



S&T Newsletter



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

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FROM THE DG'S DESK



Warmest greetings!!

The NAM S&T Centre in partnership with the National Biotechnology Development Agency (NABDA) of Nigeria successfully organised an International Workshop on 'Modern and Emerging Trend in Vaccine Development' at Abuja, Nigeria during 22-24 May 2018 with the participation of scientists, policy makers and others from 17 countries, which got concluded with the adoption of an Abuja Resolution on the Workshop theme. Five senior experts from different countries stayed back in Abuja after the event for in-depth interaction with the Nigerian researchers on formulating strategies for the capacity building on vaccine technologies in Nigeria, planning the ways and means to handle the tropical infections and reemerging diseases, and providing hands-on training in various areas of vaccine development.

While in Abuja I also called on H.E. Dr. Ogbonnaya Onu, Hon'ble Minister of S&T of Nigeria.

On 7-8 May I was in Kuala Lumpur Malaysia to attend the 2nd AGM of The Academy of Engineering and Technology of the Developing World (AETDEW) as a Fellow and Council Member and also to participate in the International Conference on Climate Change Education organised by ISTIC. I also took this opportunity to brief the President of our Centre, Datuk Seri Dr. Mohd. Azhar bin Haji Yahaya, Secretary General, MOSTI Malaysia in his office and sought his guidance on various matters.

Among others, the Centre was privileged to receive the Vice-Presidents of the Centre Mrs. Jayavadee SOOBEN, Permanent Secretary, Ministry of Education and Human Resources, Tertiary Education and Scientific Research of Mauritius and Mrs. Sandhya Wijayabandara, Secretary, Ministry of Science, Technology & Research of Sri Lanka.

The Centre brought out its 77th publication titled 'Development of Solar Power Generation and Energy Harvesting' (Ed. Abhishek Verma of India and Muhammed Musa Gaji of Nigeria).

Happy Reading!


(Arun P. Kulshreshtha)

Centre Organised

International Workshop on
MODERN AND EMERGING TREND IN VACCINE DEVELOPMENT
Abuja, Nigeria, 22-24 May 2018

Vaccine, a biological preparation from living organisms, is one of most widely practiced life saving medical interventions to reduce disease and death from infectious diseases. Though the earlier period witnessed the development of vaccinology in purely empirical fashion, with the advent of molecular microbiology, molecular genetics and molecular immunology and introduction of novel processing techniques, the production of the state-of-the-art vaccines against numerous infections of public health importance like diarrhoeal, respiratory, bacterial, parasitic, sexually transmitted, vector-borne viral, zoonotic etc and against viral cancer has gained momentum through research and development efforts. It may be borne in mind that even though the technologies today can provide adequate tools to detect, control and prevent emerging infections, the developing countries are still suffering from a variety of infectious diseases for which either the vaccines do not exist or need further R&D, requiring global and continued efforts and collaboration and coordination among regulatory agencies as well as sustainable economic system to support such initiatives. Moreover, a large number of developing countries, particularly in the African continent, are seriously lacking in indigenous production and manufacture of vaccines and have to essentially depend on their import.

With the above issues in view, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) organised an International Workshop on 'Modern and Emerging Trend in Vaccine Development' in Abuja, Nigeria in collaboration with the National Biotechnology Development Agency (NABDA) of Nigeria during 22-24 May 2018.



Inauguration of International Workshop on Modern and Emerging Trend in Vaccine Development, Abuja, Nigeria, 22-24 May 2018

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Group Photo during Inauguration of International Workshop on Modern and Emerging Trend in Vaccine Development, Abuja, Nigeria, 22-24 May 2018

The Inaugural Session commenced with a welcome note by the Overseeing Director-General/CEO represented by Mrs. Comfort Achiatar, Director (Admin & Finance), NABDA. Prof. Dr. Arun P. Kulshreshtha, Director General, NAM S&T Centre in his remarks presented the genesis of the event touching upon the basic issues related to Vaccine Development and also gave a brief description of the activities of the NAM S&T Centre. Other dignitaries who spoke during the Inaugural Session were: Mrs. Boma Ootob, Deputy Program Manager, NERICC, National Primary Health Care Development Agency (NPHCDA), Abuja; Prof. H. Mairo Inuwa, Vice-Chancellor, Ahmadu Bello University, Zaria; and Dr. Ibeh Bartholomew, Scientific Organiser, Medical Biotechnology, NABDA, Abuja. The Vote of Thanks was delivered by Prof Oyekanmi Nash, Director and Head of Department of Genetics, Genomics and Bioinformatics, NABDA, Abuja.

The Workshop was attended by 89 scientists, researchers and policy makers of 17 countries, including 20 from Egypt, India, Indonesia, Kenya, Malaysia, Myanmar, Nepal, Pakistan, Palestine, Peru, Philippines, Russia, South Africa, Sri Lanka, Vietnam and Zambia and 69 from the host country, Nigeria.

The foreign participants were from Egypt [Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb, Professor, National Research Centre of Egypt, Egyptian Academy of Scientific Research and Technology (ASRT), Cairo]; India [Prof. Harish Padh, Former Vice Chancellor in Sardar Patel University and Professor Emeritus in Gujarat National Law University, Ahmedabad and Dr. Anmol Chande, Group Leader, ICGEB-Emory Vaccine Program, International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi]; Indonesia [Dr. Dodi Safari, Head of Molecular Bacteriology Unit, Eijkman Institute for Molecular Biology, Jakarta]; Kenya [Mr. Mwai Ngibuini, Biochemical Engineer and Head of Sub-Saharan Africa, BioProcessing, Life Science at Merck Group]; Malaysia [Dr. Adiratna Binti Mat Ripen, Head of Primary Immunodeficiency Unit, Institute for Medical Research, Ministry of Health, Kuala Lumpur]; Myanmar [Dr. Kyaw Phone Zaw, Principal Scientist, National Analytical Laboratory, Department of Research and Innovation, Yangon]; Nepal [Dr. Bol Raj Acharya, Senior Veterinary Officer, Department of Livestock Services, Ministry of Agriculture, Land Management and Co-

operatives, Rabies Vaccine Production Laboratory, Veterinary Complex, Kathmandu]; Pakistan [Dr. Aftab Ahmad Chattha, President, National Academy of Young Scientists, University of the Punjab, Lahore]; Palestine [Dr. Daa O. H. Hjaija, Director, Department of Communicable Disease, Ministry of Health, Ramallah, West Bank]; Peru [Mrs. Maria Giuliana, Research Student, The University of Queensland, School of Chemistry and Molecular Biosciences, Brisbane City, Australia]; Philippines [Dr. Nina Gonzales Gloriani, Professor, University of the Philippines Manila, Philippine General Hospital, Manila]; Russia [Mr. Dmitry Krivtsov, Diplomat, CBD, Abuja]; South Africa [Mr. Patrick Vincent Tippoo, Head, Science and Innovation, The Biovac Institute, Pinelands]; Sri Lanka [Ms. Athapaththu Mudiyansele Maheshi Harendra Athapaththu, Research Scientist, Industrial Technology Institute (ITI), Colombo and Dr. Darshana Wickramasinghe, Consultant Microbiologist, General Hospital, Ampara]; Vietnam [Dr. Le Thi Quynh Mai, Vice Director, National Institute of Hygiene and Epidemiology, Hanoi]; and Zambia [Mr. Songolo Mwikisa Walubita, Research Scientist, Central Veterinary Research Institute, Chilanga]. The NAM S&T Centre was represented by its Director General, Prof. Arun P. Kulshreshtha; and Ms. Meenu Galyan, Research Associate.

The overall programme of the Workshop was conducted in six technical sessions which are summarized as below:

Technical Session I was chaired by Prof. Harish Padh from India and had five presentations, namely, 'Development of Synthetic Carbohydrate Vaccine against Pneumococcal Infection' by Dr. Dodi Safari [Indonesia]; 'Pathogen and Host Enzymes as Potential Targets to intervene with Parasitic and Viral Infections' by Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb [Egypt]; 'Vaccine, An Effective Tool For Prevention of Lassa Fever' by Prof. Ogonnaya Ogbu [Nigeria]; 'Emerging Fowl Pox Challenges due to Effective Control of Newcastle Disease in Village Chickens using NDV I-2 in Zambia - A Field Experience' by Mr. Songolo Mwikisa Walubita [Zambia]; and 'Creating Highly Innovative Vaccines Protecting Life' by Dr. Emmanuel Oluwadare Balogun [Nigeria].

