



Mauritius
Academy of
Science and
Technology

OUR MISSION:
Promote excellence in the fields of
Science, Technology and Innovation
for Human development and welfare

MAURITIUS ACADEMY OF SCIENCE & TECHNOLOGY

MAST NEWSLETTER & Journal

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Mauritius Academy of Science & Technology (MAST)

Editorial: Let's take another overall look at the main objectives of SCIENCE AND TECHNOLOGY, their study, research, advance and applications.

Surely the first objective should be the understanding of Nature and the environment, of life on earth and of our own place as part of the universe.

Then should come understanding of the need for preserving the cycles and structures of the blue planet: ranging from energy, which supports life, and of improving every aspect of human life, whether from the basics of food, shelter, security, health, to more complex processes of accumulation, advance and transmission of knowledge and skills. Finally, move to the wider issues of settlements, communication and transport and the preservation of biodiversity, with the need for keeping the planet and our living 'quarters' clean and pollution free.

There is a need to adjust population density to capacity, surveying all the parameters that allow life on earth to thrive, such as atmospheric composition and availability of natural resources, together with the recycling of these resources, including global climate and changes occurring as a result of the activities of seven billion humans on Earth.

Even if some major discoveries and inventions have been made by single scientists working and thinking alone, usually scientists cannot be effective in isolation.

So, where is scientific research organised, besides in centres of learning and research (universities and colleges), and apart from industry and Government organisations? In most countries a Science Academy exists which groups top scientists for **common reflection, common/coordinated advice and common/coordinated action. Thankfully, these academies do not act in isolation.**

Two primordial organisations help ensure such coordinated if not common reflection, advice and action, at world level. These are **ISC** (previously ICSU) and **IAP**.

ISC, the INTERNATIONAL SCIENCE COUNCIL, groups together all 40 International Unions, each responsible for a given science. For example, IUBS, the International Union of Biological Sciences is responsible for biology and all its branches.

ISC also has 142 scientific organisations as members.

IAP, the INTERACADEMY PARTNERSHIP, has currently a membership of over **140** academies of science, medicine and engineering from around the world, of which MAST is one. A number of other scientific organizations participate in IAP meetings and activities either as observers or partners. **Besides a central office, IAP works through Regional Networks, one existing for each major part of the world.**

These are :

AASSA (Director Yoo Hang Kim), for Asia, hosted by KAST ; **EASAC** (Christiane Diehl), for Europe ; **LANAS** (Juan Asenjo), for Latin America; **NASAC** (Jackie Kado), for Africa, with 25 member Academies.

Some common priority themes as considered by IAP at its latest triennial meeting in Songdo in 2019:

Agriculture & Food Security



Biotechnology & Biosecurity



Careers in Science



Disaster Risk Reduction



Energy



Environment & Climate



Health



Science Advice



Science Education & Science Literacy



Water



Women in Science



Young Scientists



The Inter Academy Partnership (IAP) logo has been modified to better reflect IAP's work, with three main GUIDELINES, namely SCIENCE, HEALTH and POLICY.

At Songdo, South Korea, in April 2019, Atchia proposed to add a fourth dimension to IAP's guidelines, namely INNOVATION.

MAST is anything but isolated : full member of NASAC hence of IAP, collaborates with ISC, and, bilaterally, with other science academies such as INSA, Assaf, AAS, Leopoldina, l'Academie des Sciences, the Royal Society amongst others. In the past few years MAST has truly consolidated its presence in IAP and NASAC, both in acquiring new ideas AND in contributing to the African and world efforts to put science and technology at the service of mankind.

Michael ATCHIA,
President, MAST

Statements from Inter Academy Partnerships

A central focus of IAP's mission is to reach out to society and participate in discussions on critical global issues in which science plays a crucial role. Since its inception in 1993, IAP has been producing statements on issues of fundamental importance to humanity. These statements – endorsed by the majority of IAP members – are not only a reflection of the major issues that confront society but are also evidence of IAP's ongoing commitment to society.

We retain the idea of similar regular (as necessity calls) statements from MAST relating to the local context.

Update FROM IAP, February 2019

IAP 'food and nutrition' events in Washington: Members of the project from IAP, NASAC, AASSA, IANAS and EASAC presented the regional and global findings at scientific sessions in Washington DC organised by the International Food Policy Research Institute (IFPRI, “**Transforming food systems to deliver healthy, sustainable diets: the view from the world’s science academies**”, February 14) and the American Association for the Advancement of Science (AAAS, “**Food and nutrition security: scientific partnerships and opportunities**”, February 15, 2019)



IAP General Assembly, Songdo, South Korea, April 2019

NEWS ITEMS

Bibliothèque numérique du CRDI.

Correspondence de M. Yahaya Ibrahim, du Centre National de Documentation et de Recherche Scientifique , CNDRS - Musée National des Comores.

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[iBS4Rk0BiqYOPWK_s0s](https://www.crdi.ca/livres?fbclid=IwAR22CpjxrGh29dFkSVnHsBKtcbG_RFE5flb5aSa-iBS4Rk0BiqYOPWK_s0s)

Le CRDI est déterminé à améliorer les conditions de vie et les moyens de subsistance des gens en soutenant les études traitant de questions essentielles en matière de développement international. Notre programme de publication d'ouvrages du CRDI et des chercheurs que nous subventionnons constituent un important moyen de susciter des changements positifs. Il permet de communiquer les résultats de nos études à d'autres chercheurs, décideurs politiques et communautés à l'échelle mondiale.

Explorez notre collection d'ouvrages des 25 dernières années; tous les ouvrages peuvent être téléchargés gratuitement en version numérique. Des centaines d'autres ouvrages du CRDI, publiés des années 1970 aux années 1990, peuvent être consultés par l'intermédiaire de la

[Bibliothèque numérique du CRDI.](#)

ROYAL SOCIETY OF ARTS AND SCIENCE OF MAURITIUS

Le JOURNAL RSAS 2018. Vol I :

Ce JOURNAL Vol I est vendu pour les membres à Rs700/ex et pour les non-membres à Rs825/ex. En plus des frais de poste à Rs 60 par enveloppe. Les paiements peuvent se faire par chèque : - RSAS, BP 55, CUREPIPE ou par virement bancaire, au compte : - RSAS, MCB No 000140505377, sans oublier d'inscrire la raison du paiement et nous envoyer immanquablement par email (rsas.mu@gamil.com) la référence de votre transfert.

En plus des intéressants articles sur l'environnement et l'art, comme à toute chose malheur est bon, le retard pris par la sortie de notre dernière publication nous a permis de compléter l'inventaire et l'historique de tous nos avoirs de la Société. Dans le volume I de notre nouveau JOURNAL vous trouverez un article de Jean Marie HURON (*Les Œuvres d'Art et Les Monuments de La Société Royale*) qui par ses recherches dans les anciens documents de la Société a pu finalement établir la provenance et la description de pas seulement nos tableaux mais aussi d'autres items importants nous appartenant. Maintenant il va falloir faire réévaluer toute cette collection afin d'avoir une assurance adéquate couvrant nos biens. En attendant, la collection de tableaux est en dépôt au Blue Penny Museum mais, tout en étant bien reconnaissant de l'aide offerte par la MCB, le Conseil d'Administration est conscient de la responsabilité que l'association a comme gardiens de ce patrimoine. *(Extrait du Newsletter de la RSAS)*

Mauritius Parliament voted on the 9th May 2019 a bill to establish the **Mauritius Research and Innovation Council**, to replace the existing MRC. With increased emphasis on innovation, public/private partnership for applied research and the creation of a new Research and Innovation Fund.

Participation in 2019 of MAST or MAST MEMBERS to Conferences / Workshops/Seminars and other science and technology events .

- * Pr. Y. Ramma and Pr. F. Driver represented MAST at the 14th AGM of NASAC in Benin from the 11th to 14th November 2018. Dr. Y. Maudarbocus was present as Vice-President of NASAC.
- * Dr. Y. Maudarbocus represented NASAC at the IAP-SPEC meeting in Rio de Janeiro, Bresil from the 27th to 29th March 2019, to review SDG's 1/10
- * Dr M. Atchia represented MAST at the tri-annual General meeting of IAP in Songdo, South Korea in April 2019
- * Dr M. Atchia participated in a one-day consultative meeting of ISC held in Pretoria on 17th October 2018. Theme : Planning the program of action of ISC Africa
- * Pr. Goolam Mohamedbhai attended the International Exhibition and Conference on Higher Education held at Riyadh, Saudi Arabia in April 2019

SMART CITIES: MAST organized a major conference back in 2018 to allow the promoters of 5 smart cities to air their projects, including the one for modifying Port-Louis making it into a new smart city. We now welcome the latest project, the Mon Trésor Smart City, which was presented to the public, in the presence of the Prime Minister, on 8th of May 2019.

