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Mauritius Academy of Science & Technology (MAST)

EDITORIAL

Navigating the Future of AI: Embracing Responsibility and Opportunity



The inexorable rise of Artificial Intelligence (AI) has thrust this subject into the forefront and the recent strides, epitomized by the advent of ChatGPT, have catapulted AI discussions squarely into the mainstream. When I turned to Google Bard for guidance on an editorial subject for this MAST Newsletter, it resolutely echoed the sentiment, suggesting 'The Future of AI' as the focal point.

AI, at its core, delves into the creation of systems endowed with reasoning, learning, and autonomous decision-making capabilities. In this evolutionary journey, we are poised to witness an incredible milestone - the advent of an entity capable of independent decision-making, devoid of human intervention. AI is currently not only replicating human tasks but in some instances, augmenting our abilities. Are we witnessing a paradigm shift, a transition from human to non-human power?

In the realm of AI, we presently find ourselves at the juncture of Artificial Narrow Intelligence (ANI). These systems excel in specific tasks, yet their scope remains constrained. For instance, a self-driving car navigates motorways adeptly but is unsteady in intricate urban environments. Anticipated are two more advanced echelons: Artificial General Intelligence (AGI), capable of understanding and reasoning akin to a human, and the pinnacle - Artificial Superintelligence (ASI), surpassing human intellect across the board, from creativity to problem-solving and social acumen. The timelines to reach AGI and ASI remain speculative, yet given the trajectory of AI's evolution, envisioning their emergence within a few decades seems plausible.

This surge in AI raises profound ethical and societal questions. How do we ensure the ethical and responsible deployment of AI? Critics put forward the potential for bias within AI systems. These systems are molded by data, and if that data carries inherent biases, the AI system will mirror and potentially exacerbate them. Additionally, we could grapple with the prospect of technological unemployment and social unrest. As AI advances, the prospect of automating numerous roles currently held by humans looms on the horizon, potentially instigating widespread job displacement and societal agitation.

Yet, on an optimistic note, AI stands as a transformative force within our grasp, an empowering tool of unparalleled potential. It is becoming vital in scientific processes, redefining paradigms across diverse domains. The judicious integration of AI into scientific endeavors holds the promise of not only economic prosperity but also innovative solutions to global challenges. Our collective task is to navigate the AI trajectory with prudence, ensuring that its ascent is marked by ethical considerations and an unwavering commitment to societal well-being.

AI stands as a game-changing technology that demands pondering, discussion, and engagement from members of our Academy for the best course of action.

Salem Saumtally

President, Mauritius Academy of Science and Technology

In Memoriam
PROFESSOR SOODURSUN JUGESSUR
 (1940-2022)



The Academy bids farewell to a luminary, Professor Soodursun Jugessur, who passed away on 7 December 2022. His numerous accomplishments both in Mauritius and abroad, stand as a testament to his esteemed leadership, sought by institutions far and wide.

A cornerstone of this achievement lies in his association with the University of Mauritius, a journey that began in 1970 when he joined as a lecturer, during the University's nascent stage. Through his unwavering dedication, Prof Jugessur contributed toward nurturing its growth, ascending to the position of Professor of Industrial Technology. His visionary work in harnessing new and renewable energies through engineering education remains noteworthy, his foresight decades ago reveals his forward-thinking approach. From Head of Industrial Technology to Pro-Vice Chancellor and finally Pro-Chancellor and Chairman of the University, his ascent was marked by tireless commitment.

Prof Jugessur held a B.Sc. (Physics) with First Class from Madras University, India and an M.Sc. (Physics) from the same institution. He later earned a D.Sc. (Electrical Engineering) from Laval University, Quebec-Canada. His accolades extended beyond academia, with esteemed memberships and fellowships in various engineering societies. He stood tall as a Fellow of the African Academy of Sciences, and the New York Academy of Sciences while also chairing the African Regional Accreditation Committee on Standards. In recognition to his contributions, he received the Insignia of Commander of the Order of the Star and Key of the Indian Ocean (CSK) in 1997, followed by the Insignia of Grand Officer of the Order of the Star and Key of the Indian Ocean (GOSK) in 2006 by the Mauritian Government.

In 2007, Prof Jugessur took the helm as the Founder President of MAST, a pivotal moment in the Academy's inception. His benevolence extended to generous donations to MAST, empowering the recognition of budding researchers in science and technology. Notably, he established the Founder President's Award in 2013, in collaboration with the University of Mauritius, in the field of energy. His philanthropy knew no bounds, culminating in a substantial contribution in 2019 to launch the MAST Fund for the Advancement of Science and Technology.

His impact transcended borders, as he lent his expertise in science and technology to governments, aiding in the formulation of policies and strategies for technological advancement. Prof Jugessur was a driving force in advocating multinational cooperation in these realms, particularly during his tenure in Africa.

Remembered for his profound humility and unwavering dedication to humanity's well-being, Prof Jugessur was a fervent advocate for peace, righteousness, and harmonious coexistence. He firmly believed that the family unit served as the bedrock for instilling values in children, shaping them into well-rounded adults poised to serve society. His life story stands as an inspiration, his greatest legacy to the Academy.



Insects for Human Food and Animal Feeds

Goolam Mohamedbhai

In many cultures, the practice of eating insects, which is known as entomophagy, is considered repulsive, while in many others it is a common practice. Humans throughout the world have been eating insects as a regular part of their diets for millennia. So have animals – spiders, lizards, birds, and even insects themselves.

The importance of entomophagy for humans surfaced over the past couple of decades because food and nutrition have become a major challenge in the developing world, especially due to limited access to proteins. The protein content of insects is high – over 60% on a dry weight basis, compared to 40% for soybean and 36% for beef. In many parts of Sub-Saharan Africa, the malnutrition of children is mainly due to a severe shortage of protein for their growth. But, in addition to their high protein content, insects are also rich sources of polyunsaturated fatty acids, which have many health benefits, as well as minerals such as iron and zinc which are important for children's growth and development.

Due to their nutritional profile, especially their high protein content, various types of insects can be used as feed for industrial animal production and aquaculture. An insect-based diet for farm animals has been scientifically investigated for pigs, poultry and edible fish. Insects can provide as much protein and essential amino acids for swine and poultry that can potentially replace soybean meal. The most common insects used in animal feed produce are black-soldier flies, common house fly larvae and mealworms.

