THE CARIBBEAN ACADEMY OF SCIENCES

NEWSLETTER

MAY 2025 - VOLUME 8 ISSUE 1

ISC 3RD GENERAL MEETING, & ISC DIGITAL JOURNEYS COHORT, OMAN.

PHOTO: NASER TAMIMI

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MAY 2025: VOLUME 8 ISSUE 1

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PHOTO: YORMAN TAMAYO

LETTER FROM OUR **PRESIDENT**

Welcome!

It is with great pleasure and honor that I extend a warm welcome to each of you to our latest newsletter issue. As we embark on this journey together, I am filled with a profound sense of optimism and excitement for the future of science in our region.

The Caribbean Academy of Sciences stands as a beacon of knowledge, innovation, and collaboration. Our collective dedication to advancing scientific research, education, and outreach underscores our commitment to addressing the critical challenges facing our communities.

In this issue, you will find a wealth of insightful articles, groundbreaking research, and inspiring stories from across the Caribbean scientific community. Our members continue to push the boundaries of knowledge and make meaningful contributions to society.

I would like to take this opportunity to express my heartfelt gratitude to each of you for your unwavering support and dedication to the mission of the Caribbean Academy of Sciences. Together, we have the power to drive positive change and shape a brighter future for generations to come.

I encourage you to explore the pages of this newsletter, engage with your fellow members, and share your own experiences and expertise. Together, we can harness the power of science to create a more prosperous, sustainable, equitable, and resilient Caribbean region.

Thank you for your commitment to excellence, and I look forward to our continued collaboration and success.

Warm regards,
Mark N. Wuddivira, Ph.D.
Professor of Agri-Environmental Soil Physics
President, Caribbean Academy of Sciences (CAS)
Regional (2023-2025)

PHOTO: JAMES NAPHTALI

"...the Caribbean Academy of Sciences (CAS) stands as a beacon of knowledge, innovation, and collaboration. Our collective dedication to advancing scientific research, education, and outreach underscores our commitment to addressing the critical challenges facing our communities..."

LETTER FROM OUR **EDITOR**

Science and technology are crucial in driving innovation, economic growth, and development in the Caribbean region. With limited natural resources and economies heavily reliant on tourism, agriculture, and services, fostering a culture of scientific research and technological advancement is imperative for sustainable growth and development in the region.

Science and technology can help address pressing issues such as climate change, energy efficiency, healthcare access, and most importantly food security. By investing in STEM education, research institutions, and technology infrastructure, Caribbean nations can improve their global competitiveness and diversify their economies. Moreover, advancements in science and technology can enhance the region's resilience to natural disasters while creating new opportunities for entrepreneurship and job creation.

The integration of science and technology into the socio-economic fabric of the Caribbean is essential for achieving long-term prosperity and improving the quality of life for its citizens. In this issue of the Caribbean Academy of Sciences (CAS) Regional Executive, together with its Chapter continues to demonstrate its commitment to addressing important issues related to Science and Technology in the region.

At the level of the executive President of CAS, Prof. Wuddivira has continued to lobby for greater research and development on sustainable agriculture and food security in climate-vulnerable countries that are disproportionately affected by the impacts of climate change, due to their geographical location, economic dependence on natural resources, and limited capacity to adapt.

PHOTO: JOSÉ IGNACIO GARCÍA ZAJACZKOWSKI

“...Science and technology are crucial in driving innovation, economic growth, and development in the Caribbean region ...”

Together with the side event at the recently concluded 2025 International Science Council (ISC) General Assembly and Muscat Global Knowledge Dialogue in Muscat, Oman, from January 26-30, not only were the potential of polar science explored as a mechanism to solve pressing issues, but also highlighted the challenges experienced by Caribbean SIDS, and the role that Digital Transformation plays in driving such solutions.

The Caribbean region has produced many successful scientists who have made significant contributions to their respective fields. These individuals such as Prof. Jagessar (appointed TWAS Fellow), and Prof. Charles (appointed honorary fellow of WAITRO) have demonstrated exceptional research skills, critical thinking abilities, and a dedication to advancing knowledge in their areas of expertise.

Further to this, the inclusion of several research pieces in this issue from Caribbean scientists on a wide range of topics such as the sustainable production of Coffee in Jamaica, the organizational resilience of manufacturers in Trinidad and Tobago, the adaptability of livestock to climate change events in the Caribbean, the representation of Cuban women scientists, the development of bioactive glasses, and even the implications of the African Dust Haze, CAS continues to highlight the work of these accomplished individuals and demonstrate the diverse talent that exists within the Caribbean scientific community.

By showcasing these successful scientists, the CAS Regional Executive not only celebrates their achievements but also hopes to inspire future generations of Caribbean researchers and innovators.

