



# S&T Newsletter



A Quarterly of the  
Centre for Science and Technology of the Non-Aligned  
and Other Developing Countries (NAM S&T Centre)

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**JANUARY - MARCH 2017**

## FROM THE DG'S DESK

Warmest greetings to our esteemed readers!!



The NAM S&T Centre in partnership with the Amity University, India successfully organised an International Workshop on 'Trends in Solar Power Generation and Energy Harvesting' during 27-29 March 2017 in Dubai. 33 experts and professionals from 23 countries and 39 scientists from the host country UAE, besides 13 renowned scientists as invited speakers, attended the Workshop, which was concluded with the adoption of a Dubai Resolution on the Workshop theme.

The Centre was actively engaged with the initiative of the Research and Information System for Developing Countries (RIS), India in organising a training course on 'Science Diplomacy' which was held in New Delhi, India during 9-20 January 2017. The course was attended by 37 senior experts, professionals, diplomats, editors and researchers from 21 developing nations.

The Centre is assisting the Palestine Engineers Association (PEA) and the Federation of Arab Engineers in identifying experts to give keynote presentations during the 1<sup>st</sup> International Conference on 'Climate Change' to be organised at Al Birh, Palestine on 8-9 May 2017.

The Selection Committee of the NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation 2017 finalised 20 participants from 12 countries for the award of 2017 Fellowships.

Applications have been invited for the Joint NAM S&T Centre - ZMT Bremen (Germany) Fellowship in Tropical Coastal Marine Research for the year 2017.

Implementation of the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme for 2016-17 is almost complete with 49 researchers from 30 countries having already joined their respective Indian host R&D and academic institutions.

International scientific activities on a range of topics are lined up by the Centre in coming period, including an international workshop on 'Drought Management and Desertification Control' at Mashaad, Iran on 22-24 May 2017 and the 2<sup>nd</sup> Training Workshop on 'Industrial Biotechnology' in Zimbabwe on 22-24 August 2017.

Happy Reading!

  
(Arun P. Kulshreshtha)

## Centre Organised

### International Workshop on Trends in Solar Power Generation and Energy Harvesting Dubai, 27-29 March 2017

The global demand for energy is currently growing beyond the limits of installable generation capacity. To efficiently meet the future energy demands, energy security and reliability should be improved and alternative energy sources should be aggressively investigated. An effective energy solution should be able to address long-term issues by utilising alternative and renewable energy sources. Of the many available renewable sources of energy, solar energy is clearly a promising option as it is abundantly available at most places and is also the cleanest energy resource on earth. Solar power, especially as it reaches more competitive levels with other energy sources in terms of cost, may serve to sustain the lives of millions of underprivileged people in developing countries.

The recent trends are to decrease the cost of the energy generation either by introducing the low cost processing techniques or to increase the efficiency of the solar cells. After 1<sup>st</sup> and 2<sup>nd</sup> generation of bulk silicon based solar cells and thin-film Si/CdTe/CIGS based solar cells, respectively, the 3<sup>rd</sup> generation technologies are underway. Many new technologies include photo-electrochemical cells, polymer solar cells, quantum dot, tandem / multi-junction solar cells, up-conversion and down-conversion, surface plasmonic, nano-crystal solar cells and other novel innovations and inventions. The aim is to define an approach for Solar Power Generation and intersecting themes for enabling better informed policy-making.

In order to deliberate on the current trends in solar power generation, its storage, harnessing and related issues, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) jointly with the Amity University, UP, India - Dubai Campus organised an International Workshop on "Trends in Solar Power Generation and Energy Harvesting" in Dubai during 27-29 March 2017. The chief organisers of this international scientific event were Prof. Dr. V. K. Jain as the Chairman and Dr. Abhishek Verma as the Secretary from the Amity University, UP, India; Dr. Chithirai Pon Selvan as Secretary from the Amity University, Dubai Campus; and Prof. Dr. Arun P. Kulshreshtha and Mr. M. Bandyopadhyay from the NAM S&T Centre.

The Inaugural Session commenced with a welcome note by Dr. Narayanan Ramachandran, Pro Vice Chancellor, Amity University, Dubai followed by the remarks by Dr. V.K. Jain, Distinguished Scientist & Professor, Amity Institute of Advanced Research and Studies (Materials & Devices), Amity Institute of Renewable and Alternative Energy, Amity University, Noida, India who spoke on current developments in solar energy research world over, underscored the background of the workshop and explained the technical programmes planned for the same. Mr. M. Bandyopadhyay, Senior Expert, NAM S&T Centre in his remarks presented the genesis of the event touching upon the basic issues related to solar power generation and energy harvesting and also gave a



Inaugural Session: (L to R) Dr. Narayanan Ramachandran, Dr. Ajit K Nagpal, Dr. V.K. Jain, Dr. Ashok K. Chauhan, Mr. M. Bandyopadhyay, Dr. Atul Chauhan, Dr. Vajhat Hussain and Mr. David Provenzano

WORKSHOP ON TRENDS IN SOLAR POWER GENERATION AND ENERGY HARVESTING,  
DUBAI, 27-29 MARCH 2017

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(Contd. from Page 1 - Solar Energy Workshop, Dubai)

presentation with a brief description of the activities of the NAM S&T Centre. This was followed by the remarks by Mr. David Provenzani, Managing Director, Architaly Green Energy DMCC, Dubai who spoke on the initiatives taken to provide solar energy to schools and universities in Dubai. In his Presidential Address, Dr. Ashok K. Chauhan, Founder President of the Amity Group of Institutions stated that Solar power either through directly converting sunlight into electricity by using Photovoltaics (PV) or by indirect use of concentrated solar energy has a competitive edge over other sources in terms of cost and may serve to sustain the lives of millions of underprivileged people in developing countries and said that the Amity University has already started several programmes in these areas. Dr. Atul Chauhan, Chancellor, Amity University briefly expressed his views about the role being played by the Amity University in the promotion of education and training in the fields of renewable energy. At the end of the Inaugural Session, a book on compilation of abstracts of papers and CVs of the participants who would make their presentation during the workshop was launched.

The Workshop was attended by 13 renowned scientists as invited speakers and 33 senior experts and professionals from 23 countries, including Afghanistan, Cambodia, Cuba, Egypt, Gambia, India, Indonesia, Iran, Iraq, Malaysia, Mauritius, Morocco, Nepal, Nigeria, Palestine, Sri Lanka, South Africa, Tanzania, Togo, Turkey, United Kingdom, Zambia and Zimbabwe. Further, 39 scientists from the host country UAE participated in the Workshop including 11 experts who had made their presentations. Moreover, several representatives of the government agencies, NGOs, academia and industry from UAE attended the Inaugural Session. Besides this, there was a poster session in which 24 Poster Presentations were made.

The overall programme of the Workshop was conducted in nine Technical Sessions and the Concluding Session.

The invited speakers were - Dr. Vikram Kumar [Emeritus Professor, Centre for Applied research in Electronics (CARE) & Coordinator, Nanoscale Research Facility, Indian Institute of Technology, Delhi, India], Dr. V. K. Jain [Formerly: Director Grade Scientist, Solid State Physics Lab. (DRDO) Distinguished Scientist & Professor, Amity Institute of Advanced Research and Studies (Materials & Devices), Amity Institute of Renewable and Alternative Energy, Amity University, Noida, India], Dr. Chetan Singh Solanki [Professor, Department of Energy Science and Engineering, Indian Institute of Technology Bombay (IITB), India], Dr. R. K. Kotnala, [Chief Scientist & Head, Materials Physics & Engineering Division, National Physical Laboratory, India], Prof. P. K. Bhatnagar [UGC BSR Faculty Fellow, Department of Electronic Science, Delhi University South Campus, New Delhi, India], Prof. Mridula Gupta [Professor, Department of Electronic Science, University of Delhi, South Campus, New Delhi, India], Dr. A. Subramanyam [Professor, Department of Physics, Indian Institute of Technology Madras, Chennai, India], Prof. Viresh Dutta [Head, Centre for Energy Studies, Indian Institute of Technology, New Delhi, India], Prof. R. Bhattacharya [Visiting Faculty, Centre of Excellence of Green Energy & Sensor Systems

(CEGESS), Indian Institute of Engineering Science and Technology (IIEST), Shibpur-Howrah & Delhi Technological Institute, New Delhi, India], Dr. R. M. Mehra [Professor Emeritus, Department of Electronics and Communication Engineering, School of Engineering and Technology, Sharda University, Knowledge Park 3, Greater Noida, UP, India], Dr. Hiranmay Saha [Chair Professor and co-ordinator, The Centre of Excellence for Green Energy and Sensor Systems, Indian Institute of Engineering Science and Technology, Shibpur, West Bengal, India], Prof. Trystan Watson [Associate Professor, A230 Engineering East, Swansea University Bay Campus, Fabian Way Swansea SA18QQ, UK] and Prof. Dave Worsley [Research Director, Baglan Bay Innovation Centre, Central Avenue, Baglan Energy Park, Baglan SA127AX, UK].