Technical Session II was chaired by Dr. Nina Gonzales Gloriani from the Philippines and Co-chaired by Prof. Ogonnaya Ogbu from Nigeria and had three presentations,

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(Contd. from Page 2 - Vaccine Development, Nigeria)



namely, 'Comparative Studies on The Immunogenicity of Two Newcastle Disease Vaccines Modified With Two Different Thermostabilising Agents' By Prof. Adebayo, Isaac A [Nigeria]; 'The Production and Use of Cell Culture Rabies Vaccine in Nepal' by Dr. Bol Raj Acharya [Nepal]; and 'Bioinformatics-based Analysis to identifying Putative Therapeutic Vaccine Candidates in Plasmodium vivax' by Abraham Isah [Nigeria].

Technical Session III was chaired by Dr. Adiratna Binti Mat Ripen from Malaysia and had two presentations Moreover, a large number of developing countries, particularly in the African continent, are seriously lacking in indigenous production and manufacture of vaccines and have to essentially depend on their import Moreover, a large number of developing countries, particularly in the African continent, are seriously lacking in indigenous production and manufacture of vaccines and have to essentially depend on their import, namely, 'Cloning, Overexpression and Purification of Hepatitis B Surface Antigen Protein preS in E.coli and preS and Core-preS Chimeric Protein in Yeast (P.pastoris) for Vaccine Development' by Dr. Aftab Ahmad Chattha [Pakistan]; 'Development of Grain Adapted Pelleted Feed Vaccine for the Control of Newcastle Disease in Village Scavenging Poultry' by Dr. Anthony Nwachinaemelu Egbuji [Nigeria].

Technical Session IV was chaired by Dr. Le Thi Quynh Mai from Vietnam and Co chaired by Prof. Adebayo Isaac A from Nigeria and had five presentations, namely, 'Development of Whole Inactivated Monovalent and Bivalent Vaccines for Leptospirosis Applicable in the Philippine Setting' by Dr. Nina Gonzales Gloriani [Philippines]; 'Building Local Vaccine Manufacturing Facility in Nigeria: Innovative Biotech Approach' by Dr. Simon Agwale [Nigeria]; 'Ten Years of Clinical Research in Novel Investigational Vaccines in Latin America and The Caribbean Countries' by Mrs. Maria Giuliana [Peru]; 'Local Manufacture of Vaccines, Challenges and Opportunities' by Mr. Mwai Ngibuini [Kenya]; and 'Mumps Outbreak among School Students of Hebron District in Palestine May 2015' by Dr. Diah O. H. Hjaija [Palestine]

Technical Session V was chaired by Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb from Egypt and along with Dr Mustaphata B. Abubakar from Nigeria and had four presentations namely, 'Establishing Vaccine Development and Manufacturing Capacity in

Africa; The Biovac Institute: Plans, Progress and Perspectives' by Mr. Patrick Vincent Tippoo [South Africa]; 'Vaccines and Vaccination: Current Status and Future Challenges for India' by Prof. Harish Padh [India]; 'Development of a DNA rabies Vaccine for Dogs' by Ms. Athapaththu Mudiyansele M H Athapaththu [Sri Lanka]; and 'Recombinant DNA Techniques as a Tool for Development of Potential Avian Influenza Subtype H5N1 Vaccine Candidate accompanying Diagnostics Kit in Eukaryotic Expression Host System' by Dr. Mustapha Bala Abubakar [Nigeria].

Technical Session VI was chaired by Dr. Diah O. H. Hjaija from Palestine and had eight presentations, namely, 'Measles Out Breaking 2013 Sri Lanka; Lessons learnt for Global Measles Elimination Programme' by Dr. Darshana Wickramasinghe [Sri Lanka]; 'Understanding Human Immunology of Infectious Diseases for Vaccine Design, Testing and Evaluation' by Dr. Anmol Chande [India]; 'Vaccine Development and Immunization Scheme in Myanmar' by Dr. Kyaw Phone Zaw [Myanmar]; 'The Demand on Technology Innovation for Vaccine Research and Production in Vietnam' by Dr. Le Thi Quynh Mai [Vietnam]; 'Vaccine Development against Leptospirosis – Malaysia Scenario' by Dr. Adiratna Binti Mat Ripen [Malaysia]; 'Characterization of Foot-and-Mouth Disease Virus Isolates Candidate Strains For Polyvalent Vaccine Development In Nigeria' by Dr. Ularamu Hussaini Gulak [Nigeria]; 'Humanized Mouse as An Appropriate Model for Accelerated Global HIV Research and vaccine Development: Current Trend' by Dr. Ibeh Bartholomew [Nigeria]; and 'Efficacy of Some



(Contd. from Page 3 - Vaccine Development, Nigeria)

Commercial Anti-Rabies Vaccines In Taraba State, Nigeria' by Dr. Woziri, Abubakar Ojone [Nigeria].

A Welcome Dinner was hosted by Dr. Ibeh Bartholomew in the evening of the Day 2 – 23rd May.

The Concluding Session was presided over by Dr. Ibeh Bartholomew of NABDA, in which a presentation was made by Dr. Alexander Ochem, Consultant, African Vaccine Manufacturing Initiative (AVMI) in South Africa. Prof. Dr. Arun P. Kulshreshtha, Director General, NAM S&T Centre initiated the discussion on a draft Abuja Resolution on 'Modern and Emerging Trend in Vaccine Development' and invited comments/inputs from the participants which were appropriately incorporated in the draft after elaborate deliberations. The finalised Resolution was then adopted by the participants during this Session.

It was also mentioned in the Abuja Resolution that the National Biotechnology Development Agency (NABDA) of the Federal Ministry of Science and Technology, Nigeria was desirous to collaborate with the NAM S&T Centre by initiating a joint NABDA-NAM S&T fellowship scheme in the area of Vaccine Development. Further, Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb, the participant from Egypt, also proposed to co-operate with the NAM S&T Centre by in principle instituting a joint fellowship scheme in the areas of DNA Vaccine Development. These proposals were greatly applauded by the workshop participants.

The Participation Certificates were individually distributed among the Workshop participants. The Concluding Remarks were made by the Overseeing Director-General/CEO, Mrs. Comfort Achiatar of NABDA. Vote of Thanks on behalf of the participants was given by Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb from Egypt and Prof. Harish Padh from India, expressing gratitude to the organisers for the successful and fruitful organisation of the Workshop and for excellent hospitality and arrangements made for the delegates. It was unanimously hoped that more similar events will be held in future with a focus on Vaccine Development.

On the last day after conclusion of the Workshop, the foreign participants were taken for a city tour.

Five senior foreign experts [Prof. Harish Padh from India, Dr. Aftab Ahmad Chattha from Pakistan, Dr. Nina Gonzales Gloriani from Philippines, Prof. Dr. Mahmoud Mohamed Bahgat Riad Abdelmotelb from Egypt and Dr. Bol Raj Acharya from Nepal] were requested by NABDA to stay back in Abuja for some more days after the completion of the Workshop for in-depth interaction with the Nigerian researchers on formulating strategies for the capacity building on vaccine technologies in Nigeria; planning the ways and means to handle the tropical infections and reemerging diseases; and providing them hands-on training in various areas of vaccine development.

