



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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From the Dg'S Desk

Warmest greetings to our esteemed readers!!



The 2nd Bureau Meeting of the 13th Governing Council of the NAM S&T Centre was held at Munyonyo Commonwealth Resort in Kampala, Uganda on 7th/8th September 2015, which was attended by the Bureau members from South Africa, Malaysia and Venezuela, representatives of Egypt, Kenya, Trinidad & Tobago, Zambia and Zimbabwe, and the host country Uganda. H.E. Yoweri Kaguta Museweni, Hon. President of Uganda could not inaugurate the event due to unforeseen circumstances; however, his speech was read out by H.E. Dr. Rahakana Rugunda, Hon. Prime Minister of Uganda during the Valedictory Ceremony. The Bureau reviewed the Centre's activities in progress, made a critical appraisal of its accomplishments and accorded approval to its new initiatives.

The Centre held a successful International Symposium jointly with the National Center for Lightning and Electromagnetics (ACLE-Zambia) titled 'Strategic Interventions to Mitigate the Hazard of Lightning' on 11th-13th August in Lusaka, Zambia which was attended by 47 participants from 17 countries. Discussion was held on the effect of lightning with main focus on African region and the measures to create awareness for mitigating the risk to human and animal life, electrical installations and other structures. Most importantly, a Resolution was adopted in the Symposium to declare 28th June of every year as International Lightning Safety Day. The Resolution has since been referred to the concerned international organisations including UNESCO for consideration.

The Centre announces the Training Fellowship on Minerals Processing & Beneficiation for the year 2016. This Fellowship programme was initiated by the Centre last year jointly with the Department of Science & Technology (DST), Government of South Africa to address the skills gap in the mineral beneficiation value chain and enable the scientists to expose themselves to new technologies in this field.

Several scientific activities on a variety of topics are lined up by the Centre in the coming period and please be on the lookout for these announcements.

Happy Reading!


(Arun P. Kulshreshtha)

2nd Bureau of 13th Governing Council (GC) of the NAM S&T Centre Meets at Kampala, Uganda on 7-8 September 2015

The 2nd Bureau meeting of the 13th Governing Council (GC) of the Centre for Science and Technology of the Non-Aligned and other Developing Countries (NAM S&T Centre) was held at Munyonyo Commonwealth Resort of Kampala, Uganda on the 7th and 8th September 2015.

Dr. Maxwell Otim Onapa, Deputy Executive Secretary, Uganda National Council for Science and Technology (UNCST), Focal Point of the NAM S&T Centre in Uganda, welcomed the



With H.E. Rahakana Rugunda, Rt. Hon'ble Prime Minister of Uganda during 2nd Bureau Meeting of 13th GC, Kampala, Uganda, 7-8 September 2015.

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Centre Organised

International Symposium on
STRATEGIC INTERVENTIONS TO MITIGATE THE HAZARD OF LIGHTNING
Lusaka, Zambia, 11-13 August 2015

Lightning is a natural phenomenon with global presence. It can cause injuries and deaths for people and animals plus costly infrastructural damage and downtime of crucial equipment. However, it remains a highly underrated weather hazard. The impact of lightning in most African regions is far worse than the rest of the world for many reasons. Parts of Central Africa have the highest lightning density (lightning strikes/km²/year) in the world. Most of the population is at high risk because safe shelters are not available; they are often employed in outdoors work; rapid high-quality medical care may not be available; and there is a general lack of knowledge about



Inauguration of ACLE-Zambia Lightning Symposium, Lusaka, Zambia, 11-13 August 2015

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Bureau members from South Africa, Malaysia and Venezuela; senior officials from other member countries of the NAM S&T Centre, viz. Egypt, Kenya, Zambia and Zimbabwe; Deputy High Commissioner of Trinidad and Tobago; and those present in the audience, offering all support from the Government of the Republic of Uganda for the successful organisation of the Bureau meeting. Honourable Dr. Theresa Sengooba, Chairperson of the Governing Body of UNCST and Regional Coordinator for the East Africa Program for Biosafety Systems (PBS) in her address said that it was a pleasure and privilege to UNCST to host this important meeting and further expand its ties with the Centre. As the principal S&T organisation in Uganda, UNCST has the objectives of improving and streamlining S&T policy, providing assistance for R&D, helping innovators in protection of IPRs, facilitating public understanding of S&T etc., and it was in line with the national priorities to reinforce the bonds between UNCST and the NAM S&T Centre. Mr. Richard Tshumereirwe, Senior Advisor to the Honourable President of Uganda said that under the Presidential Support to Scientists programme with an annual budget of ~ US\$4.2 million, promising scientists and technologists with innovative ideas are provided support for commercialisation. The Government of Uganda wants to make use of STI policy for economic planning to support national development agenda across various sectors.

Mr. Daan du Toit, President of the 13th Session of the Governing Council (GC) of the NAM S&T Centre and Deputy Director-General, International Cooperation and Resources, Department of Science & Technology (DST), Government of South Africa conveyed the good wishes from Her Excellency Naledi Pandor, Honourable Minister of Science & Technology of South Africa for successful conduct of the Bureau meeting. He said that South Africa emphasises the role of STI for development and the importance of multilateral cooperation for progress in the developing countries, and applauded the Director General (DG) of the Centre and his dedicated team for the high level professionalism shown in various spheres of working. He added that it was inspiring to note that the contributions made by the Centre were duly recognised by the NAM S&T Ministerial Conference in Tehran held in February 2015.

Mr. Daan du Toit spelt out the strategic priorities for the Centre as (a) Participation in international developmental agenda, such as SDGs, Energy, Food and Water security; (b) Innovation for industrial development – encourage greater industry partnership through NAM S&T – Industry Network; (c) Capacity building in STI – Step up communication to popularise the Centre's efforts among diplomats, policy makers etc; (d) Critically look for challenges and constraints and seek solutions to address the problems; and (e) Continue fostering friendship and understanding among developing countries to solve common problems and bring prosperity, peace and global solidarity through Centre's actions

Dato' Dr. Mohd. Azhar bin Yahya, Vice-President of the 13th GC and Deputy Secretary General (Policy) in the Ministry of Science, Technology and Innovation of the Government of Malaysia thanked Uganda for hosting the meeting which is of paramount value for Malaysia since the country has proposed to host the next Meeting of the Governing Council of the Centre. He mentioned that Malaysia has laid emphasis in its National Plan 2011-15 on STI, greater innovation through increased investment, Public-Private

Partnership Networking to connect research and industry, assistance to SMEs for product innovation, high-impact short-time low-cost commercialisation of products, etc. Malaysia is also hosting an International Science, Technology & Innovation Centre (ISTIC) in collaboration with UNESCO for promoting capacity building among developing countries on STI, and recommended active collaboration between the NAM S&T Centre and ISTIC.

Prof. Dr. Anwar Salem Hasmy Aguilar, Vice-President of the 13th GC and President, National Observatory for Science, Technology and Innovation, Ministry for Higher Education, Science and Technology of the Government of Venezuela mentioned that Venezuela is new to the Centre having joined as its member only two years back. He expressed happiness with the wide range of activities of the Centre and added that his country would like to become more proactive vis-à-vis the Centre in the near future and intends to host scientific activities in partnership with the Centre. He also hoped that besides Venezuela, more and more countries from the Latin American Region will participate in the Centre's activities and that he would endeavour to sensitise these countries to join the Centre as its member.

Prof. Dr. Said I. Shalaby, Vice-President, Academy of Scientific Research and Technology (ASRT) of Egypt said that his country had been active in the affairs of the Centre and would like to continue in future with even greater zeal and enthusiasm to benefit the Egyptian researchers from the Centre's activities and enrich the Centre's activities with Egyptian achievements in science and technology.

Dr. Eric Mwangi, Director of Research Development in the Ministry of Higher Education, Science and Technology of Kenya congratulated the Centre for its noble role in promoting STI and said that Kenya looks forward to participate in its future programmes.

Mr. John Lukonde Chongo, Senior Science and Technology Officer, Department of Science and Technology, Ministry of Education, Science, Vocational Training and Early Education of Zambia said that his country looks forward to host programmes on behalf of the Centre and participate in its various activities to benefit the Zambian academic and R&D community.

Ms. Rungano Karimanzira, Director, Projects and Technology Transfer, Ministry of Higher and Tertiary Education, Science and Technology Development of Zimbabwe said that Zimbabwe has a very strong history of NAM and shares with the principles of the Bandung Conference. She said that the Zimbabwean Government is trying to reposition the areas of excellence such as on Minerals for the development of African countries. Giving a brief account on the progress made on the setting up of the Centre of Excellence in Minerals Processing & Beneficiation (CEMPB) she stated that the process is currently on to provide a legal framework for this new entity.

The Bureau expressed regret that no representative from India, Vice-President of the 13th GC, was present in the meeting and no inputs were received from the country for this meeting.

Prof. Dr. Arun P. Kulshreshtha, Director General, NAM S&T Centre expressed his gratitude to the Government of Uganda, and more specifically, to the UNCST for hosting the meeting. He also appreciated the efforts of Mr. Edward Tujunirwe, Assistant Executive Secretary & Head,

(Contd. from Page 2 - 2nd Bureau Meeting of 13th GC, Kampala, Uganda)



Group Photo during 2nd Bureau Meeting of 13th GC, Kampala, Uganda, 7-8 September 2015

Yoweri Kaguta Museweni, the Honourable President of the Republic of Uganda who could not join the Opening Session due to unforeseen circumstances.