The foreign participants (NAM Countries) were from - Afghanistan [Mr. Sultan Ali Javid, Advisor to the Minister of Development and Energy, Ministry of Refugees & Repatriation, Waysalabad, Kabul], Cambodia [Mr. Row Vattanak, Deputy Chief of Generation Planning Office, Electricité Du Cambodge, St. Preah Yukunthor, Khan Daun Penh, Phnom Penh City], Cuba [Prof. José Luis Pérez González, Specialist for the Control of the Activity of S&T, Directorate of Science, Technology and Innovation, Ministry of Science, Technology and Environment (CITMA), Havana], Egypt [Dr. Essam Tawfik Mohamed Elshenawy, Researcher, National Research Center, Solar Energy Department, Dokki, Giza], Gambia [Mr. Lamin Morikebba Jarju, Cadet Energy Officer, Ministry of Petroleum and Energy, Futurelec Building, Kotu, Gambia], Indonesia [Dr. Arya Rezavidi, Principal Engineer, B2TKE BPPT (Center for the Energy Conversion Technology, Agency for the Assessment and Application of Technology), Gedung, Puspitek Serpong, Tangerang, Selatan], Iran [Dr. Gholamreza Farahani, Scientific Board, Manager of Telecommunication, Iranian Research Organization for Science and Technology (IROST), Ahmadabad Mostoufi Rd], Iraq [Dr. Falah Ibrahim Mustafa Al-Attar, Director, Solar Energy Research Center, Renewable Energy Directorate, Ministry of Science and Technology, Baghdad], Malaysia [Mr. Mohd Fauzi Ismail, Director, Industrial Centre of Innovation in Energy Management, SIRIM Industrial Research, No. 1 Persiaran Dato' Menteri Section 2, Shah Alam], Mauritius [Mr. Vishwamitra Oree, Senior Lecturer, Electrical and Electronic Engineering Department, Faculty of Engineering, University of Mauritius], Morocco [Prof. Ismail Mekkaoui Alaoui, Professor of Physics, Cadi Ayyad University, Physics Department, Faculty of Sciences Semlalia, Marrakech], Nepal [Prof. Dr. Jiba Raj Pokharel, Vice-Chancellor, Nepal Academy of Science and Technology (NAST), Khumaltar, Lalitpur], Nigeria [Engr. Muhammed Musa Gaji, Principal Scientific Officer, Energy Commission of Nigeria, Department of Renewable Energy, Abuja], Palestine [Eng. Makawi Diab Hraiz, Director, Industrial Synergy Center, Palestine Polytechnic University, Hebron], Sri Lanka [Dr. D. S. M. De Silva, Senior Lecturer, Department of Chemistry, University of Kelaniya], South Africa [Ms. Sophie Tshimangadzo Mulaudzi, Lecturer, Department of Physics, University of Venda (UNIVEN), Thohoyandou], Tanzania [Mr. Ahmed Mmingwa, Principal Engineer, Tanzania Electric Supply Co. Ltd, Dar Es Salaam], Togo [Dr. Komi



Group Photo

WORKSHOP ON TRENDS IN SOLAR POWER GENERATION AND ENERGY HARVESTING,  
DUBAI, 27-29 MARCH 2017

(Contd. from Page 2 - Solar Energy Workshop, Dubai)

 <b>Javid</b> Afghanistan	 <b>Vattanak</b> Cambodia	 <b>González</b> Cuba	 <b>Elshenawy</b> Egypt	 <b>Jarju</b> Gambia	 <b>Rezavidi</b> Indonesia	 <b>Farahani</b> Iran	
 <b>Mustafa</b> Iraq	 <b>Ismail</b> Malaysia	 <b>Oree</b> Mauritius	 <b>Alaoui</b> Morocco	 <b>Pokharel</b> Nepal	 <b>Gaji</b> Nigeria	 <b>Hraiz</b> Palestine	
 <b>Silva</b> Sri Lanka	 <b>Mulaudzi</b> S. Africa	 <b>Mmingwa</b> Tanzania	 <b>Amou</b> Togo	 <b>Osman</b> Turkey	 <b>Mwiinga</b> Zambia	 <b>Bhunu</b> Zimbabwe	
 <b>Watson</b>	 <b>Worsley</b>	<p><b>Foreign Participants sponsored by NAM S&amp;T Centre</b>                  WORKSHOP ON TRENDS IN SOLAR POWER GENERATION                  AND ENERGY HARVESTING,                  DUBAI, 27-29 MARCH 2017</p>				 <b>Bandyopadhyay</b>	 <b>Meenu</b>
<b>Foreign Invited Speakers</b>						<b>NAM S&amp;T Centre Representatives</b>	

Preetha Sreekumar [Faculty Member, Department of Electronics Engineering, Higher Colleges of Technology, Abu Dhabi], Mr. Ashok Thangavelu [Head - Sales & Marketing (MENA), Echosolar, Dubai], Mr. Stefan Muckstein [Chief Operating Officer, Enerwhere DMCC, Dubai], Mr. Claudio Palmieri [CEO, Green Emirates - CLS Energy Consultants DMCC, Dubai], Dr. Shashank Khurana [Assistant Professor, Department of Mechanical Engineering, Birla Institute of Technology & Science, Pilani, Dubai], Mr. Abraham Samuel [Assistant Professor, Amity University Dubai], Dr. Rajiv Selvam [Assistant Professor, Manipal University, Dubai], Dr. Swaroop. R [Assistant Professor, Amity University Dubai], Mr. Ganesan Subramanian [Assistant Professor, Manipal University, Dubai] and Mr. Anoo Babu [BIPV Solar Expert GOPA - International Energy Consultants GmbH, Dubai].

Twenty four poster presentations were made by the students of the Amity University, Dubai [Mr. Bilal, Ms. Fathima Al Zahra, Ms. Asma Sharif, Mr. Mohammed Mansoor, Ms. Mrunal Sanjeev Zuting, Ms. Nibhrita Tiwari, Mr. Affan, Mr. Udelle, Mr. Akash Bandyopadhyay, Mr. Yousif Khatir, Ms. Jeswinnie, Mr. Mamnur Rashid, Mr. Nelvin Chummar Vincent, Mr. Jalees Saqib Kamal Azhari, Mr. Akashdeep, Mr. Kaleem Ahmed and Mr. Shrey Gary]; Amity University, UP, India [Mr. Harsimran Singh Bindra, Ms. Astha Jain, Mr. Sidhant Jain, Mr. Bidyut Barman, and Mr. Vivek Kumar]; Amity University, Haryana, India [Mr. T. Munetsiwa]; and Jamia Millia Islamia, India [Dr. Javid Ali].

Apéléte Amou, Assistant Professor, BLV Gnassingbe Eyadema, Université De Lome, Lome], Turkey [Assoc. Prof. Dr. Alp Osman, Head Senior Researcher, TUBITAK Marmara Research Center, Baris Mah., Kocaeli], Zambia [Mr. Nchimunya Mwiinga, Lecturer II, Department of Physics, School of Natural Sciences, University of Zambia, Lusaka], Zimbabwe [Mr. Everson Bhunu, Science and Technology Officer, Ministry of Higher and Tertiary Education, Science and Technology Development, Causeway, Harare].

The Indian participants / speakers were - Mr. Vineet Saini, [Scientist-D, Solar Energy Research Initiative Program, Technology Mission Division, Department of Science and Technology (DST), Govt. of India, New Delhi], Dr. Kulvinder Singh [Associate Professor, Faculty of Science, University of Delhi], Dr. Abhishek Kardam [Assistant Professor, Amity Institute of Advanced Research Studies, Amity Institute of Renewable & Alternative Energy, Amity University, Noida], Dr. Alok Kumar Rai [Associate Professor, Amity University, Noida], Dr. Subramanyam Ganumukkala [Director, Siri Exergy & Carbon Advisory Services (P) Ltd, Hyderabad], Dr. Subhra Das [Professor and Head, Department of Renewable Energy, Amity School of Applied Sciences (ASAS), Amity Education Valley, Manesar, Gurgaon, Haryana], Dr. Abhishek Verma [Assistant Professor, AIARS(M&D), Amity University UP, Noida], Prof. Kanchan Saxena [Head, AIRAE, Amity University UP, Noida], Dr. Javid Ali [Assistant Professor, Department of Physics, Jamia Millia Islamia, New Delhi], Mr. Harsimran Singh Bindra [Scholar, AINT, Amity University UP, Noida], Ms. Astha Jain [Mplus Company, Delhi], Mr. Sidhant Jain [Amity University UP, Noida], Mr. Bidyut Barman [AIARS(M&D), Amity University UP, Noida], Mr. Vivek Kumar [AIARS(M&D), Amity University UP, Noida], Mr. T Munetsiwa [Amity University Haryana], Dr. Rakhi Grover [Assistant Professor, Amity University, U.P.], Dr. O.P. Sinha [Associate Professor, Amity Institute of Nano-Technology Amity University, Noida], Dr. Ayana Bhaduri [Department of Applied Physics, Amity University, Gurgaon], Dr. Sanjeev Sharma [Associate Professor, Mechanical Engineering Department, Amity University Haryana] and Ms. Meenu Galyan [Research Associate, NAM S&T Centre, New Delhi].