Rearing insects for food and feeds has several advantages. The amount of water required for their growth is quite low compared to rearing farm animals. They also do not require a lot of land and, unlike cattle for example, insects produce very little greenhouse gases. All these are positive aspects when considering the impact on climate change.

This is what led to the establishment of the African Centre of Excellence (ACE) in Sustainable Use of Insects as Food and Feeds (INSEFOODS) at the Jaramogi Oginga Odinga University (JOUST), a public university in Kenya. INSEFOODS is one of 24 ACEs in eight Eastern and Southern African countries and is part of the World Bank-funded project known as ACEII, which has as objective the strengthening of African universities to deliver quality postgraduate education and build research capacity in regional priority areas.



The INSEFOODS project, which started in 2016 and is ending in 2023, has trained over 100 Master's and 30 PhD students who have carried out research into insects which can be used for food and feed. For example, crickets have been developed and patented which have higher nutritional content to combat malnutrition. The innovations will be patented and commercialized to generate income for the institution through sales of goods and services. There have been over 100 publications from both staff and students on the topic. The project has also seen the formation of international, national and industry partnerships, as well as eight academic programmes which have been accredited nationally.

The International Centre of Insect Physiology and Ecology (*icipe*), a world-renowned insect science research centre established in 1970 in Nairobi, Kenya, has a similar project called INSEFF, which started in 2012. INSEFF has produced and commercialised several products, including Dudu Meal, a high-quality animal protein derived from black-soldier fly larvae that can be fed to fish, chickens and pets; and cookies and biscuits derived from crickets. INSEFF also pioneered the establishment of relevant standards in Kenya, Tanzania and Rwanda.

The use of insects for food and feed is by no means restricted to Africa and the developing world. The International Platform of Insects for Food and Feed (IPIFF) is an EU non-profit organisation which represents the interests of the insect production sector towards EU policy makers, European stakeholders and citizens. Composed of 76 members, IPIFF promotes the use of insects for human consumption and insect-derived products as a top-tier source of nutrients for animal feed.

Interest in using insects for food and feed is clearly gathering momentum worldwide, both academically and commercially. There is now a dedicated online *Journal of Insects as Food and Feed* published by Wageningen Academic Publishers.

31 August 2023

Goolam Mohamedbhai is the Chair of the Regional Steering Committee of the World Bank ACEII Project.

Agrobiodiversity Index winner of Food Planet Prize 2023

The **Agrobiodiversity Index**, a tool designed by scientists working Bioversity International, now the Alliance of Bioversity International and CIAT won the 2023 Food Planet Prize, granted by the [Curt Bergford Foundation](#), that rewards innovation solutions that can help the planet to reshape our food system within the limits of our planet.

What is agrobiodiversity? The Agrobiodiversity index is an innovative framework that uses 22 indicators to measure the status of agrobiodiversity (the wealth of plants, animals and microorganisms used for food and agriculture) across three pillars - diets and markets, agricultural production, and genetic resource management. It assesses to what extent commitments and actions of different food systems actors are contributing to its sustainable use and conservation. The tool provides insights on policy and business levers, as well as risks and opportunities, to increase use and conservation of agrobiodiversity to achieve sustainable food systems (Jones *et al.*, 2021).



Arwen Bailey and Sarah Jones receiving the Food Planet Prize on behalf of the Agrobiodiversity team, June 2023.

Why agrobiodiversity matters? Global food production is known to be the single largest driver of environmental degradation and biodiversity loss (DeClerk *et al.*, 2023). Agriculture produces large quantities of food, but not enough diverse and nutritious food. We know food diversity has been declining worldwide. Of the thousands of plants and animals used for food in the past, only 200 currently contribute to global food supplies and only 9 account for 70% of total crop production (FAO, 2019). The impact is that farmers cannot cope with crop failure, pests and diseases, declining soil fertility and climate change, our production system becomes more simplified and homogenous, while unbalanced human diets increase risks of malnutrition and non-communicable diseases, the main cause of premature death today (Kennedy *et al.*, 2017). Agrobiodiversity has a critical role to play in the transformation towards more sustainable - and resilient - food systems (Dulloo, 2019). This diversity - which results from thousands of years of interactions among people and the environment - is a key component of healthy diets and human health. Food biodiversity is crucial to fight malnutrition and diet-related diseases. A diverse diet increases the likelihood of consuming adequate amounts of the full range of nutrients essential to human health. In agricultural production, agrobiodiversity supports long-term productivity, resilience and multiple ecosystem services, boosting yields in quality and quantity, increasing soil and water quality, and reducing the need for synthetic fertilizers. It also makes farmers' livelihoods more resilient, reducing yield losses due to climate change and pest damage. Broadening the types of cultivated plants is also good for the environment, increasing the abundance of pollinators and beneficial soil organisms, and reducing the risk of pest epidemics. Agricultural biodiversity also keeps open options for unknown future needs, when conserved. This can happen in genebanks as well as on farms, which helps to reproduce agrobiodiversity by using it in the fields and to conserve local knowledge, ecosystem interactions and the processes that underpin this dynamic conservation of genetic diversity.

Why the Agrobiodiversity index? The Agrobiodiversity Index uses a whole food system approach to measure the gap between the agrobiodiversity we HAVE in our food system, and the agrobiodiversity we COULD have, to maintain healthy diets and resilient production systems, now and for our future generations. It helps to monitor the status of agrobiodiversity in diets, markets, production and conservation systems and the sustainability of their food supply chains. It helps actors to connect the dots between actions to use and safeguard agrobiodiversity in conservation,

The way we produce and consume our food is clearly hurting both people and the planet. We need to transform our food systems, so that they feed people with high quality diets while nurturing the planet. With the prize money of two million US dollar, the agrobiodiversity index team aims to further spread of the application of the index by closing agrobiodiversity data gaps, designing intervention platforms, and investing in changemakers in residence programmes in different parts of the world.

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THE 2023 SDG SUMMIT

In 2015, at the UNITED NATIONS, ALL countries of the world adopted the Sustainable Development Goals (SDGs) .

These **Sustainable Development Goals (SDGs)** or **Global Goals** are a collection of seventeen interlinked objectives designed to serve as a "*shared blueprint for peace and prosperity for people and the planet, now and into the future.*"

The short titles of the 17 SDGs are: No poverty ([SDG 1](#)), Zero hunger ([SDG 2](#)), Good health and well-being ([SDG 3](#)), Quality education ([SDG 4](#)), Gender equality ([SDG 5](#)), Clean water and sanitation ([SDG 6](#)), Affordable and clean energy ([SDG 7](#)), Decent work and economic growth ([SDG 8](#)), Industry, innovation and infrastructure ([SDG 9](#)), Reduced inequalities ([SDG 10](#)), Sustainable cities and communities ([SDG 11](#)), Responsible consumption and production ([SDG 12](#)), Climate action ([SDG 13](#)), Life below water ([SDG 14](#)), Life on land ([SDG 15](#)), Peace, justice, and strong institutions ([SDG 16](#)), Partnerships for the goals ([SDG 17](#)).