Kind regards,
Dr. Roshnie A. Doon
Editor, Caribbean Academy of Sciences (CAS) Newsletter,
Secretary, Caribbean Academy of Sciences (CAS) Regional (2023-2025)

PHOTO: JONATHAN GONG

"... By investing in STEM education, research institutions, and technology infrastructure, Caribbean nations can improve their global competitiveness and diversify their economies..."

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THE CARIBBEAN ACADEMY OF SCIENCES

Merry Christmas & Happy New Year!

The Caribbean Academy of Sciences (CAS) Executive would like to thank you for our fruitful meetings, inspiring co-operation, and continued support during the past year. We look forward to continuing our great work together!

May the spirit of Christmas bring you warmth, the joy of Christmas gives you happiness, and the hope of Christmas fill your heart.

May you have a Productive and Successful 2025!

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THE CARIBBEAN ACADEMY OF SCIENCES (CAS) REGIONAL EXECUTIVE

Happy International Day of Women and Girls in Science 2025!

The International Day of Women and Girls in Science, celebrated annually on February 11, seeks to promote the full and equal participation of women and girls in various scientific disciplines.

This observance emphasizes the critical contributions that women make in science, technology, engineering, and mathematics (STEM), underscoring their importance in driving innovation and progress. It serves as a call to action aimed at dismantling the barriers that hinder gender equality, striving to close the persistent gender gap that exists in these fields.

In recognition of this important day, the Caribbean Academy of Sciences (CAS) proudly celebrates the achievements and contributions of all our female members. Their work not only advances science but also serves as an inspiration for future generations. We urge girls and women across the Caribbean and beyond to pursue careers in STEM, as the insights and perspectives they bring are invaluable.

The inclusion of diverse voices and experiences in scientific research and technological development will ultimately enhance problem-solving and promote a more equitable society for all.

Happy International Day of Women and Girls in Science 2025, from the CAS Regional Executive!

THE CARIBBEAN ACADEMY OF SCIENCES (CAS) REGIONAL EXECUTIVE

8 March

International Women's Day

International Women's Day is a globally celebrated occasion that shines a spotlight on the remarkable social, economic, cultural, and political achievements of women across the globe. Observed each year on March 8th, this significant day serves not only to honor these accomplishments but also as a powerful call to action for advancing gender equality in every sphere of life.

The Caribbean Academy of Sciences (CAS) Regional Executive extends heartfelt International Women's Day greetings to all our esteemed members throughout the Caribbean region. We are steadfast in our commitment to providing a meaningful platform that raises awareness about pressing issues such as gender-based violence, workplace discrimination, and the persistent wage gap that many women in the Caribbean experience.

International Women's Day is instrumental in fostering positive change, as it promotes gender parity and empowers women in the Caribbean to find their voices and advocate for their rights. This day also provides an opportunity to celebrate and honor the extraordinary achievements of inspiring women who have made significant contributions to their communities, paving the way for future generations.

Women like you make the world a better place with your hard work, compassion, and resilience. Happy International Women's Day 2025, from the Caribbean Academy of Sciences (CAS) Regional Executive!

SPOTLIGHT

CAS-REGIONAL EXECUTIVE

THE CARIBBEAN ACADEMY OF SCIENCES (CAS)
KEY ACTIVITIES

PROF. MARK WUDDIVIRA
PRESIDENT, CAS REGIONAL (2023-2025)

1. AWARDS:

• Prof. Mark Wuddivira: Received the Award of Excellence from Niger Delta University on March 11, 2025, in recognition of his role as a strategic partner for sustainable agriculture.
• Prof. Mark Wuddivira: Received an Award of Honour as a Distinguished Guest Lecturer, 3rd Niger Delta University Public Lecture, December 4, 2024.

2. GUEST SPEAKER AT THE 3RD NIGER DELTA UNIVERSITY PUBLIC LECTURE SERIES

Delivered the 3rd Public Lecture of the Niger Delta University (NDU), Nigeria, titled "Enhancing Sustainable Agriculture and Food Security through Human Capital Development, Research, and Innovation in Vulnerable Climate-Sensitive Environments." Main Auditorium, Glory Land Campus, Niger Delta University, December 4, 2024.

From L-R: Mrs. Juliana Wuddivira, Prof. Mark Wuddivira and Prof. Allen Agih, Vice Chancellor of Niger Delta University, during the Public Lecture.

3. SPEAKER AND PANELIST

Speaker and Panelist on January 28, 2025, at the side event of the Polar Science and the International Polar Year at the Global Knowledge Dialogue / Third General Assembly of the International Science Council, January 26th – 30th, 2025, at the Oman Convention and Exhibition Centre (OCEC)Muscat, Oman. Entitled “The International Polar Year 2032-33: A Community Dialogue on Shaping Global Scientific Cooperation”.

This session explored how the upcoming International Polar Year (IPY) can reshape global scientific collaboration amidst rapid climate and societal changes. This platform highlighted the transformative potential of polar science in addressing real-world challenges through interdisciplinary and cross-regional research.

