



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

Heartiest greetings to all our readers!!



A Ministerial Conference on Science, Technology and Innovation (STI) was organised for the first time in the history of the Non Aligned Movement (NAM) at Tehran, Iran on 23rd February 2015 which was hosted by the Islamic Republic of Iran in its capacity as the current Chair of the NAM. As the Executive Head of the NAM S&T Centre, I was invited to attend this historical event and also the Preparatory Senior Officials Meeting on the preceding day. During the NAM Ministerial Conference I presented a Statement about the proactive role that the Centre has been playing on promotion of STI for Sustainable Development in the NAM and other developing countries. The Conference concluded with the adoption of a NAM Science Ministerial Declaration of Tehran. I also used the opportunity to call on the Honourable Minister of Science, Technology & Research of Iran, Prof. Dr. Mohammad Farhadi, and the ministers and senior officials of several NAM countries to discuss issues of mutual interest.

I also attended the Official Opening of the new Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation at MINTEK, Randburg, South Africa on 15th January 2015, which was inaugurated by the Honourable Minister of Science and Technology of South Africa, Mrs. Naledi Pandor. 19 Fellows from 11 developing countries have been awarded the Fellowship in this year.

The Centre's Research Training Fellowship for Developing Country Scientists (RTF-DCS) Scheme for 2014-15 is successfully being implemented with most of the 50 selected Fellows having joined their respective academic and R&D institutes. We invite applications from interested researchers for this Fellowship for 2015-16 for which we have circulated an Announcement.

Announcements have also been made for receiving applications for selection of Fellows under highly prestigious Joint NAM S&T Centre - ICCBS, Karachi, Pakistan Fellowship 2015 and Joint NAM S&T Centre - ZMT Bremen, Germany Fellowship 2015. These programmes are listed in this Newsletter and more detailed information is available in our Website www.namstc.org.

Happy Reading!


(Arun P. Kulshreshtha)

Non-Aligned Movement (NAM) Science, Technology and Innovation Ministerial Conference

Tehran, Islamic Republic of Iran, 22-24 February 2015

The Non Aligned Movement (NAM) Ministerial Conference on Science, Technology and Innovation (STI) was held for the first time on 23rd February 2015 having been hosted by the Islamic Republic of Iran in Tehran in its capacity as the current Chair of the NAM. The Conference was officially inaugurated by H.E. Dr. Hassan Rouhani, President of the Islamic Republic of Iran, who recognised the contribution of STI in eradication of poverty as well as promotion of peace and security. H.E. Prof. Dr. Mohammad Farhadi, Minister of Science, Technology & Research of Iran welcomed a large number of NAM delegations and mentioned that the NAM Member States are like minded in many international issues and common challenges such as energy, brain drain, narcotic drugs, diseases, access to advanced technologies, digital gap and internet governance, and South-South Cooperation is the way before them to promote their level of science and technology. A Tehran Declaration was adopted during the Conference, a copy of which is included in this Newsletter.

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre also attended the above NAM Ministerial Conference on STI and made a Statement, mentioning that the NAM S&T Centre was established 25 years ago with its Secretariat located in New Delhi, India in pursuance of various NAM Summit Declarations with primary objective of promoting South-South cooperation in S&T for collective self-reliance of the developing nations. With its current 47 member countries and a world-wide network of STI professionals, the Centre is vastly proactive in facilitating capacity building; STI and thematic policy formulations; securing technological excellence; imparting knowledge on IPR to appropriately exploit their traditional knowledge; and creating awareness amongst developing countries about the huge impact of the S&T diplomacy in getting better deals in bilateral and multilateral negotiations leading to higher trade and economic prosperity; and improving the quality of life for masses. Among its recent



Group Photo during Non Aligned Movement (NAM) Ministerial Conference on Science, Technology and Innovation (STI), Tehran, 22-24 Feb. 2015

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noteworthy initiatives, the Centre has been instrumental in setting up of a NAM S&T Centre of Excellence on Minerals Processing and Beneficiation in Zimbabwe and establishing the African Centres for Lightning and Electromagnetics, headquartered in Uganda.

The Ministerial Meeting was preceded by a Preparatory Senior Officials Meeting on 22nd February 2015, which was also attended by Prof. Kulshreshtha.



Non-Aligned Movement
 Science, Technology and Innovation
 Ministerial Conference
 Tehran, Islamic Republic of Iran
 22-24 Feb. 2015

NAM/STI/SOM/2015/ DOC.1

TEHRAN DECLARATION

Non-Aligned Movement (NAM) Science, Technology and Innovation Ministerial Conference

Tehran, Islamic Republic of Iran, 22-24 February 2015

1. 22-24 Feb 2015 We, the Ministers responsible for Education, Science, Technology and Innovation of Member and Observer States of the Non-Aligned Movement (NAM), met in the NAM Ministerial Conference on Science, Technology and Innovation, under the theme "Science, Technology and Innovation for Sustainable Development" held in Tehran- Islamic Republic of Iran on 23-24 February 2015.
2. We recall the 16th NAM Summit Final Document adopted in Tehran in August 2012 which encouraged in its sub-paragraph 22.15 interaction of the Ministers responsible for portfolios of relevance to the Movement, including science and technology, with the aim of enhancing the effectiveness of the Movement and increasing cooperation among its Member Countries.
3. We further recall the 13th NAM Summit Final Document adopted in Kuala Lumpur in February 2003 which expressed the Movement's deep concern over the increasing disparity in science and technology capacities between rich and poor nations posing a serious impediment to the development of developing countries.
4. We recall as well the 2005 World Summit Outcome, which emphasized the role of science and technology, as vital for achievement of the internationally agreed development goals including MDGs; and reaffirm the commitments contained in the same Summit outcome to support the efforts of developing countries, individually and collectively to create and support an enabling environment for the advancement of science, technology and innovation, in accordance with national priorities.
5. We recognize that science, technology and innovation are global assets and key drivers of economic and social progress and welfare of mankind and vital for the achievement of the internationally agreed development goals and for full participation of the developing countries in the global economy. We further recognize that science, technology and innovation as key engines for development contribute to economic growth including through the formulation of STI policies.
6. We note with appreciation the work being undertaken by the NAM Science and Technology Center in New Delhi hosted by the Government of India and having transcontinental scientific footprints, governance and presence. We support the efforts to revitalize global partnerships for sustainable development by mainstreaming STI, institutional/human capacity building through science diplomacy. To this end, we invite the NAM Center to support the Member States in implementation of the resolution adopted by the Conference of Ministers of NAM Science and Technology.
7. We further take note of the establishment of the NAM S&T centers of excellence in key thematic developmental areas such as Minerals Processing and Beneficiation, and on new and emerging technologies.
8. We believe that science, technology and innovation are instrumental to eradication of poverty and hunger and thus help promote peace and sustainable human development as well as solidarity and complementarity among and within nations.
9. We recognize that technology transfer and development and the promotion of indigenous technologies are important for developing countries to engender knowledge-based and sustainable economic growth with particular emphasis on financing, research and development for value addition and beneficiation of our resources based on comparative advantages.
10. We accord the highest priority to development of Science, technology and innovation in response to challenges that we face in implementing our national sustainable development strategies and programs and, where possible establishing NAM science and technology centers of excellence in support of this endeavor.
11. We reaffirm the necessity to continue strengthening South-South cooperation as a complement to North-South Cooperation and an indispensable element for a just and equitable international order and for preserving the policy space necessary for developing countries to pursue their development objectives and to achieve internationally agreed development goals. South-South cooperation provides a viable
12. We recognize that special efforts must be made to build and sustain scientific and technological capacities at both individual and institutional levels, and that additional resources and partnerships are required to bring knowledge-based solutions to critical economic and social needs of NAM Member States. We emphasize the need to strengthen strategic partnerships between countries of the North and the

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South so as to contribute to the sharing of knowledge, innovation and transfer of technology.

