy; and Distinguished Professorship Scheme. COMSATS' role in helping to frame the current ST&I policy of Pakistan was also brought to Mr. Maken's notice. Moreover, key facts and figures of COMSATS' projects in the host country, COMSATS Internet Services (CIS), COMSATS Institute of Information Technology (CIIT), and COMSATS Telehealth Programme, were shared.

The participants of the meeting also had interactive discussions on the International Symposium on 'Light and Life' that is being organized by COMSATS in partnership with CIIT-Pakistan and ICTP-Italy. Seeking the support from MoST-Pakistan for its organization, Dr. Qureshi informed that the event is being organized in view of COMSATS' cooperation agreement with UNESCO signed in March 2015. A dossier concerning the symposium was also shared with Mr. Maken. Ending on a note of mutual appreciation, the meeting was concluded by the Federal Minister with a pledge to extend strong support towards COMSATS.

Meetings with Officials of the Omani Institutions

On the side-lines of the Workshop on Repair and Maintenance held in Oman (Page 5), Mr. Nisar Ahmad, Deputy Director (Systems) COMSATS, held meetings with Mrs. Wafaa El Alami, Head of Planning, Information and Documentation Centre, ISESCO; Dr. Said Bin Hamed AI Rebaie, Secretary General of Education Council, Oman; Dr. Abdullah Mohammed AL Sarmi, Under-Secretary Ministry of Higher Education, Oman; Dr. Hammod Amur Hamood Al Wardi, Dean College Applied Science, Rustag, Oman; Mr. Kamel Al Amry, MoHE, Oman; and Prof. Salim Hamood Said Al-Harthi, Sultan Qaboos University. During these meetings, Mr. Ahmad gave the officials a briefing about COMSATS' activities with special focus on its international programmes. The objectives and expected outcomes of the ongoing repair and maintenance workshop were also shared. During a meeting with Mrs. Wafaa, COMSATS-ISESCO collaboration for the Islamic World Science Net (IWSN) web-portal was discussed. Potential future COMSATS-ISESCO Action Plan also came under review. An outcome of these meetings was that Prof. Al-Harthi agreed to be a speaker for the upcoming COMSATS-ISESCO 3rd Consultative Workshop on National Innovation System and Intellectual Property (Arab Region) (Tunisia, October 2015).

CIS Deploys L-Root Mirror Server

COMSATS Internet Services has successfully deployed the first ever L-Root mirror server in Lahore, second by CIS and third in Pakistan overall. This is a joint venture between CIS and Internet Corporation for Assigned Names and Numbers (ICANN), the organization responsible for administering and coordinating the Domain Name System (DNS) worldwide. This new L-Root instance in Pakistan will further strengthen the country's DNS operation, reduced overall fault tolerance and its forbearance against certain types of cyber threats, such as Distributed Denial of Service (DDoS) attacks. The addition of these L-Root mirror servers is expected to ensure rapid handling of DNS queries, giving real-time information about the Tele-health across the country. The same is also expected to improve tele-health services provided CIS' Comclinics.

SPECIAL SECTION: NATIONAL TRAINING WORKSHOP ON REPAIR AND MAINTENANCE OF SCIENTIFIC EQUIPMENT, RUSTAQ, OMAN

Introduction

The partnership between COMSATS and Islamic Educational, Scientific and Cultural Organization (ISESCO) is now more than ten years old, during which a number of joint collaborative activities have been undertaken by the two organizations. In this regard, a prominent activity is the series of National Training Workshops on Repair and Maintenance of Scientific, Engineering Equipment in Universities, Research Institutions, and Small Scale Industries. Owing to their popularity and usefulness for the common Member States of COMSATS and ISESCO, the events have become a regular feature of COMSATS-ISESCO biennial Joint Cooperation programmes. So far, the overall number of such workshops organized in different countries by COMSATS since 2004 has reached 10, having befitted around 350 technicians and scientists. These events were held in Sudan, Syria, Senegal, Egypt, Ghana, Tunisia, Iran, and Oman.

The purpose of these workshops is to develop indigenous capacities of local manpower in research institutes, industries and academia in the repair and maintenance of the scientific equipment in common Member States. Engineers, scientists and technicians in the beneficiary countries are imparted training complemented by lectures and visits to the local laboratories, to help them develop necessary capacity for indigenous upkeep and maintenance of their instruments and reducing their dependence on foreign experts. These events also facilitate information-exchange among scientists, researchers, technicians, service engineers, and industrialists for enhancing the existing scientific capacity.

8th ISESCO-COMSATS Workshop

The 8th COMSATS-ISESCO national workshop on 'Repair and Maintenance of Scientific, Engineering Equipment in Universities, and Research Institutions' was held at Rustaq, Sultanate of Oman, from August 23-27, 2015. The 5-day

August 23, 2015.

The inaugural ceremony was also attended by Mrs. Wafaa El Alami, Head of Planning, Information and Documentation Centre, ISESCO; Dr. Abdullah Mohammed Al Sarmi, Undersecretary, Ministry of Higher Education, Oman; Dr. Hammod Amur Hamood Al Wardi, Dean College of Applied Science, Rustag, Oman; Mr. Nisar Ahmad, Deputy Director (Systems), COMSATS; Mr. Kamel Al Amry, MoHE, Oman; and the two resource persons of the workshop from Pakistan, Mr. Arif Karim and Mr. Faisal Ghazanfar. Also present on the occasion were the participants of the workshop, as well as senior officials and representatives from various Omani institutions, including MoHE, the Research Council; Ministry of Manpower; Sultan Qaboos University; Military Technological College; International Maritime College; Waljat College of Applied Sciences; Nizwa University; Shoar University; German University of Technology; and A'Sharqiyah University.