All countries of the world, members of the United Nations, embarked on a journey to achieve the 2030 Agenda to promote prosperity, address inequalities while protecting the environment. The 17 SDGs offer the most practical and effective pathway to tackle the causes of poverty, violent conflict, human rights abuses, climate change and environmental degradation. The 2023 SDG Summit took place on 18-19 September 2023 in New York. It marks the beginning of a new phase of accelerated progress towards the Sustainable Development Goals with high-level political guidance on transformative and accelerated actions leading up to 2030.

POLITICAL DECLARATION adopted at the High-level Political Forum on Sustainable Development (HLPF), under the auspices of the General Assembly in September 2023

Our shared commitment

1. We, the Heads of State and Government and high representatives, have met at United Nations Headquarters in New York on 18 and 19 September 2023, at the Sustainable Development Goals Summit, to review progress on the 2030 Agenda for Sustainable Development.
2. We reaffirm our commitment to effectively implement the 2030 Agenda and its SDGs and uphold all principles enshrined in it. The 2030 Agenda remains our overarching roadmap for achieving sustainable development and overcoming the multiple crises we face. We will act with urgency to realize its vision as a plan of action for people, planet, prosperity, peace and partnership, leaving no one behind. **We will endeavour to reach the furthest behind first.**
3. **We emphasize that eradicating poverty in all its forms and dimensions**, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development.
4. We reaffirm that the 2030 Agenda is universal in nature and that its Goals and targets are comprehensive, far-reaching, people-centered, indivisible and interlinked, balancing the three dimensions of sustainable development – economic, social and environmental, in an integrated manner. We reaffirm that the 2030 Agenda and its Goals **seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and girls.**
(In all 41 paragraphs, see on line on the UNGA SITE; four further key paragraphs are cited below:

We will accelerate actions to end hunger, food insecurity and all forms of malnutrition, including through access to sufficient, safe and nutritious foods, the transition to sustainable and resilient agrifood systems, and by promoting safe, healthy and diversified diets and consumption practices..

We will address water scarcity and stress and drive transformation from a global water crisis to a world where water is a sustainable resource, ensuring the availability and sustainable management of water and sanitation for all.

We will ensure good-health and well-being for all, achieving universal health coverage and leaving no-one behind.

We will take steps to ensure universal access to affordable, reliable, sustainable and modern energy for all, including through enhanced international cooperation to assist developing countries. We will increase substantially the share of renewable and clean energy.

We affirm the absolute necessity for MAURITIUS (its Government, opposition parties, private sector, public and private organisations, unions and enterprises etc) as well as ALL CITIZENS to work for the implementation of these 17 SD goals. Our Prime Minister ably represented Mauritius in NY (as he did last week at the G20 in Delhi). In NY, Pravind Kumar Jugnauth has rightly offered full support to implementing these SDGs. For our own benefit, for that of our Ocean and Africa Region, for the Planet, as our contribution to building a better, peaceful and sustainable world.

Dr Michael Atchia

(Past programme Director at UN)

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"Vivre simplement pour que simplement d'autres puissent vivre"



EN CETTE JOURNEE MONDIALE DE L'ENVIRONNEMENT, CE 5 JUIN, J'INVITE CHACUN A PRENDRE CAS DES QUELQUES CONTRAINTES MAJEURES DE LA PLANETE ET DE MAURICE EN 2023

ESPACE DE VIE :

Les températures SUR PLANET TERRE malgré le réchauffement climatique récent sont entre moins 40°C et +50 °C et sont donc aptes à soutenir la vie (Sur la plus lointaine planète, Pluton, que nous venons de voir de près grâce à la sonde Américaine, les températures varient entre moins 150 °C et moins 240 °C, Même l'azote atmosphérique est liquide, parfois solide, mille fois inapte à la vie organique tel que nous l'avons).

Quelle chance pour NOUS et pour la Planète TERRE !

Pour nous ilois de Maurice, les lois de l'écologie bien comprises et bien appliquée nous enseignent à vivre dans les limites des RESSOURCES que nous avons. Par exemple nos terres (*seulement 2,000 km²*), nos ressources en eau douce, notre espace pour vivre, se relaxer, prier, se rencontrer, espace pour des logements adéquats pour chaque famille, terre pour la cultivation de la nourriture et la productivité industrielle. *Nous avons notre million de km2 d'océan, zone économique exclusive à exploiter mais en même temps à protéger, contre la pollution, la sur-pêche et la militarisation.*

Par exemple 600,000 véhicules sillonnent nos routes (qui ont presque atteints leurs limites), tous utilisant de l'énergie fossile importée, CELA n'est nullement soutenable. Nous avons laissé tomber un système de train sur rail qui aurait pu fonctionner sur l'énergie renouvelable (solaire+éolienne+ biomasse) et permettre Maurice de rouler quand les énergies fossiles non-renouvelables (gaz, pétrole, charbon de terre) arriveront à leur fin (en 2050 ? 2070 ?2100 ?).

SYLLE DE VIE ET POLLUTION. Nous avons **pollué** et sali notre propre MAISON (la planète terre) au point que notre style de vie exagéré menace la vie même sur la terre.

Tous mais surtout les citoyens des pays industrialisés, sont pleinement responsables de la **dégradation de notre environnement à l'échelle planétaire**, autant sur le point du changement climatique, de la perte de biodiversité, des ressources (eau, sol, air) que sur notre santé et notre cadre de vie. Mais le reste du monde surtout les milliards de personnes en Chine, en Inde et en Afrique aspirent à suivre ce mode de vie insoutenable !

ENERGIE. Essentiel pour faire tourner le monde. Aujourd'hui nous vivons essentiellement sur les énergies fossiles. L'utilisation massive du charbon et du pétrole depuis la révolution industrielle menace d'étouffer la terre et avec tous les êtres vivants. Rien qui n'est pas renouvelable par des cycles naturels ne peut servir les besoins de l'homme. Car l'eau potable, l'énergie, et l'air il en faut tout les jours, tout le temps. Alors que notre civilisation technologique a été bâtie sur des fossiles (produites sur des millions d'années il y a des millions d'années de cela) et utiliser tout d'un coup sur un ou 2 siècle.