Six latest books published by the NAM S&T Centre were released in the Ceremonial Opening.

The Bureau noted the overall achievements of the Centre since its inception and various scientific activities undertaken, fellowship programmes implemented and publications brought out during the period after the last meeting of the Bureau held in Harare in September 2014. The Bureau acknowledged the high significance of the Tehran S&T Ministerial Conference 2015 and appreciated the Government of the Islamic Republic of Iran to take the first ever initiative in convening such an important meeting. It was felt that this could be an effective mode to promote South-South cooperation in S&T under the aegis of NAM and suggested that henceforth the countries holding the NAM Chairmanship may consider carrying on with this activity and organise similar Conferences in future at regular intervals.

Corporate and International Affairs, UNCST, who at the administrative and functional level did an admirable job of shouldering the responsibility of organising the Bureau meeting on behalf of the Government of Uganda. He made a presentation on the objectives and functions of the NAM S&T Centre and its role in developing partnerships and promoting South-South and North-South cooperation through Science & Technology, and stated that in last ten years, the expenditure made by the Centre on scientific activities has been consistently growing as compared to the administrative expenditure, which has been achieved through excellent partnership arrangements, improved management practices and efficient financial control.

The Bureau further noted with satisfaction that the Centre's role in the promotion of Science, Technology & Innovation (STI) among the NAM member countries was appropriately recognised in the Declaration of the NAM S&T Ministerial Conference held in Tehran in February 2015 wherein the Centre was invited to support the Member States in implementing the Resolution adopted by the Conference

H.E. Rahakana Rugunda, the Honourable Prime Minister of Uganda graced the Valedictory Ceremony of the Bureau Meeting on 8th September 2015 when he said that the Non Aligned Movement (NAM) was founded by the giants of the three Continents and the scientists have taken lead from that to help the NAM member countries in their progress through the application of science and technology under the banner of the NAM S&T Centre. He expressed happiness at having been a part of this useful meeting and also with the fact that the Centre has published a large number of scientific and technical books. He then read out the speech of His Excellency

The Bureau also noted with appreciation the Centre's proactive facilitating role towards the establishment of the Centres of Excellence on Lightning, Minerals and STI respectively in Uganda, Zimbabwe and Iran.

The Bureau approved the Plan of Action by the Centre that was proposed right up to May 2017 for undertaking a number of scientific activities. It noted with appreciation the clear statements prepared on the achievements and year-wise income and expenditure of the Centre and presented by the DG of the Centre to the Bureau. It was observed that there was absolutely no doubt that due diligence was exercised for efficient financial management as a result of which the percentage of expenditure on scientific activities had been progressively increasing. However, it was further observed that more resources should be found by encouraging the non-paying member countries to pay their subscription and mobilising other sources of revenue.

Visitors To The Centre

20 th July 2015	Dr. Prabhat Ranjan, Executive Director and Mr. Yashwant Dev Panwar, Scientist-E, Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi
4 th Aug. 2015	Dr. Debapriya Dutta, Director, Indo-French Centre for the Promotion of Advanced Research (CEFIPRA), New Delhi
21 st Aug. 2015	Dr. Tapan Kumar Mondal, Senior Scientist, National Bureau of Plant Genetic Resources (NBPGR), New Delhi with Mr. Mohammad Abubakar Gumi, RTF-DCS Fellow from Nigeria
11 th Sept. 2015	Ms. Noumedem A.C. Nadia, RTF-DCS Fellow from Cameroon
25 th Sept. 2015	Dr. Diallo Talibé, RTF-DCS Fellow from Guinea

(Contd. from Page 1 - Lightning Symposium, Lusaka, Zambia)

lightning and how to avoid injury. In a country like Zambia, isolated efforts have been made to protect electronic/electrical equipment, but little is being done to protect human beings and livestock.

Keeping the above in view, the NAM S&T Centre and the National Center for Lightning and Electromagnetics in Zambia (ACLE-Zambia) organised an International Workshop titled 'Strategic Interventions to mitigate the Hazard of Lightning' at Lusaka, Zambia during 11-13 August 2015 for brainstorming by international policy makers, scientists, engineers and medical practitioners, lightning industry executives, lightning industry and technology producers, investors, exploration people, planners and decision-makers. ACLE Zambia is currently hosted by the Zambia Air Services Training Institute, ZASTI. The Symposium was sponsored by the Disaster Management and Mitigation Unit (DMMU) and the Ministry of Education, Science, Vocational Training and Early Education of the Republic of Zambia.

The Inaugural Session started with the National Anthem and Address by Prof. Mary Ann Cooper, MD, Director, African Centres for Lightning and Electromagnetics (ACLE), followed by Mrs. Foster Lubasi, Coordinator, ACLE- Zambia making general remarks about the new ACLE Centre. Prof. Dr. Arun P. Kulshreshtha, Director General, NAM S&T Centre presented the genesis of the event and also briefly described the activities of the inter-governmental organisation headed by him. Dr. Patrick Kona Nkansa, Permanent Secretary, Ministry of Education, Science, Vocational Training and Early Education (MESVTEE) and the Focal Point of the NAM S&T Centre in Zambia spoke about hosting the ACLE by Zambia and the excellent relationship of Zambia with the NAM S&T Centre benefitting a large number of scientists and specialists from Zambia. At the conclusion of the Session, the Chief Guest, Hon. Lazarous B Chungu, MP, Deputy Minister in the Office of the Vice President of Zambia addressed the Symposium and formally launched ACLE-Zambia. Dr. (Ms.) Ms Mwape sat in for Mr. Patrick Kwangwa, National Coordinator, Disaster Management

and Mitigation Unit (DMMU) during the Inaugural Session. The International Symposium at Lusaka was attended by 47 Participants (23 foreign and 24 Zambian) from 17 countries, including Benin, Cameroon, Egypt, India, Iraq, Malawi, Malaysia, Nepal, Nigeria, Pakistan, South Africa, Sri Lanka, Sudan, Uganda, the USA, Zimbabwe and the host country Zambia.

The foreign participants were from Benin [Dr. Boris Polynice Anato from the National Meteorological Directorate]; Cameroon [Mr. Ngamini Jean Blaise (Retired), Responsible for Meteorological Network in the Agency for the Safety of Air Navigation in Africa and Madagascar (ASECNA), Dakar, Senegal]; Egypt [Prof. Dr. Salah M. Mahmoud, Prof. of Geodynamics, National Research Institute of Astronomy and Geophysics (NRIAG), Helwan, Cairo]; India [Dr. Anirban Guha, Assistant Professor, Department of Physics, Tripura University]; Iraq [Engr. Faris Salih Mahdi Al Shaikhly, Technical Manager and Member, Iraqi Inventors and Inventors Society, Craima]; Malawi [Mr. Rodrick Walusa, Deputy Director, Department of Meteorological Services]; Malaysia [Prof. Mohd. Zainal Abidin Ab Kadir, Deputy Dean (Research & Innovation), Universiti Putra Malaysia (UPM), Serdang, Selangor]; Nepal [Dr. Shriram Sharma, Senior Lecturer, Amrit Science College, Tribuvan University, Lainchaur, Kathmandu]; Nigeria [Engr. M. M. Gaji, Senior Scientific Officer/Engineer, Energy Commission of Nigeria, Department of Renewable Energy, Abuja]; Pakistan [Dr. Muhammad Imran Shahzad, Assistant Professor, COMSATS Institute of Information Technology, Islamabad]; South Africa [Prof. Ian R. Jandrell, Dean, Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg and Mr. Ian McKechnie, Director, INNOPRO (Pty) Ltd and Global Africa (Pty) Ltd]; Sri Lanka [Mr. Nuwan Kumarasinghe, Senior Electronics Engineer, Baudhaloka Mawatha, Colombo and Prof. Dr. Chandima Gomes, Professor of Electrical Engineering, Universiti Putra Malaysia (UPM), Serdang, Selangor, Malaysia]; Sudan [Prof. Arbab Ibrahim Mohamed, Assistant Director,



Group Photo ACLE-Zambia Lightning Symposium, Lusaka, Zambia, 11-13 August 2015

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Directorate for Science Research and Cultural Relations, Department of Physics, Faculty of Science, University of Khartoum, Khartoum]; Uganda [Eng. Barongo Ronny, Manager Communications, Navigation and Surveillance, Civil Aviation Agency, Kampala; Mr. Edmund Mugizi Ataremwa, Head ACLE; Mr. Yeleise Julius of Social Research, ACLE; and Mr. Richard Tushemereirwe, Senior Presidential Advisor for Science, State House, Entebbe]; USA [Dr. Mary Ann Cooper, MD, Professor Emerita, Department of Emergency Medicine, University of Illinois at Chicago and Prof. Ronald Holle, Holle Meteorology and Photography, Tucson, Arizona]; Zimbabwe [Mr. Innocent Masukwedza, Atmospheric Scientist, Zimbabwe Meteorological Services Department, Harare]. Two senior representatives, Mr. Jim Anderson, VP International and Dr. Charlie Liu, Chief Architect were deputed by Earth Networks, Inc. to attend the Symposium. The NAM S&T Centre was represented by its Director General, Prof. Arun P. Kulshreshtha.