DISTINGUISHED VISITORS TO THE CENTRE

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| 10th April 2018 | Dr. G. Padmanabham , Director, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad, India |
| 19th April 2018 | Prof. S. Ananthkrishnan , Adjunct Professor & Raja Ramanna Fellow (DAE-BRNS), Department of Electronic Science, University of Pune and Prof. Amitava Sen Gupta , Hon. Distinguished Research Professor, The Northcap University (Formerly, ITM University), Gurgaon, Haryana, India |
| 19th April 2018 | Dr. Jigisha K Parikh , Scientist 'G', Science & Engineering Research Board (SERB), Govt of India, New Delhi, India |
| 26th April 2018 | H.E. Mr. Seyed Mohammad Hassani , Director and Mr. M. H. Asef , Assistant and Special Advisor to Director, Non-Aligned Movement Centre for Human Rights and Cultural Diversity (NAM-CHRCD), Tehran, Iran |
| 27th April 2018 | Dr. Ravi Srivastava , First Secretary for Environment, Science and Technology Affairs and Ms. Noopur Singh , Science and Technology Specialist, Environment, Science and Technology Office, Embassy of the United States of America, New Delhi, India |
| 4th May 2018 | Dr. Venugopalan Ittekkot , Member, Committee for Capacity Building, Scientific Committee on Oceanic Research (SCOR), International Council for Science; Professor Emeritus, University of Hamburg; Former Director, Leibniz Center for Tropical Marine Ecology, Bremen, Germany |
| 17th May 2018 | Prof. Hari Om Vats , Director, Space Education and Research Foundation, Ahmedabad, India |
| 22nd June 2018 | Dr. Mikhail Yu. Pavlov , Associate Professor, Department of Political Economy and Co-chairperson, Center of Socio-Economy Studies, Faculty of Economics, Lomonosov Moscow State University, Russian Federation |

The NAM S&T Centre was also privileged to receive Mrs. Jayavadee SOOBEN, Vice-President, NAM S&T Centre, and Permanent Secretary, Ministry of Education and Human Resources, Tertiary Education and Scientific Research, Mauritius; Mrs. Sandhya Wijayabandara, Vice-President, NAM S&T Centre, and Secretary, Ministry of Science, Technology & Research, Sri Lanka; Mr. Cecil Masoka, Director for Multilateral Cooperation, Department of Science & Technology, Pretoria, South Africa; and Mr. Teoh Phi Li, Undersecretary (International Division), Ministry of Science, Technology & Innovation (MOSTI), Putrajaya, Malaysia on 19th May 2018 in connection with the recruitment of a new Director General of the NAM S&T Centre.

Abuja Resolution-2018

ON MODERN AND EMERGING TREND IN VACCINE DEVELOPMENT

WE, THE DELEGATES of the 3-days International Workshop on "Modern and Emerging Trend in Vaccine Development", jointly organised by the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) and the National Biotechnology Development Agency (NABDA), Federal Ministry of Science & Technology, Abuja, Nigeria, on 22 – 24 May, 2018.

COMPRISING the scientists, researchers, academicians, technologists, policy makers and industry experts from Egypt, India, Indonesia, Kenya, Malaysia, Myanmar, Nepal, Nigeria, Pakistan, Palestine, Peru, Philippines, South Africa, Sri Lanka, Vietnam and Zambia.

RECOGNIZING THE INTENTIONS of attaining 100% coverage in vaccination according to WHO's UIP mandate.

FURTHER RECOGNIZING THAT the vaccine development against infectious, emerging and re-emerging pathogens in developing countries is weak with low level facility, most of the vaccines are dominantly developed outside the region in need with minimal capacity in those countries to utilize conventional and modern technologies to drive their own need, and the few existing capabilities in the industries, R&D institutions, universities and vaccine procurement and delivery agencies are not integrated, linked and leveraged upon the improvement and growth in vaccine development and immunization success.

CONSIDERING THAT the local consequences of these issues worsen the health status of the population and place a huge financial burden to the economy.

HAVING DELIBERATED on the local development of vaccines, improvement on the technology(ies) involved and achievement of successful immunization, which requires huge funding for establishment of vaccine plants in addition to issues like low level of vaccine technology and infrastructure as well as prevailing traditions and beliefs against vaccination acceptance.

TAKING INTO ACCOUNT the need to develop and manufacture effective vaccines against infectious agents.

WE THEREFORE RESOLVE AND RECOMMEND THAT:

- Non-aligned and other developing countries should leverage on individual country's strength to achieve a holistic vaccine development on specific pathogens.
- Indigenous strains should be used to develop vaccine candidates where appropriate.
- Setting up regional reference laboratories for development and testing of vaccines should be a priority for the member countries since a lot of resources are required, consequently needing a collective effort.
- In addition to South-South collaborations, balanced development partnerships with developed countries resulting in availability and affordability of vaccines for the developing regions should be promoted that will result in win-win situations.
- Developing countries that mainly operate 1st and 2nd generation of vaccine technology, which should be upgraded to the 4th generation.
- In addition to governments, resourceful individuals, companies and organizations should be encouraged to invest in vaccine development and subsequent manufacturing in the developing countries for the enormous health benefits of the people.
- The model used in Sri Lanka to achieve 100% vaccination coverage was acknowledged by the workshop participants and may be adopted by other countries to achieve maximum vaccination coverage.
- The National Biotechnology Development Agency (NABDA) of the Federal Ministry of Science and Technology Nigeria, agreed in principle to collaborate with the NAM S&T Centre to organize a joint NABDA-NAM S&T fellowship scheme in the area of Vaccine Development, which was greatly appreciated by the workshop participants. The details shall be worked out between the NAM S&T Centre and the NABDA.
- Professor Mahmoud Bahgat, the participant from Egypt proposed to co-operate with the NAM S&T Centre and in principle institute a joint fellowship scheme in the areas of DNA Vaccine Development, subject to the necessary approvals. This was deeply applauded by the workshop participants. The details shall be worked out between the NAM S&T Centre, the Egyptian Academy of Scientific Research and Technology and the National Research Centre in Egypt.

THUS, RESOLVED AND ADOPTED ON THIS DAY THE 24TH OF MAY 2018 AT ABUJA, NIGERIA.

Research Training Fellowship for Developing Country Scientists (RTF-DCS) 2016-17

Myanmar - Project Completion Report of Dr. Phyo Wai Htun



Dr. Phyo Wai Htun, Associate Professor, Department of Biotechnology, Mandalay Technological University, Myanmar was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the Sri Venkateswara College, Delhi University, New Delhi, India from 8th December 2016 to 4th June 2017 under the supervision of Dr. Vartika Mathur on a project titled 'Molecular Approach: Induced Responses in *Lycopersicon Esculentum* after Sequential Challenge with *Trichoderma Sp.* and *Spodoptera Litura*'.

Plants can adapt under a large number of biotic and abiotic stresses by producing and/or emitting the different kinds of physiological, cellular and molecular cues. These responses can either be constitutive or inducible. When a plant is under stress phytohormones, namely, Jasmonic Acid (JA), Salicylic Acid (SA) and Ethylene (ET) mediate molecules that transmit the signals between local and systemic induced responses, hence transmitting the stress signal all over the plant. Plants were induced with Insect alone (I), Fungus alone (F), and sequentially induced with fungus first and then insect (FI) and vice versa (IF). At the same time plants without any fungal or insect induction were used as control. Plant responses to biotic stress (Insect and/or Fungus) were assessed 7 day after primary induction (dpi). Among the treated plants, the highest total phenol content ($1.11 \pm 0.7 \text{g}/100\text{g}$), tannic acid content ($0.81 \text{g}/100\text{g}$) were occurred in fungal treated plants. Chlorogenic Acid (CGA) was no significant difference among the treated groups but they are higher than the control. Among the treated groups, the highest Relative Consumption Rate (RCR), and Approximate Digestibility (AD) were found in the fungus induced leaves (F) but it had the lowest Relative Growth Rate (RGR), Efficiency of Conversion of Ingested food (ECI) and Efficiency of Conversion of Digested food (ECD). The least larval preference' leaves are the groups of fungal and insect vice versa treated plants (IF, FI). Gene expression analysis of peroxidase gene (TAP2) gene was highly up-regulated in F, I and sequential IF induced plant while down regulated in FI plants. Whereas hydroxycinnamoyl-CoA quinate hydroxycinnamoyltransferase gene (HQT) for chlorogenic synthesis was up-regulated in plants induced with insect or were first induced with insect and then fungi and there by depicting induced resistance in these plants. Thus indicating that sequential treatments can induce the Systemic Acquire Resistance (SAR) more in plant response through phenylalanine biosynthesis.

Senegal - Project Completion Report of Ms. Nogoye Diaw



Ms. Nogoye Diaw, Renewable Energy Laboratory, Polytechnic Higher School of Dakar, Senegal was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the National Institute of Wind Energy, Chennai, Tamil Nadu, India under the supervision of Dr. G. Giridhar from 15th November 2016 to 4th May 2017 on a project titled 'Contribution to the Integration of Photovoltaic Systems to Weak Electrical Networks Sahel: Studies Constraints and Energy Optimization'.