The global polar issues such as changes in polar regions influenced by climate change and how it impacts oceans worldwide, with acidification and sea-level rise negatively affecting SIDS on the other side of the planet were major discussion points. at the Global Knowledge Dialogue / Third General Assembly of the International Science Council, January 26th – 30th, 2025, at the Oman Convention and Exhibition Centre (OCEC)Muscat, Oman.

From L-R: Dr. Mike Sparrow, World Climate Research Programme (WCRP); Dr. Johanna Grabow, Scientific Committee on Antarctic Research, (SCAR); Prof. Ramcharan Vijayaraghavan, Polar Educators International; Prof. Anna Mauranen, University of Helsinki; His Excellency Ólafur Ragnar Grímsson, Chairman of Arctic Circle and Former President of Iceland (1996-2016); Prof. Mark Wuddivira, Dean UWI-FFA and President, Caribbean Academy of Sciences (CAS); Prof. Paul A. Berkman, Director, Science Diplomacy Centre, Tufts University; Prof. Anne Husebekk, Arctic University of Norway, ISC Governing Board

4. CO-CHAIR AND SPEAKER:

- Co-Chair and Speaker: Forum of Category 2 Members on January 29, 2025, at the Global Knowledge Dialogue / Third General Assembly of the International Science Council, January 26th – 30th, 2025, at the Oman Convention and Exhibition Centre (OCEC)Muscat, Oman.
- Presented on the topic " THE CARIBBEAN ACADEMY OF SCIENCES: ADDRESSING UNIQUE CHALLENGES FACED BY CARIBBEAN SIDS.
- Chaired the session on Future endeavours addressing • Perspectives for the next years of the ISC Roaster of Experts• Strengthening networks, relationships, and collaborative programs/projects among Category 2 members, with a particular focus on cross-regional collaboration or between the Global North and Global South.

5. KEYNOTE SPEAKER:

Food and Agriculture as the Convergence of Science, Technology, and Innovation to Alleviate Food and Nutrition Insecurity. The 2nd International Hybrid Conference of the Faculty of Agriculture, Niger Delta University, under the theme "Agriculture, Food, Nutrition and Health, Environment, Science and Technology", March 11th - 13th, 2025, Main Auditorium, Glory Land Campus, Niger Delta University.

6. CAS APPLICATION SELECTED FOR FUNDING BY THE INTERACADEMY PARTNERSHIP (IAP)

Professor Mark Wuddivira (CAS President), Ms. Leneka Rhoden (UWI Mona, CAS member) and Dr. Keisha Roberts (UTT, CAS Member), worked and submitted an application in response to the call for IAP Competitive Grants Proposal 2024.

We were notified by the IAP Secretariat on March 11, 2025, that our proposal “Addressing Food Security Disparities through Collaborative Regional (Caribbean) Policy Frameworks” has been selected by the InterAcademy Partnership for funding at the level of 40,000 USD.

7. CAS ACCEPTANCE INTO THE ISC DIGITAL JOURNEYS COHORT. PROFESSOR MARK WUDDIVIRA ATTENDED THE LAUNCH OF THE COHORT.

CAS regional president, Professor Mark Wuddivira, and Trinidad and Tobago Chapter President, Dr. Albertha Joseph-Alexander, submitted an application in response to the ISC call for the ISC Digital Journeys Cohort.

We are pleased to announce that CAS has been accepted into the ISC Digital Journeys Cohort as one of just 12 ISC Members selected for this transformative initiative. Dr. Albertha Joseph-Alexander is the CAS-appointed project focal point. I attended on January 29, 2025, a special Side event titled: Unlocking Digital Potential: A closed high-level meeting of the Digital Journeys project where the cohort at the ISC General Assembly in Muscat, Oman Convention and Exhibition Centre (OCEC), January 26th – 30th, 2025, where the Cohort was launched.

At this session, the cohort was celebrated, the programme on what the digital journey means for the selected organizations was outlined, and there was an opportunity to connect with fellow Members embarking on this journey.

Why focus on digital transformation?

Rapid technological progress - driven by things like smartphone usage, internet connectivity, and artificial intelligence - is the story of our times. Therefore, there is strong potential for ISC Members to harness digital technologies and ways of working to further objectives, including:

- to recruit young members
- to enhance efficiency and productivity
- to build community or networks in the digital age
- to replace inefficient bureaucratic processes
- to improve knowledge management and sharing: databases, nomenclatures, and making content digitally accessible, discoverable, and usable

To support science organizations in the digital age, the ISC has therefore set up this small cohort of ISC Members who want to leverage digital technologies and share learnings from their experiences.

Member organizations are across the world. The focus was for organizations working with scientists in Low and Middle-Income countries.

Participating members of the organizations will have access to:

- 1:1 expert coaching by digital experts
- Exclusive webinars
- Peer exchange opportunities
- Tailored tools and methods

By the end of the project, all Members will receive a personalized Action Plan for their digital idea. The ISC will provide expertise and support at no cost but require active engagement throughout the project.