13. We recognize a general consensus for commitments to the implementation of the specific actions at the national and international levels to promote and develop science, technology, and innovation, cooperation among NAM Member States through public and private sector science, technology and innovation partnerships such as exchange of expertise, programs, and experiences among research institutions and universities including through staff and student exchange programs, science and technology weeks/events, visiting programs, networking among centers of excellence, twin academy programs, STI exhibitions and scientific award presentation.
14. We recall the decision contained in the Doha Plan of Action which led to the establishment of the international science, technology and innovation center for South-South Cooperation under the auspices of UNESCO (ISTIC) which acts as an international platform for South-South Cooperation in science, technology and innovation for the above purposes.
15. We underline the need for aligning our national higher education systems with STI requirements of our societies. In this regard, we undertake to make the necessary efforts to redirect our universities towards 3rd generation universities including through promotion of private R&D and planning institution, incubators and exploring non-public funding for STI.
16. While expressing concern over the prevailing and, in some cases, growing gap between developing and developed countries in the field of STI, we emphasize that it is to adopt appropriate measures to narrowing this gap and make necessary arrangements to facilitate and accelerate the processes of technology transfer, including among developing countries and develop an appropriate institutional framework to promote STI.
17. We call upon developed countries to fully implement their obligations on technology transfer as one of the major components, along with finance, capacity-building and trade, of means of implementation to achieve sustainable development for developing countries, and to take action to bridge the technological gap by removing barriers to technology transfer specially in the cutting-edge fields such as biotechnology, nanotechnology, electronics, nuclear science, maritime, aerospace, ICT, renewable energies, green technology and oil and gas industries.
18. We condemn the attacks by terrorist groups against STI institutions and personnel especially in some member countries.
19. We call for the early establishment by the United Nations system of a technology facilitation mechanism that promotes the development, transfer and dissemination of clean and environmentally sound technologies, including cleaner fossil fuel technologies.
20. We stress the need to protect the developing countries including NAM Member States against continuing attempts by any persons, states, institutions or companies to patent their biodiversity and genetic resources as well as traditional and indigenous knowledge, without prior consent and approval taking into account relevant international agreements.
21. We reject any attempt from developed countries or business interest to put pressure on developing countries including NAM Member States not to exercise their right to utilize TRIPS Agreement flexibilities for social, health and development purposes. Hence, we extend our solidarity with those developing countries have come under aforesaid circumstances. Concurrently, we call for regulations and policies on intellectual property to be situated within a development framework, whereby intellectual property rights are oriented towards the promotion of balanced social, economic and environmental development.
22. We reiterate the UNESCO Convention Against Discrimination in Education (1960) and express our deep concern over discrimination imposed by some developed countries against students, lecturers, researchers and innovators from NAM Member States in different high-end scientific, technological and innovation fields.
23. We underscore the importance of women engagement in all processes related to science and technology as the basis for their empowerment. We also highlight the importance of providing equal opportunities for women and girls in all aspects of STI to increase their participation and advancement in all scientific and technological fields.
24. We recognize the role of the youth as agents of change in fostering innovation and shaping the future of science and technology. We undertake to create an enabling environment for youth, invest in their quality education and training and mobilize resources for promotion of programs that support young scientists. We express our serious concern over brain drain in the developing world especially among their young scientists and urge governments to initiate "brain gain" programs to alter the trend.
25. We emphasize the importance of ensuring non-discriminatory and inclusive access of all countries to science, technology, knowledge and information. We firmly reject any attempts towards the extraterritorial imposition of domestic laws and all other forms of coercive economic measures, including unilateral sanctions against developing countries, as well as attempts to securitize the legitimate plans and programs of developing countries for technology development in their countries. We reiterate the urgent need to eliminate them immediately and emphasize that such actions not only undermine the principles enshrined in the Charter of the United Nations and international law, but also severely threaten the freedom of trade and investment.
26. We reiterate that a people-centered, inclusive and development-oriented Information Society contributes to the achievement of internationally agreed development goals, and addresses new challenges faced by mankind. We underline the importance of removing barriers to bridging the digital divide, particularly those that hinder the full achievement of the economic, social and cultural development of the countries and the welfare of their people, in particular, in developing countries. Meanwhile, we call for an end to the use of information and communication technologies, including social networks, in contravention of international law and in detriment to the interests of the Member States.
27. We call on the international community to take necessary measures to ensure that all countries of the world have equitable and affordable access to ICTs, so that their benefits in the fields of socio-economic development and bridging the digital divide are truly inclusive. We further call upon the international community to promote the transfer of technology, including ICTs, to adopt policies and programs with a view to assisting developing countries to take advantage of technology in their pursuit of development through, *inter alia*, technical cooperation and the building of scientific and technological capacity in our efforts to bridge the digital and development divides.
28. We underline the need to maximize the participation of developing countries in decisions regarding Internet governance, which should reflect their interests, as well as in development and capacity building.
29. We recognize the immense potential that building connectivity can have in contributing to economic and social progress and encourage to participate in the development of relevant regional connectivity solutions. In this regard, we invite to support efforts to improve global telecommunications connectivity and diversification of the telecommunications transit routes including by participating in relevant regional connectivity initiatives.

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30. We welcome the overall review of the implementation of the outcomes of the World Summit on Information Society (WSIS) to be held at the High Level Meeting of the UN General Assembly, at the highest possible levels, later this year in December 2015, in accordance with GA rules of procedure. In this regard, we also reaffirm the centrality of the General Assembly in this process and acknowledge that the overall review by the UNGA shall take stock of the progress made in the implementation of the WSIS outcomes, address potential ICT gaps and areas for continued focus, as well as address challenges, including bridging the digital divide, and harness information and communications technologies for development.
31. We reaffirm the inalienable right of developing countries to develop research, production and use of nuclear energy for peaceful purposes without discrimination. We confirm that each country's choices and decision in the field of peaceful uses of nuclear energy should be respected without jeopardizing its policies or international cooperation agreements and arrangements for peaceful uses of nuclear energy and its fuel cycle policies. However, we note with concern that undue restrictions on exports to developing countries of material, equipment and technology, for peaceful purposes persist.
32. We affirm the need for a sound implementation mechanism for the post-2015 development agenda to ensure development resources for the attainment of its objectives. In this regard, we call the international community for the intensification of development financing, for the establishment and improvement of technology transfer mechanisms and for the enhancement of efforts to build the related capacities of the NAM Member States in all areas under post-2015 Development Agenda, *inter alia*, transitioning to green economy in the context of poverty eradication.
33. We emphasize the importance and the supportive role of the United Nations system, particularly UNESCO, UNCTAD, UNIDO, UNDP and its Special Unit for South-South Cooperation in promoting science and technology transfer and development in developing countries. We reiterate the need to increase the capacity of these institutions to promote international technological cooperation.
34. We express our heartfelt thanks to the Government and People of the Islamic Republic of Iran for their generous hospitality and unsparing efforts in ensuring the success of this important event. We also express our desire to hold regular NAM Ministerial Conferences on Science, Technology and Innovation to further consolidate our common action and commitment in a spirit of solidarity to achieve the collective interests and aspirations of the Member States of the Non-Aligned Movement.

Visits of the Director General, NAM S&T Centre

Official Opening of the Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation, South Africa, 13-16 January 2015

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre accompanied with Mr. M. Bandyopadhyay, Senior Expert & Administrative Officer of the Centre visited South Africa during 13-16 January 2015 for Official Opening of the Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation and other meetings. This Fellowship provides opportunity to the scientists and technologists from the developing for affiliation with MINTEK, South Africa for a period of three months to address the skills gap in the minerals beneficiation value chain and to get exposed to minerals processing technologies and undergo in-service training attached to the existing MINTEK programmes. Under the scheme, DST provides a subsistence allowance of US\$300 per month, in South African Rand, to the selected Fellow for meals and out-of-pocket expenses in South Africa for the duration of the Fellowship in addition to free accommodation, but the Fellow has to make own arrangement for international travel to / from South Africa.



Group Photo - Joint NAM S&T Centre – DST (South Africa) Mineral Processing & Beneficiation Training Fellowship Opening Ceremony

In the 2015 batch 19 Fellows have been selected from 11 countries - Eritrea, Ghana, India, Malaysia, Nigeria, South Africa, Sri Lanka, Sudan, Syria, Tajikistan and Zimbabwe, who commenced their training on 12th January 2015. During the Official Opening, which was also attended by the Ambassadors of Eritrea, Sudan and Syria and the High Commissioner of India to South Africa, Mr. Daan Du Toit, President of the 13th Session of the Governing Council of the NAM S&T Centre and Deputy Director-General, International Cooperation and Resources, Department of Science & Technology (DST) of South Africa; Ms. Stella Carthy, Manager, Transformation and Skills Development, Chamber of Mines of South Africa; Dr. Stewart Foya, Senior Manager responsible for Mineral Resources Development and Engineering Geology at the Council for Geoscience of South Africa; and DG, NAM S&T Centre made their presentations besides formal inaugural address by the Honourable Minister of Science and Technology of South Africa, Mrs. Naledi Pandor.

The Minister in her speech gave the historical background of MINTEK and shed light on the difficulties of the mining-based economies. She further said that South Africa as an old resource-rich country has been able to diversify its economy by introducing the policy on both beneficiation and localisation and gave examples about the development of minerals such as titanium, platinum and fluorine. She concluded by saying that for the development in Africa science and technology plays a very crucial role and all should exploit their comparative knowledge and location advantages to create jobs and livelihood for all.

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Visits of the Director General, NAM S&T Centre

NAM Science Ministerial Conference, Tehran, Iran, 22-24 February 2015

Prof. Dr. Arun P. Kulshreshtha, DG, NAM S&T Centre attended the Non Aligned Movement (NAM) Ministerial Conference on Science, Technology and Innovation (STI) hosted by the Islamic Republic of Iran in Tehran on in its capacity as the current Chair of the NAM on 23rd February 2015, and the Preparatory Senior Officials Meeting on the previous day, and used the opportunity of his visit to call on H.E. Prof. Dr. Mohammad Farhadi, Minister of Science, Technology & Research; H.E. Dr. Vahid Ahmadi, Deputy Minister for Research and Technology Affairs; and H.E. Dr. H. Salar Amoli, Deputy Minister for International Affairs and Director of International Scientific Centre; and 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. He also discussed the issues of mutual interest with ministers and senior officials of several non aligned countries, including H.E.