Africa is the second largest and most populous continent in the world. It has a tropical and subarctic type of climate. Northern part of the continent is occupied by Sahara desert and is mostly arid. Southern and Central part of Africa consists of savanna and dense jungle forests. The present study focuses on estimation of solar energy potential in Senegal and Sahel. Nine countries (Senegal, Gambia, Mali, Mauritania, Cameroon, Burkina Faso, Chad, Niger, and Nigeria) of Africa grouped together are known as Sahel region and Senegal is also a part of it. The annual average solar radiation data from National Aeronautics and Space Administration (NASA) is extensively used to prepare various solar radiation maps, such as, Global Horizontal Irradiance, Direct Normal Irradiance and Diffuse Horizontal Irradiance. Keeping acceptable threshold limits, an exclusion zone map is generated using Slope map derived from SRTM DEM, land use land cover, protected areas, road, railway, airport information collected from various open source datasets. Arc GIS - 10.5 tools (3D Analyst, Spatial Analyst) are used for preparing the solar potential sites at various administrative levels of Sahel and Senegal.

The following are the outcome from these studies.

- The annual solar radiation varies from 1613 to 2489 kWh/m² in Sahel whereas for Senegal it varies from 2003 to 2230 kWh/m².
- The estimated solar potential in Senegal and Sahel is around 3397 and 294108 TWh respectively, which can meet electricity requirements of each country in Sahel.
- Land Area availability after removing the exclusion zones is 6,945,924 Sq.km. for Sahel and for Senegal it is 42,613 Sq.km.
- Solar PV systems can play a major role in meeting the energy demand of these countries

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South Africa - Project Completion Report of Ms. Samkeliso Takaidza



Ms. Samkeliso Takaidza, Research Technologist, Vaal University of Technology, South Africa was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the Sathyabama University, Chennai, India under the supervision of Dr Madan Kumar from 8th April to 22nd September 2017 on a project titled 'Anticancer Activity of Crude Leaf Extracts from *T. violacea* on Human oral Cancer Cells'. The main objective of this research was to determine the effect of acetone and aqueous crude leaf extracts on viability of Kb cell line using the Methyl Thiazol Tetrazolium (MTT) assay, to evaluate the antioxidant activity of the crude extracts using DPPH assay, to examine the pro-apoptotic activity of the plant extracts by using AOEB and PI staining, to detect DNA fragmentation using electrophoresis and to examine the effect of extracts on the Kb cell cycle using the flow cytometer.

Cancer is one of the major killer diseases worldwide with many types affecting the human population (Akindede et al., 2015). Oral cancer is the 8th most common cancer worldwide, with a high prevalence in South Asia (Shah et al., 2009) and higher incidence in man than woman (WHO 2014). Its development is influenced by epigenetic and genetic factors. Epigenetic factors such as tobacco and alcohol are considered major risk factors (Warnakulasuriya 2009; Serwram et al., 2016; Huang and Yu 2016). Tobacco smoking stands out as the most important oral cancer risk factor (Kumar et al., 2016).

Treatment of the majority of oral cancer is through surgery or ionisation radiation. These treatment methods cause side effects such as nausea, vomiting, hair loss, fatigue, mouth sores and complications such as mucositis (Huang and O' Sullivan 2013). Since current cancer treatments result in such adverse side effects research has focused on the application of natural pharmacological agents for treating cancer cells from sources like medicinal plants (Farha et al., 2012; Chavan et al., 2013; Akindede et al., 2015; Lakshmi et al., 2015) which are expected to have less/ no side effects.

Tulbaghia is a genus of herbaceous perennial bulbs in the family *alliceaea*. It is predominantly found in Southern Africa region (Aremu and van Staden, 2013). *T. violacea* is used to treat various ailments like fever, colds, asthma, tuberculosis, stomach problems and oesophageal cancer, (Bungu et al., 2006). Many medicinal plants have been shown to exert significant anti-tumour effects by blocking the cell cycle, inducing cell apoptosis or regulating other characteristics of cancer (Skerman et al., 2011; Monga et al., 2013). Given that *T. violacea* is used traditionally to treat cancer it is therefore likely that its crude extracts can induce apoptosis in human oral cancer cells.

Togo - Project Completion Report of Mr. Tchodou Samah Bawong



Mr. Tchodou Samah Bawong, Design Engineer - Electrical, Directorate General of Energy, Ministry of Mines and Energy of Togo was sponsored by the NAM S&T Centre under its RTF-DCS Fellowship scheme for 2016-17 to carry out research in the Information Training and Customized Services Unit, National Institute of Wind Energy (NIWE), Chennai, Tamil Nadu, India under the supervision of Dr. P. Kanagavel from 10th January to 4th July 2017 on a project titled 'Optimization of Electric Energy Production by a Horizontal Axis Wind Generator in Areas Less Windy'.

In Togo, while electricity consumption is expected to increase considerably, demand for electricity can be mitigated by considering the possibilities of using renewable energy sources beyond hydroelectric and solar power, wind power. To achieve energy sustainability, the government must increase the production of electricity from renewable energy resources. Although renewable energies have several shares, such as biomass, small hydroelectric power stations and the solar system, wind energy had recently been studied in the part of the port area of Lomé, which proves that 25.2MW Wind power plant can be installed and it will provide about 5-7% of the country's electricity production. It is therefore obvious that Togo has wind potential to exploit. For this question, this study aims to support the sustainable development of wind energy in Togo by conducting the following studies: (i) Mapping of Wind Resources in different Geographical regions of Togo for 10m and 80m agl, (ii) Quantitative Evaluation of Wind Potential at 10m on seven sites in Togo.

In the first study (Mapping of Wind Resources in different Geographical regions of Togo for 10m and 80m agl), the annual average wind speed of Togo is ranging from 2.35-5.67 m/s at 80m and 2.3-5.46 m/s at 10m agl. More than 34226.66 Km², i.e., 60.47% of the area of Togo, corresponds to areas where the average annual wind speed at 10m agl is between 3.5-5.5 m/s. The study makes it clear that the small wind turbine installation is possible may part of the country and there may be very few places for large wind turbine installation.

In the second study (Quantitative Evaluation of Wind Potential at 10m on seven sites in Togo), it shows that the production of electrical energy by small wind turbines is possible, as evidenced by the results on the seven such sites namely: Aneho_Amedjonoukou (average annual wind speed AAWS = 4.42m/s with average wind power density AWPD = 62.12W/m² and a probability P=0.54 that wind speeds between 3-5m/s appear on the site), Anie_Adeourou (AWS = 3.5m/s; WPD = 35.06W/m²; P = 0.55), Kante_Animene-Tie (AWS = 4.33m/s; WPD = 60.49W/m²; P = 0.53), Kante_Titira (AWS = 4.32m/s; DWP = 60.34W/m²; P = 0.53), Kara_Sondina (AWS = 4.02 m/s; WPD = 48.92W/m²; P = 0.58), Niamtougou_Aliande-Kadjala (AWS = 4.18m/s; WPD = 54.56W/m²; P = 0.56) and Notse_Vedome (AWS = 3.68m/s; WPD = 37.08W/m²; P = 0.57). These results made it possible to understand that more than 60.47% of Togolese territory constitutes favorable areas for the installation of micro wind power with average densities of powers between 24.5 – 94W/m².

Director General, NAM S&T Centre Meets and Visits

Visit of the DG, NAM S&T Centre to Malaysia

2nd Annual General Meeting of The Academy of Engineering and Technology of the Developing World (AETDEW)

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre attended the 2nd Annual General Meeting of The Academy of Engineering and Technology of the Developing World (AETDEW) on 8th May 2018 as a Fellow and Council Member of the AETDEW. The meeting was held at the Corus Hotel in Kuala Lumpur, Malaysia to adopt 2017 Annual Report of AETDEW and discuss the programme for the coming period.



