Plenaries and Discussion Panel: Speeches and Sumnmaries

New Approaches for the Manufacture of Pharmaceutical Products

Dr. Kamaluddin Abdur-Rashid
Kamal Pharmachem Inc., Ontario, Canada

Global pharmaceutical sales currently exceed $1 trillion annually. For many decades the market was dominated by large, branded pharmaceutical companies that for the most part focused on meeting regulatory requirements but relied on inefficient manufacturing processes. The emergence and increasing dominance of the generic pharmaceutical market impelled companies to reconsider manufacturing practices and the acceptable cost of pharmaceutical products. The incorporation of superior manufacturing processes and technologies reduces wastes, increases profitability and can offset and deter generic competition after the expiration of patents. The new pharmaceutical manufacturing landscape provides opportunities for companies that specialise in the development and applications of new technologies and processes. This talk will focus on the development and applications of catalytic processes for the manufacture of pharmaceutical products. Specific examples of work done on behalf of and in partnership with both branded and generic companies will be presented. Current development of new technologies, including those that target the emergence of stable isotope pharmaceutical products, will also be discussed.

Speaker's Profile:

Dr. Kamaluddin Abdur-Rashid *received his Ph.D. in 1994 from The University of the West Indies, Mona Campus, Jamaica, under the supervision of Professor Tara Dasgupta. He subsequently joined Professor Bob Morris' group at the University of Toronto (1998-2002) as a Research Associate where he spearheaded the group's quest into pure and applied catalysis research. His discoveries led to the development of new classes of organometallic catalysts and their applications in organic synthesis, including industrial use. In 2004 he founded Kanata Chemical Technologies Inc. which was subsequently acquired by a group of investors in 2013. In September 2013 he founded Kamal Pharmachem Inc. to focus on the applications of catalyst technologies in the growing global pharmaceutical market. He has 40 peer-reviewed publications and 48 issued and approved patents. Several of the patented catalyst technologies are being used for the industrial production of fragrances, flavours and pharmaceutical products. His catalogue of several hundred catalyst products are distributed globally by Strem Chemicals, Sigma Aldrich, Alfa Aesar, Fisher Scientific and abcr. Dr Abdur-Rashid's current research includes the development, synthesis and applications of organometallic catalysts for chemical hydrogen storage, green chemistry and the production of pharmaceuticals and stable isotope compounds.* ■

Is Transgenic Learning a Radical Boost for Innovative Education?

Professor Daniel Burgos

Universidad Internacional de La Rioja, La Rioja, Spain

Genetically Modified Organisms (GMOs) are a controversial subject focused on the production of new life or food thanks to the artificial modification of DNA. Induced by an external disruption, a significant change happens, as if it might be part of the natural evolution of a species. In doing so, adaptation is forced into the natural course, so that an additional feature is provided to that species: from a stronger plant against stormy weather or a plague, to a vitamin embedded into a cereal that does not contain it by default, through the modification of a human protein. This external intervention is conflictive from a number of approaches: ethical, scientific, societal and economic, to name a few. However, the possibility exists that if smartly applied, it provides the human being with a new resource for progress. Education, as a whole, nowadays, requires a disruptive boost. If we teach and learn in the same way that we did for the last 20 centuries; if we use the very same academic structures as 10 centuries ago; if we stress some methodologies from the early XX century; and if we use resources from before the rise of Internet; if all this happens, we will miss every single possibility that the last 20 years bring to the table. Open Educational Resources are a vital part of any Open Educational Policy, to be complemented by source data, research results, software, technology and policies. They altogether make a strong suite to provide the required evolution to the educational system. However, this step requires an urgent and convulsive boost, something that allows for a significant change in a short time, so that we do not wait for the natural evolution but we force a new paradigm. This paradigm will complement the existing ones and must be designed and implemented by the actual users of the educational community, from students to professors, from researchers to parents, from tutors to teachers. That boost is like a transgenic disruption, a GMO-based process that shakes the grounds of traditional and established structures to work with them and improve the channels, the message and the outputs. To us, this radical innovative step is the bi-directional collaboration between Open Education and official programmes, so that both can be of benefit to the other. This integration allows for the combination of proprietary and open resources into official programmes, for the accreditation of OER into regular degrees, for the open publication of learning policies created by the university system or for updating accredited content with enriched information outside the official syllabus. In doing so, the educational system will improve, adapt and challenge the learning experience significantly, and the open education paradigm will benefit from a healthy exchange with other approaches.

Author's Biographical Notes:

Professor Daniel Burgos *is Full Professor of Education & Communication Technologies, Vice-chancellor for Knowledge Transfer & Technology, UNESCO Chair on eLearning, and ICDE Chair in Open Educational Resources at Universidad Internacional de La Rioja. His interests are mainly focused on Educational Technology and Innovation primarily focused on Adaptive/Personalised and Informal eLearning, Open Education and Open policies, Learning Analytics, Social Networks, eGames, and eLearning Specifications. He has published over 100 scientific papers and 15 books and has been involved in a number of European R&D projects. He is the only researcher who has worked in all the Networks of Excellence of the European Commission on Technology-enhanced Learning. He was founder and Executive Board member of the European association for eLearning Telearc, the European Community of eLearning TELEurope, the Spanish association for eLearning TELspain, and the Mediterranean Network for Open Education OpenMed. He holds five doctorates in Communication (PhD), Computer Science (Dr. Ing), Education (PhD), Anthropology (PhD) and Business Administration (DBA).* ■

Materials for Renewable Energy Technologies

Professor Richard Catlow, FRS
The Royal Society of London, UK

One of the greatest global challenges is the need to develop low carbon energy technologies and the field is a topic of intensive research worldwide. Many of the challenges posed by renewable energy technologies are based in the performance of the materials used in devices. This lecture will review the field by considering the main technologies: high energy density batteries; fuel cells, solar energy technologies and thermoelectric systems. In each case we will discuss some of the limitations of current materials and the way in which fundamental materials chemistry is contributing to the development of systems with improved performance. We will highlight the role which computational modelling is playing in the design of new and improved materials; and will conclude with an outline of the future prospects for the field.