In his welcome remarks Dr. Al Wardi hoped for the success of the event in building relevant capacities in the participants. In his message, read out on the occasion by Mr. Nisar Ahmed, the Executive Director COMSATS, Dr. Imtinan Elahi Qureshi highlighted the importance and relevance of the event Dr. Qureshi hoped that the workshop would facilitate linkages among the participants and experts for future networking and interaction. Mrs. El Alami welcomed experts and participants of the national workshop and readout the ISESCO message of H.E. Dr. Abdulaziz Othman Altwaijri, Director General ISESCO. Dr. Altwaijri considered the event important for promoting South-South cooperation for addressing scientific needs of ISESCO Member States. He hoped that the event would enhance opportunities for mutual cooperation among researchers, technicians and engineers from different institutions of Oman.

workshop was held under the patronage of the Omani Ministry of Higher Education (MoHE) and was hosted by the College of Applied Sciences, Rustaq.

Inauguration

The workshop was inaugurated by Dr. Said Bin Hamed AI Rebaie, Secretary General of Education Council, Sultanate of Oman, on



Dr. Hamood Al Wardi, Mrs. Wafaa El Alami, and Mr. Nisar Ahmad, speaking at the Inaugural Ceremony

In his keynote address, Mr. Arif Karim, one of the Resource Persons for the workshop, highlighted the need and importance of the workshop for scientists and technicians



and elaborated the workshop methodology.

Technical Proceedings

During the 10 technical sessions of the workshop that commenced right after the inauguration, training was imparted by resource persons from Pakistan Council of Scientific and Industrial Research (PCSIR), Pakistan, Mr. Arif Karim and Mr. Faisal Ghazanfar, to more than 30 researchers, academicians, technicians, and engineers from different organizations of Oman. As per the format of the series, the technical sessions included lectures, handson training and visits to different labs of College of Applied Sciences, Rustag and Sultan Qaboos University, Muscat. During the technical sessions, troubleshooting and repairing of a wide range of equipment were covered, which included: Spectrophotometer Systems; Flame Photometer Systems; Atomic Absorption system and XRF system; Thermal Analyzer; Gas Chromatographic Systems; HPLC Systems; Electron Microscopes; Laboratory Balances; Thermal Equipments (Oven & Furnace); and pH Meters.

Benefits and Impact

- Self-reliance among Omani scientists and institutions with economy of time, effort and finances involved in outsourcing
- Enhanced indigenous capacity by training the master-trainers for maintenance of scientific equipment used in the academic and research institutions of Oman
- Instruments repaired/made operational during the workshop having approximate worth of more than US \$25,000

Using the knowledge and techniques, learnt during the workshop, participants and experts successfully repaired/made operative a number of expensive and important equipments. The equipment that was repaired/made operational include; Spectrophotometer, Analytical Balances, Ph Meter, Conductivity Meter, Thermogravimetric Analyzer, Centrifuge, Digital Function Generator, Power Supply of CNC, Hot plates and Precision High Ampere power supply.

Conclusion of the Workshop

The closing ceremony of the event was held on August 27, 2015, during which a technical report of the workshop was presented by Mr. Nisar Ahmad (COMSATS). H.E Dr. Abdullah Bin Mohammad Bin Al Sarmi, Under-Secretary MoHE, Sultanate of Oman, graced the occasion as Chief Guest. The participants received the certificates, and expressed their gratitude to organizers for an important learning experience.

The ceremony concluded with the hope that scientists, engineers and technicians trained in the workshop will further train their colleagues in their respective organizations.



Distinguished guests and participants of the concluding ceremony

S&T INDICATORS OF MEMBER STATE

In Spectrum: Republic of Uganda

The Republic of Uganda, is an East African country. Towards the east it is bordered by Kenya, to the north by South Sudan, to the west by the Democratic Republic of the Congo, to the southwest by Rwanda, and to the south by Tanzania. Uganda is the world's second most populous landlocked country after Ethiopia. The southern part of the country includes a substantial portion of Lake Victoria, shared with Kenya and Tanzania, placing the country in the African Great Lakes region. Uganda also lies within the Nile basin, and has a varied but generally a modified equatorial climate.

Uganda has substantial natural resources, including fertile soil, regular rainfall, and sizeable mineral deposits of copper and cobalt. The country has largely untapped reserves of both crude oil and natural gas. While agriculture accounted for 56 percent of the economy in 1986, with coffee as its main export, it has now been surpassed by the services sector, which accounted for 52 percent of the GDP in 2007. Uganda's economy generates export income from coffee (\$466.6 million annually), tea (\$72.1 million), fish (\$136.2 million), and other products. The country has commenced economic reforms and growth has been robust. In 2008, Uganda recorded 7 percent growth despite the global downturn and regional instability. However, economic growth has not always led to poverty reduction. Despite an average annual growth of 2.5 percent, between 2000 and 2003, poverty levels increased by 3.8% during that time. This has highlighted the importance of avoiding growth in unemployment levels and is raising awareness in development circles of the need for equitable growth, not just in Uganda, but across the developing world.

Revenues from oil and taxes will become a larger source of government funding as oil comes on line in the next few years, although lower prices since 2014 and protracted negotiations and legal disputes between the Ugandan



government and oil companies may prove to be an impediment to further exploration and development.

Instability in South Sudan is a risk for the economy because Uganda is a key destination for Sudanese refugees and South Sudan is its



main export partner. Unreliable power supply, high energy costs, inadequate transportation infrastructure, depreciating currency, increasing public debt and corruption inhibit economic development and investor confidence. Uganda has a large diaspora, residing mainly in the United States and the United Kingdom. This diaspora has contributed enormously to Uganda's economic growth, through remittances and other investments, especially in real estate. According to the World Bank, Uganda received an estimated \$994 million in remittances from abroad in 2014. Uganda also serves as an economic hub for a number of neighbouring countries, like the Democratic Republic of Congo, South Sudan and Rwanda.