2nd AGM of AETDEW

International Conference on Climate Change Education, Kuala Lumpur, Malaysia

Dato' Dr. Samsudin Tugiman, FASc, Ex-Chairman, ISTIC Governing Board invited Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre to attend the International Conference on Climate Change Education held in Kuala Lumpur, Malaysia on 7-8 May 2018 in conjunction with the 10th Anniversary of the International Science, Technology and Innovation Centre for South-South Cooperation under the auspices of UNESCO (ISTIC). 127 delegates from 20 countries, namely, Algeria, Bangladesh, Cambodia, Egypt, France, Gambia, Ghana, India, Indonesia, Malaysia, Nigeria, Philippines, Senegal, Seychelles, Singapore, Sudan, Trinidad & Tobago, Thailand, Tunisia and Zimbabwe, as well as from 10 international organisations were present during the conference that focused on integrating climate change education into the curriculum, best practices and resources for learning within the context of the UN SDG 13 on 'Climate Action'. Some of the significant recommendations made at the conclusion of the Conference were: to sensitise policy makers, politicians and national governments on the importance of climate change education in educating all levels of population and make legislations and regulations to make climate change education compulsory in school curricula; enact legislation and/or regulation to integrate climate change education across school curricula through formal and informal learning at all levels; adopt inquiry-based learning to develop analytical and creative thinking of the challenges in climate change and in-depth mitigation and adaptation solutions; Strengthen teachers' and educators' capacities to deliver accurate information, promote critical thinking about and take action on climate change mitigation and adaptation, taking into consideration local environment and cultural circumstances; allocate adequate resources to museums and science centres to carry out informal out-of-school and interactive activities on climate change in parallel with formal climate change education; involve young people, who are intrinsically more concerned and caring about our environment, to develop innovative solutions in addressing the challenges of climate change; engage industries so as to promote, raise awareness and provide inputs on best practices and trends in their sectors for sustainable development; make national academies of science as lead in motivating and energising the national STI community in government, academia, industry and civil society to act in concert in the effective implementation of climate change education; and initiate follow-up events on climate change education throughout the world in collaboration with stakeholders such as IPCC, UNESCO, the Office of Climate Education and the Inter-Academy Partnership-Science Education Programs (IAP-SEP).



DG, NAM S&T Centre with H.E. Frédéric Laplanche, Ambassador of France in Malaysia, Academician Dato' Ir. (Dr.) Lee Yee Cheong, FASc and Dr. Marlene Kanga, President (WFEO), Australia

Prof. Kulshreshtha, DG, NAM S&T Centre was invited by H.E. Frédéric Laplanche, Ambassador of France in Malaysia to a Reception at which, among a few others, Academician Dato' Ir. (Dr.) Lee Yee Cheong, FASc and Dr. Marlene Kanga, President, World Federation of Engineering Organisations (WFEO), Australia.

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Dr. Denis Nkala, Regional Coordinator / Representative, Regional Office, Asia Pacific, United Nations Office for South-South Cooperation (UNOSSC), Bangkok, Thailand

Prof. Kulshreshtha also had discussions of mutual interest with Dr. Denis Nkala, Regional Coordinator / Representative, Regional Office for Asia Pacific, United Nations Office for South-South Cooperation (UNOSSC) in Bangkok, Thailand

Meeting with the President, NAM S&T Centre

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre used the opportunity of his visit to Malaysia for calling upon the President of the NAM S&T Centre, Datuk Seri Dr. Mohd. Azhar bin Haji Yahaya, Secretary-General, Ministry of Science, Technology and Innovation (MOSTI) of Malaysia in his office at Putrajaya on 8th May 2018 and seek his advice and guidance on various matter pertaining to the functioning and planning of the Centre's activities.



Datuk Seri Dr. Mohd. Azhar bin Haji Yahaya, President NAM Centre and Secretary-General, Ministry of Science, Technology and Innovation (MOSTI), Malaysia and Ms. Hafiza Hasan of International Division

Visit of the DG, NAM S&T Centre to Nigeria

Prof. Arun P. Kulshreshtha, Director General, NAM S&T Centre visited Abuja, Nigeria during 22-24 May 2018 to organise an International Workshop on 'Modern and Emerging Trend in Vaccine Development' in collaboration with the National Biotechnology Development Agency (NABDA) of Nigeria.

Prof. Kulshreshtha took this opportunity to call on H.E. Dr. Ogbonnaya Onu, Honourable Minister of Science and Technology of the Federal Republic of Nigeria. Senior officials of the Ministry, including the Focal Point of the NAM S&T Centre in Nigeria, Mr. Ibrahim Suleiman, Director, Planning, Research and Policy Analysis Department, were present during the meeting. Prof. Kulshreshtha briefed the Honourable Minister on the scientific activities of the NAM S&T Centre.



H.E. Dr. Ogbonnaya Onu, Honourable Minister of S&T, Federal Republic of Nigeria and senior officials of the Ministry, including the Focal Point of the NAM S&T Centre in Nigeria



DG, NAM S&T Centre with Mr. Ibrahim Suleiman, Director, Planning, Research and Policy Analysis Department and Focal Point, NAM S&T Centre and Dr. Ibeh Bartholomew (NABDA)

SCIENCE AND TECHNOLOGY NEWS IN THE DEVELOPING WORLD

Argentina: Non-Browning Potatoes using CRISPR Gene Editing

Potato is the third most important crop in human nutrition, after wheat and rice. The cutting or peeling of the tubers, as well as the mechanical damages suffered during the harvest, transport and storage of potato lead to the generation of brown or black stains caused by oxidation. The browning not only generates the rejection by the consumer and the industry, but also alters the nutritional properties of the fresh potato and its derived products. Researchers of the Instituto Nacional de Tecnología Agropecuaria (INTA), Balcarce in Argentina were able to modify the gene that causes browning in potatoes, alters the nutritional properties and quality of the tubers by using gene editing technique, also known as 'gene scissors'; or CRISPR / Cas9. Using CRISPR-Cas9 they were able to generate a gene editing machinery within a potato cell that specifically targets the chosen gene and changes its genetic sequence. They focused on the polyphenol oxidase gene, which causes browning in potatoes when they are cut and exposed to air. This achievement is the basis of new breeding techniques that allow the same thing that was done for years through conventional breeding, but more quickly and accurately. With a national production of around 2.43 M tons of potatoes per year, controlling this problem would avoid significant economic losses for production and industry.

Source: Crop Biotech Update, 23rd May 2018

Brazil: Hybridisation of Mega-Pests

Hybridisation of two major pest species into a new and improved mega-pest in Brazil has been confirmed by the scientists from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Canberra, Australia. One of the pests is cotton bollworm, which is widespread in Africa, Asia and Europe costing losses worth billions of dollars annually. It had developed strong resistance against all the pesticides used to control it. The other one is corn earworm, a native of the Americas and had less resistance and host range. The combination of the two, in a novel hybrid with unlimited geographical boundaries, causes for major concern in agriculture. Through the study the scientists confirmed that among the group of caterpillars observed, every individual was a hybrid. No two hybrids were the same suggesting a 'hybrid swarm' where multiple versions of different hybrids can be present within one population. According to the researchers, the hybrid study has wide-ranging implications for the agricultural community across the Americas. On top of the impact already felt in South America, recent estimates that 65 per cent of the USA's agricultural output is at risk of being affected by the bollworm demonstrates that this work has the potential to instigate changes to research priorities that will have direct ramifications for the people of America through the food on their tables and the clothes on their backs. The evidences of the hybridisation are discussed in a paper published in the Proceedings of the National Academy of Sciences of the USA.

Source: Crop Biotech Update, 11th April 2018

China: Faster Filter to remove Salt from Water

Researchers from Zhejiang University and National Engineering Research Center for Liquid Separation Membrane, Hangzhou in China have developed a filter that removes salt from water up to three times faster than conventional filters. The membrane has a unique nanostructure of tubular strands, which are inspired by code breaker Alan Turing's lone biology paper. Turing structures arise when imbalances in diffusion rates make a stable steady-state system sensitive to small heterogeneous perturbations. For example, Turing patterns occur in chemical reactions when a fast-moving inhibitor controls the motion of a slower-moving activator. The Chinese researchers grew polyamide membranes by using interfacial polymerisation, where the reactions occur at the interface between oil and water layers. The addition of polyvinyl alcohol to the aqueous phase reduced the diffusion of the monomer. This process generates membranes with more bumps, voids and islands, which prove to be better for water desalination. The emergence of Turing structures is of fundamental importance, and designing these structures and developing their applications have practical effects in chemistry and biology. A facile route is used based on interfacial polymerisation to generate Turing-type polyamide membranes for water purification. Manipulation of shapes by control of reaction conditions enabled the creation of membranes with bubble or tube structures. These membranes exhibit excellent water-salt separation performance that surpasses the upper-bound line of traditional desalination membranes. Furthermore, the existence of high water permeability sites is shown in the Turing structures, where water transport through the membranes is enhanced.