Speaker's Profile:

Professor Richard Catlow *is developing and applying computer models to solid state and materials chemistry — areas of chemistry that investigate the synthesis, structure and properties of materials in the solid phase. By combining his powerful computational methods with experiments, Richard has made considerable contributions to areas as diverse as catalysis and mineralogy. His approach has also advanced our understanding of how defects — missing or extra atoms — in the structure of solids can result in non-stoichiometric compounds. Such compounds have special electrical or chemical properties since their contributing elements are present in slightly different proportions to those predicted by chemical formula. Richard's work has offered insight into mechanisms of industrial catalysts, especially involving microporous materials and metal oxides. In structural chemistry and mineralogy, simulation methods are now routinely used to predict the structures of complex solids and silicates, respectively, thanks to Richard's demonstrations of their power. Richard was elected Foreign Secretary of the Royal Society in 2016.* ■

Rethinking STEM Higher Education in the 21st Century

Professor John G. Hildebrand
The University of Arisona in Tucson, USA

Today's world has a larger population, greater global interconnection, more rapid technological advancement, and larger-scale problems than ever before in human history. We face complex challenges that require growing numbers of professionals in science, technology, engineering and mathematics (STEM) who are prepared with sophisticated problem-solving skills and the ability to generate innovative solutions. Indeed, it has been estimated that STEM professions will represent 75 percent of the workforce by 2025. Moreover, we are embarking on a Fourth Industrial Revolution characterised by a merging of technologies and blurring the lines between the physical, digital, and biological disciplines. Yet most universities continue to educate STEM students more or less as they did in the last century. Traditional STEM education provides a solid foundation of facts and basic techniques but rarely examines how to foster creative, cross-disciplinary skills for identifying and solving problems. Nor does it typically emphasise collaboration and teamwork, nimble problem solving, and active learning-by-doing. This presentation will examine several path-breaking approaches to engaging, motivating, and educating students for STEM careers in the decades ahead.

Speaker's Profile:

Professor John G. Hildebrand *is Foreign Secretary of the U.S. National Academy of Sciences and Regents Professor of Neuroscience and Professor of Chemistry & Biochemistry, Ecology & Evolutionary Biology. Entomology, and Molecular & Cellular Biology at the University of Arizona in Tucson. He was founding head of the university's Division of Neurobiology (1985-2009) and the Department of Neuroscience after the Division became a Department (2009-2013), as well as co-founder of the University's Center for Insect Science, a unique and renowned academic enterprise. He earned his baccalaureate degree at Harvard University and his Ph.D. (in biochemistry) at the Rockefeller University and moved to Arizona in 1985 after 16 years as a faculty member at Harvard and Columbia Universities. His research fields are insect neurobiology and behavior, physiology and functions of the chemical senses, chemical ecology, and the biology of arthropod vectors of pathogens. He is an author of more than 220 peer-reviewed research papers, reviews, chapters and miscellaneous articles and co-editor of five books. A past president of the Association for Chemoreception Sciences, International Society of Chemical Ecology, and International Society for Neuroethology, he is a member of the U.S. National Academy of Sciences, American Academy of Arts and Sciences, American Philosophical Society, German Academy of Sciences 'Leopoldina', Norwegian Academy of Science and Letters, and Royal Norwegian Society of Sciences and Letters; an Honorary Fellow of the Royal Entomological Society (UK); and a fellow of the AAAS, the Entomological Society of America, and the International Society for Neuroethology. Among his honors are the Wigglesworth Memorial Award of the Royal Entomological Society, an Einstein Professorship of the Chinese Academy of Sciences, the Silver Medal of the International Society of Chemical Ecology, a Humboldt Research Award from the Alexander von Humboldt-Stiftung, the AChemS Max Mozell Award for Outstanding Achievement in the Chemical Senses, and the R.H. Wright Award in Olfactory Research* ■

Data-Driven Decision Making: Practical Observations from the Public and Private Sectors in Jamaica

Dr. Parris Lyew-Ayee
The Mona GeoInformatics Institute, Jamaica

It is a common refrain from all modern operations, whether in the public or private sector – the need to use data to make things more efficient, profitable, or to make the right decision on important matters concerning public infrastructure, security or fiscal management. Entire businesses operate on the collection and usage of data, while the increasing complexities of managing operations in modern societies both generate and require data for the proper running of affairs. However, disconnects exist, and realities affect how well data are used for proper decision-making. Data are generated across multiple media in businesses and the public sector, ranging from sales records to taxation databases. Investments are made in data entry and processing systems, and analysts spout statistics to measure performance. What is not clear is the level to which these data inform decision-making, with budgetary and political realities swirling. Invariably, data measure the past, and are often constrained within a single dimension, where existing customers or stakeholders already on record are measured. These may not capture information on people outside that record, and therefore they are not measured. When determining strategy and forecasting, more information is needed. Indicative information from external sources needs to be integrated, and existing (past) performance needs to be projected forward. This presentation will look at how data tools and systems have been used to inform decision-making in Jamaica, ranging from crime, road safety and public health, to business expansion, risk management and customer service, all using practical examples from an executive-level perspective.