Mon Trésor Smart City : Dive into a smart coastal town, where nature and sea reign, unharmed. A smart city in the south of Mauritius, Mon Trésor reconciles eco-responsibility and contemporary urbanism. Its initial phase offers residential properties, parks, a commercial centre, a sports complex, a beach house and a business park. Holistically designed to balance private, professional and social life, it holds the promise of an easy-going and fulfilling life at the heart of a vibrant urban city.

Calls for Papers : International Journal of Social Ecology and Sustainable Development (IJSESD),

Dear Colleagues / Faculties / Researchers / Academicians / Professors / Scholars,

Per this mail, I would like to Invite original and new research paper submission for upcoming Issue - **Special Issue** on "*Sustainable Business Strategies in Digital Age Linking Sustainable Development Goals (SDGs)*" of *International Journal of Social Ecology and Sustainable Development (IJSESD)*.

More information can be found at the following link: <https://www.igi-global.com/calls-for-papers-special/international-journal-social-ecology-sustainable/1174>

Details and Guidelines to Keep in Mind for Your Manuscript Submission: <https://www.igi-global.com/publish/contributor-resources/before-you-write/>

Calls for Papers (special): International Journal of Social Ecology and Sustainable Development (IJSESD), Special Issue on: Sustainable Business Strategies In Digital Age Linking Sustainable Development Goals (SDG)

Recommended Topics

Topics to be discussed in this special issue include (but are not limited to) the following:

Social Ecology
Sustainable Employee Life-Cycle
Corporate Social Responsibility
Sustainable Development Goals
Green and/or Green Technology Valuation
Eco-Entrepreneurship and Intra-entrepreneurship
E-development (e-learning, e-health, e-education, e-society, e-governance)
Secondary and Higher Education
Knowledge Management and ICT
Globalization and Localization
Technology Management and Disruptive Technologies
Research Methodology and Technology Development
MSME partnerships
Renewable Energy Systems and Applications
Green Initiatives of International Corporations
Green Business
Religion and Environment
Environmental Ethics
Reservation Policy in Higher Education
Political Science, Sociology and Humanities
Social and Commercial Entrepreneurship
Global Warming and Climate Change
Energy Requirements and Biodiversity
Pollution and Pollution Control
Research in Business and Society
Organizations Sociology
Sustainable Management Education and MOOCs in Digital Age
Leadership, Ethics and Sustainability
Social Studies Practice and Research
Sustainability and Sustainable Development Goals
Millennium Development Goals and Sustainable Economic Growth
Water Sustainable Management and Sanitation
Sustainable Industrialization and Foster Innovation
Digital Technology and Sustainability
Sustainable Development and Green Economy.

Guest Editor : Dr. Rudra Rameshwar, L.M. Thapar School of Management,
Thapar Institute of Engineering & Technology, Patiala, Punjab, India.

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The United Nations and the African Union on the same wavelength, specifically targeting the 54 African states, including Mauritius. UN Secretary-General and AUC Chairperson Urge Greater Momentum on SDGs, Climate Action.

6 May 2019: UN Secretary-General António Guterres and African Union Commission (AUC) Chairperson Moussa Faki Mahamat expressed their commitment to deepen the strategic partnership between the UN and the AU in achieving sustainable development and addressing peace and security issues in Africa. Guterres and Faki released a joint communique following the Third AU-UN Annual Conference.

Intercropping (The well known practice of Interlignes in Mauritius)

Using advanced computer models, researchers at The Chinese University of Hong Kong (CUHK) found that intercropping enables higher productivity in crops with less synthetic fertilizers and hence reduces the air pollutants being volatilized from the cropland soil.

Prof. Amos P. K. Tai of the Earth System Science Programme teamed up with Prof. Hon-ming Lam of the School of Life Sciences at The Chinese University of Hong Kong (CUHK) to investigate the feasibility of a total replacement of the traditional farming practice of monoculture with intercropping. Using advanced computer models, they found that intercropping enables higher productivity in crops with less synthetic fertilizers and hence reduces the air pollutants being volatilized from the cropland soil. This sustainable farming practice may help maintain a stable food supply and mitigate the air pollution problem in China.

Bissessur, P., Bunsy, Y, Baider, C and Florens, F.B.V., 2019, Non-intrusive systematic study reveals mutualistic interactions between threatened island endemic species and points to more impactful conservation, *Journal for Nature Conservation*, 49, 108-117.

[UN Secretariat Issues Questions and Answers on 2019 VNRs](#)

April 2019: The UN Department of Economic and Social Affairs (DESA) has issued an updated list of questions and answers (Q&A) on Voluntary National Reviews (VNRs) to help countries prepare for their reporting on the 2030 Agenda's implementation at the 2019 session of the UN High-level Political Forum on Sustainable Development (HLPF) in July 2019.

Science for Poverty Eradication

The InterAcademic Partnership - Science for Poverty Eradication Committee (**IAP-SPEC**) held its second meeting at the Museum of Tomorrow in Rio de Janeiro, Brazil, on 27 to 29 March 2019, under the chairmanship of Professor Davidovich, President of the Brazilian Academy of Sciences. Various issues related to SDG 1 (Poverty Reduction) and SDG 10 (Reduction of Inequality) were discussed during a well-structured programme consisting of two keynote lectures by Professor Mohamed Hassan, President of TWAS, and Dr Ismael Serageldin of Egypt, respectively. Session 9, which examined ways and means to build better science-policy interfaces for poverty eradication and inequality reduction, especially in developing countries, was of particular relevance to national science academies.

As a member of IAP-SPEC, I had the privilege to chair session 4 **“Innovation as a Tool for Poverty and Inequality Reduction”**. This session focused essentially on renewable energy alternatives for the electrification of remote rural areas as well as the development and accessibility of information and communication technologies to help bridge the digital divide.

All the sessions were broadcast live on the internet worldwide.

Dr. Yousuf Maudarbocus

Fellow and Past President, MAST

Vice President, NASAC and Member, IAP-SPEC



'Nature is in its worst shape in human history' , UN report says.

May 06, 2019

The United Nations issued its first comprehensive global scientific report on biodiversity, which explored the threat of extinction for Earth's plants and animals.

Nature is in more trouble now than at any other time in human history, with extinction looming over one million species of plants and animals, scientists said Monday in the UN's first comprehensive report on biodiversity.

It's all because of humans, but it's not too late to fix the problem, the report by the United Nations says.

Species loss is accelerating to a rate tens or hundreds of times faster than in the past, the report said. More than half a million species on land "have insufficient habitat for long-term survival" and are likely to go extinct, many within decades, unless their habitats are restored. The oceans are not any better off.

"Humanity unwittingly is attempting to throttle the living planet and humanity's own future," said George Mason University biologist Thomas Lovejoy. He was not part of the report.

"The biological diversity of this planet has been really hammered, and this is really our last chance to address all of that," Lovejoy said.

Conservation scientists from around the world convened in Paris to issue the report, which exceeded 1,000 pages. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) included more than 450 researchers who used 15,000 scientific and government reports. The report's summary had to be approved by representatives of all 109 nations.

Some nations hit harder by the losses, like small island countries, wanted more in the report. Others, such as the United States, were cautious in the language they sought, but agreed "we're in trouble," said Rebecca Shaw, chief scientist for the World Wildlife Fund, who observed the final negotiations.

"This is the strongest call we've seen for reversing the trends on the loss of nature."

The findings are not just about saving plants and animals, but about preserving a world that's becoming harder for humans to live in, said Robert Watson, a former top NASA and British scientist who headed the report.

"We are indeed threatening the potential food security, water security, human health and social fabric" of humanity, Watson told The Associated Press. He said the poor in less developed countries bear the greatest burden.

'Business as usual is a disaster'

The report's 39-page summary highlighted five ways people are reducing biodiversity:

- Turning forests, grasslands and other areas into farms, cities and other developments. The habitat loss leaves plants and animals homeless. About three-quarters of Earth's land, two-thirds of its oceans and 85 per cent of crucial wetlands have been severely altered or lost, making it harder for species to survive, the report said.
- Overfishing the world's oceans. A third of the world's fish stocks are overfished.
- Permitting climate change from the burning of fossil fuels to make it too hot, wet or dry for some species to survive. Almost half of the world's land mammals — not including bats — and nearly a quarter of the birds have already had their habitats hit hard by global warming.
- Polluting land and water. Every year, 300 to 400 million tons of heavy metals, solvents and toxic sludge are dumped into the world's waters.

Allowing invasive species to crowd out native plants and animals. The number of invasive alien species per country has risen 70 per cent since 1970, with one species of bacteria threatening nearly 400 amphibian species.