The Zambian participants were Mr. Elliot Nketani Kabalo, Zambian Information and Communications Technology Authority (ZICTA); Mr. Patrick M. Simuchimba, Lusaka City Council, Lusaka; and Mr. Sebastian K. Namukolo, Lecturer, University of Zambia, Lusaka, who made technical presentation during the Symposium, and 18 others.

The overall programme of the Symposium was conducted in seven sessions, respectively chaired by Prof. Mary Ann Cooper, MD (USA); Mr. Edmund Mugizi Ataremwa (ACLE Uganda); Dr. Zainal Ab Kadir (Malaysia); Dr. Nuwan Kumarasinghe (Sri Lanka); Prof. Ronald Holle (USA); Dr. Shri Ram Sharma (Nepal); and Dr. Ian Jandrell (South Africa); a Banquet Session; three Interactive Sessions; and Concluding Session.

The scientific papers presented during the seven Technical Sessions were on 'Weather Patterns across Africa' by Mr. Ngamini Jean Blaise of Cameroon; 'Lightning Physics' by Prof. Ian Jandrell (South Africa); 'Detection Systems' by Dr. Charlie Liu of Earth Networks, Inc.; 'Concept, Progress and Preliminary Results from Permanent Gns Networks

in Africa' by Prof. Salah Mahmoud of Egypt; 'Standard and Lightning Protection' by Mr. Elliot Nketani Kabalo of ZICTA, Zambia; 'Impact of Lightning in the Events of Severe Atmospheric Conditions' by Prof. Mohd. Zainal Abidin Ab Kadir of Malaysia; 'Extended Maxwell's Equations' by Prof. Arbab Ibrahim Mohamed of Sudan; 'Populations at Risk from Lightning and Sources of Data' by Ronald Holle of USA; 'Mechanisms and Medical Effects of Lightning Injury' by Prof. Mary Ann Cooper of USA; 'Strategies for Understanding Lightning Myths and Beliefs' by Mr. Innocent Masukwedza of Zimbabwe; 'Lightning: Awareness and Protection Practices in Nepal' by Dr. Shriram Sharma of Nepal; 'Lightning and Dwelling Facilities' by Mr. Patrick M. Simuchimba, Lusaka City Council of Zambia; 'Lightning Evolution during Severe Tropical Cyclones' by Dr. Anirban Guha of India; 'Spatio-Temporal Analyses of Lightning Activities over Pakistan – Preliminary Results to Devise Strategic Interventions to Mitigate the Lightning Hazards' by Dr. Muhammad Imran Shahzad of Pakistan; 'Protection of Power Stations and Gas Heat from Solar Storms System {Geomagnetic}' by Engr. Faris Salih Mehdi Al Shaikhly of Iraq; 'Lightning Protection' by Prof. Chandima Gomes of Sri Lanka/Malaysia; 'A Strategic and Structured Approach to Effective Lightning Safety and Protection' by Mr. Ian McKechnie of South Africa; 'Mitigation of Lightning-Induced Overvoltages in Medium Voltage Distribution Lines by means of Periodical Grounding of Shielding Wires and of Surge Arresters: Modeling and Experimental Validation' by Er. Muhammed Musa Gaji of Nigeria; 'Structural Lightning Protection System for Large Exposed Area' Mr. Nuwan Kumarasinghe of Sri Lanka; 'Working with Government Organisations and Private Companies to decrease Deaths, Injuries and Property damage from Lightning' by Mr. Richard Tushemereirwe of Uganda; 'Strategic Intervention on Lightning Protection Improvement for Entebbe Control Tower' by Er. Barongo Ronny of Uganda; 'Lightning Effects and Solutions for Wireless Transmission Stations' by Mr. Sebastian K. Namukolo of Zambia; and 'Saving Lives in Lake Victoria' by Mr. Yeleise Julius of Uganda.



(Contd. from Page 5 - Lightning Symposium, Lusaka, Zambia)

Hon. Mr. George Nyendwa, Mayor of Lusaka City Council, was the Chief Guest at the Banquet Dinner on the second Day of the Symposium. The dinner was preceded by technical presentations by Mr. Jean Blaise Ngameni from Cameroon, Meteorologist associated with CIRDA Programme of UNDP, on 'Early Warning and Technological Innovations', and by Mr. Jim Anderson, VP International, Earth Networks, Inc. on 'Early Warning in Weather Forecast'.

In the Concluding Session Prof. Chandima Gomes proposed a draft for a Resolution for declaration of an International Lightning Safety Day. After extensive discussion the delegates unanimously adopted the

Resolution for its submission to higher authorities in their countries as well directly to UNESCO.

The Certificates of Participation were handed over to the Symposium participants and concluding remarks were made by some of the participants, DG NAM S&T Centre. Finally, Mrs. Foster Chileshe Lubasi, Coordinator, ACLE-Zambia proposed the Vote of Thanks. The organisers were profusely thanked for the successful and fruitful organisation of the Symposium 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 South-South cooperation.

Resolution

FOR DECLARATION OF AN INTERNATIONAL LIGHTNING SAFETY DAY

RECOGNIZING THE LOSS of thousands of lives and billions of dollars in the form of property damage and service downtime every year due to lightning which has been reported in countless media reports and numerous scientific papers;

CONSIDERING THAT recent studies from Asia, Africa and South America have shown that the level of lightning deaths, injuries and property losses in these continents remains unacceptably high;

NOTING THAT there is an urgent need for widespread public education to promote lightning safety and protection in every country, especially in those with high lightning flash density and significant risk of lightning injury;

APPRECIATING THAT the efforts of scientists and lightning awareness promotion activists in some countries have substantially reduced the number of deaths and losses in those countries;

RECALLING THE SEVERITY of some incidents, for example, on 28th June 2011, 18 school pupils were killed and many others injured by lightning in Uganda while they were taking shelter inside their school. Similar incidents are frequently reported in many countries.

NOTING THAT the Uganda incident of 28th June 2011 triggered the scientific community and activists to initiate lightning safety and injury prevention activities leading to extensive brainstorming resulting in organization of appropriate training courses and awareness campaigns in many countries;

An International Symposium on Strategic Interventions to Mitigate the Hazard of Lightning, jointly organized by the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi, India, and African Centers for Lightning and Electromagnetics (ACLE) - Zambia, was held in Lusaka, Zambia, from 11th to 13th August 2015, with the participation of high ranking professionals, scientists, engineers and practitioners from 17 countries including Benin, Cameroon, Egypt, India, Iraq, Malawi, Malaysia, Nepal, Nigeria, Pakistan, South Africa, Sri Lanka, Sudan, Uganda, USA, Zambia and Zimbabwe, who reported and deliberated on various facets of lightning mitigation measures.

The delegates at this Symposium unanimously resolve to propose the declaration of the 28th June of each year as International Lightning Safety Day, and urge the concerned national and international authorities to take appropriate action in this regard.

Thus, adopted this day, the 13th of August 2015, at Lusaka, Zambia.

Visits of the Director General, NAM S&T Centre

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre led a 4-member Indian scholars' delegation to Tehran, Iran during 26th-31st July 2015 for brainstorming on Indian Best Practices on Science, Technology and Innovation Development at the invitation of Dr. Manouchehr Manteghi, Head of Iranian Association for Management of Technology [IRAMOT]. The members of the delegation were Dr. Vishweshwaraiah Prakash [Distinguished Scientist of CSIR - India; Hon. Director of Research, Innovation and Development, JSS Mahavidyapeetha, Mysuru, Karnataka; and Immediate Past Director, CSIR – Central Food Technology Research Institute (CFTRI), Mysore], Dr. Ashok Jain [Fellow, National Academy of Sciences, India; President, Mombusho Scholars



Indian Delegation with H.E. Dr. Ali Akbar Velayati, Ex Foreign Minister and Head, Centre for Strategic Research of Iran (6th from L)



Indian Delegation with H.E. Dr. Mohammad Reza Mokhber-Dezfooli, Secretary of the Iranian Supreme Council for Cultural Revolution (3rd from R)

(LinkedIn Group); Former Vice-Chancellor, Arunachal and Apeejay Stya (Gurgaon) Universities; Former Advisor, Ministry of Science and Technology; and Former Counsellor for S&T, Health and Education, Embassy of India in USA].

During the two-days high level Seminar, after the introduction by H.E. Dr. Eng. Hamid R. Amirinia, Head of Knowledge-Based Economy Committee, Setade Ejraee Farmane Emam & Advisor, Vice Presidency for S&T of Iran and Opening Remarks by Prof. Arun Kulshreshtha, who also gave a talk titled 'Brain Storming on Indian Best Practices on Science, Technology, Innovation and Development', the delegates made their comprehensive presentations on 'All Inclusive Growth in the Sectors of Agriculture, Biotechnology, Pharmacy and Food Processing



Indian Delegation with H.E. Dr. H. Salar Amoli, Dy. Minister (C), Ministry of Science, Research & Technology of Iran



Indian Delegation with Dr. Manouchehr Manteghi, Head of Iranian Association for Management of Technology [IRAMOT] (5th from L)

Networking with Manufacturing – A Glimpse of India' and 'The Affordable Health Sector Networking Traditional Wisdom with Modern Medicine for Sustainable Healthy India – A New Paradigm Shift for Changing Lifestyle Diseases' [by Dr. V. Prakash], 'Deciphering S T I Policies and Strategies from India s Experience' [by Dr. Ashok Jain], 'The Satellite Communication Paradigm (Present, Future Technological Trends & Issues)' [by Dr. S. Pal] and 'Indian Education System and Challenges in Quality Management, Research and Sustainable Development' and 'Highlights of Indian S&T Programs, Innovation Eco-system and International Cooperation' by Prof. K.K. Dwivedi.