Speaker's Profile:

Dr. Parris Lyew-Ayee *completed his D.Phil. at the University of Oxford in two and a half years, and began working as Principal Consultant to Mona Informatix Ltd in November 2004, to revitalise operations at that facility. The organisation was restructured into an Institute of the UWI Mona campus, and re-branded the Mona GeoInformatics Institute. Dr. Lyew-Ayee was appointed Director, and with a staff of 17 has led the Institute into its third straight year of operational profitability. Dr. Lyew-Ayee was awarded the Prime Minister's Youth Award for Excellence in Academics in 2004, the Youth Musgrave Award for Science in 2005, and the Governor-General's Youth Award for Excellence in 2006. He sits on the Board of six private and public sector organisations: NEM Insurance Company, Management Control Systems Ltd, the Jamaica Conservation and Development Trust, the National Works Agency, the National Housing Trust, and serves as the Chairman of the Water Resources Authority. He is also on the National Development Steering Committee of the Planning Institute of Jamaica, and a member of the Violence Prevention Alliance and Crime Observatory. Dr. Lyew-Ayee is currently a joint researcher with the Planetary Sciences Institute (Tucson, Arizona) in examining rock breakdown characteristics of Martian rocks for a NASA project. Dr. Lyew-Ayee's research interests range from geomorphological modeling of karst landscapes (with particular emphasis on topographic signature detection) to modeling crime and sociological patterns, GPS tracking and navigation systems, natural hazards (with emphasis on public sector planning, as well as for private sector interests – for insurance companies and developers), and business planning and management (distribution optimisation, site-suitability, market analysis, and customer profiling), all of which involve the use of mapping and geospatial technologies for pattern detection, analysis and recommendations.* ■

Geoengineering and Climate Change

Dr. Douglas MacMartin
Cornell University, Ithaca, USA

The 2015 Paris agreement set a goal of keeping global mean temperature rise to well below 2°C, and ideally below 1.5°C, yet the commitments made as part of the agreement are projected to lead to closer to 3°C warming. While aggressively reducing our greenhouse gas emissions (mitigation) is essential, by itself it will not be sufficient to meet these goals. Carbon dioxide removal (CDR), if implemented at sufficient scale, could eventually reduce temperatures, but these ideas remain untested, and there could still be a potentially significant overshoot of temperature targets, with associated climate impacts. Given this context, should we conduct research to understand solar geoengineering? This includes ideas such as adding aerosols to the stratosphere that would reflect some sunlight. Climate model simulations suggest that it is plausible that a limited deployment, if used in addition to mitigation and CDR rather than instead of it, might reduce many climate impacts for most people. However, there are substantial uncertainties in the climate system, as well as substantial challenges for governance.

Speaker's Profile:

Dr. Douglas MacMartin *received his Bachelor's degree from the University of Toronto in 1987, and Ph.D. in Aeronautics and Astronautics from MIT in 1992. Currently he spends his time between the Sibley School of Mechanical and Aerospace Engineering at Cornell University, which he joined in 2015, and the Department of Computing + Mathematical Sciences at the California Institute of Technology. Prior to joining Caltech in 2000, Dr. MacMartin led the active control research and development programme at United Technologies Research Center. His primary research focus is on solar climate engineering, or geoengineering; working to develop the knowledge base to support informed future societal decisions. This includes estimating climate impacts using design principles to improve outcomes, how to assess and manage uncertainty in predictions, and attribution. While too little is known today, it is plausible that these ideas could become an additional element of an overall strategy to minimise risks from climate change. His research interests also include applying engineering dynamics and feedback analysis to study climate dynamics more broadly, as well as control design for the Thirty Meter Telescope project. Dr. MacMartin has authored or co-authored more than 65 journal articles and 70 conference papers, as well as several book chapters and patents on active noise control. In 2017, he testified in the US Congress at a hearing on geoengineering, and has provided briefings to state government and to IPCC lead authors.* ■

Technology and Science - The Promise of an Easier Life

Dr. David McBean
The Mona School of Business and Management, UWI, Jamaica

Fifty years ago, the view of the future was that science and technology would shorten the work week and extend the weekend. Families would share more quality time, as automation would relieve us of the more mundane and dangerous activities. Productivity and effectiveness were not in the lexicon of this vision. Science would make us live longer and better. Fifty years later we are faced with working longer and harder to meet the expected productivity gains of technology investments. Jobs are made obsolete and parents spend less time with families. We do live longer and diseases that were life threatening are simpler to live with. Communication, business and sometimes leisure are made easier, more convenient and cheaper, in ways that we could not conceive even a decade ago. So what happened? This presentation will explore how science and technology has impacted us, and how the gap between the early visions and reality has led to shifts in expectations and attitudes. It will also explore whether we are controlling technology in our daily lives or is technology controlling us. It will also question whether the much touted visions of AI, Machine Learning, the Internet of Things and other new inventions may not be the nirvana promised.