In the 2002 census, Uganda had an overall literacy rate of 66.8% (76.8% male and 57.7% female). Public spending on education was at 5.2% of the 2002–2005 GDP. According to the UNESCO World Science Report 2010, Uganda figures in the top ten among developing countries for the rate of loss of university-educated citizens: 36%. Brain drain is among the key problems facing sustainable scientific human resource supply. Medical doctors and researchers are leading this exodus. Poor pay – even by East African standards – is inciting many Ugandan professionals to leave

Table-A: Selected Indicators of Uganda

Indicator Name	2000	2010	2013
Food production index (2004-2006 = 100)	86.1	112.3	112.5
ICT service exports (% of service exports)	-	13.0	17.3
R&D expenditure (% of GDP)	-	0.6	-
Scientific and technical journal articles	78	154	-
Mobile cellular subscriptions (/100 people)	0.5	37.7	48.1
Fixed telephone subscriptions (/100 people)	0.3	1.0	0.7
Internet users (per 100 people)	0.2	12.5	16.2
GDP growth (annual %)	3.1	5.2	3.3
GDP per capita (current US\$)	260.7	567.2	675.4
Source: World Bank Development Indicators 2014			

the country in search of greener pastures. Uganda's health and education sectors have been badly hit as a result. In presenting the national budget for 2010/2011 in June 2010, President Yoweri Kaguta Museveni announced a 30% hike in scientists' salaries, with a budget of 18 billion Ugandan shillings (US\$ 8 million).

The UNESCO World Science Report argues that it is not the level of innovation of a country that is paramount but rather its ability to adopt, adapt and absorb technologies. However, many industries in Uganda are operating below capacity because: i) they have imported obsolete technology or for lack of regular maintenance of machinery; ii) some technologies are unsuited to local conditions or even; iii) because some technologies have been imported without the technical know-how to use them, rendering them useless. A further bottleneck stems from the fact that a number of bodies mandated to oversee technology transfer, assessment and forecasting have not been given the means to carry out their mission. These include the Uganda Investment Authority, the Uganda Registration Services Bureau, the Uganda Industrial Research Institute and the Uganda National Council for Science and Technology. Uganda is also among the COMSATS' Member countries that have yet to nominate an institution for the COMSATS' Network of International S&T Centres of Excellence.

In 2008 the Atomic Energy Act established the Atomic Energy Council. The act also provided a framework for the promotion and development of nuclear energy for use in power generation and other peaceful purposes. Uganda's Information and Communication Technology Policy dates back to 2003. Although Internet access has since grown to 2.5% (2006), Internet infrastructure remains largely confined to the cities, with rural locations depending primarily on VSAT applications.

Although GERD remains low in Uganda at around 0.3–0.4% of GDP, all government expenditure on R&D is used for civil purposes, unlike many other countries where it also encompasses defence spending (UNCST, 2007; 2009). The National Council for Science and Technology submitted a comprehensive national STI policy to the Cabinet for approval and implementation in July 2006. The national STI policy came a year after the government introduced measures to improve scientific literacy and attract more young people to scientific careers. Under the Science Education Policy, adopted in 2005, classes in biology, chemistry and physics became compulsory at all secondary schools. First-year university students are also required to take some science courses for completing their degree. The policy allocates nearly three-quarters of government scholarships to students studying towards a science degree at university and other institutions of tertiary education. (UNESCOWSR 2010)

The Knowledge Economy Index, which is an important

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2011 PPP\$)	HDI value
1980	49.5	4.0	1.9	0,834	0.293
1990	47.5	5.7	2.8	0,638	0.310
2000	48.1	10.7	3.9	0,867	0.392
2010	57.3	10.8	5.4	1,268	0.472
2011	58.0	10.8	5.4	1,307	0.477
2012	58.7	10.8	5.4	1,301	0.480
2013	59.2	10.8	5.4	1,335	0.484

Table-B: Human Development Indicators of Uganda

Source: Human Development Report 2014, UNDP

measure of how fast a nation like Uganda is transforming into a middle income country, which in the case of Uganda increased from 2.14 in 2000 to 2.36 in 2009. However, this increase has mainly been due to the improvement of the economic output and governance, which has provided incentives for the efficient use of existing and new knowledge, and the flourishing of entrepreneurship. The levels of innovation capacity among other pillars under the index have declined over the same period. (UNCST Status Report 2009/10)

Similarly, Uganda's HDI value for 2013 is 0.484, which is in the low human development category, positioning the country at 164 out of 187 countries and territories. Between 1980 and 2013, Uganda's HDI value increased from 0.293 to 0.484, an increase of 65 percent or an average annual increase of about 1.53 percent. Table-B reviews Uganda's progress in each of the HDI indicators. Between 1980 and 2013, Uganda's life expectancy at birth increased by 9.7 years, the mean years of schooling increased by 3.5 years and expected years of schooling increased by 6.8 years. Uganda's GNI per capita increased by about 60.1 percent between 1980 and 2013. (UNDP HDR 2014).

Credit should be given to Uganda for exhibiting extreme resilience in facing huge challenges of poverty, infectious disease and lack of investment in education. However, in order to meet the future challenges, the government needs to sustain R&D funding, and reform its education system, particularly in Science and Technology.

Table-C: Science 8	Technology	Indicators of	Uganda
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Indicator	Value	
Indicator	value	
Overall R&D intensity (GERD as a % of GDP), 2010	0.50%	
Government R&D expenditure as % of GDP, 2010	0.19%	
Higher Education R&D expenditure as % of GDP, 2010	0.13%	
Total R&D Personnel (Headcount)	4270	
Total R&D Personnel (Full Time Equivalent), 2010	2007	
Science and engineering enrolment as % of total	35.1%	
postgraduate (Masters, PhD) enrolment, 2012		
Proportion of postgraduate enrolment to undergraduate	1:15	
enrolment,2012		
Women researchers as proportion of total researchers	24%	
Source: Science, Technology and Innovation in Uganda: A		
Status Report 2012/2013 (UNCST)		

ACTIVITIES/NEWS OF COMSATS' CENTRES OF EXCELLENCE

TÜBİTAK MAM-Turkey Expands Collaborative ties with UNCST-Uganda and TIRDO-Tanzania

The TÜBİTAK Marmara Research Center (MAM), Turkey, has reached understanding for scientific collaboration with Uganda National Council for Science & Technology (UNCST), and Tanzania Industrial Research and Development Organization (TIRDO).