One entire day was spent by the Indian delegates after the Seminar in separate extensive deliberations with the former

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Foreign Minister of the Islamic Republic of Iran H.E. Dr Ali Akbar Velayati of Iran Expediency Council and Head, Center for Strategic Research (CSR); H.E. Dr. H. Salar Amoli, Deputy Minister for International Affairs and Director of International Scientific Centre and H.E. Prof. Vahid Ahmadi, Vice Minister for Research and Technology Affairs in the Ministry of Science, Research and Technology; H.E. Dr. Mohammad Reza Mokhber-Dezfouli,



Mr. J. Jodai, Iran National Space Administration (L), Dr. Surendra Pal (R) and DG, NAM S&T Centre

Secretary of the Iranian Supreme Council for Cultural Revolution; and H.E. Dr. M. Molanejad, Head, Indian Ocean Rim Association

Regional Centre for Science and Technology Transfer and Acting President for International Cooperation of IROST (Iranian Research Organization for Science and Technology), who is also the Focal Point of the NAM S&T Centre in Iran. Some meetings in specific scientific sectors were also held, such as with the representatives of the Iran National Space Administration and Iran Space Agency to discuss the roadmap for the space programme of Iran.



H.E. Dr. M. Molanejad, Head, IORA Regional Centre and President (Int), IROST, Iran (3rd from L) with Indian delegates (from 3rd from R) Dr. V. Prakash, Dr. Ashok Jain, Prof. Arun Kulshreshtha, Dr. S. Pal and Prof. K. K. Dwivedi

Joint NAM S&T Centre – ZMT Bremen Fellowship

Iran – Project Completion Report of Mrs. Mehrnoush Tangestani Gholami



Mrs. Mehrnoush Tangestani Gholami, Research Assistant of the Iranian Research Organization for Science and Technology (IROST), was affiliated with the Leibniz Centre for Tropical Marine Ecology (ZMT) at Bremen, Germany from November 23, 2014 to February 01, 2015 under the NAM S&T Centre – ZMT Fellowship Scheme. She worked under the guidance of Dr. Andreas Kunzmann on a research project titled 'Isolation and Characterisation of Bacteria causing Skin Ulceration Disease in Juvenile Sea Cucumber *Holothuria scabra*'.

Sea cucumbers are commonly consumed echinoderms that are becoming increasingly important for the growing aqua farming industry with high natural exploitation rates. Their trade developed in recent decades to produce them as food supply or as raw materials for ornamental, industrial and pharmaceutical applications. Diseases are potential threats to this industry and could lead to massive commercial loss. Echinoderm diseases have attracted little study in contrast to other commercial marine organisms. The investigation reported here contains a response to a question about the pathogenesis pattern in juvenile *Holothuria scabra*.

Skin ulceration or white spot is a highly invasive lethal disease in juvenile sea cucumber population. Symptoms start with a white spot on the surface of the skin, which quickly expands to an invasive lesion that destroys the vicinal and sub-epidermal tissues leading to death within 3-5 days. In Holothuroids there is little knowledge about prognosis, etiology and treatment of this and other bacterial diseases.

In this study two dead animals with white spots and some animals with similar but fewer skin lesions were observed in a recent delivery of some 50 specimens from Indonesia. These specimens were kept for ecophysiological experiments in the experimental aquaria facilities, MAREE of ZMT. Eleven pure bacteria were isolated from lesions of juvenile *Holothuria scabra* with the symptom of skin ulceration disease. This study used 16S rDNA sequence analysis to identify potential pathogenic bacteria isolated from skin lesions of animals and tested, *in vitro*, a range of antibiotics for inhibition of growth of these isolated bacteria. Molecular phylogenetic identified bacteria with 99 to 100% similarity as *Arcobacter bivalviorum*, *Pseudoalteromonas citrea*, *P. sp.*, *Vibrio azureus*, *V. fortis*, *V. owensii*, *V. parahaemolyticus*, *V. rotiferianus*, *V. Tubiashi* and *V. sp.* All isolated bacteria showed *in vitro* susceptibility to the common antibiotics imipenem, chloramphenicol and amoxicillin/clavulanic acid. These bacteria isolated from skin lesions of juvenile sea cucumbers (*Holothuria scabra*) possibly include the causative organism or organisms of white spot disease but this needs confirmation by further *in vivo* studies. Several of the isolated *Vibrio* and *Pseudoalteromonas* species have previously been implicated as pathogens in other diseases of marine animals.

This study is the first to find *V.owensii*, *V. azureus* and *V. fortis* as potential pathogens of holothuroids. The susceptibility of all isolates to three antibiotics suggests that antibiotic treatment could be developed as a means of curing white spot disease in commercial aquaculture of *H. scabra*.

Research Training Fellowship for Developing Country Scientists (RTF-DCS) 2014-15 *Research Project Completion Reports*

Guinea – Project Completion Report of Dr. Talibé Diallo



Dr. Talibé Diallo, Teacher and Research Assistant, and Head of Chair on Infectious and Parasitic Diseases at the Higher Institute of Science and Veterinary Medicine, Dalaba, Guinea was sponsored by the NAM S&T Centre to carry out research at the Department of Veterinary Parasitology, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab, India under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme on a project titled “Classical and Molecular Diagnosis of Haemoparasitic Infections with Special Reference to *Trypanosoma* in Domestic Animals” under the supervision of Professor Lachhman Das Singla from 10th April to 25th September, 2015.

In Guinea more than 80% of the population is engaged in agriculture and livestock farming. Parasitic infections in livestock are of great economic important at national level. In the zone of the Guinea Savannah, the incidence of trypanosomiasis was recognised at a significant level in cattle. In certain animal species including dogs and cats, haemoparasitic diseases remain undiagnosed due to shortage of capacity of veterinary diagnostic services despite the importance of these animals in the socio-economic life of man.

Being an important issue at national level in Guinea, the problem was selected with the aim (i) to provide insight on to the conventional parasitological diagnostic techniques, principles and tools to strengthen the capacity of the fellow to diagnose and differentiate the haemoprotozoans by classical techniques of Parasitology, and (ii) to understand and learn the immuno-molecular diagnostic techniques for specific and sensitive diagnosis of haemo-protozoan parasites in general, and cattle trypanosomosis in particular, for improved epidemiological surveillance.

Immuno-molecular techniques including Indirect Fluorescent Antibody Technique (IFAT), Card Agglutination Test for Trypanosomiasis (CATT), polymerase chain reaction method (conventional PCR), nested PCR and multiplex PCR were successfully applied on 35 equine blood samples. In CATT 17.14% and 28.57% samples depicted +++/++ and +/- titer, respectively and only 20% sample showed positive results in IFAT for *T. equi*. Primary PCR showed 5.71% infection and on the other hand nested PCR depicted 20% *T. equi* infection. Only 8.57% prevalence of *T. evansi* was recorded by multiplex PCR.

Mauritius – Project Completion Report of Mr. Dhuny Riyad



Mr. Dhuny Riyad, Lecturer, University of Technology, Mauritius (UTM), was sponsored by the NAM S&T Centre to carry out research at the Centre for Development of Advanced Computing (C-DAC), Pune, India from 20th January to 15th July 2015 under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme on a project titled “An open Framework to Geo-tag and Geo-locate Plants / Fruit Trees around the World” under the supervision of Mr. Sajeevan G., Joint Director, Spatial Sciences and Disaster Management Group.

Fruiting plants present on state lands /crown land often represent a source of food for local inhabitants in certain areas of the world. Medicinal herbs are often searched within the neighbourhood areas and picked by the local inhabitants for use in traditional medicine. Mobile computing and the internet has brought many changes in various fields. The aim of this project was to make use of smart technologies to encourage the general public to plant trees and to share their location with others. By accessing the hardware devices of a Smartphone this work proposes a way to allow the general public to photograph a plant and make its location available to others on a map. It also allows other users to search for nearby fruit trees by displaying their position and the targeted fruiting plants with some precision margins.

Setting up an IT system alone may not drive users to participate. With the aid of social networking, users can be encouraged to initiate different actions like plant a tree or share the location of a tree. The application of such a framework can have a positive impact on specific sectors like tree conservation and education sector. A good example is the tagging of near extinct plants by forestry units and a controlled tree planting programme within the education sector allowing a student to contribute a plant to the society. Further, a common man might have difficulties to search plants by their scientific names. This framework makes it possible for a user to search a plant by its common name and to get its scientific name. This work introduces a new approach of challenging the application users to encourage the audience to plant trees and to share the location of existing remote trees with others. Non-profit organisations, forestry unit or education sector finding this approach helpful may adapt this approach to suit their needs.

Nepal – Project Completion Report of Mrs. Manju Showree Karmacharya



Mrs. Manju Showree Karmacharya, PhD Scholar, Tribhuvan University, Kathmandu, Nepal was sponsored by the NAM S&T Centre to carry out research at the Department of Chemistry, Indian Institute of Technology, Roorkee, India under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme on a project titled “Physicochemical characteristics of the Activated Carbon Obtained from Waste Tire and Its Alumina Composite” under the supervision of Professor Dr. V.K. Gupta from 25th March to 16th September 2015.