Source: Science, 4th May 2018

Cyprus: Regional Hub for Climate-Change Research

Climate models suggest that the Mediterranean and Middle East are getting warmer and drier at a rate faster than the global average; precipitation in the Mediterranean is expected to drop, especially in summer, by as much as 30–40% by the end of the century if no mitigation efforts are made. Rains, when they come, will be more intense. Crop failures, forest fires and freshwater shortages are just some of the issues that threaten economies, lifestyle and tourism. Parts of the region are set to become uninhabitable; in the Middle East, for instance, average maximum temperatures could increase from 43 °C to almost 50 °C by the end of this century without mitigation. Few monitoring systems exist in the Eastern Mediterranean and Middle East to systematically measure variables such as temperature, humidity and desertification. The monitoring that does exist is inconsistent, and the data are too poor to feed into climate-change models, which would help to understand local impacts and refine policy options. Climate scientists working in the Mediterranean do not have the capacity to do a proper analysis of the mitigation options. The tiny island of Cyprus is reshaping itself into a regional hub for climate change research. The country lies at the meeting point of the Mediterranean, the Middle East and North Africa - areas where climate change is expected to take a heavy toll in the

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coming decades, but where research capacity to address the issue is limited. A government initiative was announced on 5th June 2018 that will coordinate action against global warming across the Mediterranean and support the creation of a US\$35 million Climate Change Research Centre at the 'Cyprus Institute in Nicosia, the nations leading multidisciplinary research institution. The initiative will also create a comprehensive plan to reduce Cyprus's greenhouse-gas emissions in line with the 2015 Paris Climate Accord. At the core of the proposed hub - the Eastern Mediterranean Middle East Climate and Atmosphere Research Centre - will be a high-quality observatory for monitoring concentrations of greenhouse-gas emissions and atmospheric contaminants, which will take advantage of Cyprus's geographic location to establish regional contributions. The centre will absorb the existing climate-research activities of the Cyprus Institute. The institute, launched in 2007 as a private, high-quality research institution for the Middle East, has already garnered wide support for its role in climate change action, and its work has helped to raise awareness of the issue in the region. The institute capitalises on Cyprus's position as the only European Union country in the Middle East. Foundations for the new climate centre have already been laid: it won €400,000 in EU research money to develop a plan for the facility, and it is now preparing a bid for €15 million in EU funding, which would be matched by the Cypriot government and bankroll the centre for the next decade. It is also planned to launch a Cyprus chapter of the United Nations Sustainable Development Solutions Network in the autumn, which promotes education, research and policies to achieve the UN's sustainable development goals, including meeting the Paris targets.

Source: Nature Briefing, 27th June 2018

Egypt: New Solar Power Plant to train African Scientists

The first training programme in the field of solar power for researchers from Africa and the Middle East is set to be launched in September 2018. The programme offered by the Academy of Scientific Research and Technology (ASRT) in Egypt will take place at the Multipurpose Applications by Thermodynamic Solar (MATS) plant. The plant, opened in February 2018, has been built over an area of 12 acres in the city of Borg El-Arab near Alexandria for producing electricity and desalinating water. The plant works by transferring the heat of the sun, concentrated using special lenses or mirrors, to tubes containing molten salt that stores the heat. When the salt temperature reaches 550 degrees Celsius, the energy is either stored or used directly to heat water that powers steam turbines connected to electricity generators. On a regional level, this plant in Africa would be deployed as the largest R&D centre in the field of concentrated solar power and its outputs, including the production of thermal power, electricity generation and sea water desalination. Despite the fact that Egypt gets more sunshine than all European countries combined, its dusty environment reduces the efficiency of solar plants. Therefore the plant would also involve cleaning methods, or the use of insulating material that prevents adhesion of dust particles. The academy sees the plant as the first of its kind in North Africa and as the fruit of a genuine collaboration between the academic community and the industrial sector. It implemented the project in collaboration with national partners - universities, research centres and the private

sector, as well as other parties from Italy, France, Germany and the United Kingdom. MATS was the largest European Union (EU) supported research project outside Europe when work began in 2011 with the EU contributing €12.5 million, the academy contributing €2.5 million and the rest provided by the private sector. The project is a part of an Egyptian plan to provide 20 per cent of its energy needs from new and renewable sources, especially solar power, by 2022. MATS currently has a daily production of five megawatts of thermal power, one megawatt of electricity, and 250 cubic meters of desalinated water that can meet the needs of 1,000 people. It aims to localise the technologies of solar power in Egypt, therefore it has deliberately made use of the Egyptian patents. Local components make up 40 per cent of the plant. The government is counting on the ~US\$26 million project to serve as a pilot for similar projects, aiming to turn Egypt into an exporter of renewable energy technologies. A key objective of the project is to encourage industries that can produce spare parts and key components of renewable power plants, such as mirrors, lenses and tanks.

Source: SciDev.Net Global, 29th May 2018

India: Electrons travel faster than Light in Glass

Using ultrashort laser pulses, physicists have been able to generate hot electrons that travel faster than the speed of light in a piece of glass. This opens a new avenue for understanding several areas of high-energy science ranging from laser-driven fusion to developing advanced radiation sources that have potential applications in the industrial and medical fields. An international research team, including physicists from the Tata Institute of Fundamental Research in Mumbai, India, shone ultrashort laser pulses on a glass target in a vacuum chamber placed on top of a table. The laser ejected electrons inside the glass and instantly kicked them to speeds approaching that of light. Ultrashort laser pulses, each one lasting a millionth of a billionth of a second (a femtosecond), can accelerate electrons on a solid surface to near light speeds. However, little is known about the fate of such short-lived electrons inside the solid. After travelling small distances at speeds faster than that of light, the electrons dissipate energy in the glass medium. They emit Cherenkov radiation, light produced by charged particles when they pass through an optically transparent medium at speeds greater than the speed of light. They emit such radiation throughout the length of the target. The fast electrons last 2000 times longer than the laser pulses. Theoretically speaking, this is much longer than the time they should take to traverse the target. This research is a significant step towards developing a method that will help understand hot-electron transport through solids.

Source: Nature India, 6th May 2018

India: Headquarters Agreement between India and the International Solar Alliance

An International Solar Alliance (ISA) was unveiled by the Indian Prime Minister Narendra Modi and the then French President Francois Hollande at the U.N. Climate Change Conference in Paris on November 30, 2015. The idea was to form a coalition of solar resource-rich countries to collaborate on addressing the identified gaps in their energy requirements through a common approach. Towards this,

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the ISA has set a target of 1 TW of solar energy by 2030, which current French President Emmanuel Macron said would require \$1 trillion to achieve. The ISA is open to 121 prospective member countries, most of them located between the Tropics of Cancer and Capricorn as this is the region worldwide with a surplus of bright sunlight for most of the year. So far, however, only 56 countries have signed the ISA Framework Agreement. These include Australia, Bangladesh, Benin, Brazil, Burkina Faso, Cabo Verde, Cambodia, Chad, Chile, Comoros, Costa Rica, Cote d'Ivoire, Cuba, Djibouti, Dominican Republic, DR Congo, Equatorial Guinea, Ethiopia, Fiji, France, Gambia, Gabon, Ghana, Guinea, Guinea-Bissau, Guyana, India, Kiribati, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Nauru, Niger, Nigeria, Peru, Rwanda, Sao Tome, Senegal, Seychelles, Somalia, South Sudan, Sri Lanka, Sudan, Suriname, Tanzania, Togo, Tonga, Tuvalu, UAE, Uganda, Vanuatu, Venezuela and Yemen. The Union Cabinet chaired by the Prime Minister of India gave its ex-post facto approval for entering into Headquarters (Host Country) Agreement between India and the ISA and authorised the Ministry of External Affairs to sign the Headquarter Agreement, which was subsequently concluded on 26th March 2018. The Headquarters Agreement will institutionalise the functional arrangements between India and ISA. It will help in smooth transition of ISA as an international inter-governmental organisation. Creation of ISA will lead to accelerated solar technology development and deployment in ISA member countries including India. Apart from being a founding-member, India plays a significant role in the alliance in terms of being a host as well as a major contributor to the achievement of the target. It will provide 500 training slots for ISA member-countries and start a solar tech mission to lead R&D.

