



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

Season's greetings to all our readers!!



The COVID-19 pandemic took the world by surprise. However, despite the challenges and restrictions in place around the world, the NAM S&T Centre has been able to maintain an impressive level of scientific activities - thanks to our dedicated and innovative team, and also with the generous support from our Focal Points and the scientific community in our Member Countries

I am pleased to inform you that during the last quarter of 2020, the Centre has successfully organised three online international programmes, viz. an International Training Workshop on "Capacity Building in Developing Countries in the Management of Intellectual Property Rights (IPR) and Geographical Indications (GI)", during November 11 – 12, 2020, in partnership with the Academy of Scientific Research & Technology (ASRT), Cairo, Egypt; a one-day International Virtual Training Program on "Generic Drugs" on November 19, 2020, in partnership with the CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad, India; and an International Workshop on "Technopreneurship for Developing Countries: Challenges and Opportunities in Technology Transfer and Commercialisation for Developing Countries", during November 24-25, 2020, in partnership with the International Science, Technology and Innovation Centre for South-South Cooperation under the auspices of UNESCO (ISTIC), Kuala Lumpur, Malaysia in collaboration with the Malaysian Technology Development Corporation (MTDC).

The Centre announced the organisation of two more scientific events in the beginning of the year 2021 through online platforms -International Workshop on "Renewable Energy and Storage Devices for Sustainable Development", in partnership with Amity Institute for Advanced Research and Studies (Materials & Devices), Amity University, Noida, India, and International Workshop on "Ground Water Conservation and Management by Leveraging Science, Technology and Innovation" in partnership with Kenya National Commission for UNESCO (KNATCOM), Nairobi, Kenya.

Last but not the least, it is an honour and privilege for me to inform you all that the Centre has successfully completed three fruitful and productive decades contributing significantly towards South – South Cooperation in Science, Technology and Innovation (STI), and to commemorate this milestone, a **Compendium** titled 'In Pursuit of Science, Technology & Innovation - Three Decades of NAM S&T Centre' has been published recently which was released on December 11, 2020. The book is a comprehensive record on the 30-year long journey of the Centre, so that it can be used as a ready reckoner and a reference material by various stakeholders, including the Member Countries, Network Members, and the scientific communities in the developing countries at large.

I would like to take this opportunity to thank you all for being a part of our success and the long and eventful journey so far. Stay Safe and Happy Reading!

Armitrera Bandoppthyse X

(Amitava Bandopadhyay) Director General Centre Organised

INTERNATIONAL TRAINING WORKSHOP ON CAPACITY BUILDING IN DEVELOPING COUNTRIES IN THE MANAGEMENT OF INTELLECTUAL PROPERTY RIGHTS (IPR) AND GEOGRAPHICAL INDICATIONS (GI) 11-12 NOVEMBER 2020

Creation, protection and management of *Intellectual Property* (*IP*) have become an instrument for national development in the context of internationalization of trade and commerce, and the emerging world of knowledge. Developing countries have many challenges to overcome while evolving their own IP Systems in order to satisfy their public policy needs and developmental goals. In a world, where the economic growth of nations is driven increasingly by the creativity and knowledge of their people, effective IP Systems, which provide incentives for innovation and create structures for sharing the results, are key to unlocking this human potential.

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INTERNATIONAL TRAINING PROGRAM ON GENERIC DRUGS 19 NOVEMBER 2020

Generic medicines are the copies of their brand name counterparts which are bioequivalent to their brand name twins, i.e., having the exact therapeutic efficacy, safety and performance as the original drugs. In most cases, a generic drug is allowed to be manufactured or sold by other companies after the patent on the original drug expires. The Hatch-Waxman Act, which allowed the FDA to approve the use of generic drugs based on bioequivalence studies, was passed in the US in the year 1984 with the objective of avoiding the unnecessary duplication of tests, thus reducing the production costs and eventually lowering the drug prices.

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INTERNATIONAL WORKSHOP ON TECHNOPRENEURSHIP FOR DEVELOPING COUNTRIES: "CHALLENGES AND OPPORTUNITIES IN TECHNOLOGY TRANSFER & COMMERCIALISATION FOR DEVELOPING COUNTRIES" 24-25 NOVEMBER 2020

The Centre for Science and Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) has always recognized the importance of the role of Technology, Innovation and Commercialisation in creating a knowledge-based economy and nation building. It is well observed that governments of various countries around the world are adopting appropriate policy measures to facilitate technology transfer and commercialisation, and encourage technopreneurship development. However, there are a multitude of challenges and bottlenecks in the process of technology transfer,

(Contd. from Page 1 - IPR & GI, Egypt)

Intellectual Property (IP) refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce. IP is protected in law by, for example, patents, copyright and trademarks, which enable people to earn recognition or financial benefit from what they invent or create. By striking the right balance between the interests of innovators and the wider public interest, the IP System aims to foster an environment in which creativity and innovation can flourish. Intellectual Property Rights (IPR) refers to the general term for the assignment of property rights through patents, copyrights and trademarks. These property rights allow the holder to exercise a monopoly on the use of the item for a specified period. IPR is a prerequisite for better identification, planning, commercialization, rendering, and thereby protection of invention or creativity.

Geographical Indications (GI) is the newest addition to Intellectual Property Rights (IPRs), which identify a good as originating in the territory of a country or a region or locality in that territory, where a given quality, reputation or other characteristics of a goods is essentially attributable to its geographical origin. In other words, some geographical regions acquire a reputation for origin of a product with some specific quality and uniqueness. The GI is a unique form of Intellectual Property Rights (IPRs) provided to the community of producers who have acquired traditional knowledge from generations and generate products with unique characteristics. In order to function as a GI, a sign must identify a product as originating in a given place.

Developing countries have responded to the new order in different ways and have tried to handle global IPR issues with a sense of commonality especially in the matters related to protection of genetic resources and traditional knowledge. There is a sense of urgency in developing IP systems in each country to derive maximum from the *IPR System* to address efficient utilization of innovations and creativity.

To keep abreast of the growing significance of IPR, to deliberate upon its role in sustainable development, to impart skills and knowledge on the principles and practices on the protection of IPR, and to explain the concepts and intricacies of Geographical Indications, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) and the Academy of Scientific Research & Technology (ASRT), Egypt jointly organized an International Training Workshop on "Capacity Building in Developing Countries in the Management of Intellectual Property Rights (IPR) and Geographical Indications (GI)" during 11-12 November 2020 through Virtual Mode.

The Workshop was hosted by the Academy of Scientific Research & Technology (ASRT), Cairo, Egypt. It was a highly interactive event that was aimed at providing basic knowledge on (a) Different types of Intellectual Property and Geographical Indications, (b) Principles of IPR, (c) International laws, agreements and treaties on IPR – Trade Related Intellectual Property Rights (TRIPS) and Patent Cooperation Treaty (PCT), (d) IP valuation and licensing, (e) Developing institutional IPR policies, (f) Emerging dimensions in IPR, (g) Creation and management of IPR portfolios, (h) Protection of genetic resources and traditional knowledge, (i) Importance of Geographical Indications (GI) for developing countries, and (j) Rights under GI and Protection of GI.

The Inaugural Session started with a welcome address by Prof. Gina El-Feky, Supervisor of Scientific and Cultural Relations Sector, ASRT. This was followed by an introductory address by Prof. Mona Yehia, President, Egyptian Patent Office in which she highlighted different kinds of intellectual property (IP) and the need for protection to the owners of the IP through various mechanisms. She also outlined the present institutional infrastructure on IPR in Egypt including the Egyptian Patent Office. The Inaugural Speech was then delivered by Prof. Dr. Mahmoud M. Sakr, President, ASRT, the Chief Guest for the Training Workshop. Prof. Sakr, in his speech expressed satisfaction that the ASRT and NAM S&T Centre had once again come together to organize the Training Workshop on Management of Intellectual Property Rights (IPR) and Geographical Indications (GI), a topic which is highly important to protect the interest of the developing countries. He advised that a publication should be brought out on the subject with papers and case studies contributed by the resource persons and other experts for dissemination of knowledge for the benefit of the researchers, innovators, entrepreneurs and IPR professionals from the developing countries. Dr. Amitava Bandopadhyay, Director General, NAM S&T Centre, New Delhi, in his address, welcomed the participants and briefly highlighted the importance of Intellectual Property and Geographical Indications, especially for the developing countries. Dr. Bandopadhyay then mentioned about the significant contributions made by the NAM S&T Centre for capacity building of the scientists and professionals of its Member Countries by organizing a number of training courses on this subject in the past in partnership with various global S&T institutions and agencies. He expressed his gratitude to the resource persons from various countries who are experts in the fields of IPR and GI for having spared their valuable time to deliver their learned lectures. He also thanked Professor Mahmoud M. Sakr for his consent and support to the NAM S&T Centre which had finally resulted into the organisation of the Workshop.