Speaker's Profile:

Dr. David McBean *is currently the Executive Director of the Mona School of Business and Management at The University of the West Indies, Mona. He holds a B.Sc. in Electrical and Computer Engineering from The University of the West Indies, and read for a D.Phil in Engineering Science from the University of Oxford on a Rhodes Scholarship. He has also received extensive short course training in management, including a diploma in Advanced Executive Management from the Kellogg Business School/Mona Institute of Business. In addition to his substantive career in the private sector, Dr. McBean has been involved with the UWI Mona since 1993 where he served as an adjunct lecturer both in the then Departments of Natural Sciences, and Management Studies in the mid to late 1990's. Dr. McBean has over 20 years' experience as a senior executive, serving across the Airline, Telecommunications (Commercial and Regulatory), IT and Media industries in the Caribbean. Past senior appointments include Managing Director for the Spectrum Management Authority of Jamaica, Managing Director of Products & Services for LIME Caribbean, CEO of the CVM Media Group in Jamaica, as well as VP IT for the former Air Jamaica. Dr. McBean has served on several boards of private and public sector companies, as well as charitable organisations. Past board appointments include the Jamaica Tourist Board, e-Learning Jamaica, Nutrition Products Limited, Lascelles de Mercado and Supreme Ventures. Among other appointments, he is currently a director of Mayberry Investments Limited. Married with two children, Dr. McBean enjoys a game of squash or table tennis, and is an amateur orchid enthusiast.* ■

Innovations in the Food and Agriculture Industry with an Emphasis on Packaging

Professor Melvin Pascall
Ohio State University in Columbus, Ohio, USA

Food packaging has evolved to be a common commodity in today's world and globally consumers have grown dependent on the convenience that it provides. In general, a food package is designed to protect, preserve, contain, transport, sell and communicate information about the food while providing convenience. Prior to the turn of the 21st century, especially during the 1980's and 1990's, significant changes in food packaging occurred when many food items that were traditionally packaged in glass and metal containers began being marketed in plastic materials. As a result of these changes, consumers demanded microwavable, light weight, transparent, flexible, unbreakable, and inert packaging that was safe and convenient. Since the turn of the 21st, globalisation and further technological advancements have placed the internet and cell phones into the hands of individuals even in remote areas of the world, and these have given consumers potent purchasing tools. Consumers now have information and choices that they never had since the history of mankind. These societal changes have significantly changed the landscape for food packaging. In modern societies, the preparation and sale of ethnic foods in restaurants and delicatessens have distinctively increased. Food is now distributed to consumers via home deliveries and other methods such as "meals on wheels." Due to the ready access of information via the internet, consumers are much more knowledgeable about chemicals added to foods and food packaging and as a result, they are demanding "clean label packaging" that is more "environmental friendly" but still low cost, safe and convenient. Examples of these can be seen in consumers and governmental responses to BPA in food cans and baby bottles, acrylamide in certain foods, trans fats, the carbon footprint, food waste, and the astronomical increase in plastic waste that seems to be swallowing the waterways in many parts of the world. In the Caribbean and Latin American regions, it is essential that research effort be congruent with that of the changing face of society and that it meets the needs of the growing economies. With an emphasis on increasing income earnings from exports for its manufactured products, it is essential that training, access to advanced facilities and equipment, efficient communication and transportation systems, product commercialization, intellectual property protection, and meaningful regulatory enforcement be elevated in priority for available financial resources. This is mandatory if the region is to keep pace with the dynamic changes that are taking place in the markets of developed countries in North America and Europe. In order to maximize the effort of nation building, with a view of developing a robust economy that is self-sufficient, it is imperative that a strong tripartite relationship be established between the government, industry and academia. The presentation will focus on current societal changes and how the food packaging industry is responding to these changes.

Speaker's Profile:

Professor Melvin Pascall *received his Bachelor's degree In Agricultural Science from The University of the West Indies in 1987 and his Ph.D. from Michigan State University in 1995. He then went on to work at the United States Food and Drug Administration (FDA) in Chicago IL, where he trained FDA field inspectors, performed research and later served in an administrative role in Washington DC. In 2002, he left the FDA and joined the faculty at Ohio State University, a position he continues to hold. Professor Pascall is globally known in the food*

industry, academia and regulatory agencies as an expert in food packaging, with a career pathway that spans several decades. He has served audiences and collaborated with researchers in over 25 countries on 5 different continents, from China to Brasil, Macedonia to Dubai in the United Arab Emirates, Ghana, Guatemala, Jamaica, Israel, India, Italy and the Netherlands, among others. In 2010, Professor Pascall assisted The University of the West Indies (Mona) in developing a master's degree program in Agro-processing. In 2016 he assisted the Bureau of Standards Jamaica in upgrading their Packaging Laboratory and recommended appropriate training courses for some of their technical personnel. In his career to date, he has produced 1 book, 6 book chapters and 60 peer-reviewed journal publications. His research has influenced changes to the FDA Food Code, sparked a revolution in packaging leak detection in the food industry, and he has trained and mentored numerous students and regulatory personnel who have gone on to develop notable careers in food safety, packaging, quality control, product development and food marketing. In 2017, the Ohio Agricultural Research and Development Center at Ohio State University awarded Professor Pascall the "Inventor of the Year Award" for his research in developing edible plastic packaging materials. ■

Convergence of Science: Linking Nanotechnology and Photonics with Chemistry and Biology, to Impact Energy, Health Care and Economic Development