The participants / speakers from UAE were - Mr. David Provenzani [Managing Director, Architaly Green Energy DMCC, Dubai], Ms.

The NAM S&T Centre was represented by Mr. M. Bandyopadhyay, Senior Expert and Ms. Meenu Galyan, Research Associate.

The Invited Speakers presented their papers on 'Photovoltaic Research - an Indian Perspective' by Dr. Vikram Kumar; 'Recent Trends in Solar Energy Generation and Harvesting' by Dr. V. K. Jain; 'Towards Giving Right to Clean Light' by Dr. Chetan Singh Solanki; 'Hydroelectric Cell Invention: A Boon for Green Energy & Environment' by Dr. R. K. Kotnala; 'Organic Solar Cells - Recent Developments - a Brief Review' by Prof. P. K. Bhatnagar; 'Recent Trends in Energy Saving Environmental Friendly OLEDs' by Prof. Mridula Gupta; 'Recent trends and challenges in the third and fourth generation Thin film Photovoltaics' by Dr. A. Subramanyam; 'Photovoltaic based DC Microgrids and AC Microgrids using Hydrogen Storage System' by Prof. Viresh Dutta; 'Self-cleaning of Solar panels' by Dr. R. Bhattacharya; 'Stable, Highly Efficient and Low Cost Perovskite Solar Cells' by Prof. R. M. Mehra; and 'Evolution of Silicon Solar Cells: Past History and Present Trend' by Dr. Hiranmay Saha; 'Third Generation Solar Cells from Laboratory to Factory; developing a Scale-up Route for Perovskite Solar Cells to turn buildings into Power Stations' by Prof. Trystan Watson and 'Active Buildings; the Use of Solar Active Facades for Generation Storage and Release of Energy' by Prof. Dave Worsley.

The presentations made by the participants from the NAM countries were on 'The Status of Solar Power Generation in Afghanistan' by Mr. Sultan Ali Javid; 'Solar Photovoltaic Energy in Cambodia "An Opportunity with Obstacles"' by Mr. Row Vattanak; 'Cuban's Trends in Solar Power Generation and Energy Harvesting' by Prof. José Luis Pérez González; 'Effect of Partial Shading on the PV Module Output' by Dr. Essam Tawfik Mohamed Elshenawy; 'Policies, Programmes and Current Status on Solar Power Generation in the Gambia' by Mr. Lamin Morikebba Jarju; 'Evaluation of Operation of Independent Power Producer (IPP) 5 MWP Photovoltaic Power Generator in Kupang, East Nusa Tenggara, Indonesia' by Dr. Arya Rezavidi; 'Effects of Partial Shading on MPPT of PV System' by Dr. Gholamreza Farahani; 'The Future of Solar Energy Investment in

(Contd. on page 4)

(Contd. from Page 3 - Solar Energy Workshop, Dubai)

										
Bhatnagar	Bhattacharya	Dutta	Gupta	Jain	Kontala	Das	Bhaduri	Ganumukkala	Grover	Kardam
										
Kumar	Mehra	Saha	Solanki	Subramanyam		Rai	Saini	Singh	Sinha	
<b>Invited Indian Speakers</b>					<b>Other Indian Speakers</b>					

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Iraq' by Dr. Falah Ibrahim Mustafa Al-Attar; 'A Review on Solar Thermal Technologies for Low and Medium Temperature Industrial Process Heat' by Mr. Mohd Fauzi Ismail; 'Solar Energy Harvesting in Mauritius: Opportunities and Challenges' by Mr. Vishwamitra Oree; 'On Morocco's Renewable Energy after COP 22' by Prof. Ismail Mekkaoui Alaoui; 'Chemical Storage of Solar Energy through the Use of Slaked Lime' by Prof. Dr. Jiba Raj Pokharel; 'Sustainable Renewable Energy Possibility for Nigeria as the Way Forward' by Engr. Muhammed Musa Gaji; 'Evaluating the Performance of the PV-Modules available in Palestinian Market' by Eng. Makawi Diab Hraiz; 'Fabrication of CdS/CdTe Thin Film Solar Cells via the Technique of Electrodeposition' by Dr. D. S. M. De Silva; 'An Overview of Solar Energy Landscape, Solar Radiation and Solar Cells Studies in Limpopo Province of South Africa' by Ms. Sophie Tshimangadzo Mulaudzi; 'The Solar Resource' by Mr. Ahmed Mmingwa; 'Simulation and Prediction of the Power Output for Photovoltaic Systems' by Dr. Komi Apélété Amou; 'Quantitative Analysis Of Commercial Photovoltaic Solar Cells And Modules With Electroluminescence' by Assoc. Prof. Dr. Alp Osman; 'Sigmoid Characteristics of Static Resistance – Voltage Curves for Diodes and Solar Cells under Dark Conditions: Theory, Simulation & Experiment' by Mr. Nchimunya Mwiinga; 'Trends in Solar Power Generation and Energy Harvesting in Zimbabwe' by Mr. Everson Bhunu.

'Review of Control Strategies used in Interfacing Solar Power Generation Units to the Grid' by Ms. Preetha Sreekumar 'Net Metered Solar Rooftop Schemes - An overview' by Mr. Ashok Thangavelu, 'Solar Power for Temporary Off-Grid Use' by Mr. Stefan Muckstein, 'The Importance of Provision of Construction Financing in Solar Industry' by Mr. Claudio Palmieri, 'Design and Performance Study of a Solar Operated Aqua Ammonia Absorption Refrigeration System' by Mr. Joseph Jeyasurya and Ms. Gayathri Hariharan, 'Architectural Insights on Passive Strategies towards Optimum Solar Designs' by Mr. Abraham Samuel, 'Design and Fabrication of Solar Powered Automotive Air Condition's Refrigeration System' by Mr. Nakhwa Umair and Ms. Neethu Vijayan, 'Comparison of PV Technologies and Forecasting PV Power Generation using Artificial Neural Networks' by Dr. Swaroop R, 'Internet of Things (IOT) Based Solar Panel Monitoring System for Higher Efficiency' by Mr. Ganesan Subramanian, 'Utility-Scale Solar PV and Demand Side Based Integrated Solar PV' by Mr. Anoo Babu, and 'Current Status of Solar Power in India' by Ms. Meenu Galyan.

The Concluding Session was presided over by Dr. Narayanan Ramachandran, Pro Vice Chancellor, Amity University, Dubai and Dr. V.K. Jain, Amity University, NOIDA, India. Mr. M. Bandyopadhyay, NAM S&T Centre initiated the discussion on a draft Dubai Resolution on 'Trends in Solar Power Generation and Energy Harvesting' and invited comments/inputs from the participants which were then incorporated in the draft after deliberations. The finalised Resolution was then read out before the house and unanimously adopted during the session.

							
Babu	Muckstein	Palmieri	Provenzani	Samuel	Sreekumar	Swaroop	Thangavelu

**Speakers from UAE**  
WORKSHOP ON TRENDS IN SOLAR POWER GENERATION AND ENERGY HARVESTING,  
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The participants from India and UAE presented their papers on 'Advance Research in Photovoltaic Thermal System: A Review' by Mr. Vineet Saini, 'X-Ray Switching In Commercial Grade Solar Panel' by Dr. Kulvinder Singh, 'Rapid Thermal Charging Properties of Nanomaterials embedded PCM Composites for Solar Thermal Energy Storage Applications' by Dr. Abhishek Kardam, 'High Rate Capability and Long Cycle Stability of Mixed Transition Metal Oxides as an Anode Material for High-Performance Lithium Ion Batteries' by Dr. Alok Kumar Rai, 'Energy Audit of 5 MW Solar power Plant – A Case Study' by Dr. Subramanyam Ganumukkala, 'Overview of Risk Assessment in Solar PV Power Plant' by Prof. Subhra Das, 'Dye Sensitized Solar Cells: Role of Dyes and Electrolytes' by Dr. Rakhi Grover, 'Organic- Inorganic Quantum Dots Hybrid Nanostructures for Solar Energy Harvesting' by Dr. O. P. Sinha, 'Review on Inorganic Organic Hybrid Solar Cell "or" Review on Nanocrystalline Silicon Germanium for Solar Cell Material' by Dr. Ayana Bhaduri, 'Aerodynamic Design & Development of Solar Car' by Dr. Sanjeev Sharma, 'Dubai Solar Schools Initiative, A Project to provide Solar Energy to Schools & Universities in Dubai' by Mr. David Provenzani,

a 3-member committee were given to Mr. Vivek Kumar, Amity University Noida [First Prize]; Mr. T. Munetsiwa, Amity University Haryana [Second Prize]; and Ms. Fathima Al Zahra, Amity University, Dubai [Third Prize]. The Certificates of Participation were handed over to the participants by Dr. Ramachandran and Dr. V.K. Jain.