CELEBRATING EXCELLENCE- PROF. RAYMOND JAGGESAR AWARDED FELLOW AT THE WORLD ACADEMY OF SCIENCES (TWAS), TRIESTE, ITALY.

PROF. RAYMOND JAGESSAR
FOREIGN SECRETARY, CAS REGIONAL.

- Prof. R. Jagessar is one of the recipients of The World Academy of Sciences (TWAS) Fellows, 2024.

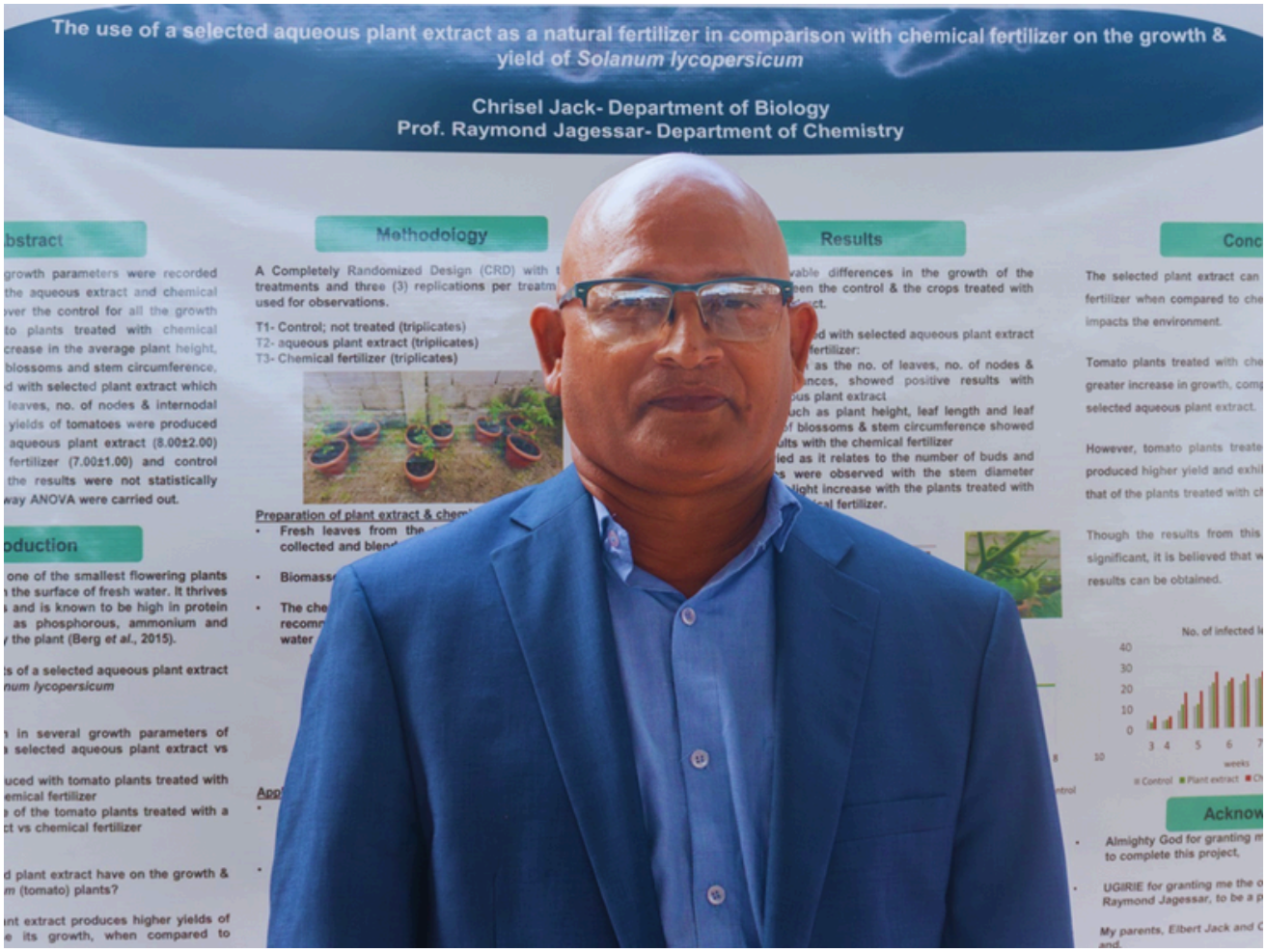
Prof. Raymond Jagessar

- Prof. R. Jagessar was nominated as CAS Representative on IANAS Committee for Amazonian Biodiversity.

- Prof. R. Jagessar attended and gave remarks on behalf of exhibitors at the Opening Ceremony for the University of Guyana Institute Research Innovation and Entrepreneurship (UGIRIE), on October 17th -19th, 2024.

- Prof. R. Jagessar presented a poster on natural fertilisers at the University of Guyana Institute Research Innovation and Entrepreneurship event, October 17th -19th, 2024.