Professor Paras Prasad
Cornell University, Ithaca, USA

The major breakthroughs required to meet 21st century technical challenges across areas of top global priority, including alternative energy, healthcare, environmental monitoring, information technology, and world security, will be achieved through convergence of science. This talk will discuss how chemistry, physics, engineering, and biology can be integrated to link nanotechnology with photonics, and biotechnology to create and apply multifunctional nanomaterials in the fields of energy and health care. We are developing new nanomaterial-based approaches for efficient harvesting of solar photons across the entire solar spectrum and their efficient conversion to electrical energy. Our emphasis is to enhance ultraviolet photon utilization while also harvesting IR photons that are unutilized in conventional solar cells. Our major approach is multiscale theory-guided development of multiphoton harvesting and photon transforming nanostructures. These optical nanotransformers enable photon management on demand, by in situ transformation of photons from one spectral region to another. We have created nanomaterials that upconvert infrared photons to visible photons, and ones that convert a single ultraviolet photon to two visible photons. Nanomedicine provides a new pathway to produce breakthrough approaches for meeting our current and future healthcare challenges including cancer, neurological disorders, infectious diseases, age-related diseases, addiction, chronic pain, depression, and obesity.1-3 Our research applies biophotonics to nanomedicine, using optical nanoprobes for bioimaging, sensing, and light-guided and light-activated therapy. A major direction pursued in our lab is brain research in the emerging field of neurophotonics, where we apply photoresponsive materials for functional mapping of the brain and optogenetic stimulation of brain function. This talk will also discuss strategies for commercialization of nanotechnology-based laboratory innovation. We have considerable experience in this as our innovations have led to the creation of 9 spin-off companies worldwide. Lessons learned from this experience will be presented to provide insight into how to successfully transform an innovation to a technology and subsequently to a commercial success.

Speaker's Profile:

Professor Paras Prasad *currently holds the unique multidisciplinary position of SUNY Distinguished Professor of Chemistry, Physics, Electrical Engineering, and Medicine (four departments spanning three schools), as well as the Samuel P. Capen Chair of Chemistry, and Executive Director of the multidisciplinary Institute for Lasers, Photonics and Biophotonics, which he founded in 1999. His pioneering contributions in interdisciplinary chemical research at the interface of photonics, nanotechnology, and biomedicine have broadly impacted healthcare, energy, and optical technologies. Scientific American named him among the world's top 50 science and technology leaders. Professor Prasad has authored more than 800 scientific papers; four field-defining monographs, widely used in teaching worldwide, in nonlinear optics, biophotonics, nanophotonics, and nanomedicine; eight edited books; and numerous patents. He introduced and advanced new frontiers of organic nonlinear optics,*

nanophotonics, biophotonics and nanomedicine. His many awards for research excellence include Peter Debye Award , the Morley Medal and Schoellkopf Medal from the American Chemical Society; UB President's Medal; SPIE's highest honor, the President's Gold medal; Optical Society of America's Michael Feld Biophotonics award; IEEE's Pioneer Award in Nanotechnology ,Guggenheim Fellowship; Sloan Fellowship; Western New York Health Care Industries Technology/Discovery Award; SUNY Excellence in the Pursuit of Knowledge award; and UB's first Innovation Impact award. Professor Prasad is a fellow of the APS, OSA, SPIE, and IEEE and listed among Thompson Reuters "Highly Cited Researchers". He has Honorary Doctorates from KTH in Sweden, the Aix-Marseille University in France, MEPhI in Russia, and Federal University of Pernambuco in Brazil. Globally, his technologies have produced 9 spin-off companies including publicly-traded Nanobiotix, now in advanced clinical trials for cancer therapy. ■

Mentorship and Networking for Scientific Advancement and a Diverse Research Workforce

Professor Jamboor Viswanatha

The University of North Texas Health Science Center at Fort Worth, USA

Effective mentorship is critical to the success of early stage investigators, and has been linked to enhanced mentee productivity, self-efficacy, and career satisfaction. The mission of the National Research Mentoring Network (NRMN) is to provide all trainees across the biomedical, behavioural, clinical, and social sciences with evidence-based mentorship and professional development programming that emphasises the benefits and challenges of diversity, inclusivity, and culture within mentoring relationships, and more broadly the research workforce. NRMN serves as a national training hub for mentors and mentees striving to improve their relationships by better aligning expectations, promoting professional development, maintaining effective communication, addressing equity and inclusion, assessing understanding, fostering independence, and cultivating ethical behaviour. Training is offered in-person at institutions, regional training, or national meetings, as well as via synchronous and asynchronous platforms; the growing training demand is being met by a cadre of NRMN Master Facilitators. NRMN offers career stage-focused coaching models for grant writing, and other professional development programmes. NRMN partners with diverse stakeholders from the NIH-sponsored Diversity Programme Consortium (DPC), as well as organisations outside the DPC to work synergistically towards common diversity goals. NRMN offers a virtual portal to the Network and all NRMN programme offerings for mentees and mentors across career development stages. NRMNet provides access to a wide array of mentoring experiences and resources including MyNRMN, Guided Virtual Mentorship Programme, news, training calendar, videos, and workshops. National scale and sustainability are being addressed by NRMN "Coaches-in-Training" offerings for more senior researchers to implement coaching models across the nation. "Shark Tanks" provide intensive review and coaching for early career health disparities investigators, focusing on grant writing for graduate students, postdoctoral trainees, and junior faculty. Partners from diverse perspectives are building the national capacity and sparking the institutional changes necessary to truly diversify and transform the biomedical research workforce. The NRMN works to leverage resources towards the goals of sustainability, scalability, and expanded reach.