Fighting climate change and saving species are equally important, the report said, and working on both environmental problems should go hand in hand. Both problems exacerbate each other because a warmer world means fewer species, and a less biodiverse world means fewer trees and plants to remove heat-trapping carbon dioxide from the air, Lovejoy said.

IP and Patenting.

How developing countries can utilise patent law to facilitate access to medicines

The South Centre is pleased to announce the publication of Policy Brief No. 59 entitled "**The ‘obvious to try’ method of addressing strategic patenting: How developing countries can utilise patent law to facilitate access to medicines**", by **Olga Gurgula**, Lecturer in Law at Brunel University London and Visiting Fellow at Oxford Martin School (the Affordable Medicines Project), University of Oxford.

The current patentability standards for pharmaceutical inventions, as well as strategic patenting used by pharmaceutical companies, have substantially impacted access to affordable medicines. This has been especially detrimental for developing countries, which are under significant pressure to remain compliant with their international and bilateral obligations, while also providing their people with essential drugs. In order to improve access to medicines, developing countries may choose from a range of various mechanisms that may help to facilitate such access, while also allowing them to remain compliant with their international and bilateral obligations. This policy brief suggests that one of such mechanisms is to strengthen the obviousness requirement by applying the ‘obvious to try with a reasonable expectation of success’ test to pharmaceutical follow-on inventions. It is argued that the application of this test may be an effective tool in addressing the negative effect of strategic patenting. It may help to prevent the extension of patent protection and market exclusivity of existing drugs by pharmaceutical companies and, as a result, may open such medicines up to generic competition.

NATIONAL INTELLECTUAL PROPERTY DEVELOPMENT PLAN FOR THE REPUBLIC OF MAURITIUS .

Needs Evaluation Report and Implementation Matrix Prepared

By Getachew Mengistie, Intellectual Property Consultant, Springfield, USA And Mr. Shane Hardowar, Lecturer (Agricultural Management and Economics)/ National Consultant, Department of Agricultural Production and Systems Faculty of Agriculture, University of Mauritius FINAL VERSION January 11, 2017

Highlight the findings related to: (i) National and sectoral development policies, (ii) IP policy, legal and institutional framework, (iii) Generation and use of IP, (iv) Commercialization of IP assets, (v) Use and awareness of intellectual property, (vi) Intellectual property rights enforcement, and (vii) Creative industry. (b) Recommend measures that should be taken by the government, where appropriate, in cooperation with WIPO and other development partners, under each of the findings.



HISTORICAL PERSPECTIVE.

DECLARATION ON SCIENCE

WORLD CONFERENCE ON SCIENCE AND THE USE OF SCIENTIFIC KNOWLEDGE

**Text adopted by the World Conference on Science, BUDAPEST
1 July 1999. Definitive version (46 PARAGRAPHS)**

**PARTICIPANTS from MAURITIUS to this World Conference on Science organised by UNESCO in June/July 1999 in Budapest:
Dr RAJ LUCHMEEAH, DIRECTOR, TEC
Dr MICHAEL ATCHIA, Programme Director, UNEP and member of IUBS/ICSU.**

Dear colleagues of MAST,
Kindly consider the attached UNESCO/ICSU document, which is amongst the best I know in the field of science and the use of science. In particular the last 8 paragraphs, reproduced below.

Sincerely,
Michael
31.5.19

4. Science in society and science for society

The practice of scientific research and the use of knowledge from that research should always aim at the welfare of humankind, including the reduction of poverty, be respectful of the dignity and rights of human beings, and of the global environment, and take fully into account our responsibility towards present and future generations. There should be a new commitment to these important principles by all parties concerned.

A free flow of information on all possible uses and consequences of new discoveries and newly developed technologies should be secured, so that ethical issues can be debated in an appropriate way. Each country should establish suitable measures to address the ethics of the practice of science and of the use of scientific knowledge and its applications. These should include due process procedures for dealing with dissent and dissenters in a fair and responsive manner. The World Commission on the Ethics of Scientific Knowledge and Technology of UNESCO could provide a means of interaction in this respect.

All scientists should commit themselves to high ethical standards, and a code of ethics based on relevant norms enshrined in international human rights instruments should be established for scientific professions. The social responsibility of scientists requires that they maintain high standards of scientific integrity and quality control, share their knowledge, communicate with the public and educate the younger generation. Political authorities should respect such action by scientists. Science curricula should include science ethics, as well as training in the history and philosophy of science and its cultural impact.

Equal access to science is not only a social and ethical requirement for human development, but also essential for realizing the full potential of scientific communities worldwide and for orienting scientific progress towards meeting the needs of humankind. The difficulties encountered by women, constituting over half of the world's population, in entering, pursuing and advancing in a career in the sciences and in participating in decision-making in science and technology should be addressed urgently. There is an equally urgent need to address the difficulties faced by disadvantaged groups which preclude their full and effective participation.

Governments and scientists of the world should address the complex problems of poor health and increasing inequalities in health between different countries and between different communities within the same country with the objective of achieving an enhanced, equitable standard of health and improved provision of quality health care for all. This should be undertaken through education, by using scientific and technological advances, by developing robust long-term partnerships between all stakeholders and by harnessing programmes to the task.

We, participants in the *World Conference on Science for the Twenty-first Century: A New Commitment*, commit ourselves to making every effort to promote dialogue between the scientific community and society, to remove all discrimination with respect to education for and the benefits of science, to act ethically and cooperatively within our own spheres of responsibility, to strengthen scientific culture and its peaceful application throughout the world, and to promote the use of scientific knowledge for the well-being of populations and for sustainable peace and development, taking into account the social and ethical principles illustrated above.

We consider that the Conference document *Science Agenda - Framework for Action* gives practical expression to a new commitment to science, and can serve as a strategic guide for partnership within the United Nations system and between all stakeholders in the scientific endeavour in the years to come.

We therefore adopt this *Declaration on Science and the Use of Scientific Knowledge* and agree upon the *Science Agenda - Framework for Action* as a means of achieving the goals set forth in the Declaration, and call upon UNESCO and ICSU to submit both documents to the General Conference of UNESCO and to the General Assembly of ICSU. The United Nations General Assembly will also be seized of these documents. The purpose is to enable both UNESCO and ICSU to identify and implement follow-up action in their respective programmes, and to mobilize the support of all partners, particularly those in the United Nations system, in order to reinforce international coordination and cooperation in science.

MAST CONSTITUTES A WORKING GROUP TO DISCUSS SCIENCE & TECHNOLOGY AND SOCIETAL ISSUES

True to its mission in strengthening the dialogue between scientists and policymakers, MAST Council took the decision to constitute a Working Group (WG) in Science & Technology and Societal Issues. The objective is to discuss global themes with a national focus leading to policy recommendations, so that science can contribute to sustainable development. Some 20 MAST members and non-members participated in the meetings and their valuable contributions are gratefully acknowledged. A short account on the deliberations is given here.

Industrialization for economic growth has led to rapid urbanization with greater demands on resources. Incentives to developers for greater adoption of renewable sources of energy should be encouraged while town and country planning should be reviewed so as to provide ample green spaces and facilities such as bicycle lanes to discourage usage of cars.

It is of concern to realize that food production is based on only a handful of crops. The conservation of crop wild relatives is deemed fundamental for resilience to cope with climate change, pests, diseases and the need to feed 9.5 billion people by 2015. More research into sustainable agriculture, a change in the mindset of both growers and consumers to pave the way towards organic food production are necessary. Awareness to adopt curricula that favour agriculture, instead of looking down on it as unfashionable, is essential.

Individualism as the credo is viewed as becoming more and more entrenched in society. Technology is contributing to this state of affairs owing to the rapid development in the area of IT, leading to addiction. Mobile phone is a very commonly cited example. This behavior is promoting tendencies to sedentary life with the consequences of obesity, psychological effects, diseases and more expenses towards health care. It is therefore deemed important to reflect on new technologies before adopting them. Such cautionary approach is to be accompanied by appropriate regulations as safeguards. A healthier lifestyle, devoting time to outdoor activities, is to be prescribed.

With modernization, the village lifestyle of family togetherness is slowly disappearing. Old people are being placed into physical and emotional hardships being left on their own or in homes. Parents are not providing the emotional family support for lack of time. Family values are considered as the bedrock of families, without which there is no empathy, sympathy, cooperation and solidarity. Therefore, bringing back family values and consolidating family ties through family dialogues on a daily basis and socio-cultural activities are vital and the competent authorities need to promote this initiative in their programme.