Besides the above, an interaction meeting with the foreign delegates (NAM Countries) was held which was presided over by Dr. Ashok Chauhan, Founder President, Amity Education Group. Dr. Chauhan also had a separate meeting with the senior Indian scientists in order to explore the possibilities of networking among the solar scientists in the developing countries and the Amity University.

The participants thanked the organisers and hosts, Amity University, for the excellent arrangements made and efficiently coordinating and conducting the Workshop.

A Dhow Cruise Dinner at Dubai Marina was hosted by the organisers on 28<sup>th</sup> March (second day) for the invited guests and participants.

## Dubai Resolution

On

# TRENDS IN SOLAR POWER GENERATION AND ENERGY HARVESTING IN DEVELOPING COUNTRIES

**WHILE EXPRESSING GRATITUDE** to the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) for organising the International Workshop on 'Trends in Solar Power Generation and Energy Harvesting' at Dubai during 27–29 March 2017.

**EXPRESSING APPRECIATION** to the Amity University, UP, India – Dubai Campus for co-organising and hosting the International Workshop.

**RECOGNISING** that solar power, especially as it reaches more competitive levels with other renewable energy sources, may serve to sustain the lives and families of millions of underprivileged peoples in developing countries.

**HAVING CONSIDERED** that renewable energy resources can improve quality of life by promoting sustainable development and systems such as solar power are practical, reliable, cost-effective, and healthier for people and the environment.

**HAVING DELIBERATED** on how solar power is the best choice for sustainability and renewable energy in developing countries, and how completed projects and on-going work in remote locations may create confidence to take up more ambitious projects.

**TAKING INTO ACCOUNT** that presently there is an urgent need for efficient harnessing of various forms of solar energy i.e. Solar Thermal & Photovoltaic in GW capacities with efficient technologies demonstrated for lighting needs, potable water generation & distribution, mid-day meal preparation and distribution in schools, vaccine preservation, health care, information distribution and comfort needs of aging population in NAM and other developing countries.

**WE, THE PARTICIPANTS OF THE WORKSHOP**, comprising Scientists, Researchers, Engineers and Policy Makers representing the governments, institutions and agencies from **Afghanistan, Cambodia, Cuba, Egypt, The Gambia, India, Indonesia, Iran, Iraq, Malaysia, Mauritius, Morocco, Nepal, Nigeria, Palestine, South Africa, Sri Lanka, Tanzania, Togo, Turkey, Zambia and Zimbabwe.**

**UNANIMOUSLY RESOLVE AND RECOMMEND THAT:**

- The governments in the developing countries should undertake appropriate policy measures to promote renewable energy development including solar PV and Solar thermal technologies and applications, appropriate for local conditions of economic development, social development and resources availability.
- Strong enabling policy framework should be evolved to promote an environment where renewable energy technologies do not face unfair disadvantages compared to conventional energy technologies to nurture the local markets.
- Adequate support mechanisms should be provided by the Governments to promote Solar Energy in order to fulfil its potential and contribute to meeting the energy needs in the developing countries.
- Governments in the developing countries should steer resources mobilised for large-scale investments into new production sectors and new technologies. The policies should base on active industrial policies, combining large scale investments and active policy interventions.
- Governmental incentives should be provided to strengthen the solar PV market that may positively affect installations for developing nations. More funding will make solar energy economical in on-grid markets, which will then lower the prices because of the high volume of manufacturing.
- New and innovative implementation models to finance and operate solar energy technologies are needed, to overcome the barrier of high capital costs and encourage the widespread use of renewable energy in rural and remote communities.
- Programmes on awareness creation and capacity building for planners and other relevant agencies should be initiated.
- The skills needed to deliver the Solar Energy programme in its entirety, including the long term support required for appropriate training for the service delivery chain need to be analysed thoroughly.
- The informal, traditional, micro, small and medium scale manufacturing sectors for solar energy devices should be transformed to become environmentally and financially sustainable by fostering R&D, capacity building and skill upgradation so that they are globally competitive.
- The trends in Solar Power Generation and Energy Harvesting are presently crystalline c-Si based. In this area manufacturing in developing countries is currently insignificant as compared to the global output for proliferation of solar power generation through PV route. Therefore, they will have to solely depend on import of PV panels. As such supporting R&D in this area in developing countries, with sub critical funding, without producing poly Silicon material cheaply and in quantities, may not necessarily translate into lower cost of solar cell manufacturing. It is therefore suggested that a task force of NAM & other developing countries may be formed to look into this problem and suggest remedial action.
- Solar thermal power generation appears to be attractive in the above context in these countries. However its proliferation will need massive investment to compete with solar PV based power generation. Techno-economics of this initiative, therefore, needs to be closely worked out.
- As cooling is the most pressing demand to maintain productivity in most of the NAM countries, efficient ways of solar cooling systems of various capacities need to be consciously developed and deployed. This requires to be studied in all its details and necessary blueprint for R&D leading to manufacturing of such systems be prepared.
- Availability of potable drinking water purified through RO, desalination & other emerging technologies utilising solar energy in schools & other remote communities, should be implemented.
- Scheffler type dishes and other related technologies for cooking mid-day meals for school children using solar thermal energy may be encouraged.
- Standardization and certification mechanisms for solar equipment should be strengthened.

Considering the high quality research infrastructure and expertise available in the Amity University and other institutions, in the area of Solar Energy, it was suggested that the scientists and researchers from the developing countries may be given opportunities for short term affiliation in such institutions for their capacity building in this field. The detailed terms and conditions for such arrangements may be settled after mutual consultation.

To facilitate close interaction and information dissemination among scientists of various countries, a website has been created by Amity University, which can lead to many collaborative programmes and also help in developing training programmes. The website has been launched as: [www.amitynamstworkshop.com](http://www.amitynamstworkshop.com).

**THUS RESOLVED AND ADOPTED AT DUBAI, UAE THIS DAY, THE 29<sup>TH</sup> OF MARCH, TWO THOUSAND SEVENTEEN.**

## SCIENCE AND TECHNOLOGY NEWS IN THE DEVELOPING WORLD

### Africa: African Countries mobilise to battle Invasive Caterpillar

African nations are gearing up to battle an invasive crop pest called the fall armyworm, which has been rapidly spreading across the continent since its arrival there just over a year ago. The caterpillar has wreaked destruction on staple crops including maize (corn), millet and sorghum. Experts warn that Europe and Asia could be next. At an emergency meeting organised in Harare, Zimbabwe earlier in March 2017 by the regional Africa office of the Food and Agriculture Organization (FAO) of the United Nations 16 countries agreed to urgent plans to boost the region's capacity to manage crop pests. The meeting was basically aimed largely at strengthening preparedness for the countries and the affected countries are assessing their preparedness for other new invasive pests. Researchers are also launching studies to understand the behaviour of the pest in new environments, as well as its susceptibility to insecticides. The fall armyworm (*Spodoptera frugiperda*) originates in Central and South America. It was first identified in West Africa in January 2016, and has since moved to at least 12 countries on the continent, reaching 7 of them in the past 2 months alone. The pest is the larval form of the fall armyworm moth, and has a voracious and indiscriminate appetite munching its way through more than 100 different plants, including leafy crops. At least 290,000 hectares of cropland across 4 countries have already been destroyed, which is an underestimate and the exact figure is probably much higher. The fall armyworm is a serious problem in the countries where it is endemic. The FAO estimates that Brazil alone spends US\$600 million each year to control infestations. Africa has its own species of armyworm, *Spodoptera exempta*, which also devours the leaves of maize plants. But the invasive fall armyworm is especially worrisome because it also eats a plant's reproductive parts, eating through the maize cob itself, resulting in even more crop loss. Although the basic biology of the insect remains similar, confrontation of the pest by different environmental conditions and host plant ranges may cause the pest to react differently. The researchers will also study the efficacy of commercially available insecticides that have had to be rushed through an ongoing emergency-registration process to tackle the fall armyworm. It is likely that the fall armyworm will spread from its current distribution throughout sub-Saharan Africa fairly rapidly. From there, it is but a hop, skip and jump to southern Europe. Because the caterpillar can live on such a wide variety of plants, it is likely to persist year-round in southern Europe. So it is 'not unreasonable' to expect it to migrate through to Eastern Europe and Asia or to be transported there by agricultural export.