- Prof. R. Jagessar presented a poster on natural fertilisers at the University of Guyana Institute Research Innovation and Entrepreneurship event, October 17th -19th, 2024.



CAS REGIONAL EXECUTIVE NEW PUBLIC RELATIONS OFFICER (PRO)

MR. CHRISTIAN CASEY-LEE VIRGIL
PRO, CAS REGIONAL

Christian Virgil, a Senior Lecturer in the Department of Environmental and Sustainability Studies at COSTAATT, is a Queen Elizabeth Scholar and member of the Trinidad and Tobago National Technical Committee for Occupational Health and Safety.

He is also a member of the International Standards Organization's Working Group (WG7), which is developing the ISO 45007 standard to help organisations manage the occupational health and safety risks arising from climate change and climate action.

His research focuses on climate change adaptation and occupational health and safety, reflected in numerous publications and presentations.

Mr. Virgil holds an MSc in Occupational Environmental Safety and Health and BSc in Biochemistry from the University of the West Indies. He is also a Certified Safety Professional, Certified Industrial Hygienist and Project Management Professional.

He is currently pursuing a PhD in Industrial Engineering in the Department of Mechanical and Manufacturing Engineering at the University of the West Indies, St. Augustine Campus.

SPOTLIGHT

CAS-JAMAICA (CASJ) CHAPTER

Cracking the Code on Coffee's Biggest Threat: Jamaican Research Offers Sustainable Solutions

Pictured: ***Dr. Dwight Robinson****, Senior Lecturer/Entomologist/Pest Ecologist, Department of Life Sciences, Faculty of Science and Technology, The University of the West Indies, Mona.*

Coffee aficionados worldwide have reason to celebrate! A groundbreaking study by researchers at The University of the West Indies (UWI) Mona, in collaboration with international partners, has cracked the code on the Coffee Berry Borer (CBB), a tiny beetle with a devastating impact on coffee crops. This research paves the way for sustainable solutions to protect coffee production, benefitting both farmers and the environment.

Jamaica's world-renowned Blue Mountain Coffee is a critical source of national pride and economic revenue. Since the arrival of CBB from Africa in 1978, however, coffee yields and quality have been under threat. The research delves into the beetle's genetic makeup, aiming to understand its survival mechanisms and how it is able to thrive, ultimately paving the way for better control methods to safeguard the livelihoods of coffee growers.

A Global Threat, a Local Solution: The CBB is a menace worldwide, burrowing into coffee berries and destroying both yield and quality. Globally, losses exceed 450 million Euros annually, a significant dent in a 65 billion Euro coffee industry. Existing control methods to combat the beetle are environmentally harmful, ineffective, expensive, or require a significant amount of effort to collect and dispose of infested berries hence the need for a more integrated pest management approach.

A collaborative team of researchers from the University of Regensburg, the University of Münster, and The University of the West Indies has conducted a comprehensive genetic analysis of the Coffee Berry Borer (CBB). By resequencing the CBB genome and comparing DNA samples from diverse Jamaican farms, the study revealed a striking pattern: low genetic diversity, indicative of a recent population bottleneck. Additionally, the analysis uncovered a significant increase in the activity of transposable elements within CBB populations.

"By studying the genetic diversity of CBB populations across Jamaica, researchers can predict behavioural patterns and identify susceptibilities to various control measures. This knowledge is essential for designing targeted, site-specific pest management strategies to minimize economic losses while protecting the environment," explains Dr. Dwight Robinson, co-author and Senior Lecturer in the faculty of Science and Technology at The UWI Mona. By understanding the beetle's genetic makeup, researchers can predict its behaviour and identify weaknesses for targeted control measures. Such measures can significantly reduce reliance on harmful pesticides, protecting both the environment and the livelihoods of coffee farmers.

Published in Genome Biology and Evolution, the study reveals a surprising finding: the Jamaican CBB population exhibits low genetic diversity, suggesting a past "genetic bottleneck." Despite this, the beetle possesses unique genetic features that enable it to thrive.

"This is exactly the type of fundamental research which is essential for bringing about novel and transformative solutions to the real problems plaguing Jamaica's agricultural industry. The future potential for using these results is enormous, particularly in safeguarding critical livelihoods in developing countries like ours," emphasizes Prof. Michael Taylor, Dean of the Faculty of Science and Technology at The UWI Mona. This groundbreaking research not only advances the fight against the Coffee Berry Borer but also underscores the transformative potential of science and collaboration in safeguarding the future of coffee farming globally.