The online Training Workshop was attended by **72** participants from **15** countries, namely Algeria, India, Indonesia, Iran, Iraq, Malaysia, Mauritius, Myanmar, Nepal, Nigeria, Palestine, South Africa, Vietnam, Zambia, and the host country Egypt. The overall Training Workshop was conducted over two days, distributed in several technical training sessions as summarized below:

Day 1: 11 November 2020

TECHNICAL SESSION - I

The Program commenced with a presentation on **'Introduction to IP, Different types of IP and IP Principles'** by Ms. Marwa Ahmed, IP Trainer, National IP Academy, Egypt in which the participants were familiarized with the basic knowledge of IPR. In her lecture, she described the concepts of Intellectual Property (IP), Intellectual Property Rights (IPR) and explained different types of IP such as Patents, Trademarks, Geographical Indications (GI), Copyrights and Trademarks, with several examples.



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COMPENDIUM ON THREE DECADES OF NAM S&T CENTRE



The Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre) was established in New Delhi, India in August 1989 as an Inter-governmental Organisation in pursuance of the decisions taken in various NAM Summits. The primary objective of the NAM S&T Centre is to promote and enhance South-South Cooperation in Science, Technology and Innovation (STI) for collective self-reliance of the NAM and other developing nations. Through its multifarious scientific activities, the Centre has been trying to bring the developing countries to the frontiers of science and technology through cooperation among the scientists and scientific organizations for mutual benefit. The Centre has been vastly proactive in STI human capacity building, STI policy formulations, securing technological excellence, imparting knowledge on intellectual property rights, and creating awareness amongst the developing countries about the huge impact of the STI Diplomacy for achieving sustainable development.

Since its inception, the NAM S&T Centre has been able to make a mark in its global presence, and working as a facilitator in science driven economic development in the countries of the South by encouraging their governments to nurture the S&T institutions and formulating action plans and policy guidelines for the integration of science and technology into national economic development plans. Over the years, the Centre has successfully

evolved and implemented scientific activities in wide range of subjects in order to provide opportunity for scientist-to-scientist and institution-to-institution contacts, familiarisation with the latest developments and techniques, implementation of collaborative projects and training courses, and facilitating the transfer of technology within the developing countries.

In order to commemorate the completion of thirty glorious years of the Centre in August 2019, a book titled: **"In Pursuit of Science, Technology & Innovation - Three Decades of NAM S&T Centre"** has been published which contains a consolidated account of the background and establishment, objectives and functions, programmes and activities, and accomplishments of the NAM S&T Centre. During this period, a lot has been achieved by the Centre in pursuing its mission and objectives, and this book not only provides a comprehensive historical perspective about the Centre but also elaborates its achievements with success stories and contributions made in capacity building of the developing countries in the implementation of various Sustainable Development Goals (SDGs).

However, due to international travel restrictions as a result of the ongoing COVID-19 pandemic, a formal release of the book by Datuk Ir. Ts. Dr. Siti Hamisah Bt Tapsir, President and other office bearers of the 14th Governing Council of the NAM S&T Centre could not be organised. Therefore, after obtaining the approval from the President, the book was released for circulation on 11 December 2020.

The book can be used as a reference material by researchers, professionals and other stakeholders who are interested about the NAM S&T Centre.

(Contd. from Page 2 - IPR & GI, Egypt)

TECHNICAL SESSION – II

In this session, Ms. Marwa Ahmed gave an overview of 'The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)' and explained the importance and objectives of TRIPS, and different provisions of TRIPS including enforcement, dispute system and transitional arrangements etc.

TECHNICAL SESSION – III

In this training session, Ms. Aliaa Mohamed, IP Trainer, National IP Academy, Egypt made a presentation on 'Patent System'. In her lecture, she not only explained the importance of the Patent System to encourage innovation by granting inventors a patent for their inventions but also discussed different legal and technical steps that are involved in filing of patent application, including the key deadlines and various other requirements. Patentability criteria were very well explained with the help of examples. Ms. Aliaa concluded the session by underlining the importance of disclosure to the society.

TECHNICAL SESSION – IV

Dr. R.R. Hirwani, Former Outstanding Scientist & Head, CSIR-Unit for R&D of Information Products (URDIP), Pune, India delivered a lecture on the theme of 'Patinformatics for Research and Technology Planning'. In his lecture, he spoke on the importance of patent information and management of various forms of information related to patents and their application for R&D Management, Product Area Surveillance and Technology Competition Analysis. He explained how the search and analysis of patents could drive research strategy and support innovation management. He also stressed that in addition to market research, patent research is a must for technologically competitive intelligence. He gave the example of patent information in USA with year wise data on US patent leaders. He also described Patent Classification System with examples of IPC G06Q and IPC G06F. He concluded his lecture by explaining various tools for patent searches.

TECHNICAL SESSION – V

Ms. Aliaa Mohamed in the last session for the day discussed various provisions and procedures of 'Patent Cooperation Treaty' (PCT) for providing international patent protection to an inventor. Further, she facilitated filing patent applications, seeking protection in many countries and providing many advantages through its International and National Phases in comparison to traditional filing system. Ms. Aliaa also explained the whole timeline of PCT procedures.

DAY 2: 12 NOVEMBER 2020

TECHNICAL SESSION – VI

Ms. May Hassan, IP Trainer, National IP Academy, Egypt conducted an excellent session on 'Trademarks and Industrial Designs'. She provided the definition of Trademarks and explained various types and categories of Trademarks with several examples, and also discussed the terms of protection and conditions of registration of Trademarks. She further dealt with the concept of Industrial Design and discussed its terms of protection, and systems and conditions of registration, with a number of examples. She conducted a few short quiz sessions both on Trademarks as well as Industrial Design in which the attendees participated actively.

TECHNICAL SESSION – VII

Mr. R. Saha, Former Adviser & Head, Patent Facilitation Centre, Department of Science & Technology, Government of India. New Delhi delivered a lecture on 'Importance of Geographical Indications (GI) for Developing Countries - Rights under GI and Protection of GI'. He explained the concept of GI as an IPR with various elements of GI, and its importance to the developing countries. He further spoke on the classification of goods under GI and various aspects of application process for GI. He provided the examples of GI system in various countries such as Australia, EU, France, Mexico and US, and also described the provisions under the GI Act of India with detailed explanation of the case of GI protection of the "Darjeeling Tea". Finally, he spoke on various international provisions for GI including TRIPS.

TECHNICAL SESSION – VIII

Ms. May Hassan spoke in this session on the topic 'Creation and Management of IPR Portfolios' where she briefly described the processes and procedures to ensure increased protection of IPRs. She discussed various issues including the role of IP Portfolio, IP Asset identification, IP Management, IP Exploitation, IP Valuation, and IP Protection Management Framework, with relevant case studies, wherever applicable.

TECHNICAL SESSION – IX

The next session was conducted by Ms. Jetane Charsley, Director - Regulatory and Compliance, National Intellectual Property Management Office (NIPMO), South Africa on the topic: Importance of Developing of Institutional IP Policies'. She spoke on the importance and goals of an institutional/internal IP Policy, and various aspects that should be taken into consideration while developing an IP Policy. She further elaborated on the scope of the policy including the responsibility and ownership in the management of IP, dissemination and commercialization of IP, and incentives and distribution of revenues from IP.





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(Contd. from Page 4 - IPR & GI, Egypt)

TECHNICAL SESSION – X

Ms. Eman Saleh, IP Trainer, National IP Academy, Egypt delivered a lecture on the topic: '**Protection of Genetic Resources and Traditional Knowledge**'. Ms. Eman discussed various aspects of protection needed for Genetic Resources and the associated Traditional Knowledge. She further discussed the issue of Biopiracy using various examples, the International Framework for Access and Benefit Sharing (ABS) regulation in light of the CBD and ITPGRFA, rejection of the public domain status, and portrayed different perspectives in the relationship between Genetic Resources & Traditional Knowledge, and Intellectual Property Systems. Before her concluding remarks, she also accentuated upon the latest updates of the WIPO IGC.

TECHNICAL SESSION – XI

Dr. I. M. Nwaedozie, Director, National Office for Technology Acquisition and Promotion (NOTAP), Nigeria gave a presentation on '**Technology Transfer: The NOTAP's Experience'**. He started his lecture with the definition and scope of Intellectual Property, and then described in details the institutional framework for IP administration in Nigeria. While discussing the role of NOTAP, he spoke on the aim and objectives of Intellectual Property Technology Transfer Offices (IPTTOS) in Nigeria. He further explained the patenting trend in Nigeria with data on foreign and indigenous patents registered, and foreign technology transfer.

At the end, a short **Concluding Session** was held, which was addressed by **Dr. Fatma Samir Abd-El-Salam**, Executive Director, National IP Academy of Egypt, ASRT. Views were exchanged on the key learning's, experiences and takeaways from the Training Workshop.