Une chose est certaine : sans énergie la vie moderne (transport, agriculture, usines, bureaux services) s'arrête net. Nous à MAURICE nous importons 80% de l'énergie que nous utilisons (charbon, gaz, pétrol-) mais la transition vers le renouvelable est trop lente.

Celebrate World Environment Day:
Go Green in 2024 |
SDG Resources



**World
Environment Day**

MAST Council Members International participations Oct 22-Sept 23

Participations

1. ISC strategy meeting of 9-11 May 2023 in Paris

The mission of the ISC, (The International Science Council) , is to act as the global voice for science. As part of that mission, the ISC:

- Speaks for the value of all science and the need for evidence-informed understanding and decision-making
- Stimulates and supports international scientific research and scholarship on major issues of global concern
- Articulates scientific knowledge on such issues in the public domain

Promotes the continued and equal advancement of scientific rigour, creativity and relevance in all parts of the world

300 delegates under the Chairmanship of Sir Peter Gluckman met at Novotel “Tour Eiffel” Hotel, to discuss Science Strategy for the next 3 years.

Dr Michael Atchia represented MAST. He proposed a resolution to the effect of providing

INTEGRATED RESPONSES FROM SCIENCE.

This Proposal to ISC was discussed at the strategy meeting in Paris. Highlight of the proposal :

“Develop a continuation and application, in practical terms, of the theme of science and social justice (the WSFORUM theme of Cape Town, December 2022)

By strengthening the relationships between the sciences, namely, in practical terms, seeking the inputs of each of the Unions to a given theme/problem/phenomenon.

In order to provide (in particular for use by decision-makers and political leaders) the obviously necessary INTEGRATED RESPONSES FROM SCIENCE.

And build up INTEGRATED RESPONSES FROM SCIENCE for each topic, which can be circulated and tested.

2. IAP Workshop

Dr Deoraj Caussy served as reviewer during a workshop organized by IAP and Save the children at IAP head quarter in Trieste from 2-5 September 2023 on Case studies focussing on science-based policy solutions for climate change and health challenges.

3. Declaration of the 10th World Science Forum on Science for Social Justice, Cape Town, 6 to 9 December 2022.

MAST was represented by the President of MAST, Dr Michael Atchia



With the encouragement and support of the partner organizations of the World Science Forum, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the International Science Council (ISC), the Hungarian Academy of Sciences, the American Association for the Advancement of Science (AAAS), The World Academy of Sciences for the advancement of science in developing countries (TWAS), the InterAcademy Partnership (IAP), and the European Academies' Science Advisory Council (EASAC), as well as the South African Department of Science and Innovation, that hosted **the 10th World Science Forum, held from 6 to 9 December 2022 in Cape Town, South Africa. Participants adopted the present declaration.**

World Science Forum (WSF), an outcome of the 1999 World Conference on Science, is a biennial event that since 2003 has been successfully assembling scientists, policymakers, industry leaders, civil society and the media to discuss the role of science in meeting global challenges.

In line with the recommendations of the 1999 World Conference on Science (WCS) and the Use of Scientific Knowledge, and taking into account the 2011 Budapest Declaration on the New Era of Global Science, the 2013 Rio de Janeiro Declaration on Science for Global Sustainable Development, the 2015 Budapest Declaration on The Enabling Power of Science, the 2017 Jordan Declaration on Science for Peace and the 2019 Budapest Declaration on Science, Ethics and Responsibility, we reaffirm our commitment to the rigorous and ethical conduct of scientific research and the free and responsible use of scientific knowledge for sustainable development to the benefit of all humanity.

4. ‘Rencontre Internationale les plastiques dans l’Océan Indien’, Madagascar’ 17-19 October 2022

Dr Salem Saumtally attended the meeting where people from a wide range of backgrounds, including school children, artists, NGOs, private companies, academies, organizations, and scientists were present. The object was to create awareness of plastic pollution, its proper use, and recycling initiatives. A presentation on behalf of MAST was made on the potential conversion of sugarcane trash into bioplastics as part of the solution to the problem. The meeting was co-organized by the *Groupe Interacadémique pour le développement* and the Indian Ocean Commission.

Annual Meeting of African Science Academies (AMASA 22) - Strengthening capacity for sustainable agriculture and food systems in Africa – 28-30 November 2022

The objective of the meeting was to boost Africa’s capacity to sustainably meet the food and nutrition security of its growing population. The challenges – such as climate change, and population growth were discussed, and opportunities were envisaged, e.g. gene editing technology and regenerative agriculture. The meeting was an opportunity to discuss science communication and a press conference was held by the Network of African Science Academies (NASAC)/AMASA to explain the benefits of GM crops. Strengthening the research ecosystem in Africa through funding for research was examined. It was felt that the Academies could play a role there in making the link between the funders and researchers.

Drs Yousuf Maudarbocus and Deoraj Caussy of MAST presented papers entitled “Enhancing food production in Africa through the utilization of nuclear techniques” and “Protecting human health from climate change in Africa” respectively. A policy paper on “Climate change and its disastrous impact on Africa” to which Dr Caussy was the Lead Researcher, was launched at the event.

Such meetings were also a means to establish contact with the other Academies and their members and the Kenya National Academy of Sciences (KNAS) was approached for collaboration.

At the General Assembly of NASAC, Dr Jean Claude Autrey, Past President of MAST was elected to serve on the NASAC Board.

5. Keynote Speaker at the 13th Annual Conference of the African Network for Internationalization of Education (ANIE), Zanzibar, Tanzania, 4-6 October 2023

Pr Goolam Mohamedbhai : . Title of presentation: "African Higher Education: Quest for Relevance and Impact".

6. Science for Social Justice – a responsibility, an opportunity and a commitment

We will prioritize efforts to support the translation of research results, through both technological and social innovation, to be applied for the benefit of all of society in support of social justice.

1. Science for human dignity –

2. Science for climate justice –

We call for the reinforcement of the participation of civil society in the shaping of the global science agenda for climate justice, which will ensure the representation, inclusion, and protection of the rights of those most vulnerable to the effects of climate change.

We commit to the principles enshrined in the UNESCO Declaration on the Ethics of Climate Change.

We recognize that our children will bear the brunt of climate breakdown, ecosystem collapse and the ravages of forced migration, we therefore commit to putting the best interests of future generations at the very centre of our science, policy, research programmes and social justice agenda.