Major objectives of the research were to prepare activated carbon and its alumina composite using waste tire rubber as low cost and easily available precursor, to study their physical properties and to use them for the active

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removal of ammonium ion and arsenic from aqueous solutions. Mrs. Karmacharya successfully prepared activated carbon from waste tire rubber by pyrolysis of the rubber at 700°C followed by HCl treatment and further activation at 700°C and 900°C, named as AC700 and AC900. Alumina composites of activated carbon obtained from waste tire rubber were prepared by activation of mixture of HCl treated carbon obtained from waste tire rubber and aluminium hydroxide powder in different ratios by weight at 700°C. Similarly, tire rubber-alumina composite (TRAL) was prepared from activation of 1:1 ratio of tire rubber and aluminium hydroxide by weight. AC900 has greater BET surface area than AC700 while the composite prepared from the carbon and aluminium hydroxide in 1:1 ratio by weight (ACAL11) has greater BET surface area and arsenic adsorptive capacity than that prepared by 1:2 ratio (ACAL12) and 2:1 ratio (ACAL21). pH_{pzc} of AC900, ACAL11 and TRAL were determined to be 3.1, 3.98 and 3.89 respectively. All the adsorption studies were carried out in batch experiments at $30 \pm 3^\circ\text{C}$ temperature. Adsorption of NH_4^+ , As(III) and As(V) found to follow Langmuir adsorption isotherm and pseudo-second-order kinetics. The maximum NH_4^+ ion adsorptive capacity of AC900 was found to be 1.14mg/g. Adsorptive capacity of ACAL11 was 14.28mg/g and 23.8mg/g for As(III) and As(V) respectively. Adsorptive capacity of TRAL was 13.51mg/g and 19.60mg/g for As(III) and As(V) respectively. As(V) removal by ACAL11 was found to be very fast and equilibrium reached almost within 10 minutes while all other adsorption processes took almost 60 minutes to reach the equilibrium. Hence waste tire rubber is successfully used to prepare activated carbon and its alumina composite, which are applied for removal of ammonium ion and arsenic from aqueous solution. Among the developed adsorbents, ACAL11 is found to be good adsorbent and it can be used to study adsorption of other hazardous metal ions present in waste water.

Nigeria – Project Completion Report of Mr. Mohammad Abubakar Gumi



Mr. Mohammad Abubakar Gumi, Lecturer II, Usmanu Danfodiyo University, Sokoto, Nigeria was sponsored by the NAM S&T Centre to carry out research at the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, India under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme on a project titled "Isolation and Characterization of Dehydration Responsive Element Binding (DREB) Genes in Some Selected Upland Rice Accessions of Nigeria" under the supervision of Dr. T.K. Mondal, Sr. Scientist from 5th March to 26th August, 2015.

DREB (dehydration responsive element binding) proteins are important plant transcription factors (TFs) that regulate the expression of many drought stress-inducible genes mostly in an ABA-independent manner and play a critical role in improving the abiotic stress tolerance of plants by interacting with a DRE/CRT cis-element present in the promoter region of many abiotic stress-responsive genes. The *DREB2A* gene from selected upland African rice (NERICAs and *O. glaberrima*) was isolated and characterised and compared with available rice *DREB2A* genes from NCBI and Ensembl database. The coding region (cDNA derived sequence) of NERICA and *O. glaberrima* showed no significant difference to the reference sequence of indica variety (100% match) suggesting the conserved nature of the gene. Comparison through alignments between coding sequence and genomic sequence revealed the position of 2 introns but of just 1 and 2 bp length though other reports from indica and japonica varieties confirmed the *DREB2A* gene to be intron less but our findings revealed variation in length between coding sequence and genomic sequence of the same cultivar (NERICA1) by almost 3 bp length thus suggesting an intron. Sequence analysis of the coding region of *DREB2A* NERICA showed high similarities to indica *DREB2A* gene with respect to protein structure prediction, molecular weight of protein, AP2/ERF binding domain. However a little variation exists with regards to the DNA binding domain of NERICA (82-139th amino acids residue) with 58 amino acids length as compared to indica sequence (82-141th amino acids) with 60 amino acids residues but in all the 2 varieties, the domain sequence is highly conserved. Overall findings concluded that the *OsDREB2A* gene in indica is orthologous to *OsDREB2A* gene in NERICA.

Sri Lanka – Project Completion Report of Mr. Gunathilaka M.D.E.K.



Mr. Gunathilaka M.D.E.K., Senior Lecturer, Sabaragamuwa University of Sri Lanka was sponsored by the NAM S&T Centre to carry out research at the Ocean Engineering Division, CSIR-National Institute of Oceanography (NIO), Goa, India under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme on a project titled 'Long Term Sea Level Change Analysis around Srilankan Coastline based on Multi-mission Satellite Altimeter and Tide Gauge Data' under the supervision of Dr. Sanil Kumar V.V., Scientist & Head of Business Development from 25th March to 6th June 2015.

A majority of the socio-economic activities of Sri Lanka is focussed around the coastal belt and it is characterised by its unique geographical and geophysical settings. Therefore a better knowledge and understanding of sea level behaviour is very important. The sea level has conventionally been measured at tidal stations. However, these stations are few and sparse. But with the increased accuracy of satellite altimetry measurements an alternative technique is available to study the global and regional sea level changes. Satellite altimeter provides satellite altitude and range measurements to the water surface from the altimeter antenna. Sea levels are always changing for many reasons. Some changes are rapid while others take place slowly. Some factors are naturally induced while others are due to excessive human activities such as greenhouse effect. The changes can be local or can extend globally. The aim of this project was to study the sea-level rise trends around Sri Lankan coastline based on the 20 years satellite altimetry data from 1993 to 2012 and coastal tidal data. The obtained sea-level rise trend around Sri Lanka is around 2.5 to 3 mm per year. The observed sea-level rise trend from the altimetry and tide gauge data is highly correlated with correlation coefficient of over 0.87. This confirms that altimetry measurements can be successfully used to analyse the long-term sea-level rise studies, especially where the tidal observations are lacking.

NAM S&T Centre Research Fellowship

Nepal – Project Completion Report of Dr. R. Parajuli



Dr. R. Parajuli of the Department of Physics, Tribhuvan University, Kathmandu, Nepal was sponsored by the NAM S&T Centre to the Tata Institute for Fundamental Research (TIFR), Mumbai, India under the NAM S&T Centre Research Fellowship Scheme from 1st to 30th January, 2015 to carry out research on a project titled 'Absolute Dissociative Electron Attachment (DEA) Cross Sections of DNA (Deoxyribonucleic Acids) Bases' under the guidance of Prof. E. Krishnakumar.

The focus of this study was the home-made electron gun especially designed to give electrons from 0 to 500eV energy. The electron gun was tested for the measurement of low electron energy to check whether it could be used for the measurement of the Dissociative Electron Attachment (DEA) Cross Sections or not, but it did not perform as expected. Therefore electron gun was modified and minute changes on grid and cathode geometries were carried out. A sample of uracil molecules was loaded in the oven and looked at the positive ion mass spectrum at 100 eV electron energy in order to test its purity. A large quantity of water vapour was found present in it. This was eliminated by heating the oven continuously at 400 K for several days and monitoring the mass spectrum. It took about 5 days to eliminate the water vapour completely. Under these conditions, the electron current profile was noted at low energies. Though the performance of the gun had improved considerably, it was still well below its expected performance. The negative ion mass spectrum and the ion yield curves for them were measured but it was realised that without improvement in the performance of the gun reliable measurements could not be made. One of the reasons for this poor performance was identified to be the deposition of the uracil and other DNA bases from the previous ionization measurements on the electrodes flanking the interaction region. For this the entire experiment had to be opened up, cleaned and reassembled.

While at TIFR, Dr. R. Parajuli continued his collaborative work with Prof. E. Arunan of the Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore. He revised one manuscript that has been submitted to Journal of Chemical Science.

SCIENCE AND TECHNOLOGY NEWS IN THE DEVELOPING WORLD

Botswana: More School Time slashes HIV Infection

Botswana is a country where almost one in four of those aged between 18 and 49 are infected with the virus. A study has found that increasing secondary school attendance in Botswana slashed HIV infection rates of adults, with the greatest drop among women. Typically, an extra year of schooling beyond primary level reduced the chance of people catching the virus by a third. Education is not only a highly-effective, but also a cost-efficient way of preventing HIV infection in countries where the virus is a severe burden. Investments in secondary schooling are a slam dunk and should go alongside biomedical interventions in any effective HIV prevention strategy. Primary education had no effect on HIV prevalence. But among those who attended an extra year of secondary school, which begins at 15, the risk of contracting the virus fell from 25.5 to 17.4 per cent, or by 8.1 percentage points. This figure jumped to 11.6 percentage points for girls. The gender difference could be partly due to a greater proportion of women being infected with HIV to begin with. But education also allows women to get better jobs, providing the money they need to afford protection, such as condoms, and reducing the likelihood of them getting involved in prostitution or other money-for-sex situations, which increase the risk of infection. The Millennium Development Goals (MDGs) include targets on primary education and HIV prevention, but not secondary school education. However, the draft Sustainable Development Goals, which are to replace the MDGs, include a target to ensure universal secondary education.