The participants of the Conference were actively engaged in the discussions throughout various sessions and expressed gratitude to the organizers – the ASRT, Egypt and the NAM S&T Centre for the excellent organisation and efficient coordination of the Training Workshop. They appreciated that the scientific program provided opportunities to them to meet, engage, and gain and share knowledge on a common platform even at the time of a Global Pandemic.

(Contd. from Page 1 - Generic Drugs, India)

The Generic Pharmaceutical Industry quite evidently plays a key role in the health care of a country by providing affordable medicines, which is achieved by development of manufacturing processes at reduced cost, thereby increasing the affordability of drugs to common people. In other words, this industry primarily helps in managing the health of people under poverty line, which is an important factor for a developing nation.

Development of generic drug industry can effectively reduce the country's dependence on imports, saving foreign exchange, and most importantly securing their medicines, especially in medical emergencies and pandemic situations like present COVID, and hence, increasing a country's self-reliance on pharmaceuticals, an important factor of National Health Security. With the increase in spending on health care and rising costs of medicines, there is an urgent need to encourage the use of generics. However, maximizing generic drug use is not possible without the public's positive perception and meeting their informational needs about generic drugs. Thus, improving the public confidence and knowledge of generic drugs in the market is imperative.

In order to impart basic knowledge about the development and use of generic drugs to researchers, scientists and professionals; and popularize the use of generic drugs in the Developing Countries, the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi, India, jointly with the CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad organised a one-day International Virtual Training Program on "Generic Drugs" on 19 November 2020.

The Training Program which was virtually hosted by the CSIR-IICT was aimed at providing its attendees with basic knowledge about the use, logistics and manufacturing of generic drugs. The program covered some key aspects such as challenges involved in manufacturing of generic drugs, quality control, impurity profiling, regulatory aspects, bio-equivalence, formulations, etc. that would help guide policy, education and practice interventions supporting the use of generic drugs.

The **Inaugural Session** began with a brief introduction and initial remarks by **Dr. D. Shailaja**, Chief Scientist and moderator of the Virtual Event from CSIR-IICT by setting the context; and was facilitated by **Dr. N.V. Satyanarayana**, Chief Scientist, CSIR-IICT. The Chief Guest, **Dr. Shekhar C. Mande**, Director General, Council of Scientific & Industrial Research (CSIR), New Delhi, inaugurated the International Training Program. Dr. Mande, in his address mentioned about the major contributions to the development of process know-how's for Generics by some of the CSIR laboratories, particularly the affordable Anti HIV drug from CSIR-IICT during the 90's. He also appreciated the recent contributions of repurposed drugs such as Favipiravir and Remdesivir from CSIR-IICT, "Feluda" testing for COVID from CSIR-IGIB, and contributions from other laboratories; once again rising up to the need for affordable healthcare during the pandemic times. Dr. Mande wished the program a success by encouraging the attendees to work towards improving access to affordable medicines for all. This was followed by a brief address by the Guest of Honour, **Ms. S. Aparna**, IAS, Secretary, Department of Pharmaceuticals (DoP), Ministry of Chemicals & Fertilizers, Government of India, who emphasized that their department has been giving







(Contd. from Page 5 - Generic Drugs, India)

special attention to promote Generic Drugs due to heavy expenditures being borne by the Indian households on medicines and health related issues. Ms. Aparna also shared a few points about the efforts behind the country's current status of "Pharmacy of the World" and insisted the attendees from various developing countries to look holistically while promoting generic medicines, and not just through the scientific point of view. She further emphasized on the importance of NAM countries to work together in this area and promised that the DoP will coordinate and facilitate the technology transfer process to help build sustained relationship between the countries.

Dr. S. Chandrasekhar, Director, CSIR-IICT, then welcomed the participants and pointed out the Training Program as a welcome step by the developing nations to gear up towards self-sufficiency; and to tap export markets with state-of-the-art manufacturing facilities for quality Generic Drugs, while the re-examination of the policy framework on selection and procurement for quality medicines is under way. Thereafter, **Dr. Amitava Bandopadhyay**, Director General, NAM S&T Centre during his address, briefly highlighted the need and importance of repurposing generic drugs that would give researchers more shots in the game of drug discovery, and improving the odds that would lead to the development of a treatment protocol to the ongoing Covid-19 pandemic. The inaugural session ended with **Dr. Rama Swamy Bansal**, Head, International S&T Affairs Directorate (ISTAD), CSIR briefing the virtual audience about the International co-operation activities of the CSIR; and a vote of thanks by Dr. D. Shailaja.

The participants of the conference included about **100** researchers, scientists, government officials, policy makers, and representatives from industry and non-government organizations - who are engaged in pharmaceutics and healthcare sector representing **12** developing countries including Bhutan, Egypt, Iraq, Maldives, Mauritius, Myanmar, Nigeria, Pakistan, Palestine, Sri Lanka, Vietnam and the host country India. The Indian participants included **63** researchers, scientists, professors and faculty members from various institutions including Amity Institute of Pharmacy, Amity University, CSIR-Central Salt and Marine Chemicals Research Institute, Sun Pharma Pvt. Ltd., Suven Life Sciences, Dr. Reddy's Laboratory, NATCO Pharma Ltd., Gland Pharma Ltd., Elixir Global, Council of Scientific and Industrial Research (CSIR), and the host institute, CSIR-Indian Institute of Chemical Technology (IICT).

The overall training programme was conducted in two Technical Sessions, during which a total of 8 training lectures were delivered by leading Indian scientists and professionals in the field, details of which are given below:

Technical Session-1 was facilitated by Dr. B. V. Rao, Emeritus Scientist, CSIR-IICT [India], and included a total of four training lectures.

The session commenced with a lecture on "**Challenges involved in the Manufacturing of Generic Drugs-1**" by **Dr. T. Rajamannar**, Executive Vice President, and Head, High Impact Innovations & Advisor to MD, Sun Pharmaceutical Industries Ltd., who elaborated on the fundamental objective of Generic Drugs, i.e., availability of high quality and affordable pharmaceutical products to the patients. He stated that the Pharma Industry is capable of producing drug products free of contamination that reproducibly delivers the therapeutic benefit promised in the label to the consumer; but the capability of producing high quality drugs in large scale, with stable crystal habits and little or no environmental burden still remains a challenge. Dr. Rajamannar explained the drivers to be achieved by the industry using the technology and capability metrics while also pointing out other challenges in manufacturing of



bulk drugs, like, designing a process with predictable quality required and a complete understanding of its reacting components, possible side reactions control, pH sensitivity, isolation procedures, etc.

Dr. A. Veera Reddy, Vice President, Suven Life Sciences, continued on the topic, "**Challenges involved in the Manufacturing of Generic Drugs-2**", speaking about the Abbreviated New Drug Application (ANDA) requirements that distinguish a generic drug from an innovator drug, while touching on the roles of National Regulatory Bodies for Indian pharmaceuticals and medical devices, such as the Central Drugs Standard Control Organisation (CDSCO) and the National Pharmaceutical Pricing Authority (NPPA) that control the prices of the drugs in India. Dr. Reddy also shared that the Government encourages essential generic drugs to be available at a much less price, usually 90% cheaper as compared to branded ones. The reason being, cheaper raw materials and improved process technology



of the drug. He then discussed the process technology improvements of some of the drugs namely, Ciprofloxacin, Rufinamide and 1,2,3-Triazole.

Dr. Satyanarayana Tirunahari, who works on API Process Engineering at Dr. Reddy's Laboratory, then delivered a lecture on "**Polymorph Selection and Particle Engineering**", explaining how most of the drugs tend to exist in its crystalline solid state (like, polymorphs, solvates or hydrates, co-crystals etc.) due to reasons of stability and ease of handling during various stages of drug development. He stated that the differences in surface and mechanical properties can influence the downstream processing of drug substances into drug products i.e., filtration, drying, handling in powder form, formulation activities etc., while differences in the thermodynamic properties like solubility may have profound effect on the bioavailability of the drug, that could lead to severe effects in patients. Dr. Tirunahari concluded by asserting that characterization of all possible polymorphs and identification of the desired form is a



crucial step in drug development process. Various polymorph screening methods to discover novel solid forms, and particle engineering technologies to control crystal size was also discussed during his talk, using case studies.

(Contd. from Page 6 - Generic Drugs, India)

Thereafter, **Dr. G. Venkata Ramana**, Principal Scientist, Drug Discovery & Clinical Research, NATCO Pharma Ltd, gave a talk on "Bioequivalence and Bioavailability of Oral Formulations", wherein he described the bioequivalence study as an important step to understand the oral/extravascular formulation performance of the drug. He discussed all aspects of bioequivalence studies that are required for both New Drug Development and Generic Drug Development programs. The New Drug Development, he elaborated, are often conducted to know the food effect, drug-drug interactions and effect of change in the formulation of New Chemical Entity (NCE). However, during Drug Development, the formulation is changed several times due to various reasons. Dr. Ramana further explained on how



for every formulation, it is not necessary to repeat the toxicology, proof-of-concept and clinical studies, which is one of the reasons why Generic Drugs are made available to patients at lesser price worldwide.