Source: Energetica Newsletter, 12th April 2018

Iran: Device for assembling Sensitive Parts

A Device for Assembling Sensitive Parts, called 'Servpress' has been designed by Ariana Modern Industry Company, a member of Pardis Technology Park, and marketed by the researchers at Pardis Technology Park. It is intended to compress or assemble sensitive parts. For example, this device can be used for precise assembly of parts and the fitting of sealing parts such as radial shaft seals requiring exact size and angle relative to their location or the exploding-bridge wire detonators that require force control. In addition, this device is used for compression of powder materials such as pharmaceutical tablets or prototyping of 'Servpress' enjoying high-precision in controlling pressing parameters in a metallurgical laboratory. Its special software has the capability of adjusting the amount of force and high precision displacement. Moreover, it is capable of applying various forces and displacement with identifiable arrangements. The software also offers chart drawing, storage and printing services. Force-acting, planning for pressing with special arrangements, force capacities ranging from 10000-12000 kg, movement with the precision of 0.001 mm, force control with a precision of 0.1% of the nominal force, and speed control with an accuracy of 0.001% of the nominal speed are among the advantages of this device. Only two American companies enjoy the technical knowledge to manufacture such device. The Iranian sample of this device has more capabilities than

those manufactured in the USA, such as a station was embedded for quality control of assembly and fitting of the parts in the final stage

Source: Pardis Technology Park E-Newsletter, 5th May 2018

Mexico: Sea of Solar Panels turns Mexican Desert Green

From a distance, it looks like a deep-blue sea formed in the middle of the Mexican desert. But this is no mirage – it is the largest solar park in Latin America. With 2.3 million solar panels covering the equivalent of 2,200 football fields in the arid northern state of Coahuila the Villanueva power plant, built by Italian energy company Enel, is part of Mexico's push to generate 43 percent of its electricity from clean sources by 2024. Arrayed across the sand in seemingly endless rows that stretch to the horizon, the solar panels are made to turn in tandem with the sun, like a giant field of shimmering metallic sunflowers. The \$650-million project came online in December and is due to produce 1,700 gigawatt hours when fully operational later this year, enough to power 1.3 million homes. Mexico won plaudits from environmentalists in 2015 when it became the first emerging country to announce its emissions reduction targets for the United Nations climate accord, ambitiously vowing to halve them by 2050. To get there, it is tendering clean energy projects in which private companies produce, sell and purchase electricity on an open market. The three projects tendered so far have generated an estimated \$8.6 billion in investment. The resulting electricity will power some 6.5 million homes, according to government figures. The Villanueva plant is the largest solar project in the world outside China and India

Source: EQ International, 26th April 2018

Oman: Oman Rocks could help save the Planet

In the arid vastness of this corner of the Arabian Peninsula, out where goats and the occasional camel roam, rocks form the backdrop practically every way you look. But the stark outcrops and craggy ridges are more than just scenery. Some of these rocks are hard at work, naturally reacting with carbon dioxide from the atmosphere and turning it into stone. Veins of white carbonate minerals run through slabs of dark rock like fat marbling a steak. Carbonate surrounds pebbles and cobbles, turning ordinary gravel into natural mosaics. Carbonate veins form when water containing dissolved carbon dioxide flows through these rocks. Even pooled spring water that has bubbled up through the rocks reacts with CO₂ to produce an ice-like crust of carbonate that, if broken, re-forms within days. When the water comes back into contact with air, a thin layer of carbonate hardens across its surface. Scientists say that if this natural process, called carbon mineralisation, could be harnessed, accelerated and applied inexpensively on a huge scale - admittedly some very big "ifs" - it could help fight climate change. Rocks could remove some of the billions of tons of heat-trapping carbon dioxide that humans have pumped into the air since the beginning of the Industrial Age. And by turning that CO₂ into stone, the rocks in Oman, or in a number of other places around the world that have similar geological formations, would ensure that the gas stayed out of the atmosphere forever. Capturing and storing carbon dioxide is drawing increased interest. The

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Intergovernmental Panel on Climate Change (IPCC) says that deploying such technology is essential to efforts to rein in global warming. But the idea has barely caught on: There are fewer than 20 large-scale projects in operation around the world, and they remove CO₂ from the burning of fossil fuels at power plants or from other industrial processes and store it as gas underground. Present researches seek to removing carbon dioxide that is already in the air, to halt or reverse the gradual increase in atmospheric CO₂ concentration. Direct-air capture, as it is known, is sometimes described as a form of geoengineering - deliberate manipulation of the climate - although that term is more often reserved for the idea of reducing warming by reflecting more sunlight away from the earth. Although many researchers dismiss direct-air capture as logistically or economically impractical, especially given the billions of tons of gas that would have to be removed to have an impact, some say it may have to be considered if other efforts to counter global warming are ineffective. A few researchers and companies have built machines that can pull CO₂ out of the air in relatively small quantities, but adapting and enhancing natural capture processes using rocks is less developed. At a geothermal power plant in Iceland, after several years of experimentation, an energy company is currently injecting modest amounts of carbon dioxide into volcanic rock, where it becomes mineralised. Dutch researchers have suggested spreading a kind of crushed rock along coastlines to capture CO₂. And scientists in Canada and South Africa are studying ways to use mine wastes, called tailings, to do the same thing. If billions of tons of CO₂ are to be turned to stone, there are few places in the world more suitable than Oman, a sultanate with a population of 4 million and an economy based on oil and, increasingly, tourism. The carbon-capturing formations here, consisting largely of a rock called peridotite, are in a slice of oceanic crust and the mantle layer below it that was thrust up on land by tectonic forces nearly 100 million years ago. Erosion has resulted in a patchy zone about 200 miles long, up to 25 miles wide and several miles thick in the northern part of the country, including here in the outskirts of Ibra, a dusty inland city of 50,000. Even the bustling capital, Muscat, on the Gulf of Oman, has a pocket of peridotite practically overlooking Sultan Qaboos bin Said's palace. Peridotite normally is miles below the earth's surface. When the rocks are exposed to air or water as they are here, they are like a giant battery with a lot of chemical potential. They are really, really far from equilibrium with the atmosphere and surface water. The rocks are so extensive, that if it was somehow possible to fully use them they could store hundreds of years of CO₂ emissions. More realistically, Oman could store at least a billion tons of CO₂ annually; Current yearly worldwide emissions are close to 40 billion tons. One possibility would be to drill pairs of wells and pump water with dissolved CO₂ into one of them. As the water travels through the rock formation carbonate would form; when it reaches the other well the water, now depleted of CO₂, would be pumped out. The process could be repeated over and over. The simplest way to use rocks to capture carbon dioxide however would be to quarry large amounts of them, grind them into fine particles and spread them out to expose them to the air. The material could be turned over from time to time to expose fresh surfaces, or perhaps air with a higher CO₂ concentration could be pumped into it to speed up the process. But each of these has practical difficulties that

have to be resolved. While the formations in Oman are special, they are not unique. Similar, though smaller ones are found in Northern California, Papua New Guinea and Albania, among other places.

Source: New York Times, 26th April 2018

Swaziland: Importation and Environmental Release of Bt Cotton

Swaziland Environment Authority (SEA) has granted two landmark approvals for importation of Bt cotton seed and environmental release of the crop making the Kingdom of Eswatini the latest African country to adopt Bt cotton. In accordance with Biosafety Act, SEA granted approval to the Swaziland Cotton Board (SCB) to import 3,000 kilogrammes of GM cotton seed for commercial release. The Board will import the seed from JK Agri-Genetics Limited, an Indian-based seed company. The authority stated that the approval is subject to export and transit permits, which should be sought by the applicant or supplier. "The applicant and transporter should take full responsibility for the load in transit, and should be aware of the Emergency Response Measures of GMO consignments" - reads part of the approval notice. SEA also requires the cotton board to adhere to the requirements for conveyor shipment as dictated in Article 7 of the Cartagena Protocol on Biosafety on the Advance Informed Agreement procedure. On environmental release, SEA reveals that in accordance with the Biosafety Act, 2012 and its Draft Regulations, approval is granted to Swaziland Cotton Board to intentionally introduce genetically modified cotton with *Bacillus thuringiensis* gene to be grown in Swaziland. In November 2016, SEA okayed SCB to undertake confined field trials for the GM crop. Cotton industry has been one of the leading industries driving Swaziland's economy. However, production has been dwindling owing to insect attack, key among them the bollworm.