H.E. Prof. Dr. M. Farhadi, Minister (2nd from L) and Dr. Hamid R. Amirinia, S&T Vice-Presidency of Iran (L)



H.E. Dr. Vahid Ahmadi, Deputy Minister for Research and Technology Affairs(C) and Iranian Officials



With Dr. H. Salar Amoli, Deputy Minister for International Affairs and Director of International Scientific Centre on Arrival at Tehran International Airport



H.E. Prof. Dr. Ali M. Abbasov, Minister of Communications and High Technologies of Azerbaijan (C) and Ms. H. Mammadova, Counsellor, Permanent Mission to UN



H.E. Prof. Jean Noël Poda, Minister of Scientific Research and Innovation of Burkina Faso (L) and Dr. Issa Tapsoba, DG in the Ministry

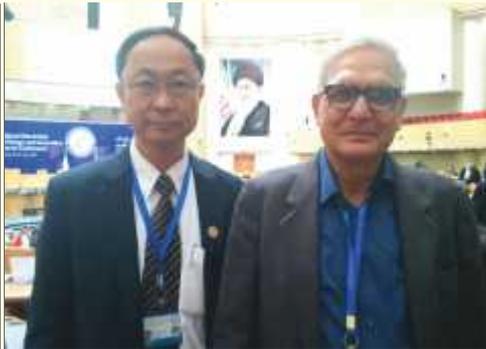


H.E. O.C.Z. Muchinguri, Minister of Higher and Tertiary Education, Science and Technology Development of Zimbabwe (3rd from R) and Delegates

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H.E. Makame M. Mbarawa, Minister of Communication, Science and Technology of Tanzania



H.E. Dr. Pichet Durongkaverroj, Minister of Science and Technology of Thailand



H.E. Dr. Maria Odete da Costa SEMEDO, Minister of Education of Guiné-Bissau



With Engr. Dr. M. Jibrin, DG and CEO, National Board for Technology Incubation (NBTI), Nigeria



Ms. Gameti Ama Dzifa, Office of Director, Ministry of Higher Education and Research of Togo (C) and Prof. Ampah Kodjo Christophe Johnson



Prof. M. Hassan Dahab, DG, Ministry of Higher Education & Scientific Research of Sudan

Prof. Dr. Ali M. Abbasov, Minister of Communications and High Technologies of Azerbaijan; H.E. Prof. Jean Noël Poda, Minister of Scientific Research and Innovation of Burkina Faso; H.E. Dr. Maria Odete da Costa SEMEDO, Minister of Education of Guiné-Bissau; H.E. Makame M. Mbarawa, Minister of Communication, Science and Technology of Tanzania; H.E. Dr. Pichet Durongkaverroj, Minister of Science and Technology of Thailand; and H.E. O.C.Z. Muchinguri, Minister of Higher and Tertiary Education, Science and Technology Development of Zimbabwe.

During his stay in Tehran Prof. Kulshreshtha visited the premises of Indian Ocean Rim Association Regional Centre for Science and Technology Transfer and met with its Head Dr. M. Molanejad, Focal Point of the NAM S&T Centre in Iran and Acting President for International Cooperation of IROST (Iranian Research Organization for Science and Technology). He also visited the National Research Institute for Science Policy (NRISP), where he had a discussion session with its Director, Dr. Mohammad Abooyee Ardakan, and his senior colleagues.

Ms. Radhika Tandon, Research Assistant of the Centre accompanied the DG on this visit.



Meeting with Dr. M. Molanejad, Indian Ocean Rim Association Regional Centre, Tehran, Iran



Meeting at National Research Institute for Science Policy (NRISP), Tehran, Iran

Research Training Fellowship for Developing Country Scientists (RTF-DCS) 2013-14

Research Project Completion Reports

Cameroon - Project Completion Report of Mr. Bomba Tatsinkou Francis Desire



Mr. Bomba Tatsinkou Francis Desire, Ph.D. Student at Dschang University, Cameroon, was deputed by the NAM S&T Centre to the Birla Institute of Technology and Science (BITS), Hyderabad, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 13th March 2014 to 6th September 2014 to carry out research work on a project titled 'Antinociceptive Activities of Aqueous Methanolic Extracts and Fractions of Stem Barks of *Drypetes gossweileri* in Mice and Rats.' under the supervision of Prof. P. Yogeeswari.

The objectives of the project were to analyse antihypernociceptive properties of *Petersianthus macrocarpus*. The results showed the methanolic extract of *Petersianthus macrocarpus* stem bark at dose 200 mg/kg exhibiting promising activity against spontaneous pain, tactile allodynia, cold allodynia, cold water tail dip test and mechanical hyperalgesia. It also reduced nitrite levels in the brain, spinal cord and down-regulated expression of TNF- α and NF- κ B levels in brain. The single treatment with aqueous and methanolic extracts of *Petersianthus macrocarpus* stem bark inhibited neuropathic pain manifestation (spontaneous pain, cold and dynamic allodynia and mechanical hyperalgesia) in the CCI model. This effect may possibly be attributed to its ability to decrease the release of pro-inflammatory mediators and NOS or NO action in a nerve injury condition.

From the different experiments conducted, Effective antihypernociceptive properties of *Petersianthus macrocarpus* stem bark may be attributed to the ability of extracts to block several signaling pathways associated with nociceptive responses such as pro-inflammatory cytokines and nitric oxide (NO).

Egypt - Project Completion Report of Dr. Abdelgawad Mohammed Saad



Dr. Abdelgawad Mohammed Saad of the Agricultural Engineering Research Institute (AEnRI), Egypt and a researcher at the Szent Istvan University, Budapest, Hungary was deputed by the NAM S&T Centre to the Central Institute of Post-Harvest Engineering & Technology (CIPHET), Ludhiana, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 21st March to 13th September 2014 to carry out research work on a project titled 'Determine the Optimum Ripeness of Fruit using Non-destructive Technique' under the supervision of Dr. S. N. Jha.

The focus of this study was Non-destructive quality evaluation of intact tomato using VIS-NIR spectroscopy. Fruits and vegetables are considered as one of the most valuable groups of food which play a vital role in human health by preventing diseases and repairing the body via maintaining its alkaline reserve. Different vegetables are used in different forms such as roots, stems, leaves, fruits and seeds and contribute to a healthy diet. Therefore, the maintenance of quality of vegetables is the main concern. However, both quantitative (such as decrease in weight or volume) and qualitative (such as reduced nutrient value and unwanted changes in taste, color, texture, or cosmetic features of food) losses in vegetables occur between harvest and consumption. Non-destructive techniques can be used for internal quality assessment and sorting of vegetables as well as for measurements of critical selection features in plant breeding programs. Different Non-destructive techniques frequently used for the assessment of vegetables quality are fast, user friendly, cheaper and accurate. It is possible to screen large numbers of diverse samples by applying these techniques. The scientific principle of non-destructive technique is to estimate vegetables quality via measuring change in energy, applied on the target.

The potential of visible/near-infrared (VIS/NIR) absorbance spectroscopy in determining the quality of intact tomato (*Lycopersicon esculentum*), at varying stages of maturity were evaluated in the wavelength range of 299 nm to 1100 nm. Prediction models were built between Vis/NIR spectra and the major fruit properties viz. total soluble solids (TSS), acidity (pH), titratable acidity (TA), and lycopene content by using partial least squares regression (PLS) method. Different pre-processing methods were applied to improve the predictability of the model for each parameter. The best prediction results were achieved using PLS model after orthogonal signal correction (OSC) data treatment at a wavelength range of 370–1040 nm for all tested parameters. The coefficient of determination (R^2) for majority of parameters were found to be higher than 0.82 except for TA ($R^2 = 0.77$, RMSEP = 4.08), and lycopene ($R^2 = 0.79$, RMSEP = 4.94). The R^2 value for TSS and pH were found to be 0.85 and 0.82, respectively. For tomato samples good correlation was found between the quality properties (TSS, pH, TA, and lycopene content) parameters. The standard errors of calibration, prediction, biases and differences in them were low, which indicated that spectroscopy has the potential to predict quality of tomato non-destructively.

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Ethiopia – Project Completion Report of Mr. Migbar Assefa



Mr. Migbar Assefa of the Mechanical and Industrial Engineering Department, Institute of Technology, Hawassa University, Ethiopia was deputed by the NAM S&T Centre to the Indian Institute of Technology Roorkee, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 2nd April to 25th September 2014 to carry out research work on a project titled 'Fatigue Crack Growth Modelling in Aerospace Materials' under the supervision of Dr. Indra Vir Singh.