Technical Session-2 was facilitated by Dr. P. G. Rao, Distinguished Scientist, CSIR-IICT [India], and encompassed four training lectures.

Dr. C. S. Venkatesan, Senior Vice President, Gland Pharma Ltd, delivered his lecture on "**Impurity Profiling in Generic Drugs**", wherein he pointed out impurities in drug substance to be very critical as they may influence the efficacy and safety of the pharmaceutical products. In the pharmaceutical industry, he disclosed, an impurity is considered as any other organic or inorganic material, or residual solvents other than the drug substance, or ingredients, that arise out of synthesis or unwanted chemicals that remain with drug substances. He explained the different types of impurities in generic drug substances and also elaborated on the decision tree for identification and qualification thresholds. Dr. Venkatesan further explained that impurities in drug products and drug substances are regulated by

various regulatory authorities such as ICH, USFDA, Health Canada, etc, which lay emphasis on the purity requirements of drug products, and in setting the acceptance criteria for impurities in drug substances.

Dr. A. Kalyan Chakravarthy, Head, Regulatory Affairs, Dr. Reddy's Laboratory, then delivered his lecture on the "**Regulatory Aspects of Generic Drugs**" and explained how regulatory involvement in the generic drug development process hastens the drug approval process which in turn accelerates the launching of the drug into the market. He further discussed on the few differences among the regulatory authorities, in the regulatory requirements for the registration and approval of generic medicines and the format of compiling drug dossiers. The key requirement, Dr. Chakravarthy explained, was an Abbreviated New Drug Application (ANDA) to be submitted by the pharmaceutical companies to the regulatory authorities for getting the approval to market a generic drug. This process, ANDA does not require the manufacturer to carry out repeat testing of generics in animals which is often time-

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consuming, as their branded versions had already been tested and approved for the safety and effectiveness; however, they are formulated when patent and other exclusivity rights of the innovator had expired.

Thereafter, **Dr. Srinivas Lanka**, Chairman, Elixir Global, delivered a talk on "**Key Aspects Pertaining to Generic Drugs – Case Studies**" and shared the pros and cons of manufacturing generic drugs locally. He highlighted the Indian Pharmaceutical Industry as a case study, wherein he mentioned that government institutions like IICT, Hyderabad; NCL, Pune, etc and a few foreign governments have helped set up the API technologies and formulation facilities in the country. Also, the fabrication, utilities, and local machine availability in India have ensured low-cost structure, whereas, the large domestic market, export promotion by government, and funds availability through banks have ensured growth of the industry and helped it to compete with firms from the developed countries. Dr. Lanka also discussed

the key concepts in portfolio selection of a drug which includes steps starting from identifying priority diseases based on incidence and impact, identifying molecules that have impact on the health care system, volume and value dimension; to screening steps like Biopharmaceutics Classification System (BCS) Classification, bioequivalence costs and challenges, risk in switch etc.

Dr. C. Raji Reddy, Senior Principal Scientist, CSIR-IICT, Hyderabad, then concluded the technical session with his lecture on "**Role of R & D in Syntheses of API's**", during which he specified syntheses of Active Pharmaceutical Ingredients (APIs) through efficient process as an important activity in generic pharmaceutical sector. He mentioned that a large number of organizations are involved in manufacturing the APIs towards generic drugs, having completely equipped to support both Good Laboratory Practice (GLP) and current Good Manufacturing Practice (GMP) regulations. The role of research & development (R&D) towards the development of novel processes for APIs, particularly the role of CSIR was also discussed with a few examples, during his lecture. Dr. Reddy further explained that in order to add value,



R&D focusing on APIs of generic drugs plays a key role in developing robust and economically viable manufacturing processes and also in transferring it to commercial manufacturers.

The **Concluding Session** was facilitated by **Dr. Prathama S. Mainkar**, Senior Principal Scientist & Chair, Organic Synthesis & Process Chemistry Department, CSIR-IICT, Hyderabad. The session had a **Panel Discussion** with all the eight Indian Speakers followed by a **Question-Answer Round** for clearing any doubt about various lectures during the training program. The panellists particularly addressed the aspects on the modalities of technology transfer; challenges



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involved in establishing the generic drug industry and advised them to focus more on formulations and API manufacturing for tapping the business opportunities as steps towards self-reliance.

Thought provoking questions were posed in the chat box by the delegates of participating countries. They were also answered by the experts and thus made best use of the virtual training platform.

The program ended with the participants posing virtually for a group photograph and expressing gratitude to the organisers and hosts – the NAM S&T Centre and IICT, for the excellent organisation and efficient coordination of the Training Program. The participants appreciated that the Training Program gave a comprehensive perspective on the various aspects of manufacturing a generic drug and facilitated them in understanding that although the profitability of generics is quite modest, but more often than not, the reason drug makers create such products is to increase the drugs' recognisability and availability.

(Contd. from Page 1 - Technopreneurship, Malaysia)

commercialisation and related issues. Converting technology arising out of academic research requires the entrepreneurs to possess different skill sets and knowledge, and a variety of support services and facilities are required to nurture start-up ventures. In the developing countries, one of the biggest impediments is to reach a high state of Technology Readiness Level (TRL) for successful commercialisation of a technology.

Taking this into consideration, the **NAM S&T Centre** and the **International Science, Technology and Innovation Centre for South-South Cooperation under the auspices of UNESCO (ISTIC)** – in collaboration with the **Malaysian Technology Development Corporation (MTDC)** organized an online International Workshop on **Technopreneurship for Developing Countries: Challenges and Opportunities in Technology Transfer and Commercialisation for Developing Countries**', during 24th – 25th November, 2020, to provide opportunities to innovators, potential entrepreneurs and researchers of the developing countries to develop their skills and knowledge in Technology Transfer & Commercialization and Technopreneurship. The workshop was hosted by ISTIC and organized in Virtual Mode.

The 2–Days Workshop was moderated by **Ms. Arni Balkish Mohamed Aris,** Vice President, Malaysian Technology Development Corporation Academy. Ms. Aris began the programme by welcoming everyone and giving a brief introduction about the workshop. Thereafter, she welcomed **Mdm. Tengku Sharizad Tengku Dahlan**, Director, ISTIC and **Dr. Amitava Bandopadhyay**, Director General, NAM S&T Centre and requested them to formally inaugurate the programme and deliver their opening remarks.

During the **Inaugural Session**, Mdm. Tengku Sharizad Tengku Dahlan spoke about the current challenges faced by the developing countries in the area of transfer and commercialisation of new technologies. She emphasised the need for holding such workshops and how it could further create a suitable ecosystem to promote *"Technopreneurship"* in the developing world. Thereafter, she spoke briefly about the ISTIC, a Category-2 Centre under the auspices of the UNESCO working towards developing and bolstering South-South Cooperation in Science, Technology and Innovation. She also thanked all the organisers and resource persons for planning and implementing the workshop on such a crucial and relevant topic for the developing world.

In his opening remarks, Dr. Amitava Bandopadhyay spoke about how technology, innovation and commercialisation are shaping economies of various countries worldwide. He also emphasised upon the role that technology transfer and commercialisation plays in nation building, and the need for capacity building to allow developing nations to reach a Technology Readiness Level (TRL) which would allow the commercialisation of technologies. Thereafter, Dr. Bandopadhyay provided a background about the NAM S&T Centre and its activities. He further expressed his gratitude to Datuk Dr. Siti Hamisah Bt Tapsir – the President of the 14th Governing Council of the NAM S&T Centre and Secretary General of the Ministry of Science, Technology and Innovation (MoSTI), Malaysia for her kind support and cooperation to the Centre. He also thanked everyone from ISTIC, MoSTI and MTDC for designing this informative and highly fruitful workshop.

The online workshop was attended by **54** participants from **17** countries, viz., Bhutan, Cambodia, Egypt, India, Indonesia, Iraq, Mauritius, Myanmar, Nepal, Nigeria, Pakistan, Palestine, Panama, Philippines, South Africa, Sri Lanka and the host country Malaysia. The 2 – Day programme was conducted in 8 sessions. A summary of the proceedings of various technical sessions is given below:

DAY 1: 24 NOVEMBER 2020

All the sessions of Day – 1 were conducted by **Dr. Wan Raihana Wan Aasim**, Vice President, Malaysian Technology Development Corporation.

TECHNICAL SESSION-I

In the first session, Dr. Wan Raihana Wan Aasim delivered a very informative lecture on, **'Lab to Market –** *The Journey*'. In the lecture, Dr. Aasim spoke about fundamentals of commercialisation and the process thereof. She explained the options available to researchers from publishing the results of their research to apply for a patent and commercialisation of their invention. She also emphasised on the role of universities and researchers for commercialisation of their research results. She informed the gathering about the term *"Valley of Death"* in the proof-of-concept phase. The session ended with Q&A in which Dr. Aasim answered several questions raised by the attendees.