Author's Biographical Notes:

Professor Jamboor Viswanatha *is a Regents Professor and Vice President, and Founding Director of the Texas Center for Health Disparities at the University of North Texas Health Science Center at Fort Worth. He is a principal investigator of the National Research Mentoring Network, a NIH Common Fund initiative to provide mentorship, networking and professional development for a diversified biomedical and behavioral workforce. He is also a principal investigator of the NIH Specialised Center of Excellence in Health Disparities. Professor Vishwanatha received his Ph.D. in biological sciences from the University of South Carolina in 1983. His research is in cancer molecular biology, experimental therapeutics and nanotechnology. His laboratory is investigating genetic markers that predict development of aggressive prostate and breast cancers, and nanotechnology-based therapies for breast and prostate cancers. Professor Vishwanatha is actively involved in mentorship and networking*

programmes to diversify the biomedical research workforce, and has mentored numerous undergraduate and graduate students from under-represented groups in biomedical sciences. As the founding director of the Texas Center for Health Disparities, a Specialised Center of Excellence funded by the National Institutes of Health, he has directed health disparity research, education and community outreach programmes. For the past 12 years, Professor Vishwanatha has organised the annual Texas Conference on Health Disparities that attract national speakers and participants. He serves on the external advisory committees for University of Puerto Rico-Cayey, PR; St. Mary's University, San Antonio, Texas; Alabama State University, Montgomery, Alabama; and Savannah State University, Savannah, Georgia. He has been an active member of the AAMC GREAT Group, SACNAS and ABRCMS. ■

The Key Ingredients of a Successful Innovation Strategy

Dr. Joy Spence, CD, LLD, ScD
Appleton Estate, Jamaica

Speaker's Profile:

Dr. Joy Spence *has the honour of being the first woman to hold the position of Master Blender in the spirits industry. In this role, Dr. Spence is responsible for ensuring the quality and consistency of existing blends, creating new rum blends and monitoring the Company's inventory of ageing rum stocks. She also travels around the world promoting Jamaica and Jamaica Rum through the Appleton Estate Jamaica Rum Platform. Dr. Spence joined Appleton Estate as Chief Chemist in 1981 where her passion for the art of creating rum-blends was inspired by her predecessor and mentor at the Company, then Master Blender, Owen Tulloch. Owen Tulloch. When Owen retired she was appointed the Master Blender in 1997.*

From 1996 to 2015, Dr. Spence was also J. Wray & Nephew Limited's Director of Technical and Quality Services and in this capacity she was instrumental in steering the company through the ISO 9002 accreditation process. The Company received in 1996 in a record time of six months, as well as the ISO 9001:2000, which the Company received in 2002. She can also be credited with implementing a Total Quality Management system at J. Wray & Nephew Limited that ensured the quality and consistency of the Company's products through the introduction of a revolutionary training and development programme for all levels of staff in the organisation as well as the implementation of the HACCP accreditation throughout the Company. Dr. Spence also championed a number of environmental initiatives including the processing of dunder to make liquid fertiliser which the Appleton Estate was the first distillery in the Caribbean to introduce, and pioneered a number of new processes for the rum industry including the reduction of barrel extractives in aged rum. Dr. Spence also developed the technical specifications and the code of practice for the Geographic Indicator for Jamaica Rum.

Over the last 20 years, Dr. Spence has created some of the finest rums including Appleton Estate Reserve Blend and Appleton Estate Rare Blend 12 Year Old. She created the limited edition rums Appleton Estate 30 Year Old Jamaica Rum; the Appleton Estate 250th Anniversary Blend, and the Appleton Estate 50 Year Old Jamaica Rum, which was created to celebrate the 50th Anniversary of Jamaica's Independence. Most recently, Dr. Spence created the Appleton Estate Joy Anniversary Blend which was released in 2017 to mark her 20th Anniversary as Appleton Estate's Master Blender. In 2005, Dr. Spence was honoured by the Government of Jamaica when she was awarded the Order of Distinction in the Rank of Officer (OD) for her service to industry. In 2017, Dr. Spence was further honoured by the Government when she was awarded the Order of Distinction in the Rank of Commander Class (CD) for her contribution to the promotion of Jamaica's rum industry and brand Jamaica globally.

In September 2012, Dr. Spence received an honorary Doctorate of Science degree from the University of Loughborough in recognition of her contribution to the distilled spirits industry and the advancement of women in the field. In November 2012, she also received an honorary Doctorate of Laws degree from The University of the West Indies. In 2011 Dr. Spence received the Golden Rum Barrel 'Pioneer's Award' for outstanding rum achievement. In 2014 she was honoured by the International Spirits Challenge with the 'Outstanding Contribution' Award. in 2016 she received the Golden Rum Barrel Award for the 'Most Influential Rum Blender of the Last 10 Years', in 2017 she received the Tales of the Cocktail 'Grande Dame Award' for contribution to the spirits industry and Food and Wine Magazine, in partnership with Fortune Magazine, named her to their list of 'Top Twenty Women in Innovation in the food and drink industry'.