The focus of his study was three major aspects of braided composites - mechanical properties, microstructural properties and failure analysis of 3-D braided composites. For the prediction of the mechanical properties of braided composites, different modeling approaches have been used by different authors; analytical, numerical and experimental. Most of the articles focused on the modeling of 3-D four directional braided composite, few on 3-D five directional and very few on 3-D full five directional braided composites. On the microstructural modeling of 3-D braided composites different models have been used; analytical, topological and numerical. But in most of the papers the most versatile finite element method has been used for the microstructural analysis of 3-D four and five directional braided composites. Most of the papers ascertained that braid angle and volume fractions are the most decisive microstructural parameters. To capture the failure mechanisms of 3-D braided composites, almost all papers implemented finite element method in one way or another. A single attempt has been performed experimentally investigate the fatigue properties of 3-braided composite at elevated temperature. Nothing was however done as far as fracture parameters of 3-D full five directional braided composite is concerned.

Malaysia – Project Completion Report of Ms. Sivanaswari Chalaparmal



Ms. Sivanaswari Chalaparmal of the Malaysian Agriculture Research & Development Institute (MARDI), Malaysia was deputed by the NAM S&T Centre to the Sathyabama University, Tamil Nadu, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 13th March to 24th September 2014 to carry out research work on a project titled 'Assessment of Genetic Variation in Manilkara zapota (Sapota) Using RAPD and ISSR Markers for developing Crop Improvement Strategies' under the supervision of Dr. T. Sasipraba.

The focus of this study was the use of ISSR and RAPD markers in detecting genetic variability of sapota genotypes of Manilkara zapota (Sapota). An attempt was made to evaluate the genetic variability of Indian sapota to offer an efficient means of exploiting the heterosis for biodiversity management and also to improve breeding strategies. Two DNA based molecular markers viz., RAPD and ISSR were used to access the genetic diversity among Indian sapota accessions. Out of eleven primers of both RAPD and ISSR screened, 120 polymorphic and 66 monomorphic bands produced. This explicitly discriminated 34 sapota accessions into two main clusters (Cluster I and Cluster II). Both RAPD and ISSR primers exhibited more than 60% polymorphism. The results indicate that the percentage of RAPD polymorphic bands (63) was higher than that of ISSR polymorphic bands (57). Thus, RAPD primers were superior in detecting the polymorphism in this investigation. Clustering of the accessions were not the same for RAPD, ISSR and also the combined analysis of RAPD and ISSR. There was no location specificity found among the accessions. PKM 1, PKM 2, PKM 3 and PKM 4 found genetically closest in both the analysis and also the combined analysis. Periyakulam 3 found to be most genetically diverse accession among the other 33 accessions using RAPD analysis, while Mohangooti, Pakala Oval and Vavilavalasa using ISSR analysis. Combined RAPD and ISSR analysis separated Pilipatti and Bombay in a different cluster. Both ISSR and RAPD markers are useful in detecting genetic variability of sapota genotypes.

This analysis is very useful in detection of duplicate sample in genotype collection and the selection of main genotypes to increase the efficiency of genotype management, hybrid production and conservation.

Nepal – Project Completion Report of Mrs. Neel Kamal Koju



Mrs. Neel Kamal Koju of the Nepal Academy of Science and Technology (NAST), Nepal was deputed by the NAM S&T Centre to the National Metallurgical Laboratory (CSIR - NML), Jamshedpur, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 27th March to 19th September 2014 to carry out research work on a project titled 'Removal of Toxic Metals (Cu, Cd, Cr, Ni) and Metalloid (As) using Biomass of Colocasia esculenta' under the supervision of Dr. Santanu Bhattacharjee.

The focus of this study was the heavy metal removal from water using *Colocasia esculenta*. Various conventional methods were used for the removal of heavy metals from environment. However, many of them have disadvantages such as incomplete removal of heavy metals ions, low selectivity and high amount of toxic sludge, high cost, non-renewable, ecologically non-viable and energy consumption. Biosorption process is recognized as an effective, rapid process and

(Contd. from Page 8 - RTF-DCS Project Completion Reports)

economically feasible. Natural biomass is used in biosorption process which may contain new family of adsorbent materials or functional groups with a potential to remove heavy metals from industrial effluents. So, the objective of this study was to use cheap and locally available materials like *Colocasia esculenta* for the removal of toxic metals from water.

Colocasia esculenta is cosmopolitan and one of the amphibious perennial herbs and has an excellent growth potential. Chemically different parts of *Colocasia* also consist of protein, amino acids, oxalate, cellulose, starch, phenolic components and others. These can act as binding sites for metals and help to replace heavy metal from contaminated water. Therefore, this research aimed to use *Colocasia esculenta* as metal removing adsorbent from heavy metal contaminated water which may input vital effort on scientific contribution to manage industrial effluent and control water pollution.

Altogether eighteen different isotherm models and five error functions were used to evaluate adsorption and desorption abilities of biomass of leaf, stem and yam parts of adsorbent for the removal of Cr (VI), Cr (III), As (V), As (III), Fe, Zn, Mn, Ni and Co from aqueous solution. Similarly effectiveness of pH, contact time and rpm factors were also studied on these heavy metals using different parts of adsorbent.

Nigeria – Project Completion Report of Mr. Abdullahi Muhammad Sokoto



Mr. Abdullahi Muhammad Sokoto of the Department of Pure and Applied Chemistry, Usmanu Danfodiyo University, Nigeria was deputed by the NAM S&T Centre to the Indian Institute of Petroleum (IIP), Dehradun (CSIR IIP), Dehradun, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 2nd August to 25th January 2015 to carry out research work on a project titled 'Catalytic Conversion of Lignocellulosic Aqueous Sugar from Saw dust to Gasoline and Diesel Fuels' under the supervision of Dr Thallada Bhaskar.

The focus of his study was Kinetics and Pyrolysis Studies of Selected Biomass Using Thermo-chemical Techniques. A study on kinetics and pyrolysis of selected biomass residues from Nigeria was carried out using thermo-chemical method. The samples analysed were *Chrosophyllum albidum* (African star apple seeds cake), *Ceiba pentandra* (silk cotton seeds cake); *Gossypium hirsutum* (cotton seed cake); *Ricinus cummnis* (castor seed cake) and *Triplochiton scleroxylon* (sawdust). Compositional, proximate, ultimate and trace metal analyses of the samples was studied; likewise, the structural analyses of the feedstock using XRD and FTIR. Results of these analyses provide an insight on the properties of the analysed biomass that are crucial for their proper handling and usage as source of energy. The decomposition profiles of the feedstock in nitrogen atmosphere from ambient temperature to 900 °C with heating different heating rates (5- 40 C min⁻¹) were also investigated using thermogravimetry. The result showed that the maximum decomposition temperature (T_{max}) of samples occurred within the range of 335-361°C with 40 °C min⁻¹ heating rates. Modeling of the thermogravimetry data using both model fitting and model free methods enable the identification of thermodynamic parameters which are vital in design and scaling of conversion units. The model fitting method predicted the mechanism for the decomposition of the de-oiled cake seed of castor, cotton and silk cotton to follow F2 order reaction mechanism with most of the heating rates and African seed apple cake and sawdust decomposition being described by F3 reaction order model. The activation energy values calculated from iso-conversion methods ranged from 126-129 kJ/mol for sawdust and castor seeds cake; and 147-172kJ/mol for silk, cotton and African star apple cakes. Slow pyrolysis process of the samples at temperature range of 300-450 °C with heating rate of 10 °C min⁻¹ resulted to gaseous, liquid and solids products. The maximum liquid yield of 33.1, 42.6, 48.3, 51 and 53.6 % were obtained from de-oiled seed cakes of silk cotton, cotton, African star apple, sawdust and castor respectively. The produced liquids were found to comprise of several chemical compounds in which phenols and their derivatives being the major compounds; these could be catalytically upgraded to hydrocarbon and to produce a range of chemicals commodity. The solid char obtained from pyrolysed samples are environment friendly and find application as catalysis support, activated carbon, in making nano-catalyst and as fuel in boiler.

Tunisia – Project Completion Report of Dr. Hidouri Slah



Dr. Hidouri Slah of the Institute of Bio-Inspired Materials Sciences of Tunisia was deputed by the NAM S&T Centre to the Adyar Cancer Institute (WCA), Tamil Nadu, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 15th February to 10th August 2014 to carry out research work on a project titled 'Development of Biosensors based on Modified Bacteria by Nanoparticles: (Chemical and Biological Assist Synthesis)' under the supervision of Dr. Balaprasad Ankamwar.

The focus of his work was on two areas, namely, 'Study of New Star-like Shape of Silver Nanoparticles synthesised by Bio-assistance of Lactobacilli Bacteria' and 'Development of Biosensor based on Modified *Lactobacillus acidophilus* by Biosynthesised Nanoparticles for Lactate Detection'.

In the former, he used three species of *Lactobacilli* (*L. acidophilus*, *L. brevis* and *L. planetarium*) for the biological assistance synthesis of silver nanoparticles. As the three species are characterised by different optimum pH, acid, neutral pH and low basic pH, the final synthesised nanoparticles were characterised by different level of agglomeration of

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the first nanoparticles formed respecting the pH of its genesis till the star-like shape was well distinct. In the case of *L. brevis*, the results are investigated using FTIR analysis and TEM and shows well the presence of the synthesised conventional form of primary silver nanoparticles in cubic system. The evolved nanoparticles formed after the agglomeration sculpt a second form never mentioned before it is the star-like shape and justify that the first genesis of nanoparticles by bioassistance is followed by a second genesis that proves the concept of a sequential synthesis of the new shape.