(Contd. from Page 8 - Technopreneurship, Malaysia)

TECHNICAL SESSION – II

The second session was on 'Lab to Market – Challenges, Tips and Tricks' by Dr. Wan Raihana Wan Aasim. In this session Dr. Aasim spoke on several issues on commercialisation like delay in development and how market requirements change by the time research ends. She busted some myths and opened the eyes of the attendees about the hard realities of commercialisation. She used the 'Professor and his Durian Fruit' anecdote to eloquently explain the challenges towards commercialisation. She ended her lecture by giving useful and handy tips on overcoming the common issues and challenges towards commercialisation. The session ended with Q&A in which Dr. Aasim answered questions like policy and regulation related issues and factors influencing research and commercialisation.

TECHNICAL SESSION – III

The third session by Dr. Aasim was on 'Researchers are from Mars, Entrepreneurs from Venus: How to Find Common Ground for Successful Commercialisation'. This session focused on differing viewpoints of entrepreneurs and researchers. She spoke on how researchers and entrepreneurs have different expectations from commercialisation and emphasised upon the need for entrepreneurs and researchers to work together and find a common ground for successful commercialisation of a viable research project. She also highlighted the benefits of working together such as sharing of resources and easy access to funds. The session ended with a brief Q&Around.

TECHNICAL SESSION – IV

Dr. Aasim's fourth session was on **'Lab to Market – Mind Mapping R&D Journey'**. She described the entire journey associated with entrepreneurship from inception of an idea to the commercialisation of a new product born out of the idea. This message was illustrated by conducting an interactive session in the form of three creative tests. Dr. Aasim then went on to describe several challenges including the ups and downs technopreneurs have to face before achieving commercialisation of their invention. She also explained the concept of *Fail Fast, Fail Often* methodology as opposed to the *Traditional Approach* involved in the *Design, Build and Test* process. She also informed everyone about the funding schemes available at MTDC to help entrepreneurs. She concluded her lecture by showcasing actual success stories of entrepreneurs who have patented and commercialised or are in the final stages of commercialisation of their inventions. The last session of the day ended with a brief Q&A session.

DAY 2: 25 NOVEMBER 2020

On Day – 2 of the programme Ms. Aris welcomed all the attendees once again and invited Dr. Aasim back to deliver her last session for the programme.

TECHNICAL SESSION – V

The first session of the day was on 'IP Strategy for New Market'. In this session, Dr. Aasim covered topics such as, 'What is Intellectual Property and its types as well as the need for IP and its uses'. She emphasised the need for encouraging innovation and how IP can be the driver of economic growth. She explained how it drives the economy by generating revenue, creating employment opportunities and also new sources of returns for the government. She spoke on seven different types of IP and also about IP as a source of revenue stream. The session ended with a brief Q&A session in which Dr. Aasim answered several pertinent questions like 'Double Taxation' and 'Industry owned IP'.

TECHNICAL SESSION – VI

The speaker for this session was **Dr. Mahaletchumy Arujanan**, Global Coordinator of the International Service for the Acquisition of Agribiotech Applications (ISAAA) and the Executive Director of Malaysian Biotechnology Information Centre (MABIC), and the session was on 'Science Communication for Commercialisation'. In this session, Dr. Arujanan spoke about how diversity in public and their opinion influence decision making of policy makers and in-turn how it influences the environment for entrepreneurs. She appraised the attendees about the importance of cultivating a scientific temper and encouraging science driven social changes. She also highlighted the difficulty entrepreneurs would encounter when their invention is not socially acceptable. She explained that science communication and building a nurturing environment for entrepreneurs are closely linked, and how diversity among the public raise concerns due the heterogeneous customs, culture and social functioning. She was vocal about the need to increase the discussion on Science and Technology to ensure widening and engendering



need to increase the discussion on *Science and Technology* to ensure widening and engendering scientific bend of mind in people. Perceptions, superstitions, cultural and personal beliefs are often at loggerheads and she articulated the need for starting dialogue and widening the scientific thought process among people. The session ended with a brief Q&A session.

TECHNICAL SESSION – VII

The speaker for this session was **Mr. Asyraf Abdul Rahman**, Managing Director of Ideaspar Robotics Sdn Bhd, a mobile robot company in Malaysia, and the session was on, 'How the Covid-19 Pandemic Became the Innovation Catalyst for Technology Based Company/Entrepreneurship'. In this session, Mr. Rahman began with speaking about Ideaspar Robotics; its genesis, and how it recognised the need to reduce the interaction between health service providers and patients, and explored the possibility of designing and developing robots. He further elaborated upon the collaboration between MTDC, Ministry of Science, Technology and Innovation (MoSTI), Malaysia and Ministry of Housing and Local Government, Malaysia for making the most of the National Technology and Innovation Sandbox (NTIS) under which they were able to develop three autonomous robots through a joint consortium program between three companies. Thereafter, he spoke about several challenges and roadblocks for



establishing a start-up successfully. The session ended with a short video on the robots developed by his company and how they are being used in healthcare setups. This was followed by a brief Q&A session.



(Contd. from Page 9 - Technopreneurship, Malaysia)

TECHNICAL SESSION – VIII

The speaker for this session was **Dr. Yeong Che Fal**, Associate Professor at the Universiti Teknologi Malaysia and the session was on 'A Case Study: How Technology Products Became Hero during the **Pandemic (Sharing from MTDC Companies)**'. The session began with a self-introduction in which he said he is a Professor starting to build a start-up. He proceeded to speak about the two things needed for building a robot:



- Programming the brain of the robot
- Designing and integration of sensors; use of Internet of Things (IoT) for device-to-device communication.

He, thereafter, spoke on the projects he was working on with support from the National Technology Innovation Sandbox (NTIS). One of the projects is to supply Healthcare Delivery Robot or nicknamed as Mak Cik Kiah 19 (MCK19) to hospitals to assist front-liners to deliver meals and medicines. The second project is an Autonomous UV Disinfection Robot. This robot can move autonomously in premises while eliminating viruses and bacteria using UV light. He showed a few short videos about the real-world application of the robots. The session ended with a brief Q&A session.

Technical Session – VIII was the last session of the 2 – Day programme, after which Ms. Aris invited Mdm. Tengku Sharizad Tengku Dahlan to deliver the closing remarks.

In her **closing remarks**, she thanked the NAM S&T Centre for their support and cooperation in jointly organising the workshop. She also expressed her gratitude towards the Resource Persons for delivering informative and highly valuable talks on several important areas concerning technoprenuership in developing countries. She thanked all the attendees for investing their time and attending the workshop. She also informed the gathering about an upcoming workshop of ISTIC on the topic 'Open Innovation'.

The participants expressed gratitude to the organisers and hosts – ISTIC – UNESCO, MTDC and the NAM S&T Centre for the opportunity to attend the well organised, fruitful and productive workshop. They acknowledged the value of organising such online workshops which provided them the opportunity to acquaint themselves with other researchers and professionals from around the world even during the times of a global pandemic. Attendees acknowledged that the programme provided an excellent platform for them to connect with professionals with similar background and interest, and to also explore avenues of future collaboration.

SCIENCE FORUM SOUTH AFRICA 2020 STILL IGNITING CONVERSATIONS ABOUT SCIENCE 9-11 DECEMBER 2020

The Science Forum South Africa (SFSA) 2020, this time, took place on a virtual platform from 9-11 December 2020, with an objective to reflect on the "Role of Science and Critical Thinking in Society" prompted by the events of 2020 and changing conditions of the world. The South African Department of Science and Innovation (DSI) organised the SFSA 2020 in partnership with the Human Sciences Research Council's (HSRC's) Radical Reason Consortium and European South African Science and Technology Advancement Programme (ESASTAP). Like previous five years, the NAM S&T Centre participated in this Conference, and deputed two of its scientists, Ms. Jasmeet Kaur and Ms. Gloria Susan Cherian, Programme Officers to attend various sessions of the SFSA.

The Forum reflected on the various partnership initiatives led by the DSI as part of South Africa's chairmanship of the African Union 2020. As usual, the Pan-African Cooperation in Science was a significant focus of the Forum agenda. Through ESASTAP, a special focus was given on cooperation with the European Union.

On 9 December 2020, the SFSA commenced with a **Welcome and Opening Address** by Dr. Blade Nzimande, South Africa's Minister of Higher Education, Science and Innovation. Dr. Nzimande, in his address expressed his pleasure that the science conversation could be continued in spite of the complexities created by COVID-19. He set forth the three main objectives which he hoped that SFSA 2020 will achieve: (i) Views of stakeholders of key science policy issues to be debated will form South Africa's new decadal plan for STI between 2020 and 2030; which is currently under preparation; (ii) Forum will continue to facilitate new science and innovation partnerships especially pan-african and global dimensions; (iii) Discussions on the present societal challenges should be translated into concrete actions which will make qualitative difference especially amongst the vulnerable section of the society. He thanked HSRC's *Radical Reason Consortium* for their contribution through intervention of humanities and social sciences and prominently featuring key societal challenges on this year's agenda. He also acknowledged South Africa's strategic science and innovation partnership with the European Union and appreciated the support of ESASTAP in the organization of SFSA2020.