Citation: Errbii, Mohammed, Myrie, Ameka, Robinson, Dwight, Schultner, Eva, Schrader, Lukas, Oettler, Jan. (2024) Genetic Variation in Jamaican Populations of the Coffee Berry Borer, Hypothenemus hampei. Genome Biology and Evolution. Volume 16 (11) https://doi.org/10.1093/gbe/evae217

SPOTLIGHT

CAS-TRINIDAD & TOBAGO (CAS-TT) CHAPTER

CAS TRINIDAD & TOBAGO EXECUTIVE 2024-2026

The Caribbean Academy of Sciences (CAS) Regional Executive congratulates the appointment of the new Executive Committee (EXCO) of the Trinidad and Tobago (CAS-TT) Chapter, based on the Election held on 7th September 2024.

The new CAS-TT Chapter EXCO Team will serve a 2-year term until 31st August 2026.

Dr. Albertha Joseph-Alexander has been a member of the Caribbean Academy of Sciences Trinidad and Tobago Chapter (CAS-TT) since 2021. She previously served, for (1) one year, as the Acting President of the chapter and is now the first female President of the CAS-TT local chapter. Dr. Joseph-Alexander obtained her PhD in Plant Science and an MSc. in Crop Protection from The University of the West Indies, St. Augustine Campus. She has a natural ability to tell stories, which led to the founding of her first business Mark De Moment Limited. In 2021, she attained a Professional Master in the Communication of Science and Innovation from the University of Trento, Italy.

Going by the name 'DrStoryTell', Dr. Joseph-Alexander desires to use science communication as a vehicle to better translate research information for the benefit of Caribbean people. Using her sobriquet, she registered her second business which is aptly called DrStoryTell Limited. Presently she is producing her first documentary, which is based on the Pigeonpea crop she studied for her doctorate. In recent years, she has also had the opportunity to be involved in the planning of the Pigeon Peas Festival and the Mango Festival. She has come to appreciate that, "Plant Festivals are fun places where facts abound."

Dr. Joseph-Alexander enjoys watching tennis and reading suspense novels at lightning speed.

Dr. Cilla T. Pemberton has been a member of the Caribbean Academy of Sciences Trinidad and Tobago (CAS-TT) Chapter since 2008. She is an industrial engineer who holds a Doctorate in Business Administration and is currently a Lecturer in Industrial Engineering at The University of the West Indies, St. Augustine Campus. She has 20 years of experience in manufacturing, business development and tertiary education, respectively. Dr. Pemberton is a past Board Member of the Institute of Industrial and Systems Engineers Sustainable Development Division, Secretary of the Caribbean Academy for Sciences Trinidad and Tobago Chapter,

and Past President of the Society of Caribbean Industrial Engineers. Her research interests include Innovation and Entrepreneurship, Sustainable Development, Economic Development in Small Island States and Value Stream Analysis of Indigenous Industries. She enjoys the beach and her favourite places to travel include Nevis and Haiti.

Dr. Lisa Benjamin has been a member of the Caribbean Academy of Sciences Trinidad and Tobago Chapter (CAS-TT) since 2014. She is a Veterinary Epidemiologist who lectures in Epidemiology, Veterinary Public Health and Food Safety in the Department of Basic Veterinary Sciences at the School of Veterinary Medicine (SVM), The University of the West Indies. Her major research interests include: antimicrobial resistance, food safety, and the surveillance of zoonotic diseases.

She aims to develop practical, cost-effective strategies to improve food safety and combat zoonotic diseases in the Caribbean region. She also supervises related undergraduate student research projects at the SVM and One Health Research Projects in the School of Medicine. Dr. Benjamin's hobbies include viewing nature as she travels throughout our beautiful nation, gardening and reading.

Dr. Oral Daley has been a member of the Caribbean Academy of Sciences Trinidad and Tobago Chapter (CAS-TT) since 2022. He is a Crop Scientist who lectures in the Department of Food Production, Faculty of Food and Agriculture, The University of the West Indies, St. Augustine Campus, Trinidad, and Tobago. His research interest includes food security, climate smart and sustainable agriculture, and crop germplasm characterization, evaluation, and conservation.

He aims to harness the genetic variation in underutilized tropical food crops for long-term genetic gain and diversity, and to understand the genetic structure of complex traits that influences quality and yields to develop sustainable crop production systems to advance food and nutrition security in the Caribbean. He supervises undergraduate and postgraduate students research. Dr. Daley hobbies include tennis, swimming and hiking.

Ms. Surujdaye Jaggernath-Furlonge has been a member of the Caribbean Academy of Sciences Trinidad and Tobago Chapter (CAS-TT) since 2008. She is an Industrial Engineer pursuing a PhD in Industrial Engineering and is currently a lecturer in Industrial Engineering at The University of the West Indies, St Augustine Campus. She has 15 years of experience in Quality Management Systems and Auditing. She is a registered engineer and a Practitioner of the Chartered Quality Institute (CQI) in London. She enjoys a 5K and hiking.