TÜBITAK MAM and UNCST have been exploring possible areas of cooperation since early 2015. In this regard, the two institutions have, inter alia, selected 'Energy research' as one of the most promising areas based on common interests. After some preliminary contacts and discussions between the two organizations, it was agreed to explore the possibility of biomass power generation and geothermal energy, depending on the potential available in Uganda. For this purpose, a team of experts from TÜBITAK MAM visited Uganda from 17th to 21st August 2015 for on-site inspection and development of a project proposal. After a one-day briefing and seminar at UNCST, the researchers of TÜBÍTAK MAM visited relevant sites to assess the country's biomass and geothermal energy potential. On 19-20 August 2015, they visited Buranga and Katwe, the two main areas of the country having great potential for geothermal energy production. Subsequently, TÜBITAK MAM has proposed a detailed feasibility study as a first step, followed by establishment of a 1 MWe geothermal power plant. The agreement and project proposal to formalize the cooperation have been drafted and exchanged for evaluation and signing.

Also during the reporting period, Prof. Dr. Mkumbukwa Mtambo, Director General TIRDO, Dr. Ludovick C. Manege, and Dr. Mihayo Musabila Maguta (Directors at TIRDO) visited TÜBITAK MAM from 24th to 27th August 2015, and held meetings with the President TÜBITAK MAM, Assoc. Prof. Dr. Bahadyr Tunaboylu; Vice President, Assoc. Prof. Dr. Murat Makaraci; and Directors and relevant scientists from various Institutes of the Centre. The delegation of TIRDO visited Chemical Technologies Institute, Genetic & Biotechnology Institute, Energy and Food institutes in order to have first-hand assessment of the ongoing R&D projects and to identify possible collaboration opportunities. The proposal for the visit was first discussed during the COMSATS Coordinating Council meeting. Based on their assessment, it was agreed that the two institutions can collaborate in areas, such as coal technologies, warm mix asphalt, recycling of waste batteries, and poultry health analysis. The cooperation will be officiated after necessary feasibility studies.

CIIT-Pakistan Strengthens Collaborations with International Institutions

The COMSATS Institute of information Technology (CIIT), Pakistan, continues to expand its international cooperation by exploring avenues of collaboration with foreign universities. A delegation from University of Malaya (UM) visited the Institute on 19th August, 2015. It included Assoc. Prof. Datin Dr. Sameen Abdul Kareem, Dy. Dean (Faculty of Sciences & IT); Dr. Hazlie Makhlis, Assoc. Prof. (Electrical Engineering); Ms. Nuntasinee Muadmanee Fatima, Head (Academic program, Marketing Unit); and Mr. Mardiansha Kalimuddin, Assistant Registrar (Admission Section). The main purpose of the visit was to assess the progress made in the light of a Memorandum of Understanding signed earlier by the two institutions, as well as to motivate the faculty of Computer Science and Engineering to visit the University for conducting collaborative research..

On August 13, 2015, Mr. Feroze A. Khan, Vice President of International Development at Stratford University (SU), USA, visited CIIT with an objective to foster collaboration between the two institutions in areas of mutual interest. During his visit, Mr. Khan held meetings with senior officials of CIIT, including its Pro-Rector; Registrar; Director Planning and Development and HRD; and Advisor International Office.



D.G. TIRDO presenting souvenir to President TÜBİTAK MAM



Rector CIIT presenting a shield to the representative of NASB

A delegation of the National Academy of Sciences of Belarus (NASB) also visited CIIT on July 30, 2015 and met the Rector of CIIT to form academic and scientific linkages between the two institutions. The NASB delegation comprised its Director of Scientific and Production Center, Dr. Yury Yatsyna and Chief Specialist, International Cooperation Department, Ms. Liutsyna Navichonak.

NMC-Nigeria Hosts Three Regional Events

The National Mathematical Centre (NMC), Nigeria, in collaboration with the African Academy of Sciences (AAS) and the African Mathematical Union (AMU), hosted the 23rd Edition of Pan African Mathematics Olympiads (PAMO); the 1st Edition of Pan African Mathematics Olympiad for Girls (PAMO-G); and the maiden edition of Pan African Science Olympiads (PASO).

NMC had the privilege of hosting these events on behalf of the Federal Government of Nigeria. The Permanent Secretary, Federal Ministry of Education (FME), Government of Nigeria, Hon. Mrs. H.U. Abdullahi, inaugurated the Olympiads on 14th August 2015. About 50 contingents from 10 African countries (Benin, Burkina Faso, Cameroon, Ghana, Mali, Niger, Nigeria, Tanzania, Tunisia, and South Africa) participated in the two-week long events.

Nigeria secured the overall best positions in both PAMO and PASO. Burkina Faso, South Africa, Tunisia and Ghana also performed brilliantly. A South African student won the PAMO-G contest and was awarded the crown as the 'African Mathematics Queen', during the closing ceremony, held on 28th August 2015. Other medals, trophies and scholarships were also awarded during the Olympiads. The scholarships awarded would enable the winners to pursue degree programme in any Nigerian-public-sector university of their choice, as well as in private-sector Turkish-Nile University, Abuja, Nigeria. These are in addition to the long standing Moroccan government scholarships for PAMO medal winners in government-owned Universities in Morocco.



Team Nigeria Leader receiving the PAMO Trophy

ITI-Sri Lanka Opens New Chemical Residue Unit

The Industrial Technology Institute (ITI), Sri Lanka, established a new Chemical Residue Unit (CRU) at its premises, which was officially opened on 26th August 2015. This Unit is equipped with high-end instruments, such as LCMS/MS, FTIR, and GC-MS. The unit is expected to meet the relevant testing and certification needs of Sri Lankan population.

The LCMS/MS recently acquired for the Unit has the capability of carrying out chemical trace analysis with high accuracy. The Unit has already initiated analysis of the dyes, Sudan I, II, III and IV, in spices; dicyandiamide (DCD) and melamine in milk products; and glyphosate in water. Another high-end instrument, ICP-MS/MS system, will be added to this Unit by end of the year, which will strengthen the component of trace heavy metal analysis in different matrices.

IRCC-Sudan Organizes Training Programmes

With an objective to strengthen scientific capacity of members of the Sudanese industry, the Industrial Research and Consultancy Centre (IRCC), Sudan, organized a fourday training focused on consultancy services and laboratory testing, from 23rd to 27th August 2015. Fifteen technicians/ scientists benefitted from the activity. The Centre also sent two of its scientists/researchers for the following training opportunities:

- Training workshop for enhancement of skills to support SME for improvement of their product quality and productivity, in Japan (8th June – 7th August 2015); and
- Workshop on 'Utilizing Indigenous Food Resources for Food Security', in Thailand (29th June – 24th July 2015).