The second work was based on synthesis. Nanoparticles were characterised by FTIR and SEM and show the capacity of *L. acidophilus* to shift the ionic form of gold element to a crystalline form. SEM analysis demonstrates the appearance of a new external membrane induced by the gold nanoparticles that play a main role in the immobilization process of the cell on the electrodes. FTIR analysis reveals different covalent links established in the interface between gold elements and free functional groups of the cell that proves the hybridization between the inorganic compound and biological part of the biosensors. Electrochemical preliminary tests are carried out and show the success of the transduction when the catalytic reaction of lactic acid is happened. We reveal that the oxidation peak of the mediator reacts with the final product of the catalytic reaction of lactic acid is detectable at -0.16V.

Vietnam – Project Completion Report of Dr. Bach Thi Mai Hoa



Dr. Bach Thi Mai Hoa of the Institute of Biotechnology of the Vietnam Academy of Science and Technology, Vietnam was deputed by the NAM S&T Centre to the Adyar Cancer Institute (WCA), Tamil Nadu, India as a Fellow under the Research Training Fellowship for Developing Country Scientists (RTF-DCS) scheme 2013-14 from 27th March to 23rd August 2014 to carry out research work on a project titled 'In-vitro Screening of Hydroxyproline Derivatives for Anti-cancer Activity' under the supervision of Prof. Rajkumar Thangarajan.

The focus of her researches was in vitro screening of hydroxyproline derivatives for anticancer activity. The present study was designed to evaluate the *in-vitro* cytotoxicity activity of hydroxyproline derivatives in different heterocyclic stereoisomers. In this study eleven proline and hydroxyproline analogues were tested using human normal cell line Hek293 and cancer cell lines HeLa, MCF7, M14 and NCIH460 for its effects on cell viability, growth inhibition and cell morphology. Cell viability, inhibition were determined by MTT-assay. The results showed decreased cell viability and increased growth inhibition in a concentration dependent manner and also altered the cell morphology after treatment with hydroxyproline derivatives in *cis*- and *L*-form. The data demonstrated that *N*-acetyl *trans*-4-hydroxy-*L*-proline, *cis*-4-hydroxy-*L*-proline and *N*-acetyl *cis*-4-hydroxy-*L*-proline, *cis*-4-hydroxy *D*-proline, *N*-acetyl *cis*-4-hydroxy *D*-proline, CBZ-*trans*-4-hydroxy-*L*-proline and Boc- *trans*-4-hydroxy-*L*-proline have a potential cytotoxicity activity on MCF7, HeLa and NCIH460 cell lines but the effect was more significant on M14 cell lines.

Visitors To The Centre

- 1st Jan 2015** **Mr. Sobhani**, Senior Advisor, **Mr. Nayebi**, Financial Director and **Mr. Hosseini**, International Expert of Pardis Technology Park (PTP), along with **Dr. Ali Azam Khosravi**, Research Counsellor, Science, Research & Technology, India & Subcontinent, Embassy of the Islamic Republic of Iran in New Delhi, India.
- 19th Jan 2015** **Dr. Jayantha Jayewardene**, Managing Trustee, Biodiversity & Elephant Conservation Trust, Rajagiriya, Sri Lanka.
- 22nd Jan 2015** **Dr. Vartika Mathur**, Assistant Professor, Department of Zoology and **Ms. Garima**, Ph.D. Student, Sri Venkateswara College, South Campus, University of Delhi, India; and **Mr. Melesse Tora Anjulo**, RTF-DCS Fellow and Ph.D. Student, Hawassa University, Ethiopia.
- 23rd Mar 2015** **Dr. M. Molanejad**, Acting President for International Cooperation of the Iranian Research Organization for Science and Technology (IROST), Head of the Indian Ocean Rim Association (IORA) Regional Centre for Science and Technology Transfer and Focal Point of the NAM S&T Centre in Iran and **Dr. Ali Azam Khosravi**, Research Counsellor, Science, Research & Technology, India & Subcontinent, Embassy of the Islamic Republic of Iran in New Delhi, India.

Participation of Centre's Scientists in Scientific Event

- 13-16 January 2015** **Mr. M. Bandyopadhyay**, Senior Expert & Administrative Officer visited South Africa to attend the Official Opening of the Joint NAM S&T Centre – DST (South Africa) Training Fellowship on Minerals Processing & Beneficiation and also other meetings with South African officials
- 16 February 2015** **Ms. Radhika Tandon**, Research Assistant attended the Public Lecture by Ambassador Balkrishna Shetty on 'Science Diplomacy' at the Indian National Science Academy (INSA), New Delhi.
- 20-25 February 2015** **Ms. Radhika Tandon**, Research Assistant visited Iran to attend the NAM Science Ministerial Conference (NAM-STIC 2015) in Tehran.

SCIENCE AND TECHNOLOGY NEWS IN THE DEVELOPING WORLD

Brazil: Plasma to combat Oral Biofilm

Low-temperature plasma obtained by ionising argon gas may become an alternative for the removal of pathogenic oral biofilm, which is composed of a community of unhealthy bacteria that can cause infections in teeth and gum tissue as well as in implants. The procedure has been shown to be effective against microorganisms in applications lasting only a few seconds, making it innovative compared with conventional therapies. Research done on this subject at the Araraquara Dental School of Universidade Estadual Paulista (UNESP) and supported by FAPESP has won an award from the Brazilian Dental Research Society. Biofilm was grown in the lab on an acrylic resin disc to simulate the development of the aggregate of microorganisms in the oral cavity. This model is well established in the literature. The same dose of plasma was then applied to oral epithelium reconstituted in the lab using human cells, with the aim of testing the toxicity of the procedure. The procedure was shown to be effective in combating mature biofilm that is resistant to eradication using antibiotics. At the same time, the tests using reconstituted epithelium showed no signs of necrosis (cell death) or apoptosis (controlled cellular self-destruction). Both cells and cell functions remained intact. The plasma used was obtained by ionizing argon gas to produce ions, free radicals, electrons and electromagnetic radiation, an effective combination of agents to combat bacteria and fungi. Furthermore, the application of plasma leads to the formation of reactive forms of oxygen inside the biofilm, which probably cause damage to the microorganisms' DNA and rupture their protective structure. As a result a significant number of the bacteria are eliminated. This type of plasma is already used in dermatology to treat chronic skin wounds that fail to heal because of bacterial contamination. In some dermatological applications, plasma has been found to stimulate the multiplication of healthy cells, favouring tissue regeneration while eliminating biofilm. However, the possibility of cell mutation during the multiplication process must be investigated in order for the procedure to be considered completely safe.

Source: Agência FAPESP Newsletter, 7th January 2015

Brazil: Sensor for Detection of Dengue before Appearance of the First Symptoms

Researchers at the São Carlos Institute of Physics of the University of São Paulo (IFSC-USP) and DNapta Biotecnologia, a company based in São José do Rio Preto, São Paulo State, Brazil, have developed a biosensor capable of detecting dengue before the first symptoms of the disease appear. The biosensor technology is based on the electrical detection of non-structural protein 1 (NS1), which is secreted by all four dengue viruses (DEN1, DEN2, DEN3 and DEN4). The protein is found at detectable concentrations from the second to ninth days after onset of the disease in the blood of people with both primary and secondary infections (first and additional dengue infections, respectively). This makes NS1 an excellent biomarker of dengue virus infection. The advantage of using NS1 to detect dengue is that the disease can be diagnosed sooner, as early as the second or third day after infection. On average, the symptoms of dengue do not start to appear until the sixth day after the patient is bitten by the *Aedes aegypti* mosquito. NS1 secreted by the dengue virus is typically detected using antibodies such as immunoglobulin G (IgG), which is obtained either via the fusion of B lymphocytes from the spleens of immunized animals with myeloma cells (B-cell tumor line) or by extraction from the blood of mammals inoculated with NS1. Both processes have drawbacks. The B-cell fusion process is very expensive. The problem with obtaining antibodies from NS1 antibodies in mammalian blood is that the quantity is very small. To increase the production of NS1 antibodies, DNapta Biotecnologia developed a technique whereby recombinant NS1 from all four dengue virus serotypes is produced in *E. coli* bacteria and then injected into laying hens. Recombinant proteins are artificially produced in the laboratory from cloned genes. Using this technique, the biotech company can obtain large amounts of IgY, the immunoglobulin from the

yolks of the eggs laid by hens inoculated with recombinant NS1, as a substitute for IgG, the immunoglobulin extracted from mammalian blood. Hens are great producers of antibodies. A very large quantity of IgY can be obtained from the yolks of eggs laid by hens inoculated with NS1. The company supplied recombinant NS1 from dengue virus and hen egg yolk immunoglobulin (IgY) to the researchers at IFSC-USP to develop the dengue biosensor. The company shares the patent on the device with the USP Innovation Agency, the university's technology transfer office.