**Source: Nature, 2<sup>nd</sup> March 2017**

### Bangladesh: GE Potato

At present, Bangladesh is the 7<sup>th</sup> top producer of potato worldwide. However, Late blight is one of the most devastating diseases of potato caused by fungal attack. Each

year, farmers in Bangladesh spend up to US\$12.8M in applying 500 tonnes of fungicide to protect potato crops from late blight. Bangladesh is now set to gain from its second biotech crop after Bt brinjal. The scientists from Bangladesh Agricultural Research Institute (BARI) have developed a new variety of potato exhibiting resistance to late blight and have applied for its commercial release. According to the researchers at BARI's Tuber Crops Research Center, the final regulatory trials held in six locations in Bangladesh during the previous potato season showed positive results. Thus the application for commercial release was submitted on 29<sup>th</sup> December 2016.

**Source: Crop Biotech Update, 18<sup>th</sup> January 2017**

### Brazil: Acetone Sensor to self-monitor Blood Sugar Levels in Diabetics

With the technology currently available, diabetics have to check their blood sugar by pricking their finger and testing a drop of blood with a glucometer. The Center for Research and Development of Functional Materials (CDFM), a Research, Innovation and Dissemination Center (RIDC) in São Paulo, Brazil has now researched a non-invasive and painless procedure, which is a sensor similar to a breath analyser, except that it analyses not blood alcohol content but rather a key biomarker of diabetes in the patient's breath. The principle underlying the device is the sensitivity of silver tungstate ( $\alpha$ -Ag<sub>2</sub>WO<sub>4</sub>) to acetone (C<sub>3</sub>H<sub>6</sub>O). Everyone's breath contains acetone vapor, but in diabetics, it's about double the amount in normal people's breath. While a non-diabetic exhales 0.3 to 0.9 parts per million, a diabetic exhales over 1.8 parts per million. Earlier the researchers had observed that silver tungstate could serve as a sensor of ozone gas. The silver tungstate used as a sensor material is made up of nanoparticles in the form of rods. The rods are deposited on an electrode. The chemical reaction between acetone vapor and the surface of the sensor material reduces the latter's electrical resistance. When the gas is removed, the resistance returns to the initial value. The variation in resistance detected by the sensor is used to establish a correlation between resistance and the acetone concentration. Because the variation does not obey a linear function, the correlation between resistance and concentration has to be obtained experimentally, point by point.

**Source: Agência FAPESP, 1<sup>st</sup> February 2017**

### China: Haizi Mountain Ultra-High-Energy G-Rays Observatory

Set high on a mountain plain in China, an ambitious observatory will offer a unique perspective on the origins of cosmic rays, high-energy particles that rain down on Earth. Construction has started on the project, which will probe, for the first time, ultra-high-energy  $\gamma$ -rays, bursts of radiation thought to be produced alongside cosmic rays in our Galaxy, but whose origins are easier to track. The 1.3-square-kilometre site near Daocheng in Sichuan, close to Tibet, received the go-ahead in January 2018 after an

(Contd. on Page 8)

## *NAM S&T Centre Sponsors*

### **RIS-ITEC Course on Science Diplomacy**

**New Delhi, India**

**9<sup>th</sup>-20<sup>th</sup> January 2017**

Science has long connected researchers across boundaries – geographic and otherwise - through a shared search for answers. Advances in science have long relied on international flows of people and ideas. 'Science diplomacy' is one such tool that enables to adapt increased scientific and technical complexities into different foreign policies across the world. International scientific collaborations hold promise for science diplomacy to mitigate most of the global issues such as hunger, poverty, terrorism, climate changes, energy security etc.

The relationship between science and diplomacy can be articulated as three concepts that depend on the goals of the relationship – diplomacy for science; science in diplomacy; and science for diplomacy (or simply 'science diplomacy'). Within this framework, science is considered in its broadest sense to encompass not only scientific research but also the whole range of international scientific cooperation activities including education, capacity building and the people involved in the enterprise. Between the countries, diplomacy is also considered broadly to include both informal (i.e. people – to - people) and formal (governmental) relationships. Therefore science diplomacy on the whole facilitates positive engagement between countries that have strained, limited, or non-existent relationships such as India – Africa partnership for food security, cooperation between American and Soviet atomic scientists during the Cold War, etc.

The Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) actively engaged itself with the initiative of the Research and Information System for Developing Countries (RIS) in organising the 1<sup>st</sup> training course on 'Science Diplomacy' held at RIS, New Delhi, India under the Indian Technical & Economic Cooperation Programme (ITEC) sponsored by the Ministry of External Affairs (MEA), Government of India. It was a 2-week course from 9<sup>th</sup> to 20<sup>th</sup> January 2017 designed for the foreign participants who were interested in issues related to Science, Technology and innovation (STI), S&T and international affairs, and S&T and South-South Cooperation. The course objectives were to enable its participants to bring about the deeper understanding on the role of Science Diplomacy in foreign policy and strategy, use and benefit from Science Diplomacy and help in leveraging the S&T capacity building in the respective countries in engagement with other countries, regional and multi-lateral institutions and global organisations including UN and other finding agencies. This training programme was organised for government officials, diplomats, academicians, researchers and journalists from the developing and transition economies dealing with international economic and developmental policy issues and/or science, technology and innovation issues.

The inaugural session was chaired by Ambassador Shyam Saran, Chairman, RIS and formerly, Foreign Secretary of India. After the Welcome Note of Prof. Sachin Chaturvedi, Director General, RIS, special remarks were made by Mr. Dinkar Asthana, Joint Secretary (DPA II), Ministry of External Affairs, Government of India and Mrs. Sadhana Relia, Adviser & Head, International Multilateral & Regional Cooperation, Department of Science and Technology, Government of India. The inaugural address was delivered by Prof. Baldev Raj, Director, National Institute of Advanced Studies (NIAS) and Vote of Thanks was presented by Dr. Amit Kumar, Research Associate at RIS.

The training programme was attended by 37 senior experts, professionals, diplomats, editors and researchers from 21 countries, viz. Algeria, Azerbaijan, Belarus, Cambodia, Cameroon, Comoros, Croatia, Egypt, Ethiopia, Haiti, Indonesia, Kyrgyzstan, Mexico, Nigeria, Palestine, Peru, Russia, South Africa, Tunisia, Uruguay, Uzbekistan and the host country India (5 delegates). On behalf of the NAM S&T Centre Ms. Rashmi Srivastava, Research Associate, attended the Science Diplomacy Course.

The Faculty for the course comprising of the experts in science diplomacy and diplomats/officials with experience in multilateral negotiations related to S&T were from RIS; National Institute of Advanced Studies (NIAS), Bangalore; Jawaharlal Nehru University (JNU); South Asian University (SAU) and The Energy and Resources Institute (TERI) as well as international organisations (CABI, UNESCO) and experts from the Departments/agencies of the Government of India. The core faculty from RIS comprised Prof. Sachin Chaturvedi, Prof. S.K. Mohanty, Prof. T.C. James, Dr. T. P. Rajendran, Dr. K. Ravi Srinivas, Dr. Sabyasachi Saha and Dr. Amit Kumar.

The lectures by the eminent speakers and resource persons were categorised under the following four themes:

- Theme I: Modalities of Science Diplomacy at Bilateral, Regional and Multilateral Levels
- Theme II: STI and Developmental Challenges: Role of Science Diplomacy
- Theme III: Trade, Investment and Technology: Role of Science Diplomacy
- Theme IV: South-South Cooperation and Science Diplomacy

The course basically comprised of lectures, case studies, self study and group discussions, wherein background materials and resources for reading and learning were provided to each participant by RIS. The evening sessions were devoted to group tasks wherein four groups were formed, namely, Sustainable Development Goals, South-South Cooperation, Culture and Science Diplomacy and Country Specific STI and Science Diplomacy. Each group was guided by a mentor, which enabled in the completion of concise project made by the participants, on the specific science diplomacy issue. During the group activities, the participants exchanged information, experiences, insights and perceptions pertaining to the study area of Science Diplomacy. On the concluding day of the training course, 20<sup>th</sup> January 2017, participants from various countries got the opportunity to present their work in the presence of subject experts from RIS research faculty.

In order to leverage the learning and experience, the programme also outlined field visits at different destinations, namely, National Agricultural Science (NARS) Complex, Agricultural Museum, Central Electronics Limited (CEL), Delhi Sight Seeing and a visit to Agra and Jaipur. The study tour, therefore, benefitted the participants in acquiring hands on experiences pertaining to STI and Diplomacy.

The Valedictory Session of the 2-week training programme was chaired by Prof. Sachin Chaturvedi, DG, RIS. He welcomed the Chief Guest Mr. Yuri Afanasiev, UN Resident Coordinator and UNDP Resident Representative in India and the participants and expressed pleasure in bringing different delegates across the developing nations to a common platform at RIS. It was also mentioned that such occasions not only provide opportunities to the participants of various countries to meet, engage, gain and share knowledge, but also facilitate in fabricating optimistic future prospects to cooperate among themselves and mitigate various global issues to foster sustainability.