3. Science for Africa and the world –How to unleash the potential of African science in global cooperation?

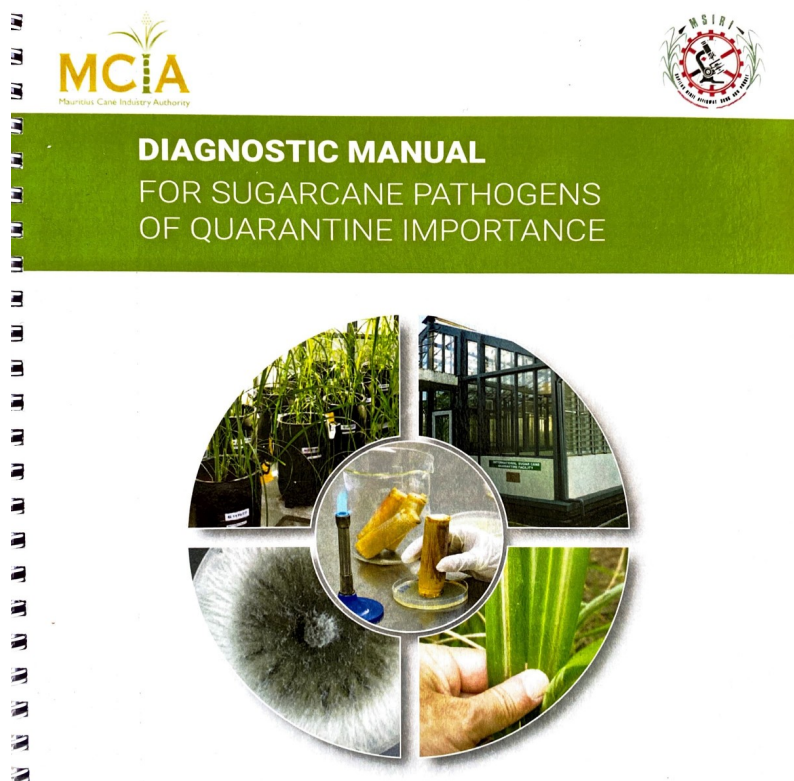
4. Science for diplomacy –

5. Justice in science –How to ensure science reflects the society we want?

We commit to respond decisively to the “Science for Social Justice” Call to Action as set out in this Declaration.

From Dr M. Atchia, delegate to the WSF, Cape Town, 9th December 2022

Publications



The Mauritius Sugarcane Industry Research Institute/The Mauritius Cane Industry Authority has published in August 2023 a Diagnostic Manual for Sugarcane Pathogens of Quarantine Importance.

Authored by **Drs Asha Dookun-Saumtally, Nawshad Joomun, and Salem Saumtally** and with a foreword by **Dr Jean Claude Autrey, CSK**, it is a comprehensive publication aimed to be a reference for sugarcane pathologists and quarantine officials.

Combining hands-on experience with photographs and protocols on the use of various conventional and molecular methods for detecting pathogens, the 61-page Manual will be valuable to bolster global efforts in safeguarding the sugarcane industry from devastating diseases.

The publication, was an initiative supported by EU in the framework of the ACP Sugar Research Programme 2010-2015, and has been sponsored by the MAST Fund for the Advancement of Science and Technology.

Dr Deoraj Caussy

Strategic Interventions for addressing regional climate change and health challenges published as T20 Policy brief in May 2023 in preparation for G20 meeting in New Delhi, India (co-author)

Pr Goolam Mohamedbhai

A Review of Regional Variations in Vulnerability to Infectious Diseases a Policy Implications for Climate Change and Health accepted for publication
Natural Hazard Research (co-author)

APPOINTMENTS

Dr Deoraj Caussy has been appointed as advisor to the Regional Director of WHO-AFRO on matters of Epidemic Preparedness and Response for an initial term of 3 years.

A field for development: The cultivation and use of algae



Life on earth could not survive without seaweed and algae. Every second oxygen molecule that we inhale originates from them. In the future, they could also become an important food source. Many researchers are working on processes for commercial cultivation, as well as the extraction of different proteins and other nutrients, from algae.

Agricultural uses of seaweed

One of the oldest uses of seaweed is in agriculture. In fact, the beneficial effects of seaweed on soil and crops have been empirically observed by farmers and confirmed by scientific studies. Seaweed supplies macro- and micronutrients, has liming properties, increases phosphorus availability, the phycocolloids improve soil structure, increases the water retention and cation-exchange capacities of soil, binds metals, boosts biological activity, and improves plant resistance to aggressive biotic and abiotic agents. Also, seaweed constitutes a useful bioresource free of adventitious seeds and pathogens. These properties improve soil quality and allow seaweed to be used on any type of crop, whether organic or otherwise.

Algae in food:

Algae are common all over the Earth. Due to their rich chemical composition and content of bioactive substances they have been used in many fields of industry. Their gelling, thickening and stabilizing properties have led to the development of such products as agar, alginate and carrageenan. Moreover, algae are used in the food industry as food supplements and an addition to functional food. Algae are also added to meat products, such as pasty, steaks, frankfurters and sausages, as well as to fish, fish products, and oils, to improve their quality. Cereal-based products, such as pasta, flour and bread, are another

group of products enriched with algae. Due to their properties algae may also be used for construction of fermented functional food. Fermented products containing algae are, most of all, dairy products, such as cheese, cream, milk deserts, yoghurt, cottage cheese, and processed cheese. Combination of fermented products offering a high content of lactic acid bacteria with algae possessing biologically active metabolites of natural origin allows not only to compose products with a high content of nutrients, but also to create a brand new segment of fermented food.

Minamata Convention on Mercury

Highlights of 5th Meeting of the Conference of the Parties to the Minamata Convention on Mercury, Geneva, Switzerland, held on 3 November 2023

The COP considered the first full round of national reports made by governments on eradicating the use of mercury, discussing possible acceleration actions and how the reporting framework could be strengthened.

On the final day of COP-5, delegates made arrangements for the work of the Convention leading up to COP-6 in two years' time.

Osvaldo Patricio Álvarez Pérez from Chile, was elected as the COP-6 President

The last day of COP-5 also saw substantive decisions being taken. Delegates agreed on the following phaseout dates for certain types of batteries, switches and relays, fluorescent lamps, and cosmetics; phase out the use of mercury as a catalyst in polyurethane production by 2025; to declare mercury-free technologies technically and economically feasible for production of sodium or potassium methylate or ethylate; and to require parties which have not yet phased out dental amalgam to either submit a national plan or national report on steps toward phaseout.