Health care is becoming very expensive with the escalating practitioners' fees and cost of medicine, whereby those who cannot afford treatment are affected. Side effects of prescribed drugs are quite harmful and it is timely to consider alternative forms of medicine. Research in that area should be encouraged. Ethical issues regarding health care being used as a business have to be addressed and the spirit of vocation in medical practice has to be encouraged. It was felt necessary to improve public health system, be it with the introduction of a minimal payment, for a better service in public hospitals.

Substance abuse refers to the harmful or hazardous use of psychoactive substances, including alcohol and illicit drugs. The specific causes of substance abuse are unclear, though they seem to be a combination of hereditary, environmental and social factors. Treatment of substance abuse is geared towards abstinence and includes a variety of therapies. Psychotherapy counseling of patients in understanding behavior, motivations, developing self-esteem and coping with stress is an essential element. Self-help groups are very effective and prevention through Drug Education at all level of the education system is necessary. Scientists allied with the medical profession can make the negative, at times lethal effects, of such substances widely known.

The Working Group is in the process of finalizing the full report of the discussions and recommendations.

Present: Prof. S Jugessur (Chairman), Drs M Atchia, T Jawaheer, R Bhagooli, D Kaullysing, S Saumtally, J Soulange-Govinden, R Sultan

EARTHRISE:

The view from space, a quantum leap for mankind



Other Recent quantum leaps:

Man on the moon, 50th Anniversary of N. ARMSTRONG walking on the moon surface, 20th July 1969.

The inhabited space station (ISS)

Mars explorer.

British probe to the sun

Japanese rocket to a distant asteroid



"That's one small step for man, one giant leap for mankind"

(Neil Armstrong, 20.7.1969)

Opinion paper: Educating for the Future: Are we failing our kids?

By [Nafissah Fakun](#) & [Jameela Jadoo](#) (News on Sunday, MAURITIUS), Jan 2017

It is not a secret that many education systems are geared towards results and certificate at the detriment of other skills development and most importantly towards future job skills. What should be done to prepare our children for the future world of work? News on Sunday reports.

The world's education systems are failing our children by not preparing them for the workplace of the future. This is the key finding of a new report by the World Economic Forum, "Realizing Human Potential in the Fourth Industrial Revolution" – which puts forward a series of practical measures for aligning education and training with future job requirements. News on Sunday spoke to local experts in view of getting an oversight of the situation in Mauritius.

Technology and globalisation continue to reshape business models across all sectors and geographies, creating new types of jobs and disposing of old ones at great pace. However, monolithic, underfunded education and training systems around the world have fallen short of responding to this trend. This means that by the time they leave education, as many as two-thirds of children entering primary school today will not have the skills required to get a job. The impact will be worse for women who already have less than two-thirds of the economic opportunity that men have. The report was put together by a panel of business leaders, policy-makers, unions, educational institutions and academics. It recommends that governments and the private sector work together in eight core areas to ensure the world's children are equipped for the future. Here are the main findings of the report on how to reinvent education for the future.

1. Focus on the early years: Reinventing education starts in early childhood, where the focus should be on literacy and reading. Adequate childcare provision for working parents will be critical in both developed and developing economies.

2. Keeping it dynamic: Training curricula must be aligned with market demand for skills – both job-specific and generic, such as problem-solving and project management. The challenge will be to keep these curricula dynamic and responsive to evolving business needs. In Finland, one of the world's top-performing nations in education, the curriculum is updated regularly to provide an overall framework, with room for local adaptation by the schools themselves.

3. Open-sourcing education: The report advocates adopting training innovations more quickly, opening up to alternative learning routes (such as Hackathons) and allowing for experimentation with new techniques. For example, the New York City Department of Education has created "Lab" schools and tasked them with reinventing teaching and learning. In Ghana, the US and France, schools are pioneering short courses in coding based on peer-to-peer teaching, project-based learning and gamification.

4. Taking teachers out of the ivory tower: To bring education and business closer together, the report recommends initiatives such as teacher "externships" in businesses, workplace mentoring and involving the private sector in teacher training.

5. Giving students a sense of the real world of work: Similarly, students should experience the world of work from early on – for example through internships and ongoing career coaching – to help them see a variety of career options and the skills required.

6. Addressing the vocational stigma: Vocational and technical education is critical to the world economy but has been neglected and often looked down on as second best. The World Economic Forum advocates promoting vocational and technical career paths more proactively and raising the quality of vocational training on offer. For example, Germany's vocational training system sees apprentices divide their days between classroom instruction and on-the-job training at a company. Apprentices are paid and their training typically extends to between two and three years. Not only does this approach create an excellent talent pool, it also smoothes the – often difficult – transition from education to the world of work.

7. Digital fluency: Digital skills will be fundamental to a wide range of careers, but “digital fluency” is not a given. The report highlights the need for a greater focus on ICT in teacher training and students’ work placements to address the growing digital skills crisis. One successful example comes from India, where the National Association of Software and Services Companies (NASSCOM) has partnered with NGOs and the Government of India to build National Digital Literacy Centres across the country to enable digital literacy.

8. Education, education, education: Given the rapid evolution of the job market, workers can no longer rely on just one skill-set or narrow expertise to sustain long-term careers. The report advocates incentivising employees to commit to lifelong learning so they continue to develop their skills or even retrain for new roles. For example, in Singapore, individuals receive an annual training allowance they can spend on a range of training courses all geared towards developing future-oriented skills.

The fourth industrial revolution will turn the world of work as we know it on its head as it continues to unfold. The report suggests that, unless the world’s monolithic education systems can be reformed and rendered more nimble, their failings will come back to haunt future generations’ ability to prosper.

Dev Virahsawmy: “We have failed to adopt the right language policy”

How is our education system preparing our children for the future?

The first question to ask is what do we understand by ‘preparing our children for the future’. Most importantly, they should be able to read and write at least ONE language and if possible, a minimum of TWO languages. In Mauritius, Rodrigues and Agalega less than 30 per cent of the population are literate in at least ONE language; 50 per cent are semi-literate, able to draw or scribble their names and a few random words but unable to write a coherent, grammatically correct sentence; 20 per cent are non-literate.

Why is literacy important and why have we failed?

“A literate community is a dynamic community, one that exchanges ideas and engages in debate. Illiteracy, however, is an obstacle to a better quality of life, and can even breed exclusion and violence (UNESCO)”. The acquisition of literacy and language learning should not be confused as it is often the case in our country. We may want to learn several languages for different reasons but if we want the learning process to be satisfactory, we must first of all ensure that literacy has been acquired.

How to achieve this?

The UNESCO has always been categorical on this issue. The mother tongue must be used. Research has also shown how mother tongue literacy skills help the development of the brain. It boosts the organisation of the visual cortex; it allows the area of the brain responsible for spoken language to be activated by written sentences; it refines how the brain processes spoken language.

What are the shortcomings of our education system in Mauritius?

The fundamental shortcoming is that we have failed to adopt the right language policy. Most people think that when a child is born their brain is just a blank sheet or a clean slate. There is nothing further from the truth than this. Besides genetic endowments, the foetus-child is exposed to loads of information coming from both inside and outside the womb. Richard Berengarten writes in *Imagem 2*: “The developing human foetus is bombarded constantly by multiple sounds from its environment, the all-encompassing body of the mother...” In Mauritius, the general trend is to ignore all this and parents, teachers and society think that they have the right to write anything they want on the blank sheet or clean slate and are not aware of the damage done to the child’s brain. A good example is our attitude to language. Mauritius is the only place in the world where children are forced to learn the basics of literacy in Three Foreign Languages at one and the same time while at the same time TOTALLY ignoring the womb language to which the child was exposed. The human ear is the first sensory organ to develop and from four-and-a-half months before birth, the ears of a child are fully functional. In view of this, it is now generally accepted that a child hears in the womb and it already recognises and indeed listens to its mother's voice before and after birth. When we ignore this, we are sowing the seeds of disaster and we do it everyday with gusto. The result is already known. Only 30 per cent of our population master functional literacy. Moreover, the impact of our idiotic language policy has not been fully examined.

According to you, what changes should be brought to our education system so as to enable our children to meet up with future job requirements?

To solve all other problems, let us first solve the language issue.

Surendra Bissoondoyal: “Our education system is totally unsuitable”

According to the Chairman of the Board of the Tertiary Education Commission (TEC), our education system is not meeting its intended purpose. “However appropriate it may have been in the past, our education system is totally unsuitable to meet the challenges facing the modern world, be they economic or social. We concentrate mainly on the learning of some academically oriented subjects. This starts at the primary level where the 'instruction' – I won't call it 'education' – is geared towards the CPE exam, based on essentially what are in the prescribed textbooks. The main purpose of our primary education system is to select the top achievers in the prescribed subjects for admission to select secondary schools,” utters Surendra Bissoondoyal.