This was followed by a **Special Message** by the African Union Commissioner for Human Resources, Science and Technology, Prof Sarah Anyang Agbor, who thanked the government and people of Republic of South Africa for yet again organizing the SFSA and building momentum in crucial policy and program debates on developmental challenges and their solutions through Science, Technology and Innovation. "It is now time for governments to be true to their word and invest in education, science and technology, and in doing this ensure African solutions to African problems," she added.

During the intervals, the recorded **Messages of Support** from the strategic international partners of SFSA were played including the one by Dr. Amitava Bandopadhyay, Director General of the Centre for Science & Technology of the Non-Aligned and Other Developing Countries (NAM S&T Centre), New Delhi.

This was followed by a plenary lecture by two internationally-acclaimed South African scientists renowned for their work in the fight against HIV-AIDS and recently Covid-19 - Prof. Salim Abdool Karim, Director and Prof. Quarraisha Abdool Karim, Associate Scientific Director, Centre for the AIDS Programme of Research in South Africa, who gave reflections on their



careers devoted to **'Science for Social Justice.'** Prof. Salim in his lecture summarized his 35 years of inspirational journey in which he used science and collected data and projected available evidence for social justice. He took up issues like early days challenges of apartheid, HIV, related stigma, ethics, human rights, AIDS denialism and science for social justice, etc. Whereas Prof. Quarraisha in her lecture recapitulated her 3 decades' journey on HIV prevention focusing women, flagging out issues like gender inequalities and how it can be addressed through Science.

Thereafter, Prof. Quarraisha and Prof. Salim got honored with the prestigious **'500 Years of the Strait of Magellan Award'** by the Chilean Ambassador to South Africa, H.E. Ambassador Francisco Javier Berguño Hurtado, in recognition for their pioneering scientific work in HIV-AIDS and contribution to humanity.

A presentation on the 'Science Forum South Africa 2020 Programme' on behalf of the HSRC Radical Reason Consortium was given by Prof. Crain Soudien, CEO of the HSRC. He explained at length about the preparatory exercises in developing the SFSA-2020 programme.

The day ended with a plenary programme item of the opening day of SFSA 2020 on **HSRC Consortium Book Launch: "The Fabric of Dissent: Public Intellectuals in South Africa'** edited by Vasu Reddy, Narnia Bohler-Muller and Greg Houston (HSRC Press, 2020).

The three days Forum comprised of **9 Virtual Rooms** under which **44 different Parallel Sessions** were held, all deliberating the critical interface between science and society. The sessions held under each virtual room are described below:

10 December 2020

Special SFSAPlenary Debate "The Future of Trans-disciplinarity: How do we Relearn to be Human in New Ways?"

VIRTUAL ROOM 1	Conversations with Global Thinkers: Shaj Mohan
	Combating Violence Against Women: Advancing Gender and Social Justice"
	Conversations with Global Thinkers: Boaventura de Sousa Santos and Sabelo Ndlovu-Gatsheni
	African Philosophies and Histories of Technology: Global Narratives of Artificial Intelligence
VIRTUAL ROOM 2	Influencing Science in Africa through a Gendered Lens – A Decade of Progress or Stagnation?
	Roundtable Discussion: Discourses of Race
	The South African Protection of Personal Information Act No 4 of 2013: A Code of Conduct for Research
	Government and Social Partner Responses to the COVID19 Pandemic: Early Observations & Reflections
VIRTUAL ROOM 3	Promoting Diversity and Inclusion in Science
	Education and Social Justice: Themes, Debates and Dilemmas in Post Apartheid South Africa
	Being ALHIV': What Do We Know About HIV Adolescents Living in South Africa? (A Youth Dialogue)
	Integrating Gender Across Sustainable Development Goals Research in South Africa
VIRTUAL ROOM 4	Presenting the Pan African Network for Economic Analysis of Policies (PANAP)
	Using Earth Observation and Open Geo-information for SDG Monitoring and Decision Making
	Africa-EU Cooperation Best Practices in Healthcare and Nutrition
	Smart Specialization Policies for Green Industrial and Territorial Transformations in Sub-Saharan Africa: Evidence Gaps & Institutional Requirements
VIRTUAL ROOM 5	National Big Data Hubs and the Strategic Role of International Collaboration
	The Presidential Employment Stimulus: Research Opportunities
	Sustainable Business Modelling for Cleantech
	Sustainable Innovation Policy: Building Back Greener: Opportunities Across the Board
VIRTUAL ROOM 6	Improving Work Skills and Employability: Lessons Learnt from Europe and South Africa Collaboration
	Climate Change: Reflection on Five Years of Paris Agreement
	Open Science: Future of Science, Science of the Future
	Technology Transfer from Academia to Industry
VIRTUAL ROOM 7	Technology Assessment in Energy & Agricultural Sectors in Africa to Accelerate Progress in Science, Technology & Innovation
	Indigenous Knowledge Systems: Flagship for African Science
	International Cooperation for Sustainable Development: A South Africa – Norway Case
	Building Capacity for an African Platform for Science Advisors
VIRTUAL ROOM 8	Legacy of South Africa's AU Chairship: Trade and Innovation under the African Continental Free Trade Area
	Looking into Africa's Future: The Fourth Industrial Revolution and the Role ICT Education
	The Policy & Practice of Drug, Alcohol & Tobacco use during COVID-19
	Transformative Innovation Policy Consortium: Building a Community of Practice in Southern Africa
VIRTUAL ROOM 9	Digital Inclusion Research and Covid-19
	Advancing Careers in the Natural Scientific Professions
	The Role of the Scientific Community in Disaster Response: Lessons from COVID-19
	Ethanol: Benefits and Technological Possibilities



(Contd. from Page 11 - SFSA 2020, South Africa)

Evening Programme: Conversations with Global Thinkers: Homi Bhabha and Premesh Lalu (HSRC Consortium) HSRC Consortium Book Launch: Rock, Water, Life: Ecology and Humanities for a De-colonial South Africa		
11 December 2020		
VIRTUAL ROOM 1	Roundtable Discussion: Research Excellence, Peer Review and Epistemic Justice	
VIRTUAL ROOM 2	South Africa – China Science Park Cooperation	
VIRTUAL ROOM 3	African Platform for Science Advisors: Developing COVID-19 Policy Responses	
VIRTUAL ROOM 4	South Africa – Ireland Technology Development Fund	
VIRTUAL ROOM 5	Showcase for African Science: Agricultural Technology	
VIRTUAL ROOM 6	Strengthening Africa's Medicine Manufacturing Capacities	
VIRTUAL ROOM 7	Water Quality and Health Research, Development, and Innovation Excellence and Partnership in the Indian Ocean Region	
VIRTUAL ROOM 8	Science Diplomacy: Considering the Health Diplomacy Response to COVID-19	
The Closing Sess presented by the S (<i>C4IR</i>). The debat governance of the opened the sessio Fulufhelo Nelwam presentation on th (C4IR-SA). The se academia, industr	sion began with a Plenary Debate on 'Disruptive Technology: Narrowing or Widening Inequality' South African Affiliate Centre of the World Economic Forum's <i>Centre for the Fourth Industrial Revolution</i> e focused on effectively addressing the challenges of poverty, unemployment and inequality through 4IR and its disruptive technologies. Prof. Alison Gillwald, Executive Director, Research of ICT Africa, n with a critique of the contemporary response to the 4IR and gave a rhetoric vision of digital future. Prof. onda, Executive Manager, NextGen Enterprises and Institutions Cluster of CSIR followed this up with a e value proposition of collaboration with the South African Centre for the Fourth Industrial Revolution ession was concluded with a panel discussion featuring various representatives from government, y, and civil society. The SFSA annual episode got wrapped up with concluding remarks by South Africa's	

Science, Technology & Innovation News

Deputy Minister of Higher Education, Science and Innovation, Mr. Buti Manamela. He hoped that the digital programme presented, rich in guality, diversity and relevance, justified the Forum's motive of igniting conversations about Science.

RESEARCH AND DEVELOPMENT

World's First Room Temperature Superconductor

Scientists have created a mystery material that seems to conduct electricity without any resistance at temperatures of up to about 15 °C. That is a new record for superconductivity, a phenomenon usually associated with very cold temperatures. The material itself is poorly understood, but it shows the potential of a class of superconductors discovered in 2015. The superconductor has one serious limitation, however - it survives only under extremely high pressures, approaching those at the centre of Earth, meaning that it will not have any immediate practical applications. Still, physicists hope it could pave the way for the development of zero-resistance materials that can function at lower pressures. The latest study, published in Nature on 14 October, 2020, seems to provide convincing evidence of high-temperature conductivity, says physicist Mikhail Eremets at the Max Planck Institute for Chemistry in Mainz, Germany — although he adds that he would like to see more "raw data" from the experiment. He adds that it vindicates a line of work that he started in 2015, when his group reported the first high-pressure, high-temperature superconductor — a compound of hydrogen and sulfur that had zero resistance up to -70 °C.