They adopted a decision on trade and the Secretariat to develop guidance to assist parties in identifying, managing and reducing mercury trade from primary mercury mining, and to facilitate the exchange of any trade-related information that the Secretariat has received from parties. Delegates also agreed to make technical changes to the existing format for countries to submit their national reports, explaining how their actions are contributing to the Convention's implementation. The changes will help to ensure that reports are clear and reflect recent data.

A decision on mercury waste thresholds, finalized only on Thursday night, was adopted on Friday. The decision means that countries have a fixed standard now for measuring whether imports and exports contaminated with mercury contain more than the allowed total concentration value of 15 mg/kg. This is important for countries who fear becoming global dumping grounds for hazardous waste, as it gives a basis that enables them to block imports. It also means that producer nations have a benchmark for blocking exports of mercury-contaminated waste.

MAST - Lecture on Thursday 26 October 2023

Amongst its various objectives, the **Mauritius Academy of Science and Technology (MAST)** facilitates the exchange of ideas and knowledge among scientists and technologists as well as supporting the dissemination of scientific knowledge through public activities. **In this context, the MAST organised a lecture on:**

Chlorophyll fluorescence in marine organisms: A sentinel for climate change-driven ocean warming

by

Professor (Dr) Ranjeet Bhagooli, from the Dept of Biosciences and ocean studies, Faculty of Science, University of Mauritius

Prof. Bhagooli's talk will be focused on the waters of the Republic of Mauritius, which support one of the most diverse but fragile coral reefs and mangrove ecosystem-associated organisms. The ecosystems are now under threat due to extreme climatic phenomena, including climate-change ocean warming. He presented applications for measuring the impact of various stressors on marine life in Mauritius, Rodrigues, St Brandon, and Saya de Malha as well as demonstrate equipment used in such studies.

Lecture was attended by scientists, students and the general public.

News from Partner organisations

A Message from the INDIAN SCIENCE ACADEMY, INSA

“We must take decisive action to reduce our dependence on fossil fuels and transition to clean energy. A just transition is the only way forward; one that prioritizes a safe, healthy environment and creates secure jobs for workers in the new green economy. It’s time for us to come together and make this happen for future generations.”

Prof. Ashutosh Sharma, INSA President



In preparation for the **G20 SUMMIT** in India in September 2023, all 20 countries and Mauritius were invited by INSA to the **S20 preparatory meeting**. In our case invitation to Dr S. Saumtally and to Dr M. Atchia. **The theme: ONE EARTH, ONE FAMILY, ONE FUTURE.**

Royal Society, UK.

Career Development Fellowship

This scheme provides the most talented early career scientists from underrepresented groups in STEM with research funding and high-quality training opportunities to build a strong base for a successful research career.

The Career Development Fellowship was opened to applications on 7 November 2023. The deadline for applications is 24 January 2024, at 3pm UK time. Interested applicants can obtain details on :

[Royal Society Conditions of Award \(PDF, 238.8kb\)](#)

[Career Development Fellowship Scheme Notes \(PDF, 364.1kb\)](#)

[Career Development Fellowship FAQs \(PDF, 142.6kb\)](#)

About the scheme

The Career Development Fellowship (CDF) is a four-year, postdoctoral research fellowship that aims to support the retention in STEM of researchers from underrepresented backgrounds. The scheme will initially run as a pilot with researchers from Black heritage. If successful, the pilot may be broadened to researchers from other underrepresented groups.

The scheme has been developed following cross-sector roundtables and [Royal Society-commissioned reports](#) which looked at trends across 11 years of Higher Education Statistics Authority (HESA) data and [benchmarked the Society's early career fellowships \(PDF\)](#) against the eligible applicant pool.

Research must be within the Royal Society's remit of natural sciences, which includes but is not limited to biological research, chemistry, engineering, mathematics and physics. For a full list, please see the [breakdown of subject groups and areas](#) supported by the Royal Society. Up to £690,000 over four years to cover the Research Fellow's salary and associated on-costs (at 80%), directly allocated costs (at 80%) and research expenses;

The application form can be accessed through the Society's grant management system Flexi-Grant®.

The deadline is **24 January 2024**.

NEWS FROM ISC

Through the **Fellowship**, the International Science Council seeks individuals to help plug important skills gaps by acting as experts or advisers for ISC projects, programmes, and collaborations. Fellows also act as ambassadors and advocates for the ISC's work, notably at [high-level global events and fora](#) - connecting the Council with influential actors. The ISC Fellowship represents the highest honour that can be conferred on an individual by the Council.

The [Fellowship currently counts 126 individuals](#), and subsequent annual calls will build the Fellowship to an anticipated network of 600 active Fellows

For ISC Members and your networks

The landmark meeting of Pacific scholars at the beginning of this week concluded with an ambitious plan to co-design and establish a **Pacific Academy of Sciences and Humanities**. The establishment of a Pacific Academy would respond to a pressing need to foster co-creation of knowledge to empower Pacific scholars to be part of solutions in their region. Read and share the press release: <https://council.science/current/press/pacific-science-academy/>.

Top read

For ISC Members and your networks

Global solidarity for climate justice – Perspectives from an early-career researcher: <https://council.science/current/blog/global-solidarity-for-climate-justice>

[Call for nominations](#) for Thieme–IUPAC Prize for early career scientists in synthetic organic chemistry (**deadline: 15 December**)

[Call for grant proposals](#) for "Databases, Campaigns, and Meetings" providing support for creating databases of solar-terrestrial data (**deadline: 22 December**)

Events within the ISC community

For ISC Members and your networks

15 December: Places are filling up fast for the closing ceremony of the IYBSSD – <https://council.science/events/closing-ceremony-iybssd/>

All ISC Member organizations are invited to participate in a one-day Science Filmmaking workshop on 1 April in the frame of the 2024 Ethnografilm Festival in Paris. The workshop aims to empower scientists to create short films highlighting their own research. Following the workshop, participants will work on creating a short film about their research throughout 2024 with the support and remote assistance by the workshop instructors. All films created will be screened at the 2025 Ethnografilm Festival. Nominate your interested scientist **by 1 December**. More information: <https://council.science/events/introduction-to-science-filmmaking/>

Opportunities and deadlines relevant to ISC Members can be found on the ISC Membership Notice Board <https://council.science/members/membership-notice-board/>.