Dr. Spence has been a pioneer in the premium aged rum category, which is one the world's newest and most exciting spirit categories. Not only has she created several of the rums that helped to define and develop this category, but she has also led the field in terms of educating industry personnel, the media and consumers about premium aged Jamaican rum. Each year, Joy travels around Jamaica and the world providing comprehensive training on the manufacture of rum from "cane to the cocktail". ■

Panel Discussion on: "Forum on Gender Disparity"

CAS-P012: UNESCO's Work in Achieving Gender Equality

Ms. Andrea Giselles Burbano Fuertes
UNESCO Cluster Office for the Caribbean, Kingston, Jamaica

Ms. Andrea Giselles Burbano Fuertes *is a national of Ecuador. Since 2016 she has been the Programme Specialist for Social and Human Sciences and the Gender Focal Point in UNESCO's Office for the Caribbean based in Kingston. She holds a Master's Degree in Comparative Studies in Development from the 'Ecole des Hautes Etudes en Sciences Sociales' / School for Advanced Studies in Social Sciences, Paris, France. She joined UNESCO in 2006 and has since then developed programmes and actions working both for the Regional Office for Sciences in Latin America and the Caribbean in Montevideo and in UNESCO's Headquarters in Paris. In addition to her academic background and comprehensive experience across UNESCO, she has strong capabilities in mainstreaming the specific mandate of the Organization in social and human sciences, as well as in project management, partnership and network development, donor relations and resource mobilization and a sound knowledge of the United Nations System. Her mother tongue is Spanish and she is fluent in English, French and German. Ms. Burbano F. can be contacted at: ag.burbano-fuertes@unesco.org.* ■

CAS-P013: Women in the Academies of Sciences in the World, Still in Disadvantage – "More Women, Better Science"

Dr. Lilliam Margarita Alvarez- Diaz
ICS Regional Committee for Latin America and the Caribbean

Dr. Lilliam Margarita Alvarez-Diaz *received her Ph.D. degree in Physics-Mathematics from the former Academy of Science of the USSR, Moscow in 1989. She is a Merit Member and Executive Secretary of the Cuban Academy of Sciences, Head of the Group of promotion of Sciences and President of the Commission of Women in the Academy and National Chapter of OWSD. She was elected a TWAS Fellow in 2008 and has been a full member of the Caribbean Academy of Sciences since 2000. Dr. Alvarez-Díaz has participated in more than 60 seminars, workshops and conferences in her specialty in Mathematics - Numerical methods for non-linear partial differential equations; and in Policies and Strategies for S&T, giving priority to Basic Sciences and related topics on Science,*

Technology and Gender issues in Latin America and the Caribbean. She has published more than 70 papers and is author of several books. She received the National Prize for the best scientific publication in Cuba in 1991 and the National Order Carlos Finlay in 2001 due to her relevant contributions to the Cuban Sciences. Particularly relevant has been her leadership in the Iberoamerican Program of S&T, CYTED, and in the Network on Gender, Science and Technology. Dr. Alvarez-Diaz was Co-chair of the IANAS Program of Women of Sciences from 2013-2016. She was Member of the ICSU-LAC Scientific Planning Group of Mathematics Education, and nowadays is a very active Member of the ICS Regional Committee for Latin America and the Caribbean since 2014. ■

CAS-P014: STEM Disparity and the Need for Female Inclusion

Dr. K. Renee Horton

The NASA Residential Management Office, Michoud Assembly Facility (MAF), New Orleans, USA

Dr. K. Renee Horton *is a native of Baton Rouge, Louisiana and lifelong lover of science and NASA. She graduated from the Louisiana State University with a Bachelor's degree in Electrical Engineering (Math minor) in 2002 and later obtained her Ph.D. in Material Science with a concentration in Physics, becoming the first African American to graduate from the University of Alabama in 2011 in this area. Dr. K. Renee Horton currently serves as the Space Launch System (SLS) Lead Metallic/Weld Engineer in the NASA Residential Management Office at Michoud Assembly Facility (MAF) in New Orleans. She worked for NASA, first as a student from 2009 to 2011, and then started her career as a mechanical test engineer in 2012. In 2014 she was promoted to her current position. In 2016, Renee was elected President of the National Society of Black Physicists (NSBP) as the second woman to hold the office. She has served the physics community abroad as a member of the International Union of Pure and Applied Physics (IUPAP) Women in Physics Working Group and currently serves on several advisory boards dedicated to a more diverse inclusion in physics. In 2017, she was elevated to a Fellow in the NSBP, which is the highest honour bestowed upon a member. Renee has been an invited speaker for the first International Women and Girls Day at the United Nations, Essence Power Stage, March for Science – New Orleans and recently the LSU Engineering Spring Commencement. She has spoken all over the world including South Africa, Brazil, South Korea, Canada, Mexico and the beautiful Virgin Islands. She is featured in NASA's I am Building SLS, Physics Today, and the LSU Alumni Magazine. She recently graced the cover of the Hearing Health Foundation Magazine, winter edition that can be found online. She is the author of Dr. H Explores the Universe, Dr. H and her Friends, and Dr. H Explores the ABCs.* ■

CAS-P015: Moderator for the Forum on Gender Disparity

Ms. Petal Punalall Jetoo

National Science Coordinator, Guyana, South America

Ms. Petal Punalall-Jetoo *started her career as a Sugar Technologist with the Guyana Sugar Corporation Incorporated (GuySuCo) in 1997 after receiving her B.Sc. in Chemistry from the University of Guyana. She was the first female appointed Production Manager in GuySuCo and served in this capacity at the Enmore Sugar Estate. She received specialist training in Raw Sugar Technology from Nicholls State University, Louisiana, USA. She was responsible for sugar production and quality assurance for four Demerara Estates from 2003-2006. During this period she led the Quality Assurance team that established the company's Quality Management System which gained ISO 9001 certification for the Blairmont Sugar Estate. As a consultant, with Delphi Consultants Ltd., Trinidad, she established the Quality Management System for the National Milling Company, Guyana which gained ISO 9001 certification. Through UNESCO's support, Ms. Punalall-Jetoo, in her capacity as National Science Coordinator for Guyana, served as the project coordinator for the development of national policies for Science, Technology and Innovation and Education for Sustainable Development. She is a member of the Caricom Science, Technology and Innovation Committee (CSTIC). She is also a member of the Caribbean Academy of Sciences (CAS) and serves on the STEM training team as a facilitator. Ms. Punalall-Jetoo actively promotes capacity development in the basic sciences through the use of the UNESCO microscience programme.* ■