In 2018, a high-pressure compound of hydrogen and lanthanum was shown to be superconductive at -13 °C. But the latest result marks the first time this kind of superconductivity has been seen in a compound of three elements rather than two — the material is made of Carbon, Sulfur and Hydrogen. Adding a third element greatly broadens the combinations that can be included in future experiments searching for new superconductors, says study co-author Ashkan Salamat, a physicist at the University of Nevada, Las Vegas.

Source: www.nature.com; October 14, 2020

Artificial Intelligence Improves Control of Powerful Plasma Accelerators

Researchers have used AI to control beams for the next generation of smaller, cheaper accelerators for research, medical and industrial applications. Experiments led by Imperial College London researchers, using the Science and Technology Facilities Council's Central Laser Facility (CLF), showed that an algorithm was able to tune the complex parameters involved in controlling the next generation of plasma-based particle accelerators. The algorithm was able to optimize the accelerator much more quickly than a human operator, and could even outperform experiments on similar laser systems. These accelerators focus the energy of the world's most powerful lasers down to a spot the size of a skin cell, producing electrons and X-rays with equipment a fraction of the size of conventional accelerators. The electrons and X-rays can be used for scientific research, such as probing the atomic structure of materials; in industrial applications, such as for producing consumer electronics and vulcanised rubber for car tyres; and could also be used in medical applications, such as cancer treatments and medical imaging. Several facilities using these new accelerators are in various stages of planning and construction around the world, including the CLF's Extreme Photonics Applications Centre (EPAC) in the UK, and the new discovery could help them work at their best in the

(Contd. from Page 12 - STI News)

future. The results are published in Nature Communications. "Plasma accelerator technology provides uniquely short bursts of electrons and X-rays, which are already finding uses in many areas of scientific study. With our developments, we hope to broaden accessibility to these compact accelerators, allowing scientists in other disciplines and those wishing to use these machines for applications, to benefit from the technology without being an expert in plasma accelerators."The team worked with laser wakefield accelerators. These combine the world's most powerful lasers with a source of plasma (ionised gas) to create concentrated beams of electrons and X-rays. Traditional accelerators need hundreds of metres to kilometres to accelerate electrons, but wakefield accelerators can manage the same acceleration within the space of millimetres, drastically reducing the size and cost of the equipment. However, because wakefield accelerators operate in the extreme conditions created when lasers are combined with plasma, they can be difficult to control and optimise to get the best performance. In wakefield acceleration, an ultrashort laser pulse is driven into plasma, creating a wave that is used to accelerate electrons. Both the laser and plasma have several parameters that can be tweaked to control the interaction, such as the shape and intensity of the laser pulse, or the density and length of the plasma. While a human operator can tweak these parameters, it is difficult to know how to optimise so many parameters at once. Instead, the team turned to artificial intelligence, creating a machine learning algorithm to optimise the performance of the accelerator. The algorithm set up to six parameters controlling the laser and plasma, fired the laser, analysed the data, and re-set the parameters, performing this loop many times in succession until the optimal parameter configuration was reached. Lead researcher Dr Matthew Streeter, said: "Our work resulted in an autonomous plasma accelerator, the first of its kind. As well as allowing us to efficiently optimise the accelerator, it also simplifies their operation and allows us to spend more of our efforts on exploring the fundamental physics behind these extreme machines." The teams demonstrated their technique using the Gemini laser system at the CLF, and have already begun to use it in further experiments to probe the atomic structure of materials in extreme conditions and in studying antimatter and quantum physics.

Source: www.imperial.ac.uk; December 11, 2020

Bio-Inspired Materials for Energy & Biotechnology Sector

Scientists have developed a synthetic material that mimics the dynamic capability of living organisms to adapt to new environments by utilizing simple natural design principles to create complex networks. The new materials developed opens new avenues for smart materials because of their dynamic and adaptive nature. Hence, they would be useful as recyclable polymers for the energy and biotechnology sector. Reduction–oxidation (redox) processes are central to many biological functions. Cellular functions like growth, motility, and navigations depend on assembling of biopolymers whose dynamic behavior is linked to a redox reaction in which enzymes are involved. Nature synthesizes these biopolymers controlling their size and dispersity to regulate their functions, without which their sophistication and efficacy are affected. Researchers have been trying to mimic such complex structural control based on chemical reaction networks.

Scientists from the *Jawaharlal Nehru Centre for Advanced Science and Research (JNCASR)*, Bengaluru, India have developed a synthetic mimic of such redox-active biological assemblies, with precise structure and dynamics that can be manipulated. In their recently published work in *Nature Communications*, Prof. Subi George and his group have shown that such bio-inspired structures are formed by assembling transient dormant monomeric molecules (basic units of polymers) by coupling them to a reduction-oxidation reaction network. They form a chemical entity called supramolecular polymers with strikingly dynamic properties. The properties arise because they are connected by non-covalent bonds, which are reversible bonds that hold their chains together. These dynamic properties open up prospects of many new applications of these materials. The research by the team is a major step towards the goal of chemists to harness blueprints of life to design innovative materials and provide future energy or biotechnology-related solutions.

Source: www.pib.nic.in; October 17, 2020

PUBLIC HEALTH AND WELLBEING

New Digital Health Research Toolkit for TB Care

TDR, in partnership with the WHO Global Tuberculosis Programme, has developed an interactive web-based toolkit that supports national TB programmes and other partners to conduct implementation research designed to evaluate digital technologies for TB care. This will be launched at a workshop taking place in Beijing, China.

The persistence of the tuberculosis (TB) epidemic demands innovative approaches to TB care and prevention. Digital technologies present novel ways to improve patient-centred care or to make better use of resources by TB programmes. Thus, digital technologies are emerging as important tools to advance progress towards reaching targets of the WHO End TB Strategy and political declaration of the UN High Level Meeting on TB in 2018. These technologies are even more critical in times of crisis, such as the current COVID-19 pandemic. However, barriers to effective implementation and scale-up of innovations are often context-specific and may require different approaches depending upon the setting. Implementation research (IR) is the systematic approach to recognizing, understanding and addressing barriers to implementation and scale-up of effective and quality health interventions, strategies and policies. IR provides an important approach to evaluating how innovations like digital technologies can be used to overcome challenges in TB care, and to generate evidence that can guide their future introduction and scale-up in other settings. The content of the toolkit is also relevant to the application of digital technologies for other health conditions, including COVID-19.

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The Implementation Research for Digital Technologies and TB (IR4DTB) toolkit aims to build capacity in IR and help fill knowledge gaps around using and scaling up digital technologies for TB care. The interactive toolkit comprises six modules that reflect key steps in the IR process: Preparing for implementation research; Developing IR objectives and questions; Research methods; Data management and analysis; Planning and conducting IR; and Knowledge translation. The toolkit will be launched during a five-day training workshop in Beijing, China, organized by the Chinese Centre for Disease Control and Prevention and the Chinese Anti-TB Association, in collaboration with TDR and the WHO Global TB Programme.

"The WHO Global TB Programme and TDR are helping countries to collect evidence on innovative digital technologies to improve TB prevention and care" said Tereza Kasaeva, Director of the WHO Global TB Programme. "The toolkit and the training course will help countries to mount more effective interventions and to contribute to global policy, at this critical juncture when TB practitioners face the added challenge of COVID-19"

Source: www.who.int; November 24, 2020

SUSTAINABLE AND CLEAN ENERGY

Making Green Hydrogen a Cost-Competitive Climate Solution

As global economies turn increasingly carbon neutral, IRENA drives hydrogen agenda and sees renewable hydrogen at least cost possible within decade. Hydrogen produced with renewable electricity could compete on costs with fossil fuel alternatives by 2030, according to a new report published by the International Renewable Energy Agency (IRENA). A combination of falling costs for solar and wind power, improved performance as well as economies of scale for electrolysers could make it possible. 'Green Hydrogen Cost Reduction: scaling up electrolysers to meet the 1.5° climate goal' looks at drivers for innovation and presents strategies that governments can peruse to reduce the cost of electrolysers by 40% in the short term and by up to 80% in the long term.

Green hydrogen could play a critical role in decarbonisation strategies, particularly so where direct electrification is challenging in harder-to-abate sectors, such as steel, chemicals, long-haul transport, shipping and aviation. However, regulations, market design and the costs of power and electrolyser production are still major barrier to the uptake of green hydrogen. "Renewable hydrogen can be a game-changer in global efforts to decarbonise our economies", said Francesco La Camera, Director-General of IRENA. "Levelling the playing field to close the cost gap between fossil fuels and green hydrogen is necessary. Cost-competitive green hydrogen can help us build a resilient energy system that thrives on modern technologies and embraces innovative solutions fit for the 21st century."