Anne Thieme | Membership Liaison Officer
International Science Council (ISC)
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Paris, France

Sudan at risk of losing a generation of scientific talents

The Sudanese National Academy of Sciences has appealed to the solidarity of global science community, as conflicts are threatening an entire generation of scientists and researchers - struggling to keep working on pressing issues, as many fled the violence in safer parts of the country or abroad.

MAST Newsletter carries this paper from ISC, on 'Insights on the future of trans-disciplinary research'. Transdisciplinary., on a major new strategy for research.

Transdisciplinary Bridges

Jul 7 2023

By Steven Hartman

The ISC's discussion paper Looking at the Future of Transdisciplinary Research by Matthias Kaiser and Peter Gluckman is a necessary provocation to a research establishment that, in the aggregate, is not sufficiently meeting the challenges of the Anthropocene and the needs of a post-carbon transition.

In his response to the discussion paper, Paul Shrivastava noted that the term 'transdisciplinary', by centering on the disciplinary, "may inadvertently be devaluing action, agency and impacts". Generally speaking, the prevailing organisational structures of many research institutions limit their capability to embrace the realities of societal challenge-driven knowledge production. Non-academic communities must have an equal part (at least) to play in the framing and execution of research agendas, though this is not yet possible at the scale required for national, regional and international impact.

The structures of research institutions generally reflect the disciplinary logics of national academies, international scholarly associations and scientific organisations promoting knowledge advancement through elite programmatic structures bound by common epistemological assumptions and traditions (e.g. traditional faculties and colleges). These structures not only separate scientists and humanities scholars from teachers and learners through power asymmetries that are both symbolic and functional — they also separate scientists *from* scholars, teachers *from* learners, experts from practitioners, and to no small extent universities from the very communities that support them.

Institutionalisation of these asymmetries assume linear processes of knowledge production and top-down solutions-brokering in which the academic community are the providers (and gate-keepers) of knowledge and societal stakeholders are the users. This model of scientific production is incommensurate with the dynamic realities of complex socio-ecological systems that require increased feedback capacities, greater reflexivity, and more efficient knowledge exchange in the co-production process. Shorter intervals for assessment of risks, vulnerabilities and both mitigation and adaptation options are precisely what is needed in the present moment of climate disruption, catastrophic biodiversity loss and mass extinctions. These conditions require a dramatic mainstreaming of transdisciplinary knowledge co-production.

The distributed agencies and capacities for learning and action throughout our societies as we move into the mid 21st century call for models of knowledge production that move beyond those of the late 20th century, especially as the nations of the world continue, year after year, to fall short of their own targets and obligations in intergovernmental treaties and resolutions such as the Paris Agreement and Agenda 2030. Paul Shrivastava notes the many different terms have shown up in place of ‘transdisciplinary science’ in his own research on the topic. Whatever we call it, transdisciplinarity will be central to any model by which the global community may hope to alter this trend and live up to the vision of "peace and prosperity for people and the planet, now and into the future" envisaged in the Sustainable Development Goals.

From 2015 to 2017 the international project "Broadening the Application of the Sustainability Science Approach" brought together several UNESCO sectors with international scientific councils such as ISC and the International Council for Philosophy and Human Sciences (CIPSH), national ministries of science and education, sustainability science institutes, sustainability research networks and expert groups from around the world. Funded by the Japanese Ministry of Science and Technology, this project sought to examine good practice in the field over the previous 15 years and recommend how the interface between academia and sustainability practitioners—at the levels of policy, governance and action—could be enhanced to strengthen the sustainability agendas of UNESCO member states. One important outcome of the project was the acknowledgment of the role the humanities, the arts, and qualitative social sciences, as well as Indigenous and local knowledge communities, could play as vital knowledge communities in meaningful articulation with scientific domains, policy organs, governance structures and management systems involved in mainstream sustainability science.

Another key outcome of the project was the initiation of an international multi-stakeholder process to co-design and establish the first humanities-led sustainability science coalition in the UN family of organizations. Inaugurated as the BRIDGES Coalition, this initiative brought international actors with significant capabilities for reach and impact together with regional and local site-based stakeholders representing diverse communities and environments at risk. Led by UNESCO, the CIPSH and the Humanities for the Environment global network, this multistakeholder consultation and design process spanned four international workshops in 2019-2021, bringing together more than forty organizations, institutions and programs from around the world. In this process the ISC played a key role.

What emerged was a consensus vision for a new coalition, global in scope and diverse in its array of participating organizations, connecting high-impact international actors in sustainability science, education, civil society, and policy, with smaller regional and territorial stakeholders tied to environments and communities on the front lines of global social and environmental change.

This new humanities-led sustainability science coalition, now part of UNESCO's Management of Social Transformations (MOST) programme, is intended to complement and work together with existing programs at various levels internationally to promote the bridging of top-down and bottom-up initiatives, serving as a focal point for humanities-anchored knowledge and learning in assessment, policy and action contexts in the sustainability domain. The coalition aims to contribute as a potential force-multiplier in the generation and application of knowledge for transformative social change through its active promotion of genuinely transdisciplinary collaborations that bridge diverse disciplines, knowledge communities, stakeholders and sectors.

Exploring Healthier Sugars from Mauritius

Sucrose is the common table sugar, derived mainly from two important crops namely sugarcane and sugar beet. Mauritius has long been associated with sugarcane production, dating back to its introduction into the island from Java by the Dutch in 1639, mainly to produce an alcoholic drink. It was during the French occupation from 1715 to 1810 that sugar (sucrose) production started. In fact, when the British conquered Mauritius in 1810, sugar production was less than 1000 tonnes and by 1860, it rose to some 120 000 tonnes with 259 factories in operation. Post-independence, Mauritius benefitted from the signing of the Lomé convention that guaranteed preferential prices and access to the EU market. Sugarcane reached its peak production and was cultivated on some 87 000 ha with a peak record production of 718 464 tonnes in 1973. However, with the end to the sugar protocol and globalization, a re-engineering of the industry and new strategies became necessary. One of the steps taken was to increase the production of raw specialty sugars that fetch a higher premium price than refined sugar. In 2022, some 232,000 t of sugars, were produced of which special sugars, some unique to Mauritius, represented more than 50%.

There has been growing concerns about the impact of sugar on human health. Sugar when consumed, breaks down into two simple sugars, namely glucose and fructose. Glucose rapidly enters the bloodstream, causing a surge in blood sugar levels or hyperglycemia that in the long term can lead to health problems.