IROST-Iran Researchers Develop Vaccine for Fish

Researchers at the Iranian Research Organization for Science and Technology (IROST), Iran, have developed a special vaccine to counter bacterial diseases in cold-water trout. *Lactococcus* and *Streptococci* are the strains of bacteria that pose a threat to the survival of cultured fish. Developed for the first time in the country, the aquaculture vaccines developed by the IROST researchers provide up to 90 percent anti-bacterial protection and immunity to trout. "The vaccine helps fish develop significant antibody responses to bacteria", noted Dr. Mehrdad Azin, the Head of Biotechnology Institute of IROST. The researchers also successfully completed field trials of the vaccine in some of the trout hatcheries and achieved satisfactory results.

OPINION: CELEBRATING THE INTERNATIONAL YEAR OF LIGHT & LIGHT-BASED TECHNOLOGIES

Mohammad Aslam Khan*

The UN General Assembly in its 68th Session proclaimed 2015 as the International Year of Light and Light-based Technologies (IYL). The main idea is to raise global awareness about how light and light-based technologies are promoting or may further enhance sustainable development and provide solutions to global challenges in energy, education, agriculture and health. The IYL therefore offers an excellent opportunity to make the policymakers and all stakeholders aware of the problem-solving potential of light and light-based technologies.

Light, which in the language of physics is an electromagnetic wave or a beam of photons, is not restricted to the visible part of the electromagnetic spectrum but spans a whole range of frequencies from radio waves to x-rays and even gamma rays. In that sense, light plays a very important role in our everyday lives. For example, sustenance of life on this planet is made possible through light from the sun and the associated photosynthesis in plants, and vitamin D synthesis in humans, a truly invaluable gift from The Creator of Everything. From another perspective, light is our main messenger for investigating the large-scale universe as well as the extremely small atomic and subatomic world. Apart from science and technology, light is also central to the cultural side of human society.

Guided by the important optical phenomena in nature, the human beings tried to look for other photon-initiated, photonsustained and photon-assisted processes. Accordingly, many different sources of light have been developed for use in a wide range of applications from the basic lighting of the house and streets to sophisticated processes using advanced sources such as lasers and synchrotrons.

A key question that inspired many minds relates to the basic interaction of light of different frequencies with materials from the macroscopic world to microscopic world of atoms, molecules and even the living cells. This has indeed involved all possible disciplines and specializations including the physical sciences, agricultural and biological sciences, engineering, and medicine. Over the last few decades, manmade sources of light have helped our understanding of a vast range of phenomena in nature and the underlying science has helped in developing new technologies for betterment of life in general. More importantly, this has revolutionized medicine and materials processing, and has opened up fast and superior international communications via the Internet that is central to linking cultural, economic and political aspects of the global society. Indeed light will continue to underpin the future development of human society. As an interdisciplinary field, physicists, astronomers, chemists, electrical engineers, electronic engineers, materials engineers, mechanical engineers, geologists, biologists, artists and designers are now well aware of the tremendous importance of optical science and technology for future development. It is therefore vital that this message about light and light-based technologies is communicated widely and that the brightest young minds are attracted to careers in optical science and engineering.

Sources of Light

The natural sources of light include the sun, stars & galaxies, lightening, and bio-luminescence from some worms and insects, fire flies, and some marine life. The underlying science in most cases is now well understood. Man-made sources of lighting initially evolved from fire and hot bodies and subsequently lead to incandescent lamps, low pressure fluorescent lamps, including energy savers, high intensity electric discharges, semiconducting light emitting diodes and, more recently, organic light emitters. Further growth in understanding of the underlying science led to highly sophisticated light sources such as lasers and synchrotrons. Lasers are usually made from atoms or molecules and are very narrow band monochromatic sources of light covering a large part of the electromagnetic spectrum that can be made highly intense. The coherent nature of laser radiation leads to some very unique properties of light for advanced applications. Another class of lasers is free-electron lasers that utilize accelerated electrons bent through curved paths through oscillating electric and magnetic fields. Synchrotron radiation are emitted when charged particles are accelerated (ultra-relativistic speeds these days) and constrained to move in circular paths with the help of magnetic fields. The radiation produced can cover the entire electromagnetic spectrum. The free-electron laser is based on the same principle but with the added coherence effects.

Interactions of Light with Materials

Light is a form of energy. On a basic level we can say that

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when light is incident on any material, it can be partially or totally absorbed and/or scattered and/or transmitted depending on the nature of the material and the quality of the surface where interaction occurs together with the characteristics of the incident light, particularly its frequency and intensity (energy per unit area per unit time). However, when viewing in further detail, many other effects may also occur. These may include changes in frequency or in polarization state of the incident light or its frequency. The material itself may undergo changes in its electrical, chemical, compositional or optical properties, temporarily or on a long term basis. In fact, the interaction is with the atoms and molecules of the materials. An important consideration is what happens to the energy that is absorbed and what changes are brought about. Light-based technologies are based on one or more of the processes occurring during this interaction.

The advent of lasers, in particular, has added several new dimensions in the study of interaction of light with matter. The intense coherent beams from lasers have enabled even the usually weak scattered signals, for example, to be recorded with high signal-to-noise ratio. Furthermore, tunable lasers made possible resonant enhancements in many optical effects that have been exploited in many applications such as isotope separation and excited-state chemistry and physics with applications in many diverse fields. On the other hand, interaction of ultra-intense laser beams with materials has led to a totally new field of nonlinear optics having many more technological applications. For example, a non-absorbing material may become a strong absorber under intense laser irradiation. This has many practical implications associated with heating, melting and evaporation of any material for cutting, welding, evaporation, and shaping for micromachining of even the hardest materials. A specific case of interest is the recently demonstrated fiber-laser assisted drilling of hard rocks, such as granite or volcanic rocks for geothermal energy sites or for oil and gas fields capped by hard rock. Interactions with living or diseased cells has led to the important fields of bio-medical engineering and photodynamic therapy.