HOW TO STRENGTHEN ORGANISATIONAL RESILIENCE OF TRINIDAD AND TOBAGO MANUFACTURERS? FACTORS AND INSIGHTS

MRS. SURUJDAYE JAGGERNATH-FURLONGE AND PROF. KIT FAI PUN
THE UNIVERSITY OF THE WEST INDIES – TRINIDAD AND TOBAGO, WEST INDIES
DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

Abstract:
This article provides empirical determination of factors that affect resilient operations of manufacturers in Trinidad and Tobago. It sheds insights on using measurement models (MMs) to assess whether the observed indicator variables adequately measure the latent variables whilst a structural equation model (SEM) examines the relations between independent and dependent variables (hypothesis testing). SPSS AMOS (Analysis of Moment Structures) was used to test the hypotheses, followed by SmartPLS4 to confirm the findings. The greater the adaptive capacity, organization culture for resilience and supply chain resilience, the greater the capability of the manufacturers' organisational resilience (OR) will be.
Keywords: Organisation Resilience, SEM, SmartPLS4, Manufacturers

Introduction

The Covid-19 Pandemic affected Trinidad and Tobago (T&T)'s manufacturers in terms of gross domestic product (GDP), capacity utilisation rate and employment. Statistics show that GDP decreased by 2.3% in 2019 and 10.6% in 2020 with the monetary GDP contributions being TT$26,518.9 million in 2019 and TT$21,685.5 million in 2020 (CBTT, 2022). Besides, capacity utilisation rate decreased to 63.3% in 2020 and 61.2% in 2021. Moreover, employment dropped to 7.6% (44,900 persons) in 2019 and 6.3% (35,900 persons) in 2020 (CBTT, 2022). These challenges/problems threatened the survival of T&T manufacturers (TTMA, 2020). The Pandemic exposed the vulnerability of T&T manufacturers to disturbances. Vulnerable organisations lack the ability to endure or withstand the effects of adverse environmental conditions (Ciurean, Schroter and Glade, 2013). There is no exception for manufacturers in T&T.

On the other hand, Resilient Organisations (RO) have the capability to anticipate and plan for disturbances, implement mitigations when adversity becomes a reality and thereafter survive and even thrive (Denyer, 2017). Managing vulnerabilities is essential to improving organisational resilience (Darkow, 2019 and Longstaff, 2005). Rodriguez-Sanchez (2021) advocates that surviving and thriving an adversity is akin to establishing RO. As such, the factors affecting resilient operations among manufacturers could be investigated. Based on a recent study conducted in T&T, this article paper sheds light on identifying several RO/OR factors that have been affecting the resilient operations and improving the OR capability of manufacturers in T&T.

Methodology

Research Design

The study adapted a measurement scale for organisational resilience which was developed and validated by Jaggernath-Furlonge, Williams and Pun (2023) based on data collected from manufacturing organisations in T&T. The survey instrument was then processed to 85 large manufacturers via local post, e-mail, hand delivery and google forms.

Based on the data collected from the survey, SPSS AMOS was used to develop measurement models (MM) for each construct i.e., anticipating a disturbance, adaptive capacity, organisation culture for resilience, digitalisation, management systems and supply chain resilience. Thereafter, established MMs were used to construct a structural equation model. An established MM is one whose model fit statistics are satisfactory i.e., at least three indices must be satisfied from CMIN (Chi-Square Minimum), GFI (Goodness of Fit Index), CFI, TLI (Tucker-Lewis Index), SRMR (Standardised Root Mean Square Residual) and RMSEA (Root mean square error of approximation) as recommended by Hair et al., (1995 and 2012), in addition to, acceptable validity and reliability (Singh and Singh, 2019).

Response

A total of 30 responses were received. This gives a response rate of 35.3%. The respondents were manufacturers of construction materials, food and beverage, printing and packaging, household and cleaning chemicals. Of the 35.3% responses, the food and beverage sector constituted 30%, printing and packaging, 23.3%, construction, 26.7% and Miscellaneous manufacturing, 20%.

Lewis, Pun and Lalla (2006) and Syan and Ramoutar (2008) suggested response rates for surveys in T&T would traditionally be low, as such, additional efforts were made to get an acceptable response rate. Newman (2006) highlighted that 10% of the defined population is an acceptable sample size. Furthermore, Hair et al. (2010) recommends a respondent: independent variable ration of a minimum of 5:1 and a preferred ratio of 20:1, with no more than six (6) independent variables. The response rate therefore met these recommendations.

Selection of Measurement Models For SEM

Table 1 shows the justification for selecting the various measurement models for the structural equation model. As shown, these constructs have met the criteria and were included in the structural equation model (SEM) which was used to test the hypotheses.

Structural Equation Model and Hypothesis Testing

The hypothesised relationships to be tested using the Structural Equation Model, are described below:

H1: Preparing for the disturbance occurrence will strengthen manufacturers' capabilities of organisational resilience. That is, the stronger the intent of preparation is, the greater the capability of the manufacturers' organisational resilience will be.

H2: The ability to adapt to a disturbance (adaptive capacity) will strengthen manufacturers' capabilities of organisational resilience. That is, the greater the adaptive capacity, the greater the capability of the manufacturers' organisational resilience will be.