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environmental report convinced the government that construction would not harm the threatened white-lipped deer (*Cervus albirostris*) and other animals in a nearby nature reserve. Now, contractors are installing infrastructure for the US\$174 million Large High Altitude Air Shower Observatory (LHAASO). Chief among the physics questions that LHAASO will investigate is what accelerates cosmic rays — charged particles such as protons or atomic nuclei — to such high energies. Some cosmic rays that hit Earth have energies millions of times greater than the energies produced by the most powerful human-made particle accelerator, the Large Hadron Collider near Geneva, Switzerland. LHAASO's dense configuration of detector arrays and its location give it an unprecedented ability to spot ultra-high-energy  $\gamma$ -rays. Earth's upper atmosphere absorbs these rays, which splinter into 'air showers' of lower-energy particles. Because LHAASO is more than 4.4 kilometres above ground, its detectors will be able to capture much of the shower before it decays to much lower energies. The observatory has more than 5,000 'scintillator' detectors, which convert  $\gamma$ -radiation into light that can be measured to identify the original energies of the incoming particles. Scientists have proposed certain celestial phenomena, such as black holes or supernovae, as origins, but no one has confirmed this conclusively. Magnetic forces can alter the direction of charged particles as they pass through space, which makes their paths untraceable. But  $\gamma$ -rays, which have no charge, shoot straight. Scientists suspect that some of the mechanisms that emit high-energy  $\gamma$ -rays might also be the ones that launch cosmic rays; hence they hope to track back the path of falling  $\gamma$ -rays to pinpoint a cosmic-ray producer. " $\gamma$ -rays can point straight back to the source. Around 180 sources of high-energy  $\gamma$ -rays have been identified, but none has been confirmed to also produce cosmic rays. But LHAASO will be the first to hunt for the highest-energy  $\gamma$ -rays - those in the peta-electronvolt ( $10^{15}$  eV) range and will open a new window into the  $\gamma$ -ray sky as the first observatory in this range. One-quarter of each of the arrays will be installed in 2018, and first results are likely to be an analysis of the Crab Nebula in 2019. The observatory is set for completion in January 2021. LHAASO will also include 80,000 square metres of surface water pools to take advantage of the Cherenkov effect in which particles travelling faster than the speed of light in a particular medium emit light. This phenomenon occurs when particles from  $\gamma$ -ray showers travel through air or water. The surface pools will be equipped with photo-multiplier tubes to detect the bluish light, and scientists can use these data to calculate a particle's energy and direction. By combing data from different particles, they try to recreate the original  $\gamma$ -ray. Another kind of detector will also help LHAASO to spot  $\gamma$ -rays in the peta-electronvolt range: 1,171 underground water tanks that will pick out muons, which unlike other particles can penetrate into Earth. Gamma-ray showers contain fewer muons than cosmic-ray showers, which helps researchers to pick out  $\gamma$ -ray events.

**Source: Nature, 16<sup>th</sup> March 2017**

### **Egypt: Cutting Rice Irrigation Water by Half**

During its cultivation rice usually requires complete submersion in a layer of water 10-15 cm above the soil

surface, which demands huge amounts of water and fertilisers. However, a researcher at the Desert Research Center in Cairo has been granted the prestigious WatSave Award for Young Professionals from the International Commission on Irrigation and Drainage (ICID) during the Second World Irrigation Forum held in Thailand for inventing a soil and water management machine that ploughs fields in a manner that saves about half the amount of water usually used for irrigation, and a quarter of fertilisers used in cultivation. A specially imported unit, which sows rice seedlings mechanically, is mounted on the machine. The machine makes 'V' shaped lines into the soil, at a depth and width of 20 cm, and sows rice seedlings automatically. This operation maintains the water level necessary for rice to grow in the V-shaped troughs, which is less than the water used in conventional agriculture that requires the entire plot of land to be completely submerged. This machine was tested in a field in Kafr el-Sheikh governorate, which is known for rice crop cultivation in Egypt, with good results. It reduced the amount of water used by half, and the crop yield increased by 4.6 per cent. The machine costs about US\$5000, but needs further development before it is ready for commercial production. On the other hand, saving water and fertilisers does not mean much for Egyptian farmers, who get water for free and fertilisers subsidised by the State, and it will be hard to tempt the small farmers to buy the machine, because the increase in the yield is not huge.

**Source: SciDev.Net, 2<sup>nd</sup> February 2017**

### **India: Fluorescent Graphene Quantum Dots from Mango Leaves**

Researchers from the Department of Biosciences and Bioengineering, Indian Institute of Technology (IIT), Bombay have synthesised fluorescent graphene quantum dots that can be used for bioimaging and as intracellular temperature-sensing probes. The existing fluorescent materials, such as organic dyes, metal clusters and quantum dots, are toxic to biological cells and unstable when exposed to light. In search of a biocompatible fluorescent material, the scientists prepared fluorescent graphene quantum dots by heating dried mango leaf extract in a domestic microwave oven. They then explored the quantum dots' potential for bioimaging and temperature-sensing in specific mice cells. When incubated with the mice cells, the quantum dots easily permeated the cell membrane without disrupting the proliferation and viability of the cells. This shows that the dots are biocompatible. The dots' fluorescence intensity peaked at 25°C and then decreased when the temperature rose to 45°C. The dots lost 95% of their fluorescence intensity within a temperature change of 20°C, indicating their suitability for detecting minute temperature variation inside cells. The quantum dots also retained their fluorescence intensity up to fifth cycle of temperature-variation experiments. Since the quantum dots emit red light, this property could potentially be exploited to make light-emitting diodes from a natural source like mango leaves. Such diodes can function as temperature sensors.

**Source: Nature India, 15<sup>th</sup> March 2017**

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### India: Nanotechnology to the Aid of Snake-Bite Victims

There are about 600 species of venomous snakes around the world, of which 60 are in India. Antisnake venom serum (ASVS) is the only available treatment for snake-bite but it has many adverse effects and limitations. A new therapy against snake-bite, a major health hazard in tropical countries, might be in the offing with scientists creating herb-nanoparticles exploiting the anti-venom properties of the herb *Hemidesmus indicus*. Researchers from the Toxicology Laboratory of the University of Calcutta conjugated gold nanoparticles (GNP) with HMBA (2-hydroxy-4-methoxy-benzoic acid), a compound they extracted from the root of the herb Anantamul (*H. indicus*), which shows anti-venom activity. Animal experiments showed that the GNP-HMBA combination successfully neutralized all kinds of toxicity (nephrotoxicity, myotoxicity and hepatotoxicity) in mice injected with the venom of Russell's viper, one of the most venomous snakes. The herb-nanoparticle may open up a new strategy to treat snake-bite. However, more intensive research is needed to explore the mechanism of action of GNP-HMBA in detail.

**Source: Nature India Alert, 25<sup>th</sup> January 2017**

### Jordan: Cloud Seeding Technology for Water

Jordan suffers from severe water shortages due to a decline in its renewable water resources and the widening gap between water demand and availability, especially after the large influx of refugees in recent years. It has become the second among the world's most water-poor countries. However, the promising results of a cloud seeding experiment using ionisation technology have persuaded the Jordanian government to extend its use of the technology to March 2017 as figures showed improved rainfall. The technology has performed well in a six-month pilot that began in May 2016 under an agreement between WeatherTec Services GmbH and the Jordanian government signed in March 2016. The technology was used in most days of December, doubling rainfall levels in 17 days of the month. In the North, the performance of the rainy season reached 150 per cent [against the average for the season], while it reached 145 per cent in the Central Western regions and 167 per cent in the Central Eastern regions. The technology does not create rain out of nowhere. It requires certain conditions such as percentage humidity levels, wind speed and direction, as well as specific conditions related to atmospheric pressure values. For example, when humidity reaches 33 per cent, the technical emitters are switched on, sending a massive number of negative ions, estimated in the trillions, to the higher layers of the atmosphere to form a 'rain cell'. The ions are emitted by corona wires (wires with a current running through them) charged to a high voltage, which are placed at the top of ionisation towers, while electricity is generated from solar panels. Ionised particles are a hundred times more electrically attracted to water vapour than non-ionised particles. They enhance the process that forms vapour clusters which, through a chain-reaction condensation process, grow into larger clusters that eventually become raindrops. The introduction of ionised particles helps the entire process along and produces more rain that would be

the case otherwise. Atmospheric particles become ionised through this process and get transported into the part of the atmosphere where cloud formation can occur. The technology mimics sun ionisation and uses no chemicals. Being environmentally friendly at all stages is its most important characteristic. The technology used by WeatherTec in Jordan has also had good results in Australia and the United Arab Emirates, showing an improvement in the amounts of rainfall in the targeted areas of these countries.