The biosensor developed by the research group consists of a nanometer-scale gold electrode with a sample of IgY immobilized on the top and a reference electrode with constant electrical potential. When the electrode with immobilised IgY comes into contact with NS1, its electrical potential changes relative to the reference electrode because the connection between the protein and the antibody produces an electrical signal. The electrical signal is 'read' by a computer using custom software, which presents the findings within 30 minutes at most. Test results can be accessed in real time via a smartphone or laptop. The higher the concentration of NS1 in contact with the electrode with immobilised IgY, the greater the difference in electrical potential. To assess the biosensor's effectiveness the researchers performed tests with samples of NS1 at concentrations of 0.01-10 microgrammes per millilitre ($\mu\text{g/mL}$), covering the range of NS1 concentrations found in the blood of patients diagnosed with dengue. The test results showed that the device was capable of detecting the presence of NS1 at 0.09 $\mu\text{g/mL}$ minimum concentration. The average concentration of NS1 in the blood of people infected by the dengue virus is 2 $\mu\text{g/mL}$. The biosensor succeeded in detecting much lower concentrations than this. The researchers have obtained initial approval from the Ethics Committee of the Federal University of São Carlos (UFSCar) to test the biosensor using blood samples from dengue-infected subjects, starting within a few months after final approval.

Source: Agência FAPESP Newsletter, 4th March 2015

China: Molecular Fan opens under Light

Researchers at the Beijing National Laboratory for Molecular Sciences have constructed micrometre-sized, stacked layers that slide open like a folding fan when illuminated. They created thin, ribbon-like structures up to 1 μm wide. The ribbons are composed of multiple layers, each consisting of pairs of a long, thin molecule called perylene diimide. Under a blue-green laser, the layers slide apart because the photons excite electrons and distort molecular conformations. As a result, the ribbons expand, reaching around 12 μm in width after 3 minutes. They shrink back in seconds when exposed to an electron beam. Materials that change shape under light could have many applications, including in artificial muscle.

Source: Nature China Research Highlights, 21st January 2015

Colombia: National Mercury Plan to phase out Use of Mercury in Industrial Processes

The Colombian Ministry of the Environment and Sustainable Development has presented the National Mercury Plan, which seeks to phase out and ultimately do away with the use of mercury in the country's mining and industrial sectors. It is a strategic roadmap to be implemented by the National Government for the purpose of eliminating the use of mercury in mining and industrial processes throughout the country by means of inspection, control, surveillance, and information and awareness management. The plan represents a joint effort between different government levels, the mining, industrial, commercial and environment sectors, the health and labour sectors, and civil society in general, for the purpose of achieving compliance with Colombia's national and international commitments. The National Mercury Plan sets out clear guidelines for technology transfer, the use of clean technologies, and training and awareness in the use of mercury and products that contain mercury in order to minimise its impact and protect the

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environment and human health. The target is to reduce and gradually phase out the use of mercury throughout the country, with deadlines being set for July 2018 for mining, and July 2023 for industrial and production processes. The Plan is the result of an agreement involving eight ministries (Environment and Sustainable Development; Mining and Energy; Health and Social Protection; Labour; Industry, Commerce and Tourism; Foreign Affairs; Agriculture and Rural Development; and Transport) and two mining institutions (the National Mining Agency and the Mining and Energy Planning Unit). The National Mercury Plan has its legal basis in Act 1658 of 15th July 2013, which governs the use, importation, production, commercialisation, handling, transportation, storage and final disposal and release into the atmosphere of mercury used in industrial processes. This legislation seeks to protect and safeguard human health, whilst conserving natural renewable resources and the environment.

Source: Newsletter FuturENVIRO, 12th January 2015

Ethiopia: Ethiopian Jawbone may mark Dawn of Humankind

On 29th January 2013, scientists combing a stretch of north-eastern Ethiopia's Afar region found a jawbone that may belong to the earliest of the *Homo* species - perhaps the first ancient human. Its teeth are small, like those of other *Homo* species, and the parabolic shape of the jaw is a better match to *Homo* than to *Australopithecus*. The 2.8-million-year-old battered jawbone from Ethiopia may represent the earliest ancient human fossil ever discovered, pushing back the known origins of humankind by 500,000 years. The remains, alongside a digital reconstruction of a damaged fossil from a key early-human species, point to an evolutionary explosion at the dawn of our genus, *Homo*. Modern humans, *Homo sapiens*, are the latest link in a chain of ancestry that stretches back 5 to 7 million years to a common ancestor with chimpanzees and bonobos, humanity's two closest living relatives. An incomplete fossil record means that researchers have had a hard time finding the other links of that chain and distinguishing true human ancestors from evolutionary dead-ends, side branches in the family tree. Most agree that *Homo erectus* is one ancestor. The species emerged in East Africa around 2 million years ago. Its big brain and tall body are all similar to those of modern humans. Another possible link is a more ape-like creature that lived around 3 million to 4 million years ago: *Australopithecus afarensis*, which walked upright but stood only just over a metre tall and had a puny brain. One species that may bridge the gap between these two is *Homo habilis*, but some researchers speculate that at least two 'early *Homo*' species existed between 3 million and 2 million years ago.

Source: Nature, 4th March 2015

Guyana: Launch of Public - Private Partnership to support Alternative Energy in Rice Industry

On March 6, 2015 the first test run of a gasifier producing alternative energy using rice husk was conducted in a rice mill on the Essequibo Coast. This is part of the future transformation within the rice industry. As part of the Low Carbon Development Strategy, Guyana has embarked on a programme for alternative energy sources and for the reduction of the country's dependency on fossil fuel. This approach is not only from a cost perspective and the instability of fossil fuel prices, but also a programme to reduce carbon emission. The agriculture sector is designed to ensure a significant part in Guyana's carbon footprint successes. In this regards, the Government of the Republic of Guyana (GoG) and The Energy and Resources Institute (TERI) of India signed a Memorandum of Understanding (MoU) on May 25, 2011, to provide support as Guyana implements its climate initiatives and Low Carbon Development Strategy (LCDS). Under phase II activities it is proposed to carry out technical studies in various sectors including the rice sector to achieve energy efficiency, cost reduction and reduced carbon emission.

Source: ICPE Newsletter, 8th March 2015

India: Porous Hydrogel to carry Drugs

Researchers from the Indian School of Mines, Indian Institute of Technology (IIT), Kharagpur and Central Salt and Marine Chemicals

Research Institute (CSIR), Bhavnagar, Gujarat, India have synthesised a novel biocompatible and biodegradable hydrogel that can slowly release the antiameobic ornidazole and the antibiotic ciprofloxacin¹. The hydrogel releases the drugs in response to external stimuli such as changes in temperature and pH. It raises the possibility of delivering two drugs simultaneously and hence could be effective for administering treatments that involve using two drugs. The researchers synthesised the porous hydrogel by chemically linking dextrin with polyacrylic acid using methylene bisacrylamide, a linker compound. They then loaded the hydrogel with ornidazole and ciprofloxacin and found that the diffusion rate of water molecules through the network of polymers in the hydrogel increased with increasing temperature. These rates were higher in alkaline media than in acidic causing the hydrogel to absorb water and swell faster than in acidic media. This resulted in better sustained release of ornidazole and ciprofloxacin in alkaline media. The hydrogel was biocompatible (it did not show any toxic effects on human mesenchymal stem cells) and biodegradable (it progressively lost mass when left in hen egg lysozyme analogous to human lysozyme). The technique could be applied to synthesise other types of functional porous hydrogels.

Source: Nature India, 25th February 2015

India: Sensor for Detection of Medullary Thyroid Cancer

Researchers at the Indian School of Mines, Dhanbad, Jharkhand, India have fabricated a sensitive sensor that can detect minute traces of the hormone calcitonin in blood. This hormone is secreted by the thyroid gland and can be used as a biomarker for detecting the onset of medullary thyroid cancer. Calcitonin helps metabolise calcium by reducing its levels in blood. Previous studies had shown that this hormone is an excellent biomarker for predicting osteoporosis, thyroid cancer and other cancers. Existing techniques for detecting calcitonin employ various compounds including radioactive compounds, which are harmful to human health. In addition, these techniques are tedious and complex. To develop a simple and effective technique for detecting calcitonin, the researchers synthesised zinc oxide nanostructures modified by a compound derived from the amino acid tyrosine. They then produced a calcitonin-imprinted electrochemical sensor by coating a pencil graphite electrode with a reducing agent, a catalyst, calcitonin molecules and the modified zinc oxide nanostructures. The researchers evaluated the efficacy of the sensor in detecting calcitonin by performing electrochemical measurements while exposing it to solutions with different calcitonin concentrations. The sensor successfully detected calcitonin in blood samples, suggesting its suitability for clinical diagnosis. It retained its sensitivity even when stored for one month at various temperatures between 0 and 50 °C.