Source: *SciDev.Net Update*, 6th July 2015

Brazil: New Compact Laser with Highest Efficiency

An innovative design has enabled a physicist at Brazil's Energy & Nuclear Research Institute (IPEN), to create a laser with 60% efficiency, a world record for this type of equipment, which means more than half the power used to operate the device is converted into laser light, producing a beam of extremely high quality. The result was achieved under the aegis of the research project 'Development of Compact and Efficient Diode-Pumped, Solid-State Lasers for Use in Portable LIDAR and Satellites', supported by FAPESP, and reported in the article 'Influence of Pump Bandwidth on the Efficiency of Side-Pumped, Double-Beam Mode-Controlled Lasers: Establishing a New Record for Nd:YLiF₄ Lasers using VBG', published in the journal *Optics Express*. This result was achieved without adding complex or expensive components to the original equipment by reconfiguring the geometry of a Nd:YLF (neodymium-doped yttrium lithium fluoride)

laser. The laser is highly compact, robust and light. All three characteristics are essential for applications in satellites and other mobile devices, such as those that use LIDAR (light detection and ranging) technology. The device can be operated anywhere without the need for a temperature-controlled environment or vacuum. More efficient lasers are available elsewhere, but these require special materials costing a lot of money. The best laser in existence at present, which uses ytterbium, can reach approximately 80% efficiency but has to be kept at very low temperatures: 78°K, or about minus 195°C. Further, the intensity of a laser beam varies radially as a Gaussian distribution, i.e., the intensity is highest along the centreline and lowest at the edge of the beam. The new laser used geometric reconfiguration to boost the centreline intensity, in which the key innovation consisted of polishing the crystal not only on the faces where the beam enters and exits but also on one of its sides and then pointing the beam at the polished side. Total internal reflection then exposed the core of the beam, which is pumped by the diode. To obtain a beam of excellent quality, an additional procedure was devised whereby the beam is again fired at the pumping surface at a carefully calculated distance from the initial point. The proximity of the two lines prevents the beam from widening and losing quality. These two components, which are part of the same laser beam, fight for pumping energy. Because they are very close together, their diameter cannot expand unless they steal energy from each other. As a result, the beam's cross section remains as small as possible. Because the reconfigured design is based on the needs of the Brazilian market, it avoids any dependence on costly inputs, complex pumping systems or special care to ensure thermal insulation from the environment. Instead of operating continuously, the laser emits very intense, short pulses lasting 7-8 nanoseconds and delivers more than 1 millijoule of power at intervals of 1 millisecond. The high intensity makes a number of effects possible, for example, second-harmonic generation. This means that the laser can operate in the visible light spectrum, in the green colour range, as well as in the usual near-infrared region. Green lasers are well known for their use by dermatologists to remove tattoos. Their uses are actually far more varied, however, ranging from environmental research involving pollution tracking based on the emission of pulses into the atmosphere and subsequent collection of the reflected light to industrial engraving, cutting and marking.

Source: *Agência FAPESP*, 19th August 2015

Brazil: Double Shelf life of Pasteurized Fresh Milk

Nanox, a spinoff nanotechnology company located in São Carlos from

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the Center for Research and Development of Functional Materials (CDFM), one of the Research, Innovation and Dissemination Centers (RIDCs) supported by FAPESP under its Innovative Research in Small Business (PIPE) programme, has developed a technique to increase the shelf life of grade A pasteurized fresh whole milk from seven to 15 days, which has been tested by Agrindus, an agribusiness company located in São Carlos, São Paulo State, Brazil. The technique involves incorporating silver-based microparticles with bactericidal, antimicrobial and self-sterilising properties into the rigid plastic bottles used as packaging for the milk. The microparticles are included as a powder in the polyethylene preform that is used to make plastic bottles by blow or injection moulding. The microparticles are inert, so there is no risk of their detaching from the packaging and coming into contact with the milk. The core of the technology consists of coating ceramic particles made of silica with silver nanoparticles. The silver nanoparticles bond with the ceramic matrix to form a micrometre scale composite with bactericidal properties. The combination of silver particles with a ceramic matrix produces synergistic effects. Silver has bactericidal properties, and while silica does not, it boosts those of the silver and helps control the release of silver particles to kill bacteria. Tests of the material's effectiveness in extending the shelf life of fresh milk were performed for a year by Agrindus, Nanox and independent laboratories. In addition, the material was also tested by two other dairies that distribute fresh milk in plastic bottles in São Paulo and Minas Gerais and by dairies in the southern region that sell fresh milk in flexible plastic packaging. In milk bags, the material is capable of extending shelf life from four to ten days. Nanox plans to market the product in Europe and the United States, where much larger volumes of fresh milk are consumed than in Brazil. The kind of milk most consumed in Brazil is ultra-high temperature (UHT), or 'long life' milk, which is sterilised at temperatures ranging from 130°C to 150°C for two to four seconds to kill most of the bacterial spores. Unopened UHT milk has a shelf life of up to four months at room temperature. Whole milk, known as grade A in Brazil, is pasteurized at much lower temperatures by the farmer and requires refrigeration. Doubling the shelf life of whole milk translates into significant benefits in terms of logistics, storage, quality and food safety. The silver-based microparticles developed by Nanox are currently being used in several other products other than packaging for fresh milk, including plastic utensils, PVC film for wrapping food, toilet seats, shoe insoles, hair dryers and flatirons, paints, resins and ceramics, as well as coatings for medical and dental instruments such as grippers, drills and scalpels. But the company's largest markets today are makers of rugs, carpets and white goods, such as refrigerators, drinking fountains and air conditioners. Neither Brazil nor the US has clear legislation on the use of particles at the nanometre scale in products that involve contact with food, so the company uses nanotechnology processes that result in silver-based particles at the micrometre scale.

Source: Agência FAPESP Newsletter, 1st July 2015

Caribbean Region: FAO/CARDI Cassava Project

Cassava has been identified by the cluster of agriculture institutions as one of the target commodities for the Caribbean Region to meet its food and nutrition security targets, reduce its food import bill and boost trade. In collaboration with the Food and Agriculture Organisation (FAO) of the United Nations, CARDI is implementing the 'Increasing the Integration of Cassava into Caribbean Livelihoods' project in Grenada, Guyana and Jamaica. Under this project a protocol for the safe movement of disease free cassava planting material will be produced, technical packages will be developed, small and large scale demonstration plots will be established and a training programme in the cassava propagation and production techniques will be executed. To date, four small scale (1 acre) demonstration plots have been established at Lavera and La Portrie in Grenada and Salem and Craig in Guyana. One plot in each country utilised standard farmer practices and the other updated methodologies (such as irrigation and bio stimulants) to assess performance on yield. Additionally two large scale plots (5 acres) have also been established in Guyana and Jamaica to demonstrate the appropriateness of large scale methodologies of mechanised planting and harvesting in cassava production. Training on best practices in cassava propagation and production begun in April 2014 and will continue until the end of the project.

Source: CARDI Bi-weekly, 10th August 2015

China: Stem-Cell Rules announced

For years, clinics around China have been ignoring government regulations and warnings from the scientific community, offering desperate patients costly and, according to experts, probably ineffective treatments. These were often labelled as clinical trials as a cover to charge patients. Other countries have experienced similar problems. In January 2012, the government took stock of the situation. It implemented a ban on unapproved stem-cell therapies and a temporary moratorium on new clinical trials, promising to establish a clear framework for future trials. Since then, however, many rogue stem-cell clinics have continued to operate, while stem-cell scientists with valid research agendas have waited for a way to move forward. On 21st August 2015 National Health and Family Planning Commission of China announced through state media the measures that offer a straightforward path towards clinical studies. Chinese stem-cell scientists have welcomed long-awaited measures that will rein in rogue use of stem cells in clinics while allowing research. But some also warn that the measures do not have the teeth needed to stop clinics offering unproven and unapproved treatments. The new measures outline requirements for studies, including obtaining patients' informed consent and using clinical-grade stem cells that have been approved by an independent body. Stem-cell clinical studies can be carried out only at authorised hospitals, and they forbid the hospitals from charging recipients or advertising. Researchers, who want to do pilot studies, will need to register with the health ministry with documentation showing that there are sufficient animal studies to support trials in humans and that they are using certified cell lines verified by independent evaluation. The penalties for breaking the rules are not yet clear, although a senior health-ministry official has pledged to use them to clean up the stem-cell field in China. A researcher at the RIKEN Center for Developmental Biology in Kobe, Japan says that the mechanism laid out for clinical studies looks pretty similar to those in other countries, and more rigorous than some. But he worries that the measures might not apply to military hospitals, or to private clinics affiliated with military hospitals, which have in the past fallen outside health-ministry jurisdiction in China.

Source: Nature, 26th August 2015

China: Cloning Rare Gene to enhance Rice Grain Yield

Scientists from the Chinese Academy of Agricultural Sciences and Chinese Academy of Sciences have reported in *Molecular Plant* journal that an important gene *GS2* was successfully isolated and cloned from a local Chinese rice variety Baodali from Zhejiang province. The gene *GS2* could significantly enhance the yield of super rice. The research article discusses the cloning and characterisation of dominant quantitative trait loci (QTL) that codes for a transcriptional regulator Growth-Regulating Factor 4 (*OsGRF4*). *GS2* is located in the nucleus and may serve as transcription activator. Increase in *GS2* expression leads to larger cells and increased numbers of cells, causing improved grain weight and yield.