Source: Crop Biotech Update, 16th May 2018

Tanzania: New Improved Yield Variety of Sunflower Seeds

The field trials of high-yielding and pest-resistant sunflower varieties in Tanzania showed promising results. A long term facility has been established by the Agricultural Markets Development Trust to address the challenges in sunflower farming and marketing. Successful development of better sunflower varieties would lead to improved supply of sunflower oil, which is cholesterol-free. Trials have been conducted in nine out of 12 regions where the sunflower programme is being implemented. These regions include Iringa, Njombe, Songwe, Rukwa, Singida, Shinyanga, Manyara, Lindi, and Mtwara. The trials were conducted outside the normal sunflower season and were in wetlands or areas where irrigation farming has been conducted. Farmers who have tried the hybrid seeds of sunflower expressed their appreciation for the benefits that they gained. The production increased significantly. The farmers normally harvesting six sacks of sunflower in one acre, after following expert recommendations such as proper spacing, use of required fertilisers, weeding and observing proper harvesting time, harvested 16 sacks in one acre.

Source: Crop Biotech Update , 9th May 2018

Past Scientific Associate of NAM S&T Centre

Ms. Geeta



Ms. Geeta joined the NAM S&T Centre in April 2016 as a Research Associate and worked until October 2017. 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 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 organisation of several International scientific events, viz. the International Workshop on 'Evolving Energy Model in Emerging Economies' held at Ahmedabad, Gujarat, India 12-14 December 2016 where she presented her research paper entitled 'The Resilience of Critical Urban Infrastructure Systems and Energy Efficiency – An Indian Perspective'. Another important landmark in her career was that at the International Workshop on 'Drought Management and Desertification Control' held at Mashhad, Iran, 22-24 May 2017 where she presented a research paper titled 'Water Management and Infrastructure Planning to cope with Water Scarcity in Drought Prone areas in India' that was widely applauded. Ms. Geeta has also acquired editorial skills during her affiliation. She contributed in the compilation and further publication of highly valuable books titled 'Minerals Processing and Beneficiation' (Ed) Dianne A. McDonald (Guyana), Prof. D. J. Simbi (Zimbabwe) and Ms. Lebohang Musi (South Africa). Being post graduated in Planning and Geography she also has acquired excellent knowledge of the fundamental concepts of socio-economic survey methodologies, data collection, data compilation, data analysis, GIS and Report Writing, Project monitoring, Planning and Implementation.

After the enriching experience at NAM S&T Centre, Ms. Geeta is working as a Programme Associate in Science and Engineering Research Board (SERB), which is a statutory body under the Department of Science and Technology, Government of India. She is involved in managing and coordinating the various scientific schemes and programmes which promote basic research in Science and Engineering and provide financial assistance to persons engaged in such research, academic institutions, research and development laboratories, industrial concerns and other agencies for such research and for matters connected therewith or incidental thereto are the primary and distinctive mandate of the Board.

She has acknowledged that the NAM Centre is an excellent organisation which has provided her the opportunities to build up her strength and understand the dynamics of an organisation.

Ms. Sunaina



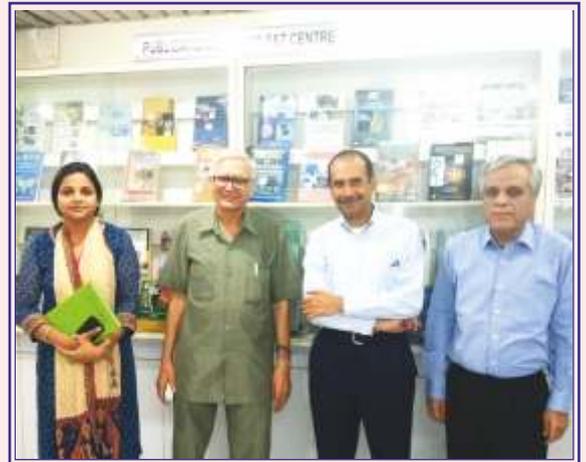
Ms. Sunaina worked in the NAM S&T Centre as a Research Associate from January 2016 to August 2016. Her primary responsibilities included planning, implementation, evaluation and assessment of various scientific programs of the Centre. She actively contributed towards the promotion of scientific activities among students, scientists/academia and scientific organisations in the developing countries through workshops, seminars and training courses and for the publication of the quarterly Newsletter of the Centre. She worked on the implementation of various schemes of the Centre, viz. Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme sponsored by the Department of Science & Technology, Government of India and ICCBS Fellowship in Natural Products Chemistry, Drugs and Pharmaceuticals. She contributed towards the preparation of the guidelines and announcements of these schemes in a major way, managing the database of R&D and academic institutions, and coordination with scientists & researchers from developing countries.

Ms. Sunaina assisted in the organisation of the international training programme on 'STI Policy and Management for Developing Countries' held at Kuala Lumpur, Malaysia during 8-12 August 2016 where she also attended as a participant. Ms. Sunaina has acquired editorial skills during her affiliation with the NAM S&T Centre and contributed in the compilation and publication of a highly valuable book of the Centre.

After the enriching experience at the Centre, Ms. Sunaina is now pursuing Ph.D. in Environmental Science from the School of Environmental Sciences, Jawaharlal Nehru University (JNU), New Delhi. Her research area includes Application of Chemistry and Geochemistry in monitoring and management of Air, Water and Soil Pollution, Biogeochemical Cycling, Weathering and Paleoclimate Studies. Majorly, Ms. Sunaina research work is on Atmospheric Science field under the supervision of Prof. Umesh Chand Kulshrestha.

While expressing her personal experience in working in the NAM S&T Centre, Ms. Sunaina wrote: *"It was an enriching experience while working with Arun Sir & Bando Sir at the onset of my career. Their valuable support and guidance has been tremendously helpful through my professional journey. I am really thankful that I got an opportunity to work with such an esteemed organization."*

DISTINGUISHED VISITORS TO THE CENTRE



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New Publication

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The global demand for energy is currently growing beyond the limits of installable generation capacity. In order to efficiently meet the future energy demands, energy security and reliability need to be improved and alternative energy sources be investigated more aggressively. Of several available renewable energy sources, solar energy is clearly a promising option, being abundantly available and also the cleanest energy resource on our planet.

The present book edited by Engr. Muhammed Musa Gaji and Dr. Abhishek Verma comprises 20 papers by the scientists from 17 countries covering several issues related to the status and trends of solar power generation, designing of solar cells and risk assessment of solar power plants.

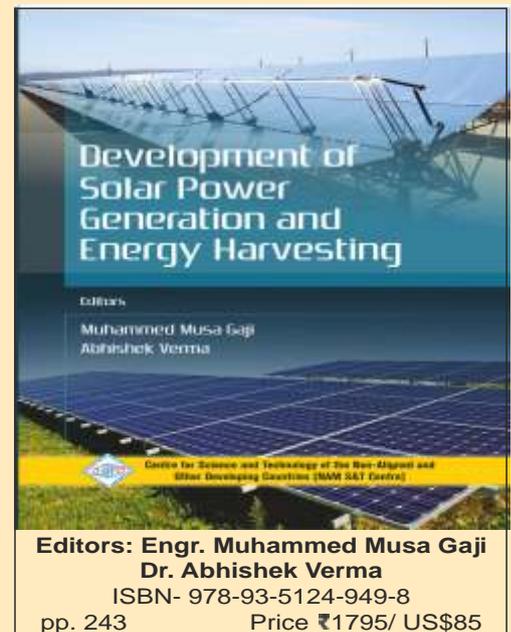
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Ph: +91-11-24645134, 24644974, Fax: +91-11-24644973 E-mail: namstcentre@gmail.com, namstct@bol.net.in ❖ Website: <http://www.namstct.org>

Lovely Printers, New Delhi, E-mail: lovely_printers@yahoo.com; Ph: 9811086866.