CAS-P016: Implementation of the UNESCO SAGA Project: The Jamaica Experience

Dr. Aisha Jones

Biotech R&D Institute, Kingston, Jamaica

Dr. Aisha Jones *is the newly appointed Executive Director for the Biotech R&D Institute in Kingston, Jamaica based at The University of the West Indies. The privately-owned biotechnology company is a premier research organisation in Jamaica which conducts innovative activities geared at validating the medicinal properties of Jamaican plants for the development of natural products. She is a trained fish biologist/ecologist with academic focus on the impacts non-invasive fish species on the local artisanal fisheries of Jamaica. Her professional background spans several areas including science education, alternative energy, solid waste management and island biodiversity. More recently her assignment within the public sector focussed on establishing and promoting policies and programmes that support research and development as drivers of national development. She represented the Government of Jamaica in several national and international fora, including UNESCO Science Advisory Board for Jamaica, Organisation of American States Inter-American Committee for Science and Technology, the International Network for Government Science Advice.* ■

CAS-P017: Gender Disparity by UNESCO Officer

Ms. Zelmira May

Regional Office for Science for Latin America and the Caribbean, Uruguay

Ms. Zelmira May *is an Agronomy Engineer (UdelaR, Uruguay) and holds an MSc on Water and Environmental Management from WEDC, Loughborough University of the UK. Along her professional life, Ms. May has worked in the field of water resources management in several international organizations acquiring wide experience in the execution and implementation of water programmes at the global and regional level. Over the past ten years she has been working at the Division of Water Science of UNESCO based in the Regional Office for Science for Latin America and the Caribbean, being presently responsible for the implementation of the International Hydrological Programme (IHP). The IHP is the only scientific intergovernmental water programme in the UN System. As coordinator for the implementation of UNESCO water programme in the region, she is responsible for development and execution of the water initiatives, and of fostering and strengthening the network of the IHP, composed by its National Committees, UNESCO water-related Centres and Chairs, and other relevant partners in the region. She acted as Executive Secretary of the Global Water Partnership in Uruguay, an organization aiming at fostering the integrated management of water resources. Moreover, she was the Executive Secretary of the InterAmerican Water Resources Network, a network of organizations and individuals working on water in the Americas. Furthermore, Ms. May is the Executive Director of the AquaLAC scientific journal and guest editor in the Special Journal Issue on Sciences in Cold and Arid Regions for Water and Development Information for Arid Lands – a Global Network (G-WADI). In addition, she is member of the Board of Directors of the Water Web Consortium.* ■

CAS-P018: Participation of Women in Mathematics at the Autonomous University of Santo Domingo

Dr. Elizabeth Rincón Santana

Autonomous University of Santo Domingo, The Dominican Republic

Dr. Elizabeth Rincón Santana *has a Bachelor's degree in Mathematics and Physics Education, a Master's in Educational Technology, and a Ph.D. in Pedagogical Sciences. She is a Professor of Mathematics at the Autonomous University of Santo Domingo (Universidad Autónoma de Santo Domingo), first university of the Americas. She has participated as a speaker in the most important congresses organised in her country by educational institutions. She has also represented her country in international educational events held in Cuba, Mexico, Puerto Rico, Colombia, Chile, Paraguay and El Salvador. She works assiduously for the inclusion of women in the sciences, specifically for the development and participation of Dominican women in the teaching-learning processes of Mathematics. Her work in favour of the development of Mathematics Education has been recognised by different institutions of the Dominican Republic such as the Ministry of Education, Office of the First Lady, Central Bank, the Autonomous University of Santo Domingo, Apec University, among others.* ■

CAS-P019: Female Participation in Engineering and Opportunities

Ms. Elena Trim

Faculty of Engineering and Technology, The University of Guyana, South America

Ms. Elena Trim *was born in Russia, Moscow and graduated from Moscow Aviation Institute with a MSc. in Aeronautical Engineering. She joined the staff at the Central Scientific Research Institute of Automation and Hydraulics as part of team engineers and scientists responsible for the design of military equipment. In 1997 she immigrated to Guyana and in 2000 joined the academic staff at the University of Guyana as a lecturer in the Faculty of Engineering and Technology. Over the years she has taught several engineering mathematics courses at various capacities among which are teaching engineering mathematics and physics courses at the University of Guyana and at the Art Williams & Harry Wendt Aeronautical Engineering School. She has also served as Coordinator for Engineering Mathematics; Assistant Dean and in 2013 was appointed as the Dean of the Faculty of Engineering and Technology, a position that she currently holds. Her main areas of research are STEM Education with an emphasis on engineering students background and performance ("Students performance based on entry grades", Engineering Student's level habits and factors affecting them", Students performance based on self-teaching in tertiary education") and green energy ("Utilisation of rice husk (agricultural waste) and use expanded polystyrene (inorganic waste)) She is a member of GAPE (Guyana Association of Professional Engineers), The Bureau of Standard's (Member of several Committees), UGST, 2013-2015 Member of UGSTP (World Bank Project) Research Technical Committee.* ■