Source: Crop Biotech Update, 23rd September 2015

Egypt: Fast Filtering of Seawater

Researchers at Alexandria University in Egypt have unveiled a cost-effective desalination technology which can filter highly salty water in minutes. The technology is based on membranes containing cellulose acetate powder, produced in Egypt. The powder, in combination with other components, binds the salt particles as they pass through, making the technique useful for desalinating seawater. The technology uses pervaporation, a technique by which the water is first filtered through the membrane to remove larger particles and then heated until it vaporises. The vapour is then condensed to get rid of small impurities, and clean water is collected. Using pervaporation eliminates the need for electricity that is used in classic desalination processes, thus cutting costs significantly. This method can be used to desalinate water which contains different types of contamination, such as salt, sewage and dirt. Using existing procedures such kind of water is difficult to clean quickly. The membrane technology in combination with vaporisation can be applied in remote settings, as it requires only the membranes for the filtering process, and fire to vaporise the filtered water. Using pervaporation eliminates the need for electricity that is used in classic desalination processes, thus cutting costs significantly. Pervaporation is

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used to separate organic liquids like alcohols and is one of the more common systems used in sewage treatment to separate water from organic solvents. The technology has been around since the mid-90s, but what is new is making the membrane locally, using materials abundant in Egypt and developing countries. The existing pervaporation membranes are fabricated using complicated procedures, making them unsuitable for cheap production.

Source: SciDev.Net, 7th September 2015

Ghana: Sharing New Superlab with West African Scientists

A new central laboratory has been established at Kwame Nkrumah University of Science and Technology (KNUST) of Ghana and for once the researchers in Ghana can start to dream. The Lab, opened in May 2015, cost the university US\$6.5 million to build and fill with some of the most advanced lab equipment in the world. The idea behind it is to reduce costs by sharing equipment between individual departments. And the novel collaborative approach is even more ambitious than that as it is open to researchers from other universities both in Ghana and other West African countries. Apart from academia, people in industry also use this place. So one company, for instance, is trying to look at the presence or absence of heavy metals in their soil samples at the places where they operate and use atomic absorption spectrophotometer in this lab. The Environmental Protection Agency, the Food and Drugs Board, the Ghana Standards Authority etc. all use this facility. There are lab charges for using equipment over here, which is used for maintaining the equipment. The Lab's designers are confident that the fees charged will help pay for its upkeep. KNUST is taking the lead to solve African problems.

Source: SciDev.Net, 24th August 2015

India: Cochin Airport, World's Largest to operate on Solar Power

In September 2015 India's Cochin International Airport became the world's largest to operate entirely on solar power. The 12 Megawatt peak power (MWp) solar plant was constructed by German engineering giant Bosch; made of 46,150 solar panels laid across 45 acres near the cargo complex. Cochin Airport consists of a 100 kilowatt peak (kWp) rooftop photovoltaic (PV) plant that was actually built in 2013 to test the waters. The airport authorities then followed up with a 1 MWp PV plant that was divided between the rooftop and the ground at its aircraft maintenance hangar facility. Then came the most recent 12 MW plant. Cochin Airport does not have any battery storage. Instead, its 50,000 to 60,000 units of power more than provide for the airport's functioning, and excess power is sold to the grid. This means that it can easily buy back any power that it may need to operate during the night. The \$10 million project will apparently recover these funds in just five years of operation through energy savings alone. The airport is entirely grid neutral, and according to the Airport Authority's website, the amount of carbon emissions it would save over the next 25 years has been calculated to be equivalent to planting 3 million trees or not driving 1.2 billion km.

As far as green benchmarks are concerned, the combined solar capacity at Cochin Airport (12 MW+1.1 MW) narrowly outstrips the solar PV system installed at the Indianapolis International Airport -- a single 12.5 MW system located on the ground. The Baltra Airport in the Galapagos Islands, while far smaller than these two, runs entirely on a combination of solar and wind power. In a country starved of electricity this is an accomplishment that is bound to inspire many others.

India has turned out to be a global front runner in the use of solar power, where the National Solar Mission has targeted a staggering 100 GW of installed solar capacity, upped from the 22GW target that was in place not long ago. Bolstered by the success of Cochin Airport, the Airport Authority of India, which operates 125 airports across the country, has now planned another 30 solar-powered airports, which will make a unique feat in a country starved of electricity, if the plans come through.

Source: ZDNet Innovation Weekly, 25th September 2015

Indonesia: Indonesia's Mangroves can help slow Climate Change

Indonesia is home of one-quarter of the world's mangroves (2.9 million hectares) and its mangroves store 3.14 billion tonnes of carbon, the highest in the world. But the continuing rapid deforestation at 52,000 hectares per year for aquaculture development, mostly due to conversion to shrimp ponds, is endangering another natural storage sink.

Conserving mangroves is difficult because of many conflicting land uses in coastal zones. Compared with other habitats, mangroves have the ability to store carbon three to five times higher than a traditional forest. Mangrove carbon storage is derived from leaf litter, dead roots and woods that fall on waterlogged soil, trapping the carbons in the water in a slow decomposition rate. Given the global significance of mangroves as large sinks of carbon, preventing mangrove loss would be an effective climate change adaptation and mitigation strategy. The demand therefore is that this should be a high-priority component.

Source: SciDev.Net, 4th August 2015

Kenya: New Online Tool for Seed Selection

Farmers in Kenya can now benefit from a new online tool, MbeguChoice, which allows them to quickly obtain information about the best suited seed varieties for local conditions. Mbegu means seed in Kiswahili language. MbeguChoice, which is the first of its kind in Sub-Saharan Africa, allows Kenyan farmers, agro-dealers and extension workers to analyse information on counties, crops, seasons and crop attributes such as drought-tolerance, disease- and pest-resistance, resulting in a list of suitable seed varieties and where they can be obtained. The tool was developed through a partnership involving the Kenya Agricultural and Livestock Organisation (KALRO), Kenya Plant Health Inspectorate Service, Kenyan crop seed companies and the Nairobi-based Agri Experience Ltd, with support from the Kenya Markets Trust. They worked with agricultural extension workers and agro-dealers to narrow the range of crop seed choices after realising that farmers often plant seeds out of position, out of season and because often farmers and agro-dealers lack knowledge and awareness. The online database has more than 200 commercialised crop varieties, including 61 varieties of maize, 25 common bean types and 11 of cassava varieties. The website gives more options on the attributes of crop variety and agro-ecological zones.

Source: SciDev.Net, 30th June 2015

Turkey: Biosafety Board approves 5 Biotech Traits

Turkey's Official Gazette for July 16, 2015 published the Biosafety Board Decisions on the import of genetically modified crops for feed use. The Board approved 3 corn (MIR604, MON863, and T25) and 2 soybean (MON87701 and MON87701 x MON89788) events and their products for feed use only. The announcement also included a decision regarding an amendment on the 'Rules of Packaging, Carrying, Conservation and Transferring' for the purpose of preventing contamination. The decision marks the first approvals since 2011 when the Board approved 16 corn events and 3 soybean events.

Source: Crop Biotech Update, 29th July 2015

Zimbabwe: Earthworms helping Smallholders increase Crop Yields

Increased soil degradation and soil infertility have led to the massive drop in food production in Zimbabwe, thus requiring interventions to boost agriculture. Soil conservation technologies enhance productivity and help farmers realise increased production. Thus a project in Zimbabwe is promoting the use of earthworms to enable the country's small-scale farmers improve soil fertility and boost crop yields. Earthworms eat organic wastes and their faeces that are more potent than ordinary compost are used to improve soil fertility. Zim Earthworm Farms (ZEF) held a campaign in August 2015 in the capital Harare, and so far has trained 100 farmers to use earthworm technology at no cost to them. 60 grams of earthworms each were given to farmers after the training to help breed and keep them. The next green revolution is going to come from earthworm technology. Earthworm technology is cheap and can alleviate poverty, is a cost-effective and income-generating activity, and is economically viable, sustainable and socially acceptable. Every household has waste from animals, food waste and field waste, which if composted and inoculated with earthworms, can be converted into rich bio-fertiliser. According to the Chemistry and Soils Research Institute at Zimbabwe's Ministry of Agriculture, Mechanisation and Irrigation, earthworms degrade wastes faster than conventional systems. Organic farming can help improve soil structure and unlike chemical fertilisers, which are popular in the country, organic manure is not prone to nutrient losses through leeching.