He argues that children with skills and abilities in other fields than academics are not given the opportunity to grow and shine. “Children who may have aptitudes in other fields are not given the opportunity to develop them. They do not grow up as children who need to develop themselves physically through sports and other physical exercises, intellectually through thinking and not through rote learning, aesthetically through an appreciation of music and art, as well as exposure to the environment in order to preserve it from the ills of high rise buildings, heavy traffic, etc.” He also underlines that “very importantly we are not inculcating in children values that will help them differentiate between good and evil in a world that is becoming hostage to materialism and drug abuse.”

Regarding changes that should be brought to our education system, Surendra Bissoondoyal explains that children need a good general education to allow all the aspects of education to be exposed to a good all round education as indicated above. He highlighted that the new education reform, namely the Nine-Year Continuous Basic Education, will bring many positive aspects. “The purpose of the Nine-Year Continuous Basic Education for all children is precisely to provide such an education without the bogey of the CPE playing havoc with their development. After nine years of this basic education for all, the children will be in a better position – with the help of their teachers and parents – to choose what would be best for them. This is when the world of work starts to act as a guide to channel their aptitudes. Some of them will continue their education as well as skills development in many areas in which there is a great demand, particularly skills needed in the field of construction.”

He trusts that “many of them will be able to become good mechanics, electricians, plumbers etc., and if they are very good, they will be very much sought after. They may, as Sir Gaetan Duval said in the 1980s, have to keep a diary to attend to all the requests from far and near. In Singapore, 25 per cent of the children go to Institutes of Technical Education to become proficient in these areas. Others will continue their school education for a few years before they will be able to enter the new polytechnics that have been set up to provide an appropriate training for them to become qualified technicians or middle level professionals in different fields. In fact, again in Singapore, 40 per cent of students follow that route, leaving only 25 per cent to complete their HSC/A Levels before being eligible university studies.”

However, Surendra Bissoondoyal is of the opinion that for a small country like Mauritius, it is not easy to plan what the world of work will need in 5 to 10 years time. “But finance has already emerged as one of the pillars of our economy, whilst technology is becoming increasingly important in every aspect of the world of work.”

Dr Michael Atchia: “We need programmes to fulfil the needs of 2030”

Dr Michael Atchia believes that our education system is not preparing our children for the future. “A close look at the Mauritius Institute of Education/Ministry of Education programmes of studies for grades 1 to 9 and the syllabuses of Cambridge for SC and HSC will lead to this conclusion: while some new subjects have been introduced and syllabuses in part upgraded, these programme of studies serve the needs of the 1990s, in some cases of the 1970s. What we need are programmes to prepare youth to fulfil the needs of 2030 (when the 12-year old of 2017 will be a young adult who has just started his professional career). And the needs of 2050 when the same 12-year old will be in the 40-55 age group and has become a CEO, a supervisor, a headmaster, an editor, a head of department, a minister, a medical director, a police inspector, a prisoner, a senior factory worker, a designer, a farmer, most importantly a father or mother caring for the grown up children and for the increasingly long-living aged parents and even grand-parents, etc. The basis and values he/she will need then can and should be acquired in the schooling of today!”

Commenting on emerging fields of study, he says that before talking about academic subjects, we need positive learning environments, which allow students to feel comfortable and confident as learners; trained teacher, devoted to their work, knowing the syllabus, prepared for the lesson at hand and who will devote the entire time to teaching, monitoring and guidance of learners, as well as well equipped open classrooms. Based on his almost 50 years of educational experience in a variety of contexts and countries, he adds, we need BOTH the prospects of the future and the traditional values of the past.

“Looking at the trends and projecting into 2050, we will see a context where IT, electronic communication, is everywhere and in all fields. Anyone left behind in electronics will be like an illiterate and innumerate of today. Imagine not just version 50 of Microsoft (we are now at 10) and iPhone 30 (we are now at 8), but the scores of new systems and equipments which will have been designed and be in operation by 2050! Other areas which will predominate are the biological sciences (we are first and foremost living organisms) and the huge advances that will occur in medicine, agriculture, genetics, biosecurity, conservation of biodiversity (without which somehow the human species cannot survive). Also engineering, in all its aspects in particular electronic engineering, biomedical engineering, environmental engineering; renewable energy production, sustainable manufacturing and construction. And finally, environmental management (a new subject which I created in the 1980s and which is already being offered at SC Level) which would include renewable energy management, freshwater resources management, natural hazard, risk and disaster management, transportation, amongst others.”

Faizal Jeeroburkhan: “Students should be prepared for future jobs”

Education specialist Faizal Jeeroburkhan explains that the world is changing fast with globalisation, climate change, trade liberalisation, knowledge explosion, digital and communication revolution, etc. “Students sitting in our classrooms today will inevitably face a totally different world confronted with environmental, social, economic and technological challenges. They should be prepared for jobs that do not exist yet and for situations that we can hardly imagine at present. Education for these students cannot be realised in the traditional ‘business as usual’ school set up. Apart from learning how to read, to write and to do maths, students should be given the opportunity through the appropriate curriculum and pedagogy to develop intellectual curiosity, critical and creative thinking skills, modern communication skills (to retrieve, assess and use information intelligently), metacognitive skills, problem solving skills, entrepreneurship and leadership skills, research and innovation skill. They should also develop personal values such as integrity, discipline, effort, patience, perseverance, etc. as well as citizenship qualities to enable them to promote patriotism, democracy, good governance, meritocracy, teamwork, etc. and to fight corruption, pollution, drug abuse.”

He argues that to cope with the advances taking place in science and technology including ICT, new subjects such as quantum physics, nano technology, artificial intelligence, and robotics will find their way in the school curriculum. “To cope with the world food, water and energy crisis, new subjects such as bio-farming, sustainable fisheries, aquaculture, apiculture, biotechnology, renewable energy technologies, water management technologies, waste recycling, and ecosystem preservation will be introduced. On the economic and social front, new subjects such as eco-tourism, global business, regional and global economy, ports technology and management, healthy living and healthy lifestyle, values and multicultural education should also form part of the school programmes.”

The Education Specialist states that sophisticated electronic devices will play a crucial role in teaching/learning in schools, at home and other places. “Teachers will be mere facilitators. Textbooks and black boards will be replaced by pen drives, laser discs, tablets, laptops, mobile phones, interactive whiteboards, cable television etc. Classes will be available online via social media such as YouTube or Google Assistant both in real time and archived. If students miss a class, they go to the online class to catch up. Classes will be fully connected to social media. All students will be able to share their screens with others via tools such as Skype, Google, etc. Homework and projects will be submitted online via Dropbox. Students will each have a digital portfolio where they store all of their projects, assessments and notes. All students will have a web-based email account. Schools will have digital bulletin boards. Schools and students will work on a 24/7 basis and absenteeism will not matter anymore. Assessment will be based on digital portfolios and real life approaches. Education will be individualized and students will assume greater responsibility for their learning. Parents, teachers and schools will work as a digital community for the benefit of students.”

Hands-on Science Education



A NEW DISCIPLINE : Climate engineering

Introduction: What is Climate Engineering?

“Climate engineering, or climate intervention, is risky but needs to be explored”

Climate engineering, also known as geo-engineering, describes a diverse and largely hypothetical array of technologies and techniques for intentionally manipulating the global climate, in order to moderate or forestall some of the effects of climate change.

For example technologies may target different areas of the climate system; possess varying mechanics, costs, and feasibilities; have diverse environmental and societal impacts on varying scales; and create their own sets of risks, challenges, and unknowns. In practice two main targets emerge: removal of greenhouse gases from the atmosphere (often referred to as greenhouse gas removal technologies, or GGR for short) and approaches designed to reflect sunlight away from Earth (often referred to as solar radiation management technologies, or SRM for short).

Climate change is here: With fires, droughts, high intensity cyclones, record-breaking temperatures and changes in the natural environment, there is growing evidence that our earth’s systems are becoming increasingly unstable. This has potentially catastrophic consequences.

Public debate often places climate risks in the context of "this century" or "by 2100". But scientists are increasingly highlighting the risks of devastating and irreversible impacts in just 20 or 30 years. This is within our lifetimes, and certainly within our children’s.

At the 2015 Paris conference on climate change, governments agreed to limit temperature increase to well below 2 °C, aiming for 1.5 °C. The question is now: how to get there?