**Source: SciDev.Net, 9<sup>th</sup> February 2017**

### Pakistan: Papaya Pest squashed through Biocontrol

A severe infestation of the papaya mealybug (*Paracoccus marginatus*) nearly wiped out papaya orchards in Pakistan before the largely farmed country decided to replace conventional chemical pesticides that were ineffective with natural predators. Mealybugs have great resistance to most pesticides. For one thing they exude waxy secretions that can insulate them against chemicals and for another they have developed resistance to most commonly used chemical insecticides. The cost-effective, pesticide-free technique was developed by agro-biotechnologists and entomologists at the Pakistani chapter of the UK-based Centre for Agriculture and Bioscience International (CABI) who introduced the use of *Acerophagus papayae*, a parasitoid (insects whose larvae parasite upon and eventually kill the host), to effectively control the mealybug infestation. According to the National Agriculture Research Council (NARC), papaya once covered some 921 hectares in the two coastal provinces of Sindh and Balochistan, But after the first mealybug attack on papaya was reported in 2008, the area under papaya had shrunk to 307 hectares by 2014. Demonstration of the bio-control technique and awareness building among farmers helped wide-scale adoption and resulted in over 80 per cent control of the papaya mealybug. After the pest had gripped almost 80 per cent of the papaya orchards, CABI, US Development Agriculture and the US Agency for International Development initiated the biological control programme in close collaboration with NARC to stop the pest's possible spread to other more important commercial crops. In 2014, under CABI's papaya pest management programme, *A. papayae* specimens were collected from the coastal areas near the port city of Karachi, reared in the laboratory and then released into papaya plantations after screening and environmental assessments. CABI researchers also set up a Natural Enemies Field Reservoir on the farmers' fields to breed the *A. papayae* parasitoid as well as eight other natural predators of the papaya mealybug. The bio-control approach has saved the papaya (farming) and also increased profits by reducing expenses on the pesticide sprays once used to fight the pest. Controlling the papaya mealybug has helped contain its potential spread to commercial crops like citrus, tomato, aubergine, peppers, mulberry, beans and peas, sweet potato, mango, cherry, and pomegranate.

**Source: SciDev.Net, 4<sup>th</sup> January 2017**

## Past Scientific Associates of NAM S&T Centre

### Ms. Manisha Bansal



**Ms. Manisha** joined the NAM S&T Centre in August 2012 as a Research Assistant and worked till December 2012. Her primary responsibilities included planning, implementation, evaluation and assessment of various scientific programmes of the Centre. She actively contributed towards promotion of scientific activities among students, scientists / academia and scientific organisations in the developing countries through workshops, seminars and training courses and also contributed for the S&T Newsletter published quarterly by the Centre. She assisted in the organisation of a number of International scientific activities, viz. Centre's International Fellowship Scheme titled 'Research Training Fellowship for Developing country Scientists (RTF-DCS)' for 2012-2013, which is a destination India programme fully sponsored by Government of India, Department of Science and Technology (DST). She processed the research proposals received from nearly 300 researchers

from the developing countries across the globe, created a data base of Indian R&D and academic institutions, and coordinated with the scientists in these institutes to match the project proposals submitted by the Researchers for this Flagship programme. She was also responsible for compilation and preliminary scrutiny of scientific articles, research papers, and country status papers and also assisted the editors in bringing out various publications of the centre.

Ms. Manisha has now moved on to the position of a Procurement Executive in KPMG, Gurgaon, India and providing her expertise in planning and managing the requirements of the company.

Ms. Manisha has remembered her association with the Centre with the following words:

**.....Special thanks to Arun Sir and Bandyopadhyay Sir. Their meaningful advice, teachings and directions will always help me to reach my goals. They are the best bosses, best mentors and best persons I have ever met.**

### Ms. Bidisha Pal



**Ms. Bidisha Pal** joined the NAM S&T Centre in June 2011 as a Research Assistant and worked until December 2012. Her primary responsibilities included planning, implementation, evaluation and assessment of various scientific programs of the Centre. She actively contributed towards promotion of scientific activities among students, scientists/academia and scientific organizations in the developing countries through workshops, seminars and training courses and contributed for the S&T Newsletter published quarterly by the Centre. She assisted in the organization of several International scientific events, viz. the First International Winter School on Industrial Biotechnology organized by the Centre at the National Research Centre (NRC), Giza, Egypt during 2-6 December 2012 where she presented her research paper entitled 'Non-Invasive Methods of DNA Isolation; Analysis of Human Saliva Sample'. Another important landmark in her career was that at the International Conference on 'Nanotechnology in the Edge of Convergence' that the Centre

organized at The National University of Malaysia in November 2011 where she presented another research paper titled 'Therapeutically Engineered Nanoparticles and their Targeted Delivery' that was widely applauded. Ms. Pal also was deeply involved in the organization of an International Advanced Training Course on 'Contemporary Management Strategies in Intellectual Property Rights (IPR) relevant to NAM and Other Developing Countries' held in India in July 2012. Ms. Pal has also acquired editorial skills during her affiliation. She contributed in the compilation and further publication of highly valuable books titled 'Role of Science Centres for Sustained and Responsible Growth in Developing Countries' and 'Nanotechnology in the Edge of Convergence'.

After the enriching experience at NAM S&T Centre, Ms. Bidisha moved on to the position of Research fellow at the Central Board of Secondary Education (CBSE) Headquarters, New Delhi, India before finally leaving for pursuing her Masters at the University of Texas at Tyler, Texas, US. She explored the interactions between microbes and cancer cells to understand disease spread within the human body. She presented her research at the American Society of Microbiology which was highly discussed during the meeting. Currently, she is working as a research associate in Dr. Bikul Das's lab at the Forsyth Institute, Harvard School of Dental Medicine in Cambridge, Massachusetts, US. She is involved in understanding the mechanisms involved in cancer stem cell self-renewal leading to chemotherapy drug resistance and tumor relapse. She is working in collaboration with the research teams of Professors Dean W. Felsher, MD, PhD at Stanford University and Herman Yeger, PhD at the University of Toronto, collaborators of Dr. Das. She is responsible for designing and conducting experiments and performing data analysis. Importantly, she is contributing in the lab by writing manuscripts and National Institute of Health (NIH) grants. She has submitted her first authored review paper as well as two experimental scientific manuscripts which are now currently under review at major peer-reviewed journals. Recently, she was selected to give an oral talk to present her research at the American Association for Dental Research meeting at the Tufts University of Dental Medicine in Boston. She was also selected to present her research in a poster presentation at the Annual Meeting of American Association for Cancer Research at New Orleans in 2016 and at Washington D.C, this year.

While expressing her personal experiences at the NAM S&T Centre, she wrote: **My tenure at NAM S&T Centre had been an amazing experience for me where I could learn from every member of the NAM S&T Centre team and indeed that made me capable of standing where I am right now. The discussions about life, career, passion for learning more with Dr. Kulshreshtha and Dr. Bandyopadhyay unfolded a whole new insight in front of me; that the drive to follow our passions in life should never die out. Probably, that's one of the reasons which got me here. My training in editing and compiling manuscripts at the Centre is now helping me to design and edit my own manuscripts. I would like to thank Pankaj Sir, Rahul Sir, Jaya Sir, Sunil Sir and all the colleagues of our NAM S&T team, who helped me in shaping my career and in being a better person. Indeed, everything we learn from our different stages of our life contributes in becoming a better individual tomorrow.**

## Research Training Fellowship for Developing Country Scientists (RTF-DCS) 2015-16

### Sierra Leone - Project Completion Report of Mr. Moses Fayi



**Mr. Moses Fayi**, Lecturer, Department of Forestry, Njala University, Sierra Leone was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2015-16 to carry out research in Tropical Forest Research Institute (TFRI), Jabalpur, India on a project titled 'An Evaluation of the Potentials in Sustainable Forest Resources Management: A Vehicle for revitalizing the Economy and Rural Livelihood of Local Communities' under the supervision of **Dr. Avinash Jain** from 10<sup>th</sup> January to 2<sup>nd</sup> July 2016. The main aim of this research was to evaluate the potential of sustainable forest management and its livelihood impacts in rural communities.

This research was carried out to unveil the potentials embedded in natural forest when sustainably managed and the livelihood contribution it can create for local communities. In order to fully exploit the potential of sustainably managed natural forest, both quantitative and qualitative research methods were employed. Study sites were selected in Barha Natural Forest, District Jabalpur, Madhya Pradesh, India (Latitude – 23°01'42.8" N; Longitude - 79°59'35.9" E; Altitude – 1423ft). In total, 10 quadrats (10m x 10m) were randomly laid within Barha forest with 100m, and above distance from one quadrat to another. Within each quadrat, a detailed vegetation survey was carried out by measuring the DBH and height of all trees above 10cm DBH. In each quadrat, a sub quadrat of 1m x 1m was laid for herbs and seedlings of trees while another sub quadrat of 3m x 3m was laid for identifying shrubs and saplings of trees. Parameters such as relative density, relative frequency and relative dominance were used to estimate the Importance Value Index (IVI). A total of 28 trees species, 50 herbaceous species were recorded in the selected 10 quadrats. Trees, shrubs, herbs, seedlings and saplings of trees falling in the selected quadrats were identified taxonomically. The species with maximum IVI were *Tectonagrandis* and *Pongamiapinnata*. Vegetation survey was conducted and species richness was calculated as follows; Evenness - 0.79932, Shannon Weiner Index - 1.131 and Simpson Index - 0.112. Carbon stock assessment in the trees found in the selected quadrats was done using allometric regression equations. The amount of carbon sequestered in both soil and trees was estimated to be 15.50 t/ha and 15.63 t/ha, respectively. Soil samples from each quadrat were collected from 0-15cm and 15-30cm soil layers and analysed for Organic carbon (C), Nitrogen (N), Potassium (K), Sodium (Na), Magnesium (Mg), Calcium (Ca), Phosphorus (P), Soil texture, pH and Electrical conductivity. The regeneration status of trees in the study area was determined and the status concluded varied from 'good' to 'poor'.