From Optics to Photonics & Laser-based Photonics

The study of light usually called optics started with the observation of shadows made by sunlight, and dates back to pre-Greek era. However, the science of optics was significantly extended by the Muslim scholar Ibn Al-Haitham (Alhazen) over a thousand years ago through studies on reflection, the human eye and then the camera obscura. Developments in the pre-twentieth century era through major contributions of many renowned scientists, including Newton, Huygens, Fresnel, Maxwell, and many others, laid strong physical and mathematical foundations of the science of optics. The twentieth century saw major advancements in

the study of optics, initially through the discovery of photoelectric effect and then Einstein's major theories followed by the development of quantum mechanics and quantum elctrodynamics. The advent of lasers, fiber optics and a variety of semiconductor sources and detectors have truly revitalized the study of optics and its applications. The transformation of optical sciences into useful optical devices has been named as photonics, where photon is the key player rather than the electron. The field of photonics, sometimes referred to as optical electronics or optoelectronics has evolved vigorously during the last couple of decades. Benefits of turning optical research into photonic tools that help mankind are particularly obvious in life sciences in applications such as bio-medicine and bioimaging.

Lasers in particular have found applications in almost every field of human activity, including defense, energy, communications, information processing, data storage, entertainment, manufacturing and materials processing (cutting, shaping, drilling, welding, surface hardening, micromachining), catalyzing chemical processes, environmental monitoring and remote sensing, therapeutics medicine, surgery, cosmetic and medical technology, analytical and forensic science, biosciences, printing, barcode reading, and in many other avenues of basic scientific as well as industrial research. This list is expected to grow further in the future as new applications are discovered. In fact, no other scientific discovery of the 20th Century has demonstrated so many diverse and exciting applications as laser has.

The extensive use of lasers in various applications may be gauged from the laser market surveys that have forecast laser sales of around US\$ 10 billion during 2015, with major shares for optical communications, materials processing, medical and cosmetics. Military and defense-related technologies also constitute a very significant component. This market is growing at a very high rate of nearly 10 percent.

Developing-world Perspective

According to a survey published recently in *Laser Focus World*, laser-enabled photonics sales in Scotland alone exceeded US\$ 1 billion employing about 3,000 persons. The secret being the extraordinary pool of talent graduating from universities, especially those specializing in lasers and photonics. Developing countries, on the other hand, are generally far behind in adopting laser and photonic technology (specialized education, indigenous production of lasers and their use, related instrumentation and R&D). It is therefore, necessary to develop indigenous expertise irrespective of cost considerations. Initially, the primary focus could be on capacity building in terms of training and producing highly skilled manpower (scientists, engineers and technologists) and development of facilities leading to design and fabrication of prototype laser systems, optical components, and other related instrumentation. While the ultimate objective should be to carry out internationally competitive and relevant applied and basic research to stay up-to-date with new developments in this important field and its evolving applications, and to transfer its benefits to the country.

A Strong Education Base is a Must for Development

No country or society can progress without properly educated and skilled human resources. The main reason for the success of the industrialized world is the strong education and training available together with good leadership. There is no shortage of talent even in the developing world but their main weakness is the lack of wellplanned and structured learning and training programmes. Of course no programme or plan has any value if is not effectively implemented. A regular, systematic and critical review of any initiative undertaken is always needed to ensure that things are moving in the right direction. Any problems and weaknesses have to be addressed properly and well in time before these become unmanageable.

Internationally, investment in science and technology has provided returns in many forms and on many timescales. It is the fundamental understanding of physical principles and the underlying science that allows development of new ideas that eventually form the basis for new technologies and tools, and this builds the capacity for new industries and businesses. Innovations are therefore strongly dependent on the advancements of knowledge of underlying science and its applications. Strong educational foundations only can guide the way to higher ideals. Unfortunately, this is where most developing countries, if not all, are lacking.

Optics & Photonic-related Education in Developing Countries

From the perspective of photonics, it is a matter of concern that even the basic optics-related courses are not included in many undergraduate programs in the developing countries. This needs to be changed. For high quality research, high quality education is a pre-requisite, hence the need for a strong educational base to be developed at schools, colleges and universities. In addition to sensitizing the society about the importance of photonics as an area of specialization, the main focus should be towards attracting the best students and the best teachers in this field. In this context, the following recommendations deserve serious consideration.

- While the basic courses relating to Optics and Lasers should be part of the core undergraduate curriculum, specializations in Lasers & Photonics should be offered at MS and even Ph.D level.
- · Well-equipped teaching and research labs should be

provided for promoting strong experimental and analytical skills.

- Strategies should be evolved to recruit and train more inspirational teachers for schools, colleges and universities. Improved pay packages and better working conditions will attract the best talent.
- Creative thinking in sciences, from basic knowledge to applications, should be promoted.
- The habit of independent study and research among students and teachers should be strongly encouraged.
- Considerably more emphasis should be given to developing the communication skills of students, both oral and written.
- Merit, together with relevant training and experience, should be the only criterion for jobs. Leadership positions should be given to only those who excel in the respective fields.

International Symposium on Light & Life, October 14-16, CIIT, Islamabad (Pakistan)

The International Year of Light is being celebrated the world over and many conferences and symposia are being organized. The main idea is to create awareness about the new developments in the science and technology of photonic devices for the benefit of mankind. In the same spirit, a three-day symposium on Light & Life is being organized jointly by the Commission on Science and Technology for Sustainable Development in the South (COMSATS) and COMSATS Institute of Information Technology (CIIT), Islamabad (Pakistan), from 14 to 16 October 2015. This event is intended to provide a platform for discussing advancements in sources of light, their characteristics, interactions of light with materials, and possible applications in sustaining and enhancing the quality of life on this planet.

This symposium will consist of plenary sessions, invited and contributed talks, poster sessions, a workshop and an exhibition. Several leading experts and practitioners from US, the UK, Europe, China, Turkey, and Iran are presenting plenary and invited talks on front line research being conducted in top tier universities and R&D organizations. Researchers, faculty members, engineers, graduate and senior undergraduate students are expected to participate.