Source: Nature India Update, 7th January 2014

Indonesia: Free Permits for New Small and Medium Enterprises

Many SMEs in Indonesia still find it difficult to obtain business permits, which are important requirements to get loans from a bank. Earlier, the World Bank had pointed out that the Indonesian government needs to strengthen the country's SMEs ahead of the commencement of the ASEAN Economic Community (AEC). AEC, to be marked with free regional trade toward the forming of a single economic community in this region, is set to begin by the end of 2015. With this in view, the Indonesian government is providing free services to those who wish to procure permits for new small and medium enterprises. The permit letter is required to be written on a piece of paper only. It will be processed by state-owned Bank Rakyat Indonesia. Currently, the biggest challenges that Indonesia will face ahead of the implementation of the AEC are domestic problems, including the preparedness of business players, gaps in infrastructure and skills, and the need for regulatory reforms to reduce corporate costs. The government could take on a proactive role by helping companies prepare themselves, as practiced by Singapore and Malaysia. The governments of these two countries help their SMEs promote their products in international markets.

Source: WASME SME Update, February 2015

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Iran: New Facultative Barley Variety for Cold Dryland Areas

Ansar is a new facultative barley cultivar developed from ICARDA germplasm (IWPBYT 1994-1995 (Yea 168.4/Yea 605.5/Yea206-4A-3) released for commercial cultivation in the cold dryland areas of Iran. Evaluation of the new cultivar under rainfed condition in Maragheh, Qamloo, Zanjan, Sararood, Ardebil, Shirvan, and Orumieh research stations (1994-2013) showed that Ansar had high grain yield potential under dryland conditions. The mean grain yield for Ansar was 2724 kg/ha, for Abidar - 2335 kg/ha, and Sahand - 2643 kg/ha. Results revealed that Ansar is more tolerant to cold and drought stresses and resistant to lodging and shattering, thus it is suitable for the cold drylands areas of Iran. It had the highest 1000 kernel weight. It is a facultative growth habit genotype with early maturity, 73 cm plant height, 46 g 1000 kernel weight, white grain colour, and stable grain yield. Based on these results, the new line was released in 2014 under the name of Ansar for the cold dryland areas of Iran.

Source: *Seed Info No. 48, January 2015*

Kenya: Geothermal Investments contribute to Green Energy Growth

Geothermal is presently the largest source of electricity for Kenya, ahead of hydro which has dominated the country's power supply for decades. Kenya's rapid investment in geothermal power in recent years is increasingly paying dividends through the supply of reliable, clean energy and by lowering the cost of electricity to consumers. Geothermal power, which is generated from natural steam from the earth, some from as far as three kilometers underground, is a renewable source of energy and unlike hydro its output is not affected by vagaries of weather. Kenya's government has recently stepped up geothermal development in new fields, including Menengai, run by the Geothermal Development Company. Geothermal's contribution to the national energy mix increased to 51% last week, following the commissioning of two new plants with a combined capacity of 280 megawatts: Olkaria 1 and Olkaria 4 in the Rift Valley. Supported by the World Bank Group, Olkaria is one of the largest single geothermal investment projects in the world. In 2010, geothermal accounted for a mere 13% of Kengen's power mix. Other partners in the Olkaria project include the Japan International Cooperation Agency, the European Investment Bank, Agency France de Developpement and Germany's KfW. Kenya's plan is to increase geothermal capacity by another 460 megawatts by 2018 to reduce the volume of hydro power in its mix to 28% by 2018. This will significantly reduce the exposure of Kenya's electricity consumers to the consequences of drought, which considerably reduces power supply from the hydro power stations and forces the country to resort to costly diesel generated power.

Source: *futurENERGY, 2nd March 2015*

Saudi Arabia: Attosecond Laser Biomedical Laboratory

A cutting-edge laser facility, the first of its kind in the Arab world, opened early February at Saudi Arabia's oldest and largest university, King Saud University (KSU) in Riyadh. The Attosecond Science Laboratory hosts an 'attosecond laser', which generates ultrashort pulses of light, lasting just a few billionths of a billionth of a second, that can image otherwise invisible electrons as they move similarly fast within atoms. Attosecond lasers were invented in 2001, and facilities now exist at dozens of sites around the world. The Saudi Arabian facility is the result of a collaboration that began in 2008 with the Max Planck Institute of Quantum Optics (MPQ) in Garching, Germany, which hosts its own attosecond laser, and the Ludwig Maximilian University of Munich. One of the first planned experiments for the KSU laser will study the behaviour of electrons in atoms of melanin, best known as the pigment that protects skin from the sun's ultraviolet rays. No one knows why ultraviolet photons do not normally break the chemical bonds in the molecule when they hit it, but it is assumed that melanin's electrons redistribute, and diffuse, the energy among them. The experiment at KSU will test this hypothesis by developing extremely short, high-intensity ultraviolet pulses to excite the electrons, and will then capture their movements with the attosecond laser. Further, the laser will be adapted to generate pulses of infrared light for analysing proteins and nucleic acids

in blood samples from people with cancer. The aim will be to find molecular 'fingerprints' that might diagnose cancers, or predict response to therapy or the future onset of a cancer. The value of such a source of infrared light is that a table-top-size laser system could be developed and used at patients' bedsides. Currently, the only sources of such radiation are synchrotrons, which require large, expensive infrastructures.

Source: *Nature, 19th February 2015*

Uganda: Project N2Africa for Africa's Fertiliser Gap

Global use of nitrogen fertiliser is forecast to grow by 1.4 per cent each year to above 119 million tonnes in 2018, according to a report published by the UN's Food and Agriculture Organization (FAO) on 16th February 2015. But less than five per cent of that growth will come from Sub-Saharan Africa, largely because fertiliser is often too expensive for subsistence farmers. The lack of nitrogen in Africa's soils is the 'most limiting factor' holding back agriculture on the continent. As an alternative to fertiliser, Africa's meagre crop yields are getting a boost from an edible and more environmentally friendly source instead: beans. When growing legumes such as beans and peas, nitrogen fertiliser is not required because the plants grab all the nitrogen they need from the air with the help of bacteria living in their roots. Some of the captured nitrogen also enters the soil through fallen leaves and from decomposing roots. This helps to fertilise crops that are later farmed on the land. An ongoing project called N2Africa that encourages African farmers to plant beans as food and fertiliser could help counteract the impact of limited fertiliser take-up across the continent. The project aims to use legumes to boost harvests of staple crops, such as maize, that have stagnated at around one tonne per hectare since the 1960s. The legumes also provide poor farmers with additional food and income and are proving popular with them. N2Africa began in 2009 and now involves more than 250,000 farmers. Data published last May shows that average legume harvests have increased by 12 per cent to nearly 400 kg per farm. On average, the legumes added 28 kg of nitrogen to the soil per farm, a rise of 169 per cent from previous levels. The legumes have helped to boost average maize yields by at least 40 per cent. N2Africa was honoured for its contribution to nutrition and food security at a World Bank event on 19th February showcasing the winners of the 2013 Harvesting Nutrition Contest. Beans are not just for subsistence farmers in Africa, but they are also becoming more popular among some of their richer counterparts in Brazil and the United States, where they are planted to cut down on nitrogen fertiliser use, which saves money and spares the environment.

Source: *SciDev.Net update, 2nd March 2015*

Uganda: Trial for 3-D Printing of Prostheses

Researchers are to 3-D print cheap, custom-made prosthetics for child amputees in the developing world after winning CAD\$112,000 (US\$90,000) from the Canadian government. The money is coming through the Grand Challenges Canada fund, which supports health-related innovation in developing countries. There are more than ten million people in the world with amputations, most of whom live in developing countries. Around 300,000 of them are landmine survivors and this number is growing by about 26,000 people annually. Conventional prosthetic sockets for the remaining part of patients' injured limbs are made using plaster-of-Paris moulds, but these take up to a week to dry in the sun. Children also require at least two fittings a year - equivalent to around 25 prostheses over a lifetime - to adjust for body growth, making the process expensive for their families. But this whole process may be expedited with 3-D scanning and printing. The researchers hope to produce prostheses in developing countries for around US\$250. At present, they cost up to US\$5,000 in developed countries. In this, the first step is to measure a patient's residual limb using a handheld US\$500 infrared laser scanner. This produces a digital, 3-D image in less than a minute through freely available software called Socketmixer, which is used to design a matching prosthetic socket. The software is automatic, but once users have gained more experience in designing prostheses they can override its features to amend the resulting socket models, according to cbm Canada.