Two villages Karondi and Mahgaon were selected for the qualitative study. Respondents were selected from all social and economic background. 10 respondents were randomly selected from Below Poverty Line (BPL) category, 10 from Above Poverty Line (APL) and 10 from APL having 10 ha or more farm land category. A total of 30 respondents were selected for questionnaire interview. Critical observation and oral discussions were other forms of information gathered for the study. The research reveals that most of respondents belong to Gond tribe with 60% illiteracy rate. The livelihood system of the study area is mainly agrarian but it's strongly complemented by forest resources gathering and livestock grazing. Agriculture, Non Timber Forest Product (NTFP) collection and grazing were the main sources of income for the tribal communities. The major social practice complemented by forest resources use was 43% religious and burial ceremonies, 37% marriage and 20% festival celebration. It was observed that 90% of inhabitants in both villages have at least two cattle that produce milk and at the same time help to plough farms. *Diospyros melanoxylon* (tendu) leaves, *Madhuca indica* leaves and flowers, *Mangifera indica* (mango) fruits, honey and Aonla, formed the bases of saleable products for income generation. The studies further revealed the day to day livelihood of respondents on the forest as 80% energy, 65% building materials, 30% food security, 30% water, 31% eroded nutrients in farms, 45% medicinal purpose, 55% livestock grazing, 50% domestic utensils and household furniture and 60% spiritual fulfillment as well as traditions.

### DISTINGUISHED VISITORS TO THE CENTRE



**Mr. Omar Obouzeid**, Third Secretary, Embassy of the Arab Republic of Egypt in New Delhi

### Participation of Centre's Scientists in Scientific Events

- 9<sup>th</sup> – 20<sup>th</sup> January, 2017** **Ms. Rashmi Srivatava**, Research Associate attended the **RIS-ITEC Course on Science Diplomacy** organised by the Research and Information System for Developing Countries (RIS) in New Delhi in which she presented a paper on 'Cooperation for Brahmaputra Water between Sovereign States: India and China'.
- 17<sup>th</sup> January 2017** **Ms. Geeta** and **Ms. Keerti Mishra**, Research Associates attended a Seminar on '**Supporting and Incentivizing MSMEs to Perform Better**' organised by Pahle India Foundation at India International Centre, New Delhi.
- 27<sup>th</sup> February 2017** **Ms. Rashmi Srivastava**, Research Associate attended the inauguration of '**GRIHA Green Building Mock Up**' organised by The Energy and Resources Institute (TERI) at India Habitat Centre Complex, New Delhi.
- 27<sup>th</sup> – 29<sup>th</sup> March 2017** **Ms. Meenu Galyan**, Research Associate participated in the International Workshop on '**Trends in Solar Power Generation and Energy Harvesting**' jointly organised by the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) and Amity University, Dubai in Dubai in which she presented a paper on 'Current Status of Solar Power in India'.

## Research Training Fellowship for Developing Country Scientists (RTF-DCS) 2015-16

### Cameroon - Project Completion Report of Dr. Kotue Taptue



**Dr. Kotue Taptue**, Lecturer, Department of Biochemistry, University of Yaounde, Cameroon was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2015-16 to carry out research in National Institute for Interdisciplinary Science and Technology (NIIST), Kerala, India on a project titled 'Protein Profile Analysis and Isolation: Phytochemical Constituents and Antioxidant activity of Black Seeded Bean (*Phaseolus vulgaris* L.) cultivars from Cameroon West Region' under the supervision of **Dr. P. Jayamurthy** and **Prof. Ashok Pandey** from 26<sup>th</sup> February to 19<sup>th</sup> August 2016. The main objective of this research was to isolate and analyse amino acid profile to determine phytochemical

constituents and antioxidant activity in black seeded bean (*Phaseolus vulgaris* L.) cultivars from Cameroon West Region.

Sickle cell disease (SCD) is a genetic disorder which affects the red blood cells (RBCs). A bone marrow transplant is considered the only curative therapy available to date. Its application in Africa is difficult because its complexity and is highly expensive. Due to this economic incidence, treatment of SCD is out of reach for the populations where the use of medicinal plants constitutes part of their culture and tradition. This study showed the presence of protein, dietary fiber, carbohydrates, amino acids and mineral contents in black bean seed with highest values for TPC, TFC and TAC. The free radicals scavenging activities of methanol / water and acetone black bean powder extracts was also demonstrated, which depicted the significant differences between soaked and pulped beans compared to the whole black bean seed, consequently, signifying importance of the black bean seed coats. The acetonetic extract, which was more effective in free radicals scavenging, showed IC<sub>50</sub> with minimum concentration.

Thus, the study showed the presence of certain amino acids and minerals, which have anti-sickling properties, support the use of black bean seed (*Phaseolus vulgaris* L.) to manage SCD in West Cameroon Region. Further, it also illustrated the potential antioxidant properties of black bean seed that could help in the managing SCD, wherein etiology have been linked to oxidative stress.

## NAM S&T Centre – ZMT Fellowship

### Jordan - Project Completion Report of Ms. Maysoon M. Kteifan



**Ms. Maysoon M. Kteifan**, Research Assistant in Coral Lab at Marine Science Station, Jordan was sponsored by the NAM S&T Centre under its ZMT Fellowship scheme for 2016 to carry out the research work in Tropical Coastal Marine Research at ZMT, Bremen, Germany under the title 'Assessing Stress Response in Octocorallia towards Anthropogenic Pollution in the Gulf of Aqaba, using Biochemical Markers' under the supervision of Dr. Andreas Kunzmann from 21<sup>st</sup> November 2016 to 18<sup>th</sup> February 2017.

In the Red Sea, soft corals (Octocorallia) are important faunistic components occupying space on the reefs. They play vital role in the formation of coral communities on reef and harbor many different invertebrates. Considering that two species of Octocoralliaian of soft corals (*Dendronphthya* sp. and *Sarcophyton* sp.) were used as the bio-indicators to identify and assess anthropogenic stresses using biochemical markers, the objective of the research was to evaluate the use of stress biomarkers as prognostic tools to assess the health conditions of reef organisms before it reaches to the irreversible stress symptoms, such as bleaching or death.

The area of study included *five* coastal sites of the Gulf of Aqaba, in which *four* of the sites were expected to be potentially impacted as they were located at the vicinity of the oil terminal (OT), phosphate port (PP), public beach (PB), and industrial complex (IC); whereas the *fifth* site was located at the Marine Science Station (MSS), which is regarded as the marine protected area and was used as the control site for the research due to restricted human activities. Throughout the research, Lipid peroxidation (LPO) was used as the biomarker to assess stress responses in corals. The result exhibited that there was high LPO levels in corals which were situated in the stressed environmental conditions (oil terminal, phosphate port, public beach and industrial complex) than the ones which were falling in the regions of marine protected site (Marine Science Station). Consequently, these findings indicated that LPO levels can also be used as the biomarker to assess stress responses in soft tissues of corals, along with its characteristic to compare the stress between different sites. Further, it was also determined that *Dendronephthya* sp. of coral communities were more sensitive to stress conditions than *Sarcophyton* sp. due to high level of LPO recorded in *Dendronephthya*, which resulted in suggesting that *Dendronephthya* sp. can be used as the 'bioindicator' for evaluating stress responses.

EDITORS: Mr. M. Bandyopadhyay and Dr. Kavita Mehra ❖ ASSISTANT EDITORS: Ms. Keerti Mishra, Ms. Meenu Galyan, Ms. Geeta and Ms. Rashmi Srivastava

COMPILATION & DESIGN: Mr. Pankaj Buttan ❖ PUBLISHED BY: Prof. Arun P. Kulshreshtha, Director General, Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), Core 6A, 2<sup>nd</sup> Floor, India Habitat Centre, Lodhi Road, New Delhi-110003 (India)  
Ph: +91-11-24645134, 24644974, Fax: +91-11-24644973 E-mail: namstcentre@gmail.com, namstct@bol.net.in ❖ Website: <http://www.namstct.org>

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