The main topics of the symposium are: Light Detection & Harvesting; Light Emitting Devices; Light-Matter Interactions; Light-based Technologies; Light and Health; Light in Art, Culture & Society; Cosmic Light; Photochemistry & Photobiology; Optics & Optoelectronics; Imaging Science; and Quantum Informatics.

Further details are available at the symposium website:

http://ww2.comsats.edu.pk/LightAndLife2015/.

SCIENCE, TECHNOLOGY AND DEVELOPMENT

Wildlife Gives Early Warning of Antibiotic Resistance

An ecological research on *E. coli* - a bacterium commonly found in the foods and intestines of people and animals – has studied its effect in wild animals, humans and cattle to examine patterns of antibiotic exposure and how human activities influence this process. The research reported by Munyaradzi Makoni (*SciDev.Net*, August 14, 2015), was undertaken by Dr. Kathleen Alexander, a disease ecologist at Virginia Tech in the United States, and originally published in the Journal of Wildlife Diseases on 31st July 2015.

Dr. Alexander and her colleague Sarah Jobbins studied antibiotic resistance of *E. coli* among humans, domestic animals and wildlife in the Chobe National Park and two villages in northern Botswana. Studying wild animals helps to understand how resistance moves from humans and farming systems across ecosystems and ultimately back to humans. Forty-one per cent of the faecal samples from 18 wild species were found to contain *E. coli* resistant to one or two of ten antibiotics tested. On the other hand, samples were collected from domestic cattle, healthy and ill people, and environmental sources of human faeces. Cattle faeces seemed to have no antimicrobial resistance. Bacteria from wildlife, humans and the environmental samples were resistant to a similar range of antibiotics, and water was shown to be the most important medium for the spread of antibiotic resistance. In addition, bacteria resistant to multiple drugs were more common in animals, which live in urbanised areas, and in carnivorous species. The study approach of this research can be applied to other ecosystems to improve the early detection of antimicrobial resistant epidemics.

Solar Cell Efficiency to Double with Novel Antenna

A news release of the American Chemical Society (ACS) (August 18, 2015) has reported the development of a unique, "green" antenna that could potentially double the efficiencies of certain kinds of solar cells and make them more affordable. The research work that would be presented at the 250th National Meeting & Exposition of the American Chemical Society (ACS), suggests the best use of the spectrum of solar light to produce electric current. The silicon solar cells commonly used are not very efficient in the blue part of the light spectrum. The antenna enhances their efficiency greatly by collecting the unused blue photons and converting them to lower energy photons that the silicon cell can convert into current.

Unlike typical radio antennae, this one is a thin, pinkish film that can be coated on top of a solar cell. It is made of organic dyes that are excited by photons in light which can relax and emit less energetic but more silicon-friendly photons. The quantum mechanical requirements of the antenna are met by embedding the dyes inside a protein-lipid hydrogel by mixing them together, warming them up and then cooling them to room temperature. These antennas are biological and non-toxic materials, and even compostable. "It's very simple chemistry," says Challa V. Kumar, the developer of the antenna. "It can be done in the kitchen or in a remote village. That makes it inexpensive to produce." Work is now underway to mass produce this antenna for use with commercial solar cells.

MRI Scanner Steers Cancer-killing Virus Inside The Body

Magnetic Resonance Imaging (MRI) scanners used to produce diagnostic images have been shown to steer cellbased, tumour busting therapies to specific target sites in the body. The novel use of MRI has been discovered by scientists from the University of Sheffield, according to the University's official website (August 18, 2015). An international team of researchers, led by Dr Munitta Muthana of the university's Department of Oncology, have found MRI scanners to non-invasively steer cells, which have been injected with tiny super-paramagnetic iron oxide nanoparticles (SPIOs), to both primary and secondary tumour sites within the body. This targeted approach is extremely beneficial for patients as it dramatically increases the efficiency of treatment and drug doses could potentially be reduced – helping to alleviate side effects. The study (DOI: 10.1038/ncomms9009) shows that the new approach not only increases the therapeutic efficacy but also decreases the risk of unwanted side effects.

Pumping CO₂ into Frack Wells could Prevent Water Contamination

Newscientist.com (18th August 2015) has reported a way to use carbon dioxide emissions from power plants to prevent fracking chemicals from contaminating drinking water supplies, hence helping with solving two problem with one solution. Despite its benefits in unlocking new fuel sources and slashed energy prices, fracking fluid poses a threat of mixing toxic fuels to shallow aquifers via fractures in the bedrock. This could be prevented by pumping CO₂ into the wells, according to the researcher, Andres Clarens at the University of Virginia in Charlottesville and his team. The principle of their research rests on the premise that at the high temperatures and pressures found at depth, CO₂ reacts with silicate minerals in rocks to form a carbonate deposit. Clarens and his team have shown through their experimental simulation that half of he injected CO₂ was converted into solid carbonates within a day. The technology for injecting CO₂ into rocks already exists, and shale has an enormous capacity for storing it. There is great potential for this technology to help improve the integrity of well bores.

PROFILE OF HEAD OF COMSATS' S&T CENTRE OF EXCELLENCE

ACADEMICIAN DR. GALIMKAIR MUTANOV, RECTOR AL-FARABI KAZNU, KAZAKHSTAN

Dr. Galimkair Mutanov is a professor of technical sciences and the incumbent Rector of Al-Farabi Kazakh National University (KazNU), Kazakhstan.

He graduated from Kazakh Polytechnic Institute, majoring in "Automatics and Remote Control" in 1979 and worked for two years as research fellow at the Moscow Institute of Steel and Alloys. During 1986-1993, he completed his graduate and doctoral studies at Moscow State Mining University. His Ph.D doctoral theses are dedicated to the theory and practice of automatic process control with the use of elements of artificial



intelligence. In his 36 years of academic career, Galimkair Mutanov became one of the youngest doctors of technical sciences and a well-known scientist in the field of technical and socio-technical spheres in the country. Other areas of the scientific interest of Prof. Mutanov are: applied mathematics, econometrics, science and higher education policy and governance technological processes management, case management, risk management, modeling and management of socio-economic systems and processes.