Source: SciDev.Net, 21st September 2015

Past Scientific Associates of NAM S&T Centre

Ms. Namrata Jit Kaur



Ms. Namrata Jit Kaur joined the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) on 27th October 2005 in the capacity of Research Assistant and continued her association with the Centre till 6th September 2006. Her primary responsibilities included the planning, implementation, evaluation and assessment of various scientific programmes of the Centre. She significantly contributed to the International Workshop-cum-Training Courses on 'Natural Products –Drugs, Pharmaceuticals and Nutraceuticals for the benefit of mankind' organised by the International Center for Chemical Sciences, H.E.J. Research Institute of Chemistry at Karachi, Pakistan during 10-19 February 2006 and 'Coastal Ecosystems: Hazards Management and Rehabilitation' organised by the Centre in Indonesia during 8th-17th August in association with Zentrum für Marine Tropenökologie (ZMT) Center for Tropical Marine Ecology, Bremen, Germany and Jenderal Soedirman University (UNSOED), Purwokerto, Indonesia. She was also involved in the implementation of the Joint NAM S&T Centre – ICCS Fellowship programme being implemented by the Centre jointly with the International Center for Chemical Sciences, H.E.J. Research Institute of Chemistry, Karachi, Pakistan. While at the NAM S&T Centre, Ms. Namrata significantly contributed to the compilation and publication of the S&T Newsletter brought out quarterly by the Centre. Her efforts in giving final shape to the book entitled Plant Tissue Culture and Transformation Techniques 'are on records. She also assisted in drafting and finalisation of the Biennial report (2004-2006) of the Centre. She attended a number of international and national seminars and conferences on behalf of the Centre e.g. i) Pre WTO Hong Kong Ministerial Meeting Consultation workshop; ii) Symposium on 'the Doha Round After Hong Kong; iii) Symposium on 'IP Management in Public Private Partnership'; iv) ICRIER-International Conference on WTO and Doha Round, v) Interactive meeting on WTO organised by the PHD Chamber of Commerce & Industry held on 6th June 2006 at New Delhi; vi) Thematic Seminar on 'Reaching out of the Tribal Communities in India: the European Commission's Experience'; and vi) Lecture on 'HIV Preventive and Therapeutic Strategies in 2010' by H.E. Prof. Michel Kazatchkine, Ambassador of France for Fight against HIV/AIDS.

Ms. Namrata moved on to the positions of Senior Research Biologist at Ranbaxy Laboratories Limited and Senior Research Fellow at the All India Institute of Medical Sciences (AIIMS), New Delhi and had an experience of six years. Her name has appeared in three international publications - Human Spleen Tyrosine Kinase, Syk, Recombinant Expression Systems for High-Throughput Assays. *Biotech J* 5(2):201-212 (2009); UDP-N-acetylglucosamine Enolpyruvyl Transferase from *Pseudomonas Aeruginosa*. - *World Journal of Microbiology and Biotechnology*, 29 (9):1623-1627 (2009); and Purification of Recombinant Human Phosphodiesterase 7A expressed in *Dictyostelium Discoideum*, *Prot Exp Purif* 61(2):149-54 (2008). She has also presented two posters – 'Over-expression and Purification of Human Aurora Kinase A from *E.coli*', Poster Presentation and Abstract got published at International Symposium on Novel Strategies for Targeted Prevention and Treatment of Cancer at Jawaharlal Nehru University (December 20, 2008); and 'Bioprospecting for Novel Esterase Producing Bacteria isolated from Soil Samples of Lachchiwala, Doon Valley' published in the abstract book (p. 17) of the National Conference on New Horizons in Applied Biosciences and Entrepreneurship Development held at the Indian Institute of Petroleum.

Presently, Ms. Namrata is working as Post Graduate Teacher in Biology at Guru Harkrishan Public School, India Gate, New Delhi. Her current activities involve teaching biology to senior secondary students as per Indian Central Board of Secondary School (CBSE) curriculum, conducting workshops, preparation of biomedical models for CBSE and implementing in-house projects aiming at social issues related to children like drug abuse and other related research areas.

Ms. Deepali Mishra (Nee Pandey)



Ms. Deepali Mishra (nee Pandey) joined the NAM S&T Centre in September 2005 and worked as a Research Assistant until August 2006. She assisted in the work related to the planning, implementation, evaluation and assessment of the scientific programmes undertaken by the Centre. Ms. Deepali actively contributed towards the activities on the S&T cooperation among developing countries through the organisation of international workshops, roundtables and training programmes on various scientific and technological topics and implementation of the Fellowship schemes of the Centre. She also contributed towards the publication of scientific and technical books and S&T Newsletter of the Centre. She got the opportunity to interact with the scientists not only within India but also from other countries and attended ministerial meetings and consultation workshops that helped her to inculcate knowledge on coordination, presentation and public relations that served as a foundation of her career. In the Centre she got an excellent platform to explore her skills on writing, communication and interaction.

Subsequently, Ms. Deepali worked in various healthcare organisations such as Bal Pharma Ltd, Bangalore; Himalaya Drug Company, Bangalore; and Marion Biotech Pvt Ltd, Noida in the departments concerned with regulatory affairs. During her tenure in these organisations, she advised the business units on compliance with regulations and requirements for the marketing and sale of drugs, preparation of dossiers for drug registration in CIS countries and management and monitoring of regulatory activities, and also on the proceedings or applications with local regulatory bodies and government agencies. She is currently working as a regulatory professional (freelancer) with the Integrated Global Regulatory Services (IGRS), Bangalore, an international global regulatory service provider.

(Contd. from Page 13 - S&T News)

United Nations: UN adopts 2030 Agenda for Sustainable Development

At the UN Sustainable Development Summit held on 25th September 2015, the 193-member United Nations General Assembly formally adopted the 2030 Agenda for Sustainable Development, together with the new Global Goals. UN Secretary-General Ban Ki-moon hailed the new Global Goals as universal, integrated, and transformative vision for a better world, an agenda for people to end poverty in all its forms – a plan of action for people, planet and prosperity.. The new framework, called 'Transforming our World: The 2030 Agenda for Sustainable Development', is comprised of 17 goals and 169 specific targets to wipe out poverty, fight inequality, and tackle climate change in the next 15 years, which demonstrate the scale and ambition of this new universal Agenda. They seek to build on the Millennium Development Goals, complete what these did not achieve, realise the human rights of all and achieve gender equality and the empowerment of all women and girls. They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental. One of the 17 goals aims to end hunger, achieve food security and improve nutrition, and promote sustainable agriculture. This Agenda also seeks to strengthen universal peace in larger freedom and inclusive societies which are free from fear and violence as sustainable development cannot be realised without peace and security; and peace and security will be at risk without sustainable development. This agenda also recognises that social and economic development depends on the sustainable management of our planet's natural resources and therefore it is necessary to conserve and sustainably use oceans and seas, freshwater resources, as well as forests, mountains and dry lands and to protect biodiversity, ecosystems and wildlife. All countries and all stakeholders, acting in collaborative partnership, will implement this plan. The new Goals and targets will come into effect on 1st January 2016 and will guide the decisions taken by the countries over the next fifteen years.

Source: Sustainable Development Knowledge Platform: UN Department of Economic and Social Affairs

DISTINGUISHED VISITORS TO THE CENTRE



(From L) Mr. Yashwant Dev Panwar, Scientist-E and Dr. Prabhat Ranjan, Executive Director, Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi



Dr. Tapan Kumar Mondal, Senior Scientist, National Bureau of Plant Genetic Resources (NBPGR), New Delhi (3rd from L) and Mr. Mohammad Abubakar Gumi, RTF-DCS Fellow from Nigeria (6th from L)



Ms. Noumedem A.C. Nadia, RTF-DCS Fellow from Cameroon (C)



Dr. Diallo Talibé, RTF-DCS Fellow from Guinea (C)

Centre Announces

THE CENTRE INVITES APPLICATIONS FOR NAM S&T CENTRE – DST (SOUTH AFRICA) TRAINING FELLOWSHIP ON MINERALS PROCESSING & BENEFICIATION (2016)

In line with its resolute efforts to promote South-South and North-South cooperation in Science and Technology, the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) has instituted a number of Fellowship schemes that are aimed at supporting the deserving young scientists in the developing countries to establish closer linkages with the Centres of Excellence located in various countries through the affiliation of these researchers with the academic and scientific institutions such as the Leibniz Centre for Tropical Marine Ecology (ZMT) in Bremen, Germany and the International Centre for Chemical and Biological Sciences (ICCBS), H.E.J. Research Institute of Chemistry in Karachi, Pakistan, as well as various academic and research institutions in India.

Yet another Fellowship scheme - this time to cover the area of Minerals Processing & Beneficiation - was launched by the NAM S&T Centre [www.namstct.org] in 2015 jointly with the Department of Science and Technology (DST), Government of South Africa [www.dst.gov.za]. The Centre is now inviting the applications in the prescribed format for the Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation for the year 2016. The objective of the Training Fellowship is to address the skills gap in the minerals beneficiation value chain and enable the scientists / technologists from the member countries of the NAM S&T Centre [lists of these countries is available in the Centre's website to update their knowledge for benefitting from their countries' mineral resources by exposing themselves to new technologies in the area of Mining and Minerals. The selected Fellows will be hosted and attached to MINTEK, South Africa [www.mintek.co.za] for exposing them to minerals processing technologies and undergo in-service training attached to the existing MINTEK programmes. Twenty Fellowships are available this year for a maximum duration of three months.

Under this scheme, DST (South Africa) will provide a subsistence allowance @ of US\$ 300 per month, in South African Rand, for meals and out-of-pocket expenses in South Africa for the duration of the Fellowship. Accommodation will be covered by the government of South Africa. **The sending country or the candidates themselves will have to arrange for their international travel to and from South Africa.**

Completed applications recommended by the parent institutions of the applicants may be submitted directly to Mr. Selby Modiba and Ms. Palesa Motsoeneng at Selby.Modiba@dst.gov.za; Palesa.Motsoeneng@dst.gov.za DST, South Africa by **15th January 2016**.

In matter of selection, the decision of DST, South Africa shall be final which will also send the Fellowship Award Letters to the selected applicants.

Further details, Guidelines for the Fellowship and the application form are available at the Centre's Website www.namstct.org .