Source: *SciDev.Net update, 29th March 2015*

Past Scientific Associates of NAM S&T Centre

Ms. Rashmi Hemdani



Ms. Rashmi Hemdani joined the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) in July 2004 in the capacity of Research Assistant and continued her association with the Centre till 10th December 2005. Her primary responsibilities as a Project Assistant included involvement in planning, implementation, evaluation and assessment of scientific programmes undertaken by the centre. She actively contributed towards promotion of scientific activities among students, scientists / academia and scientific organisations in the developing countries through workshops, seminars and training courses and also contributed for the S&T Newsletter published quarterly by the Centre. She assisted in the organisation of a number of International scientific events, viz. 'The International Seminar-cum-Exhibition on Cost Effectiveness in Cement Manufacture & Construction: Technological & Management Options' held in association with the Cement Manufacturing Association (CMA) in Mumbai, India during 11-12 January 2005; 'International Training Course-Cum-Business Opportunities Workshop on Surface Engineering' held in association with International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI) in Hyderabad, India during 19-26 July 2005 and 'International Roundtable on Understanding and Prediction of Summer and Winter Monsoon' held in association with the Indonesian National Agency of Meteorology and Geophysics (BMG), Government of Indonesia and The National Centre for Medium Range Weather Forecasting (NCMRWF), Department of Science and Technology (DST), Government of India in Jakarta/Bandung, Indonesia during 21-24 November 2005. Apart from this she also assisted in giving final shape to the book entitled 'Mineral Resources and Development', 'Management of Natural Disasters in Developing Countries' and 'The Changing Role of Science Centres in Developing Countries'. She attended the fourth high level Conference on 'Asian Economic Integration: Towards an Asian Economic Community' held on 18-19 November 2005 at New Delhi.

Ms. Rashmi Hemdani has now moved on to the position of a Section Officer (Assessment Unit) in the Indian Council of Agricultural Research (ICAR), Ministry of Agriculture, New Delhi, India.

Mr. Shashank Pande



Mr. Shashank Pande joined the Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) in October 2002 in the capacity of Programme Associate soon after his completion of B.E. Mechanical Engineering from the Birla Institute of Technology, Mesra, Ranchi and continued his affiliation with the Centre till February 2004. His primary work responsibilities included involvement in planning, implementation, evaluation and assessment of scientific programmes undertaken by the Centre. He actively contributed towards promotion of scientific activities among students, scientists/academia and scientific organisations in the developing countries through workshops, seminars and training courses and also contributed to the NAM S&T Centre Newsletter published quarterly by the Centre. He assisted in the organisation of a number of International scientific events and was also involved with the publication of the 'Builder's Handbook on Low Cost Housing'.

Mr. Shashank Pande subsequently moved to Australia where he studied MBA Advanced (Finance) in Griffith University, Gold Coast. Later, he joined HP Credit Services in Adelaide, Australia as a Loan Officer and learned about Consumer Mortgages. In 2009-2010, he joined as a Junior BA in the Reporting and Analytics Team of Westpac, the second largest bank in Australia. In 2012, he moved into a Process Business Analyst role and was involved in transitioning the work from Adelaide to Bangalore. Later in 2013, he was offered an opportunity to be a part of an industry wide transformational initiative which was based on implementing an electronic exchange for mortgage settlements. At present, he is working as a Senior Business Analyst at Westpac.

The Centre Invites Applications

**RESEARCH TRAINING FELLOWSHIP FOR DEVELOPING COUNTRY SCIENTISTS
RTF-DCS - 2015 - 16**

The Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) is presently implementing a Fellowship scheme titled 'Research Training Fellowship for Developing Country Scientists (RTF-DCS)' to provide opportunity to young researchers of the developing countries for their capacity building in science and technology through their affiliation with premier academic and research institutions in India to carry out short-term research work for a period of six months. This scheme is sponsored by the Department of Science & Technology (DST), Government of India.

Under this scheme, 50 researchers from the developing countries (irrespective of whether a country is a member of the Centre or not) will be selected this year with full financial support for their international travel to India (by economy class and shortest route), subsistence allowance comprising a consolidated monthly Fellowship amount of Indian Rupees 35,000 (~US\$560 at current exchange rate) to meet accommodation, meals and other miscellaneous expenses, and a one-time grant of Indian Rupees 30,000 (~US\$480) for research contingency and domestic travel in India (on actual cost basis).

In the fourth year of implementation of the RTF-DCS scheme, the NAM S&T Centre invites applications from the eligible researchers of the developing countries for the Fellowship for the financial year 2015-16 (1st April 2015 to 31st March 2016). The applicants should possess at least a Post Graduate Degree in any Natural Science subject or an equivalent degree in Technology / Engineering / Medicine / allied disciplines. **The last date for submission of completed Application Form is Monday, 15th June 2015.**

Applications are required to be submitted to the NAM S&T Centre **ONLINE** by following the link: <http://goo.gl/FsQ4gB>. Hard copies of the applications are not required. Guidelines for the Fellowship and the application form are available at the Centre's Website www.namstct.org.

DISTINGUISHED VISITORS TO THE CENTRE



Mesrs. Sobhani, Sr. Advisor; Nayebi, Finance Director; and Hosseini, International Expert of Pardis Technology Park and Dr. Khosravi, C (Res, S&T), Iran Embassy in India



Dr. Jayantha Jayewardene, Managing Trustee, Biodiversity & Elephant Conservation Trust, Sri Lanka



Dr. Vartika Mathur, Asst. Prof., Shri Venkateswara College, Delhi University, India (C) and Ethiopian RTF-DCS Fellow Mr. Melesse Tora Anjulo



Dr. M. Molanejad, Acting President for International Cooperation of the Iranian Research Organisation for Science and Technology (IROST) and Head of the Indian Ocean Rim Association (IORA) (2nd fm L) and Dr. A.A. Khosravi, C (Res, S&T), Iran Embassy in India

Centre Announces

JOINT NAM S&T CENTRE-ICCBS FELLOWSHIP 2015-16

CALL FOR APPLICATIONS

The Centre for Science & Technology of the Non-aligned and Other Developing Countries (NAM S&T Centre) and the International Centre for Chemical & Biological Sciences (ICCBS) of the H.E.J. Research Institute of Chemistry and Dr. Panjwani Center for Molecular Medicine and Drug Research, University of Karachi, Pakistan are implementing a Joint NAM S&T Centre-ICCBS Fellowship scheme to provide opportunities to the scientists and researchers from the developing countries to work in the ICCBS laboratories in the areas of Natural Products Chemistry, Herbal Medicines, Drugs, Pharmaceuticals and Nutraceuticals, Molecular Medicine, Medicinal Chemistry, Computational Chemistry, Structural Biology, Nanotechnology, Proteomics and Genomics, Drug Research, Clinical Research etc. in order to enhance their research skills, facilitate exchange of information and contacts and create a network among the scientists and researchers from Pakistan and other developing countries.

The NAM S&T Centre invites applications from the deserving scientists and researchers from its member countries and the members of its NAM S&T-Industry Network [*Lists of the member countries and members of the NAM S&T-Industry Network are available in the Centre's website www.namstct.org*] for award of this Joint NAM S&T Centre-ICCBS Fellowship for the year 2015-16.

Under this Joint Fellowship Scheme, the Centre will sponsor up to five scientists during the year for short-term affiliation at ICCBS for a period of up to ~3 months. Only one scientist each from a particular developing country can be selected strictly on a competitive basis and based on the applicant's academic and professional background, the plan of work and the mutual research interests of the applicant and ICCBS. The ICCBS will provide free furnished accommodation and a monthly subsistence allowance of US\$200 to the selected Fellows for the duration of the Fellowship. The NAM S&T Centre will pay the return international airfare from the home country to Karachi, Pakistan to the selected Fellows.

Applicants from Pakistan are not eligible to apply for this Fellowship.

Completed applications recommended by the parent institutions of the applicants may be submitted directly to the NAM S&T Centre. **There is no last date for submitting the application and selection will be made on a first-cum-first basis** in consultation with ICCBS depending upon the availability of the seats and based on the professional details supplied and the Plan of Work submitted by the applicants.

JOINT NAM S&T CENTRE - ZMT BREMEN (GERMANY) FELLOWSHIP IN TROPICAL COASTAL MARINE ECOLOGY AND BIOGEOCHEMISTRY: CALL FOR APPLICATIONS FOR 2015

The Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) is pleased to invite applications from suitable candidates for the Joint NAM S&T Centre - ZMT Bremen (Germany) Fellowship scheme in Tropical Coastal Marine Ecology and Biogeochemistry for the year 2015 for affiliation of the scientists from the developing countries with the Leibniz Centre for Tropical Marine Ecology (ZMT), Bremen, Germany [www.zmt-bremen.de] for a period of up to 3 months to work with its senior researchers and faculty members for upgrading research skills and undertaking short-term joint research projects in the fields related to Ecology and Biogeochemistry of Tropical Coastal Marine Systems.

Under this Fellowship scheme, the NAM S&T Centre sponsors up to five scientists in a given calendar year, of which only one scientist can be from any given developing country. The Centre covers the international airfare of the Fellows from its member countries, but scientists from other developing countries, which are still not the member of the NAM S&T Centre, are also welcome to apply subject to certain conditions. ZMT provides a monthly subsistence allowance of 1250 Euros to meet the accommodation and other expenses in Bremen. The selection is made strictly based on the professional details of the applicant, plan of work to be carried out and mutual research interests of the applicant and ZMT. The Guidelines of the scheme are available at the Centre's Website www.namstct.org, which may please be read carefully before submitting the application.

Applications recommended by the parent institutions of the applicants may be submitted to the NAM S&T Centre **by email** in the relevant format.

The last date for submitting application for the Fellowship is 20th May 2015.

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