Influential climate models seem to suggest that reaching these targets would require substantial interventions into the earth’s natural systems through so-called ‘climate engineering’ technologies. For example, most of the low-temperature pathways presented in the Intergovernmental Panel on Climate Change’s Special Report on 1.5 °C rely on a massive expansion of bio-energy use with subsequent carbon capture and storage, or large-scale afforestation, to extract billions of tonnes of carbon dioxide from the atmosphere. The report’s reference to stratospheric aerosol injection (a technology that imitates volcanic eruptions to cool global temperature) as an option to ‘temporarily reduce the severity of near-term impacts’ further indicates that in mainstream climate science, some form of climate engineering is expected to become part of the response to climate change

In Africa, three workshops on climate engineering were organised in a collaborative effort of the African Academy of Sciences and the Solar Radiation Management Governance Initiative: on 27 June 2012 in Dakar, Senegal, on ‘Governance of Solar Radiation Management Research: African Perspectives’; on 28 September 2012 in Boksburg, South Africa, on ‘Solar Geo-engineering: Research, Governance, and African Involvement’, and on 14 January 2013 in Addis Ababa, Ethiopia, on ‘African Involvement in Solar Geo-engineering’. All together, these workshops were attended by about hundred participants from 21 African states. All workshops discussed solar radiation management only; their results were summarised in a single report (African Academy of Sciences and Solar Radiation Management Governance Initiative 2013

The views of Frank Biermann of INEA . Is climate engineering marginalizing the Global South?

“Numerous recent studies project that ‘climate engineering’ technologies might need to play a major role in the future. Such technologies may carry major risks for developing countries that are often especially vulnerable to, and lack adaptive capacity to deal with, the impacts of such new technologies. In this situation, one would expect that developing countries—especially the least developed countries that are most vulnerable—should play a central role in the emerging discourse on climate engineering. Knowledge production around climate engineering remains heavily dominated by the major research institutions in North America and Europe. Drawing on information from 70 climate engineering events between 2009 and 2017 along with extensive document analysis,

Biermann maps a lack of involvement of developing countries and highlights the degree to which their concerns remain insufficiently represented in politically significant scientific assessment reports. Developing countries may have to influence the agenda on climate engineering, reflecting on earlier attempts to increase control over novel technologies and influence global agenda setting”

Future developments: Climate scientists believe that a CO₂ concentration of 450 parts per million is likely to warm the climate by 2°C, the safe upper limit. By 2015, CO₂ in the atmosphere rose to 400 parts per million. At our current rate of emissions, we will reach 450 ppm within 20 years. Even if we achieve the Paris Agreement reductions in greenhouse gas emissions, the gases that were generated over the past few decades will be absorbed back into the earth slowly, and will be at an elevated level in our atmosphere for hundreds, if not thousands, of years.

To stay below the safe threshold of 2°C, the UN and IPCC plans entail removal of CO₂ from the atmosphere using methods that do not exist yet (“negative emissions”).

Future Climate-Engineering Solutions (FC-ES) is a global alliance of national engineering institutions working to develop and share good practice in national energy and climate planning, with the objective to reduce greenhouse gas emissions and dependence on fossil energy.

The national climate and energy plans evaluate potential actions and measures that could be adopted to reduce emissions and our dependence on fossil fuels and other non-renewable sources of energy. The goal is to implement plans that coincide with the Intergovernmental Panel on Climate Change’s (IPCC) best case scenario to keep global temperature rise within 2°C.

The network of engineering associations agrees in advance to a framework which is used to create the national climate and energy plans. Each new framework is a new iteration that builds up on lessons learnt in order to establish a useful good practice guideline which can be widely shared and applied.

The Paris Agreement and bold decisions by certain nations to expand solar/wind and bio renewable energies, end the widespread use of fossil fuels and introduce electric vehicles and trains, change lifestyle towards low energy, low carbon utilisation and deliver on the Sustainable Development Goals, are powerful multilateral steps to mitigate the impact of climate change. Mauritius as an island state is strongly engaged in these solutions, but the scale is still small. The latest figures published end 2018 shown that India, China and the USA were the worse ‘offenders’ in terms of production of CO₂, the European Union and Japan the best, while Africa as a whole static.

Will all of these efforts be enough? If not, do we have other options? (No, Mars is not an option !)

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(from the Editors desk)

THE CONSTITUTION AND ROLE OF IAP (Inter Academy Partnerships)

WELCOME BY IAP PRESIDENTS

Three years ago, the largest ever gathering of the world's merit-based academies was convened in Hermanus, South Africa. At that meeting, during the General Assembly, we all agreed to bring our three inter-academy networks (then known as IAP, IAC and IAMP) under a single umbrella – the InterAcademy Partnership. Since then, IAP has made great strides forward: in harmonising our strategies, operations and outreach; in consolidating the efforts of our member academies and our regional networks; and undertaking high-profile global projects that have fully engaged our members and raised our profile in the international science-policy arena. The 'Food and Nutrition Security and Agriculture' project funded by the German Federal Ministry for Education and Research (BMBF) and the two projects funded by the Carnegie Corporation of New York, on 'Harnessing SEM to Address Africa's Challenges' and 'Improving Scientific Input to Global Policymaking' are testament to this. Also in Hermanus, we held a very successful conference on 'Science Advice' that concluded with a series of recommendations*, on which we continue to build.

The present IAP triennial conference on 'Science and the Sustainable Development Goals: The role of academies', for which some 60 academies will convene, provides us with a further opportunity for self-reflection: to celebrate our achievements over the past three years; to reflect on lessons learned and ways we can continue to improve, including through building the capacity of our members; and to identify new opportunities for strengthening the voice of science at global, regional and national levels. During these next two days, we will explore the role of the academies through the lens of the UN Sustainable Development Goals (SDGs), hearing from policy practitioners, leading scientists working at the science-policy interface, and colleagues in the academies who are successfully engaging with the SDGs in their own countries and who have been working on IAP and other academy projects highly relevant to these goals. It is important to highlight that policy design and implementation generally take place at the national level, so that national academy action is critical. IAP's strength lies in its national and regional-level reach. The value and potential impact of IAP activities, including this conference, therefore, depend on member academies' ownership of, and contributions to, those collective activities. We would like to extend our sincere thanks to our guest speakers and moderators, and to acknowledge the work of the members of our Scientific Committee who helped design the conference agenda. We are especially grateful to our hosts, the Korean Academy of Science and Technology (KAST) for their gracious and generous hospitality, especially Past President Professor Myung Chul Lee, for his support in making initial arrangements, and current president, Professor Min Koo Han, who has worked so hard to host this meeting. Our thanks also go out to all the staff of KAST and the IAP secretariat staff in Trieste, Washington and London for their work and dedication to realise this important event. With the valuable inputs and interactions among our member academies over the next two days, it is expected that the outcomes of this meeting will help IAP strengthen its role in the global science-policy environment through the coming years.

**Prof. Volker ter Meulen
Prof. Depei Liu
Presidents,
IAP**

*www.interacademies.org/29857/Summary-of-the-IAP-Conference-on-Science-Advice

THE BOEING 737 MAX 8, a step too far? **Capt. Dick Twomey AMMAST, May 2019**

It is already two months since the second of the two similar, horrific, fatal crashes of the “MAX 8” hit the headlines, and the Boeing Company - the manufacturer - seems (at this time of writing) still to be struggling to find a convincing answer to the problem. Meanwhile hundreds of the aircraft type remain grounded, and rightly so. Everyone was shocked at the two tragedies that occurred on October 29 2018 in Indonesia and on 10 March this year in Ethiopia, and at the inappropriate software design that is being admitted as the cause; and even more at the apparent lack of proper oversight by the responsible “fitness-to-fly” authority, the US Federal Aviation Administration (FAA).

Let us recap the background story: The MAX 8 is the 4th generation development of the Boeing 737, the best-selling commercial airliner ever. The first model, the 737-200, was introduced into airline service as long ago as 1968, took quite a while to gain world-wide popularity, but in the end over a thousand were built and some remain in service, mainly in Africa, to this day. The so-called Classic series came next (737-300, -400 and -500), powered by bigger and more powerful engines made by CFM, a joint French/American manufacturer, establishing an enviable reputation in the 1980s for reliability and safety. The -300 in fact was the first commercial airliner to feature the digital instrument displays known as the “glass cockpit”, and the writer has spent many relaxed and happy flight-hours operating this aircraft.

Boeing’s motivation for a third development of the B737, the “New Generation” series, came from the sales successes of the market-competing Airbus A320-319 aircraft family. The main common factor within these repeated design upgrades was that their engines were becoming more and more powerful: Note that thrust has been increased from 28,000 lbs (from two engines) in the original 737-200 to almost twice as much (54,000lbs) in the NG aeroplanes, the 737-600, -700, -800 and -900. Alongside the improvements being made by the engine manufacturer, the airframe was also being refined, notably by the addition of winglets which were added to reduce wing-tip vortices, with improvement to the lift/drag ratio and consequent further savings in fuel consumption.