Today, green hydrogen is 2-3 times more expensive than blue hydrogen, produced from fossil fuels in combination with carbon capture and storage (CCS). The production cost for green hydrogen is determined by the renewable electricity price, the investment cost of the electrolyser and its operating hours. Renewables have already become the cheapest source of power in many parts of the world, with auctions reaching



power in many parts of the world, with auctions reaching record price-lows below USD 20 per megawatt-hour (MWh). While low-cost electricity is a necessary condition for competitive green hydrogen, investment costs for electrolysis facilities must fall significantly too.

IRENA's new study identifies key strategies and policies to reduce costs for electrolysers through innovation and improved performance aiming to scale up electrolysers from today's megawatt to multi-gigawatt (GW) levels. Standardisation and mass-manufacturing of the electrolyser stacks, efficiency in operation as well as the optimisation of material procurement and supply chains will be equally important to bring down costs. For that, today's manufacturing capacity of less than 1 GW would have to massively grow beyond 100 GW in the next 10 to 15 years.

In the best-case scenario, using low-cost renewable electricity at USD 20 USD/MWh in large, cost-competitive electrolyser facilities could produce green hydrogen at a competitive cost with blue hydrogen already today. If rapid scale-up and aggressive electrolysers deployment take place in the next decade, green hydrogen could then start competing on costs with blue hydrogen by 2030 in many countries, making it cheaper than other low-carbon alternatives before 2040, IRENA's analysis shows.

Source: www.irena.org; December 17, 2020

Renewable Power is Defying the Covid Crisis with Record Growth

Renewable power is growing robustly around the world this year, contrasting with the sharp declines triggered by the Covid-19 crisis in many other parts of the energy sector such as oil, gas and coal, according to a report from the International Energy Agency released today. Driven by China and the United States, new additions of renewable power capacity worldwide will increase to a record level of almost 200 gigawatts this year, the IEA's Renewables 2020 report forecasts. This rise – representing almost 90% of the total expansion in overall power capacity globally – is led

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by wind, hydropower and solar PV. Wind and solar additions are set to jump by 30% in both the United States and China as developers rush to take advantage of expiring incentives.

Even stronger growth is to come. India and the European Union will be the driving forces behind a record expansion of global renewable capacity additions of nearly 10% next year – the fastest growth since 2015 – according to the report. This is the result of the commissioning of delayed projects where construction and supply chains were disrupted by the pandemic, and growth in markets where the pre-Covid project pipeline was robust. India is expected to be the largest contributor to the renewables upswing in 2021, with the country's annual additions doubling from 2020.

Over the first 10 months of 2020, China, India and the European Union have driven auctioned renewable power capacity worldwide 15% higher than in the same period last year – a new record that shows expectations of strong demand for renewables over the medium and long term. At the same time, shares of publicly listed renewable equipment manufacturers and project developers have been outperforming most major stock market indices and the overall energy sector. By October, shares of solar companies worldwide had more than doubled in value from December 2019. Renewable fuels for transport and industry are an area in particular need of potential policy support, as the sector has been severely hit by the demand shock caused by the crisis. More can and should be done, to support deployment and innovation in bioenergy to supply sustainable fuels for those sectors. The report's outlook for the next five years sees cost reductions and sustained policy support continuing to drive strong growth in renewable power technologies. Total wind and solar PV capacity is on course to surpass natural gas in 2023 and coal in 2024. Driven by rapid cost declines, annual offshore wind additions are set to surge, accounting for one-fifth of the total wind market in 2025. The growing capacity will take the amount of renewable electricity produced globally to new heights.

Source: www.iea.org; November 10, 2020

ENVIRONMENT AND BIODIVERSITY

World could lose coral reefs by end of century, UN environment report warns

Every one of the world's coral reefs could bleach by the end of the century, unless there are drastic reductions in greenhouse-gas emissions, the United Nations Environment Programme (UNEP) has warned. "In the face of inaction, coral reefs will soon disappear," Leticia Carvalho, head of UNEP's Marine and Freshwater Branch said on Monday. "Humanity must act with evidence-based urgency, ambition and innovation to change the trajectory for this ecosystem, which is the canary in the coalmine for climate's impact on oceans, before it's too late." Coral reefs are incredibly important and sustain a wide variety of marine life. They also protect coastlines from erosions from waves and storms, sink carbon and nitrogen and help recycle nutrients. Their loss would have devastating consequences not only for marine life, but also for over a billion people globally who benefit directly or indirectly from them. When water temperatures rise, corals expel the vibrant microscopic algae living in their tissues. This phenomenon is called coral bleaching. Though bleached corals are still alive and can recover their algae, if conditions improve. However, the loss puts them under increased stressed, and if the bleaching persists, the corals die. The last global bleaching event started in 2014 and extended well into 2017. It spread across the Pacific, Indian and Atlantic oceans, and was the longest, most pervasive and destructive coral bleaching incident ever recorded. In its report Projections of Future Coral Bleaching Conditions, UNEP outlines the links between coral bleaching and climate change. It postulates two possible scenarios: a "worst-case scenario" of the world economy heavily driven by fossil fuels; and a "middle-of-the-road" wherein countries exceed their current pledges to limit carbon emissions by 50 per cent.

Under the fossil-fuel-heavy scenario, the report estimates that every one of the world's reefs will bleach by the end of the century, with annual severe bleaching occurring on average by 2034, nine years ahead of predictions published three years ago. This would mark the point of no return for reefs, compromising their ability to supply a range of ecosystem services, including food, coastal protection, medicines and recreation opportunities, the report warns. Should countries achieve the "middle-of-the-road" scenario, severe bleaching could be delayed by eleven years, to 2045, adds UNEP. Report's lead author Ruben van Hooidonk, a coral researcher with America's National Oceanic and Atmospheric Administration (NOAA), said "the sad part is that the projections are even more dire than before." "It means we really need to try to reduce our carbon emissions to save these reefs. This report shows that we need to do it even more urgently and take more action because it's even worse than what we thought."

According to UNEP, while it is not known exactly how corals acclimate to changing temperatures, the report examines the possibility of these adaptations assuming between 0.25 degree Celsius and 2 degrees Celsius of warming. It found that every quarter degree of adaption leads to a possible seven-year delay in projected annual bleaching: that means corals could receive a 30-year reprieve from severe bleaching if they can adapt to 1 degree Celsius of warming. However, if humanity keeps up with its current greenhouse-gas emissions, corals won't survive even with 2 degrees Celsius of adaptation.

"What this shows is even with the adaptation, we need to reduce our emissions to buy time for those locations (where) we can do restoration efforts and keep corals alive," said Mr. van Hooidonk.

Source: news.un.org ; December 22, 2020

Threatened Species Lack Sufficient Protection

A failure by governments to deliver on commitments under a global nature conservation treaty, the Convention on Biological Diversity, could have devastating effects. The warning comes after a consortium of scientists, led by Dr. Sean Maxwell and Professor James Watson from the University of Queensland, reviewed national area-based

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conservation efforts, including protected areas. In 2010, almost all nations agreed that area-based conservation efforts must cover at least 17 per cent of land and 10 per cent of ocean by 2020, in areas that are important for biodiversity and ecosystem services. "We reviewed progress toward this target by overlaying maps of protected areas on natural ecosystems, threatened species, carbon services on land and sea, and fisheries productivity in the world's oceans," Dr. Maxwell said. The scientists found some welcome progress, particularly in the marine realm, since global environmental targets were agreed. But terrestrial protected area expansion needed to be double what it was in the past decade in order to achieve 17 per cent coverage for land and freshwater environments. There is also alarming shortfalls in ecological representation and management effectiveness, and measurable biodiversity outcomes persist in area-based conservation efforts. They found that 78 per cent of known threatened species and more than half of all ecosystems on land and sea remain without adequate protection. And seven of the world's most productive at-sea fisheries have no formal protected area coverage. The researchers also reviewed how effective and equitable protected area management has been, given these criteria featured in the 2010 targets. "We know that adequately funding protected areas are one of our best tools for reducing threats to biodiversity," Dr Maxwell said. "Yet the current financial shortfall for area-based conservation likely exceeds the multi-billion dollar mark, and as much as 90 per cent have inadequate or below optimum on-site staff capacity."

Professor Watson, of UQ and the Wildlife Conservation Society, said the next round of conservation targets, which were meant to be set this year, is fundamental to the future of global biodiversity. "It is obvious that governments have dramatically underinvested in protected areas and been weak in legally protecting them," Professor Watson said. For biodiversity to have any chance to survive climate change, he continued, nations must invest more resources in consolidating area-based conservation efforts and ensuring biodiversity conservation is a far stronger part of managed land and seas. There are significant opportunities to better recognise and support conservation by indigenous peoples, local communities and private actors, but the need now is to embrace new models for land stewardship that rewards good behaviour by farmers, developers and miners.

Source: www.uq.edu.au; October 07, 2020