This led to exploring low glycemic index (GI) sugars, which lead to slower, steadier increases in blood sugar, thus reducing the risk of sugar spikes associated with health issues. In this context, it was considered imperative to determine the characteristics of the specialty sugars produced in Mauritius to better understand their properties.

Further research targeted the extraction and concentration of active antioxidants compounds from sugarcane. When blended with white refined sugar, these compounds significantly reduced its GI from 65 to 50. This finding suggests a potential avenue for producing low GI, antioxidant-rich sugar blends derived from Mauritian sugar cane. The incorporation of antioxidant compounds from sugarcane into refined sugar could revolutionize the health benefits of this everyday staple. Additionally, transforming refined sugar from a high-GI to low-GI product holds immense market potential both locally and internationally.

This research, co-authored by three MAST Members opens new avenues to healthier sugar options and promising commercial prospects for the Mauritian sugar industry.

For in-depth information, refer to the full paper.

L J C Autrey, A S Saumtally, A Dookun-Saumtally and G Umrit (2023): Characteristics of specialty and physiologically-enhanced refined sugars produced in Mauritius favourable for good health. Sugar Industry International, 148 (4): 214-219.

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NASAC
NEWS

National Academies of Science in Africa

Academies of Science support the implementation of a nation's science policy through their dual mandate: promoting and honouring scientific excellence and providing evidence-based science advice to their nations. Since 2008, ASSAf has engaged in collaborative and academy development work with various national science academies. There are over 110 academies of science across the globe, some of which are over 350 years old such as the [Royal Society](#) (United Kingdom). In Africa, there are **twenty-nine (29) national academies of science** namely:

Algeria – [Académie Algérienne des Sciences et Technologies](#) (AAST)
 Benin – [Académie Nationale des Sciences, Arts et Lettres du Benin](#) (ANSALB)
 Botswana – [Botswana Academy of Sciences](#) (BAS)
 Burkina Faso – [Académie Nationale des Sciences du Burkina](#) (ANSB)
 Burundi – [Academie Burundaise Des Sciences Et Technologie](#) (ABST)
 Cameroon – [Cameroon Academy of Sciences](#) (CAS)
 Congo – [Académie Nationale des Sciences et Technologies du Congo](#) (ANSTC)
 Cote d'Ivoire – [National Academy for Cote d'Ivoire](#)
 Egypt – [Academy of Scientific Research and Technology](#) (ASRT)
 eSwatini – [Kingdom of eSwatini Academy of Sciences](#)
 Ethiopia – [Ethiopian Academy of Science](#) (EAS)
 Ghana – [Ghana Academy of Arts and Sciences](#) (GAAS)
 Kenya – [Kenya National Academy of Sciences](#) (KNAS)
 Madagascar – [Madagascar's National Academy of Arts, Letters and Sciences](#)
 Malawi – [Academy of Sciences in Malawi](#)
Mauritius – Mauritius Academy of Science and Technology (MAST)*
 Morocco – [Hassan II Academy of Science and Technology in Morocco](#)
 Mozambique – [Academy of Sciences of Mozambique](#) (ASM)
 Nigeria – [The Nigerian Academy of Science](#) (NAS)
 Rwanda – [Rwanda Academy of Sciences](#)
 Senegal – [Académie des Sciences et Techniques du Sénégal](#) (ANSTS)
 South Africa – [Academy of Science of South Africa](#) (ASSAf)
 Sudan – [Sudanese National Academy of Science](#) (SNAS)
 Tanzania – [Tanzania Academy of Sciences](#) (TAS)
 Togo – [Académie Nationale Des Sciences, Arts Et Lettres Du Togo](#) (ANSALT)
 Tunisia – [Tunisian Academy of Arts and Letters](#)
 Uganda – [The Uganda National Academy of Sciences](#) (UNAS)
 Zambia – [Zambia Academy of Sciences](#) (ZaAS)
 Zimbabwe – [Zimbabwe Academy of Sciences](#) (ZAS)

The oldest academy is [Madagascar's National Academy of Arts, Letters and Sciences](#), which was established in 1902, while the youngest academy is the **Academy of Sciences in Malawi** which was established in 2021. In addition to the national academies, there is an individual member-based academy, the [African Academy of Sciences](#) (AAS) that draws its membership from across Africa.

COUNCIL of MAST, 2022-24

About MAST

The Mauritius Academy of Science and Technology (MAST) is a non-profit, non-governmental organization created by a group of high-level concerned scientists to bring together some of the best brains in the country and the diaspora, under one association, willing to reflect on some of the burning issues of **Science, Technology and Innovation** and offer independent and studied opinion on them and to promote our development. It strives to promote excellence in all areas concerned by its mission.

The Academy, in collaboration with existing institutions, promotes the popularization and understanding of **Science and Technology** in the population, while encouraging creativity and innovation that can make the service and production sectors competitive on the world market. In partnership with relevant organizations, local and foreign, the Academy enhances cooperation and dissemination of scientific and technological knowledge for a knowledge-based economy.

The Academy addresses current national problems where Science and Technology can contribute answers and solutions.

List of Office Bearers for 2022-2024

President: Dr Salem Saumtally

1st Vice President: Prof Goolam Mohamedbhai

2nd Vice President: Prof Yashwant Ramma

Immediate Past President: Dr Michael Atchia

Founder President: Prof Soodursun Jugessur

Secretary: Dr Ravhee Bholah

Assistant Secretary: Dr Asha Dookun-Saumtally

Treasurer: Dr Ranjeet Bhagooli

Assistant Treasurer: Past President Dr Yusuf Maudarbaccus

Member: Past President Dr Jean Claude Autrey

Member: Dr Deoraj Caussy

Public Relations Officer/Editor: Dr Michael Atchia

MAST Membership consists of:

1. Honorary Fellows

2. Fellows: *very senior scientists with many years of experience*

3. Members: *scientists with minimum of 8 years post PhD*

4. Associate Members: *Scientists with basic science qualifications and ready to promote Science and Technology in Mauritius*

Picture Gallery

MAST lecture series :
Pr. Ranjeet Bhagooli on Chlorophyll fluorescence in marine organisms. At MSIRI on 26 October 2023



MAST Council, 2022-2024 Council Meeting in Board Room, MSIRI



MAURITIUS ACADEMY OF SCIENCE & TECHNOLOGY

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Appeal

Willing to join
MAST and put your
expertise at the
service of the
country?

Send us a short resumé
on yourself, and tell us
how you can assist.

Newsletter & Journal

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