In 2017 came the 4th development of the 737, the MAX 8 version fitted with two yet-more-powerful motors, the CFM LEAP-1b. (LEAP stands for Leading Edge Aviation Propulsion).

These high-bypass (bigger circumference) motors required the manufacturer to integrate these larger, even more powerful motors into the traditional 737 airframe, and the Boeing designers achieved this by fixing the LEAP engines higher and further forward than had been necessary for previous motors, that is to say much further ahead of the aircraft’s centre of gravity. Not surprisingly the result was a tendency for the MAX 8’s nose to be raised on the application of power. MAST Newsletter readers will know that too much upward inclination (“angle of attack”) of the wings may risk a breakdown of the airflow and a loss of lift. This is basic aerodynamics.

While every modern airliner design team takes care to avoid this situation by fitting a “stick-shaker” warning to the pilots in the cockpit, which will operate if a stall is imminent, and even a “stick-pusher” to initiate stall recovery, Boeing chose to introduce a completely new additional precaution known as the “Manoeuvring Characteristics Augmentation System” (MCAS), set to operate on the MAX 8 without pilot input unless deliberately switched off, whenever the angle of attack was detected as being too high. The software was designed to give the aircraft a gentle push nose-down for 10 seconds, and then after a 5 second pause to keep repeating this command if the situation had not been rectified. In the industry a view is now circulating that after each “push” the system would reset itself to a zero datum, thus steepening the next push and further increasing the aircraft’s nose-down attitude. As the MCAS operates only in manual flight (not when using the autopilot) the traditional pilot remedy for any kind of control problem to “revert to manual flight” is not an available answer. There was another drill, so why wasn’t it effectively used?

Following the Lion Air, Indonesia, accident the Boeing Company issued to all MAX operators an Emergency Airworthiness Directive requiring changes to be made immediately to the aircraft Flight Manual so that pilots could be given more detailed procedures for dealing with horizontal stabilizer issues. In spite of this, the Ethiopian repeat calamity occurred within months. Have we, although professionals, become much too relaxed, thinking – in the case of converting to yet-another new version of a tried, tested and proven airframe– that pilot Type Rating training (for moving from flying one aircraft type version to another) is “no big deal”?

It would be wrong to try to forecast the results of investigations that are still ongoing, or to think of apportioning blame. What is certain is that this is a very big issue for both the FAA and the Boeing Company, which must be under great external and internal pressure to re-establish the MAX as a safe vehicle. With over 380 MAX aircraft in service worldwide before the order was given to ground them, and with 5,000 more MAXs on order, re-establishing confidence is likely to prove the biggest challenge that the company in Seattle has ever, or will ever, face. I suspect that merely improving the software will not bring back the customers (the passengers and the MAX airlines); and if the design team is ever persuaded to design a 5th generation of the 737 narrow-bodied short haul airliner, it will come up with something radically different – perhaps even with the engines over the wings instead of under, thus avoiding the Pitch-up situation entirely.

“Correcting” a basic design flaw (sub-optimal balance of forces) with an electronic gimmick (like the MCAS) cannot be best engineering practice, can it?



International Exhibition and Conference on Higher Education, Saudi Arabia

Pr Goolam Mohamedbhai

The International Exhibition and Conference on Higher Education (IECHE), held annually in Riyadh, was started by the Ministry of Higher Education of Saudi Arabia in 2010. It serves two specific purposes. First, there is an Exhibition which provides space for some of the best universities around the world (as well as Saudi ones) to have a booth where potential Saudi students can obtain information in order to apply for a scholarship under the prestigious King Abdullah Scholarship Program (KASP). It is one of the largest international university fairs in the world, attracting over 300 universities from some 30 countries. The KASP, launched by the late King Abdullah in 2005, has been a multi-million dollar undertaking and has been described as the largest national scholarship programme worldwide. Originally the aim was to enable some 50,000 Saudi students to study at universities overseas as there were insufficient seats available at Saudi universities to meet the local demand, especially in the areas of science and technology. However, this target has been grossly surpassed. In 2017, the number of Saudi students, both male and female, benefitting from the KASP had reached 127,000. The majority of the students choose universities in the United States, with UK coming next. But scholars have also been studying in Canada, Australia and Europe.

Second, an International Conference is organised. In view of reform taking place in Saudi universities, and new ones being created, leading academics from around the world are invited to discuss issues of direct relevance to Saudi universities. The Conference is attended by the Rectors and senior academics of Saudi universities as well as representatives of industry and the private sector. To assist in the organisation of the Conference, the Ministry set up an international Scientific Advisory Committee, of which I have been a member. Both the Exhibition and the Conference are held over the same period at the Riyadh Convention and Exhibition Centre.

Since the publication of Saudi Vision 2030 in 2016, the Conference is increasingly focussed on the role of higher education in achieving the Vision's objectives. A key strategy of Vision 2030 is to reduce Saudi Arabia's dependence on oil, diversify its economy and move the country towards a modern, knowledge-based economy with a thriving research and innovation sector. A new Research and Development Office has been created and the proposal is to invest \$1.6 billion in research and development over the next few years, including \$75 million for international collaboration to help transform the higher education sector in Saudi Arabia. The plan is to enhance the capacity of public Saudi universities to undertake high-quality research to enable at least five of them to be, in 2030, among the top 100 institutions in global university rankings.

Accordingly, the theme for the 7th IECHE Conference in April 2017 was "*Saudi Universities and Vision 2030: Knowledge is the Oil of the Future*". At the opening ceremony of the Conference, the then Minister of Education mentioned his Ministry's efforts in developing a new system of universities to give them more autonomy academically, administratively and financially, to enable them to be more flexible in facing the challenges and responding to changes.

There was no IECHE in 2018. The 8th IECHE was held in April 2019 under the theme "*Transforming Saudi Universities in an Era of Change*". There were five sub-themes, namely rethinking the university, leadership opportunities for women in science and entrepreneurship, new governance models for vision and inspiration, teaching and learning in an era of AI and iGen, and skills for the future of work. The two keynote speakers were Prof. Alain Beretz, former President of the University of Strasbourg and former Director-General for Research and Innovation at the Ministry of National Education of France; and Sir Malcolm Grant, Chancellor of University of York, UK, and former Chairman of the National Health Service of England. There were also 25 distinguished speakers and, for the first time, the Ministry invited 60 fully-sponsored Fellows, academics from around the world who are currently working in the field of higher education, to participate in the Conference. They gave a truly international flavour to the Conference.

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NASAC NEWS

MAST Immediate Past President, Dr. Yousuf Maudarbocus, re-elected as NASAC Vice President

At the meeting of the NASAC General Assembly held on 09 November 2016 in Johannesburg, South Africa, the Immediate Past President of MAST, Dr. Yousuf Maudarbocus, was re-elected as the Vice President of the Network of African Science Academies for an additional period of 3 years. The new Board has been constituted as follows:

President – ***Prof. Mostapha Bousmina - Morocco***

Vice President for Policy Review and Administration – ***Dr. Yousuf Maudarbocus – Mauritius***

Vice President for Resource Mobilization and Development – ***Prof. Nelson Sewankambo - Uganda***

Vice President for Scientific Affairs and International Relations - ***Prof. Oyewale Tomori - Nigeria***

Secretary General – ***Prof. Barney Pityana - South Africa***

Treasurer – ***Prof. Bernard Aduda – Kenya***

Immediate Past Chair – ***Prof. Robin Crewe – South Africa***

NASAC Membership reaches 24

At the same General Assembly, three new members were admitted bringing the membership of NASAC to twenty four (24). The new members are:

The Algerian Academy of Science and Technology (AAST)

The National Academy for Cote d'Ivoire and

The Botswana Academy of Sciences (provisional membership)