Dr. G. Mutanov has previously served as the Rector of the North Kazakhstan State University (1995-2002), the first Vice-Minister of the Ministry of Education and Science of Kazakhstan (2002-2003), and the Rector of East Kazakhstan State Technical University (2003-2010). He has also worked as the Chairman of the Board of Directors of the Center for Engineering and Technology Transfer and Scientific and Technological Park "Altai". Since 2010, Dr. G. Mutanov has been serving as the Rector of Al-Farabi KazNU, where he is engaged in a goal-oriented work on transformation of the university into high level Research University.

Under his guidance, AI-Farabi KazNU, has immensely increased its standards in a short period, moving forward to a position among 300 top universities in QS World University Ranking, and according to the ranking results of international organization (Great Value Colleges), it is ranked among the 50 most technologically advanced universities in the world (31st place). Now AI-Farabi KazNU is the regional hub of a UN programme for sustainable development and the UN 'Academic Impact Programme', organizing several large-scale international conferences dealing with the 10 principles of the UN.

Dr. G. Mutanov has created a scientific school of management in the technical and socio- economic fields and trained more than forty candidates and doctors of sciences.

He is the Academician of more than ten national and international Academies.

Dr. G. Mutanov's contributions to education and science have been recognized through national and international awards and honours, such as: Barys Award (III) and Parasat Award, Chevalier of the Order of the Academic Palm (France), the Chevalier Cross of the Order of Merit of the Republic of Poland, the Badge of a 'Special Sign of the President of the Republic of Kazakhstan', Golden Medal of M. Curie, the Order of the CIS (Moscow), Golden Medal of 'United Europe' (Oxford), 'Medal for Outstanding Achievements in Science and Innovation' Higher Engineering Institute of Lisbon (Portugal), prestigious ranks: 'The Honorable Engineer of the Republic of Kazakhstan', and 'The Best Inventor of the Republic of Kazakhstan'. Moreover, Prof. Mutanov has been awarded the diploma 'Altyn Zhyldyz' (Golden Star) of the Academy of Journalism of Kazakhstan for publishing the unique series of books 'Onegeli Omir' (Enlightening Life).

Dr. G. Mutanov is a member of the World Academy of Art and Science; the Presidium of the Kazakhstan National Academy of Natural Sciences; and the Royal Economic Society. He has also contributed to a number of national and international organizations as President, including: Kazakhstani Office of the International Society for Engineering Education IGIP (Switzerland); Kazakhstan Society for Engineering Education (KazSEE) of International Federation for Engineering Education; and the National Academy of Higher Education of Kazakhstan.

He is an author of more than 400 scientific publications and 20 monographs, textbooks, teaching materials in the management of technical, social and economic processes, published in Kazakhstan, USA, Czech Republic, Sweden, Switzerland, among others. In 2014, Springer Publishing company published his book 'Mathematical Methods and Models in Economic Planning, Management and Budgeting', which has been acclaimed by experts. Dr. G. Mutanov has more than 40 patents and inventions. In 2014, Dr. G. Mutanov and a group of the University scientists had two patents registered with the US Patent & Trademark Office (USPTO), USA.

Contact details:

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COMSATS' BRIEF AND ANNOUNCEMENTS

Selected Forthcoming Scientific Events in COMSATS' Countries

18-20 November 2015	The 21 st IEEE Pacific Rim International Symposium on Dependable Computing (PRDC 2015), Zhangjiajie, China (http://prdc.dependability.org/PRDC2015/)
23 - 25 November 2015	2 nd International Workshop on 'Applications of ICTs in Education, Healthcare and Agriculture', Rabat, Morocco (www.comsats.org)
30 Nov - 4 Dec 2015	The XI Latin American Symposium on Nuclear Physics and Applications, Medellin, Colombia (www.gfnun.unal.edu.co/LASNPAXI)

The 3rd Commission Meeting and The 3rd Consultative Committee Meeting Accra, Ghana (26-28 October 2015)

COMSATS is pleased to announce the convening of the 3rd Meeting of its Commission by the Chairperson of COMSATS, H.E. Dr. John Dramani Mahama, President of the Republic of Ghana. The meeting will be held in Accra, Ghana, on October 27-28, 2015. The 3rd Meeting of COMSATS Consultative Committee will also be held in conjunction with the Commission Meeting, on 26th October 2015. The letters of invitations for these statutory body meetings of COMSATS have been extended to the relevant officials in Member States. The invitees of the two meetings are welcome to contact the following focal persons for any assistance:

Hon. Dr. Rashid Pelpuo

Office of the President of Ghana (Chairman of Planning Committee for 3rd Commission Meeting), Accra Tel.: (+233-302) 665447 Email: rashpelp.rp@gmail.com

Mr. Tajammul Hussain Advisor (Programmes) COMSATS Secretariat Islamabad Tel.: (+92-51) 9204892 Email: husseint@comsats.net.pk

Publication of AS-ICTP: 50 Years of Science for the Future - Views from Islamabad

COMSATS has published a book entitled, 'AS-ICTP: 50 Years of Science for the Future - Views from Islamabad'. This publication primarily covers proceedings to the ceremony held in Islamabad (18th October 2014) in connection with the 50th Anniversary of the Abdus Salam - International Centre for Theoretical Physics, Trieste, Italy. Apart from the talks made during the ceremony the publication features statistical and historical information on ICTP; and pictorial projections of ICTP 50th Anniversary events held in Italy and Islamabad. Copies of the book can be ordered from COMSATS Secretariat.

Science Vision - Call for Papers

COMSATS invites scholarly contribution for Volume 21(1) of its biannual journal Science Vision, which aims at highlighting the important scientific and technological developments that have a bearing on socio-economic conditions of the people.

For more information, visit the journal's website: www.sciencevision.org.pk

A BRIEF ON COMSATS

The Commission on Science and Technology for (COMSATS) is an intergovernmental organization, with its Secretariat located in Islamabad, Pakistan.

COMSATS, currently, has 22 developing countries as its members, spread across three continents, i.e., Latin America, Africa and Asia. A network, of 20 International S&T Centres of Excellence, is also affiliated with COMSATS to Member States. The mission of COMSATS is to

COMSATS NETWORK











TIRDO





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