AMASA 12

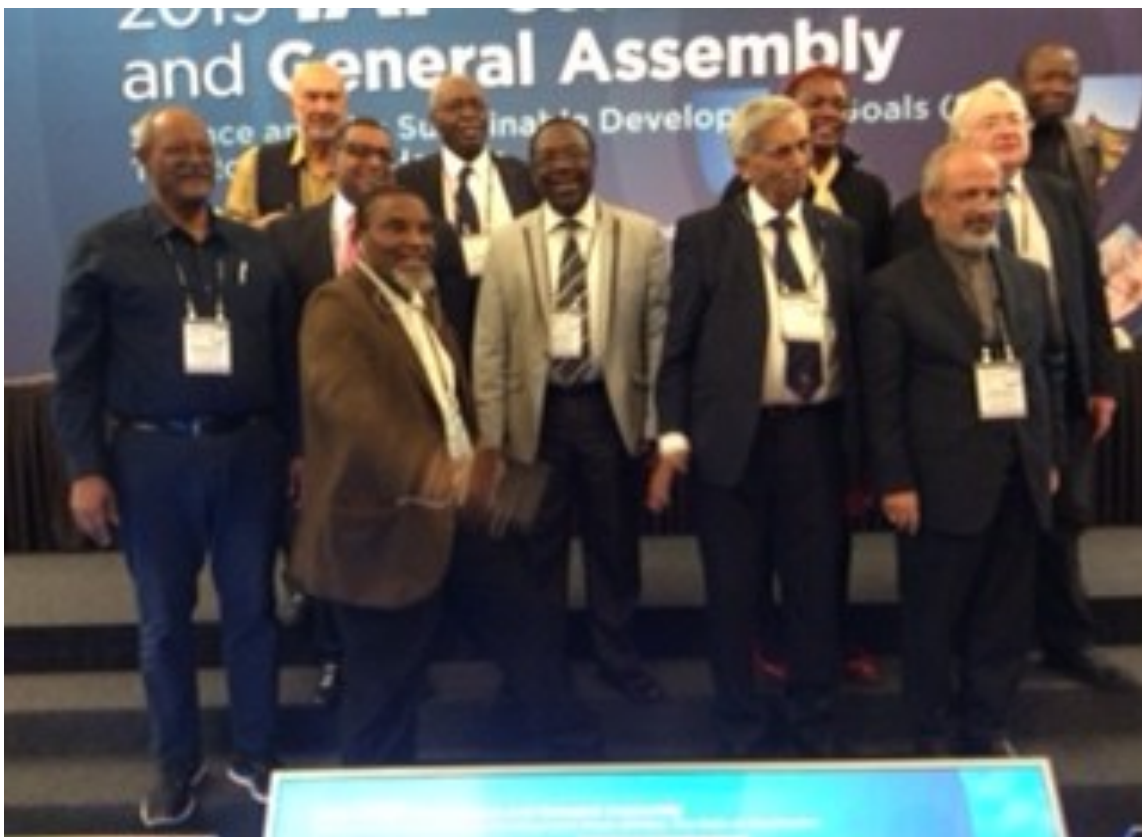
The 12th Annual Meeting of African Science Academies (AMASA 12) was held in Johannesburg on 7-8 November 2016, just prior to the NASAC Board Meeting and General Assembly. The theme of this year's meeting was "Poverty Reduction" covering the sub-themes of food security, health, gender, agriculture, water and energy. Dr. Y. Maudarbocus and Dr. M. Nowbuth, of MAST, presented papers and participated in panel discussions on the sub-theme of water. A policymakers booklet entitled "Social Protection in Africa", prepared by the Academy of Science of South Africa (ASSAf) and endorsed by several African national science academies, including MAST, was launched on this occasion.

NASAC NEWS

The last NASAC General Assembly was hosted by the Benin National Academy of Sciences, Arts and Letters and held on 14 November 2018 in Cotonou, Benin, in conjunction with the Fourteenth Annual Meeting of African Science Academies (AMASA-14).

The theme of the AMASA-14 Conference was “Sustainable development in Africa: the role of young and senior science academies”. Three MAST members participated in this conference, namely, Professor Yashwant Ramma, Dr Françoise Driver and Dr Yousuf Maudarbocus, the latter as Vice President of NASAC.

AMASA-15 and the next NASAC General Assembly will be hosted by the Ghana Academy of Arts and Sciences in Accra in November 2019. It is important to note that a new NASAC Board will be elected at this General Assembly.



The NASAC delegation at the IAP General Assembly in Songdo, Incheon, South Korea, April 2019, together with the new IAP Co-President Dr Krishan Lal.

Also in the picture Jackie Kado the Executive Director of NASAC, and

ACEs: Promoting Development in Africa through Science and Technology Education

Pr Goolam Mohamedbhai

Sustaining Africa's Growth

Although Africa has experienced robust economic growth in recent years, it is still lagging behind all other developing world regions. Africa has attracted significant foreign investment for its development, but several of its projects are constrained by an acute shortage of highly-skilled domestic labour. For Africa to sustain its growth, to become competitive, to achieve the Sustainable Development Goals by 2030, and to move towards a knowledge-based economy, it needs highly-skilled human capital, especially in the areas of science, technology and innovation (STI). Indeed, emerging economies such as China, India, Brazil and Korea have transformed their economies through extensive use of STI.

A number of indicators are used for assessing the STI capacity of countries and regions, and these include the expenditure in R&D as a proportion of a country's GDP (referred to as GERD), the tertiary education enrolment in S&T, the number of researchers per million of population, the number of scientific publications produced, and the number of patents filed. A comparison of data of these indicators across the world reveal that the figures for Africa are not only far below the world average but also significantly less than in other developing regions.

AU's Strategy on STI

Conscious of this situation, the African Union (AU), since the beginning of the 21st century, has been emphasising the importance of STI for development in its plans and strategies for higher education in Africa. Thus, in its Plan of Action for the 2nd Decade of Education for Africa (2006-2015), the AU identified higher education as one of the seven areas of focus, and among the strategies mentioned were support for Centres of Excellence in S&T and promotion of postgraduate and postdoctoral education. More recently, the AU's STI Strategy for Africa (STISA-2024), developed as part of AU's Agenda 2063, again stresses the importance of building and/or upgrading of research infrastructure and providing an enabling environment for STI development in Africa.

The ACE Project

The World Bank, taking AU's strategy into consideration and drawing from its own research on development challenges in Africa, developed its African Centres of Excellence (ACE) project, which was launched in 2014. The main objectives of the ACE project are: i) to build institutional capacity to provide quality postgraduate education and conduct high quality research, both relevant to key development priorities; ii) to develop and enhance partnerships with national, regional and international academic institutions, as well as industry and the private sector; and iii) to improve institutional governance and management.

The approach used is to identify existing higher education institutions in African countries which have the potential to host Centres of Excellence in identified priority areas (mainly industry, agriculture and health), and provide them, if eligible, with soft loans to the tune of US\$ 6 million per Centre from the World Bank's International Development Association (IDA). This funding is provided through the ministry of finance of the respective country and channelled through the ministry responsible for higher education, which thus ensures the commitment and oversight of policy makers.

COUNCIL of MAST, 2019-2020**MAST Membership****MEMBERS:**

Dr. M. Atchia	- President
Dr. A. Dookun-Saumtally	- 1st Vice President
Professor G. Mohamedbhai	- 2nd Vice President
Professor Y. Ramma	- Secretary
Dr L. Mamet	- Assistant Secretary
Dr .S. Saumtally	- Treasurer
Dr. Y. Maudarbocus	- Assistant treasurer
Dr J.C. Autrey	- Immediate Past President
Professor S. Jugessur	- Founder President
Dr M. Nowbuth	- Member

1. Honorary Fellows

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

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

4. Associate Members:

Scientists with basic science

**MAST**

<u>President</u> Dr M. Atchia	<u>Secretary</u> Pr. Y. Ramma	<u>Treasurer</u> Dr S. Saumtally
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<u>jcautrey@intnet.mu</u>	<u>sjugessur@gmail.com</u>	<u>asha.saumtally@msiri.mu</u>

Meeting at MSIRI, Reduit, MAURITIUS. c/o Dr S. Saumtally
Members of Council: Pr G. Mohamedbhai, Dr L. Mamet, Dr M. Nowbuth,
Representative to NASAC: Dr Y. Maudarbocus yousuf1630@gmail.com
Website: <http://academyscience.intnet.mu>

About Innovation.

Internationally it was proposed to add innovation to the three existing guideline-themes of IAP, to make it Science, Health, Policy, and Innovation.

In Mauritius, Parliament adopted a bill in May 2019 to transform the MRC into *The Mauritius Research and Innovation Council*.

One of the world's foremost IT corporations, namely SAMSUNG uses detailed analysis of the past to innovate for the future.

A visit to SAMSUNG Innovation Centre and Museum in South Korea is very revealing.



Picture Gallery



The future of personal computing as imagined by Samsung (picture by M. Atchia at the Samsung Innovation Centre, South Korea



Prof. Krishan Lal, new Co-President of IAP, at IAP Conference in South Korea.



Annual General Meeting of MAST 2019, held at MSIRI on 19th June 2019.

**MAST has its HQ. at
REDUIT MAURITIUS.**

For further info. on the
Academy contact the
Hon Secretary, **Pr.
Yashwant RAMMA**

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.

Email us at:

mast@intnet.mu

Newsletter & Journal

Editor:

Dr. Michael Atchia

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Editorial Committee.

Picture Gallery:



A doyen of science education in Africa, Pr Mohammed HASSAN of Sudan, past Executive Director of TWAS, at the IAP Conference in SONGDO, SOUTH KOREA

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