H3: An organisation culture for resilience will strengthen manufacturers' capabilities of organisational resilience. That is, the more mature an organisation culture for resilience is the greater the capability of the manufacturers' organisational resilience will be.

H4: Digitalisation will strengthen manufacturers' capabilities of organisational resilience. That is, the more digitalisation is practiced, the greater the capability of the manufacturers' organisational resilience will be.

H5: A mature management system will strengthen manufacturers' capabilities of organisational resilience. That is, the more mature a management system is, the greater the capability of the manufacturers' organisational resilience will be

H6: A resilient supply chain will strengthen manufacturers' capabilities of organisational resilience. That is, the more resilient the supply chain is, the greater the capability of the manufacturers' organisational resilience will be.

Regression weights and their p-values were used in the decision of accepting or rejecting hypotheses. The null hypothesis was accepted if p≥0.1 (i.e., 90% Confidence Interval).

Construct	At Least 3 Model Fit Indices Acceptable?	Cronbach α >0.7?	Composite Reliability >0.7	Convergent Validity AVE ≥ 0.5	Discriminant Validity is √AVE ≥ Latent Variable Correlation	MM Established to Include in SEM?
AD	√	√	√	√	√	Yes
AC	√	√	√	√	√	Yes
OCR	√	√	√	√	√	Yes
DIG	√	√	√	√	√	Yes
MS	√	√	√	√	√	Yes
SCR	√	√	√	√	√	Yes

Keys: AD -Anticipating a Disturbance, AC- Adaptive Capacity, OC- Organisational Culture for Resilience, MS- Management Systems, DIG-Digitalisation and SCR-Supply Chain Resilience

Table 1. MM Constructs Meeting SEM Criteria

Structural Equation Model SEM-01

A structural equation SEM-01 (see Figure 1) model generated through AMOS, was used to test the relationships between the independent variables (AD, AC, OC, MS, DIG and SCR) and the dependent variable, Organisation Resilience (R). Besides, the model examined two mediating relationships i.e., AC - OC- R and DIG-SCR -R.

Table 2 shows the model fit results for SEM-01. The fit indices for SEM-01 are CMIN/df (1.972), CFI (0.9) and GFI (0.9) which were within the acceptable range. The SEM model was accepted.

Figure 1 SEM-01

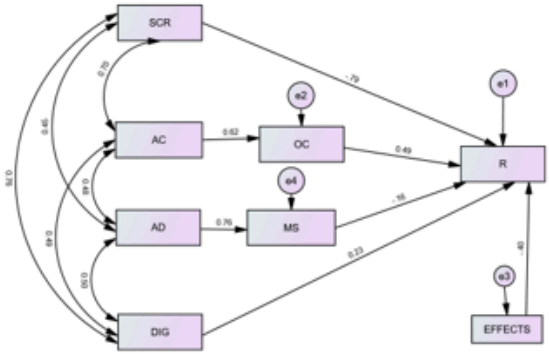


Table 2 Model Fit Results SEM-01

	Acceptable Level	SEM-01	Conclusion
CMIN/df	3-5 (≤5 reasonable, ≤3 acceptable)	1.972	√
CFI	≥0.9	0.9	√
GFI	≥0.9	0.9	√
TLI	>0.9	0.756	Close
SRMR	<0.08	0.1022	Close
Chi-Square	Insignificant	29.58 (p=0.014)	-

Table 3 shows the standardised regression loadings for the hypothesised relationships. As can be seen, the hypothesised paths SCR-R, OC-R and AC-OC are significant with *p*-values <0.1. As such the null hypothesis for supply chain resilience (H_{06}), organisational culture for resilience (H_{03}) and adaptive capacity (H_{02}) were rejected. The other paths MS-R, and DIG-R were found to be insignificant since *p*-values were >0.1; The null hypothesis was therefore accepted for management systems (H_{04}) and digitalisation (H_{05}).

Table 3. Regression Weights for Structural Model SEM-01

			Estimate	S.E.	C.R.	P
OC	<---	AC	.624	.178	4.299	***
MS	<---	AD	.762	.144	6.342	***
R	<---	OC	.494	.220	3.689	***
R	<---	MS	-.160	.176	-1.219	.223
R	<---	DIG	.233	.224	1.238	.216
R	<---	SCR	-.789	.224	-4.055	***

*** p<0.001

In order to validate the results, the same structural equation model was recreated using SmartPLS4.The results of the path analysis are shown in Table 4. The mediating relationships AC-OC-R and AD-MS-R were tested, and it was found that AC-OC-R was significant at a 90% Confidence interval with a p-value of 0.0509. However, AD-MS-R was not significant with a p-value of 0.270. As can be seen from Table 4, p values were <0.1 for AC-OC and OC-R; SCR-R. These results support the findings of SEM-01 at 90% confidence interval.

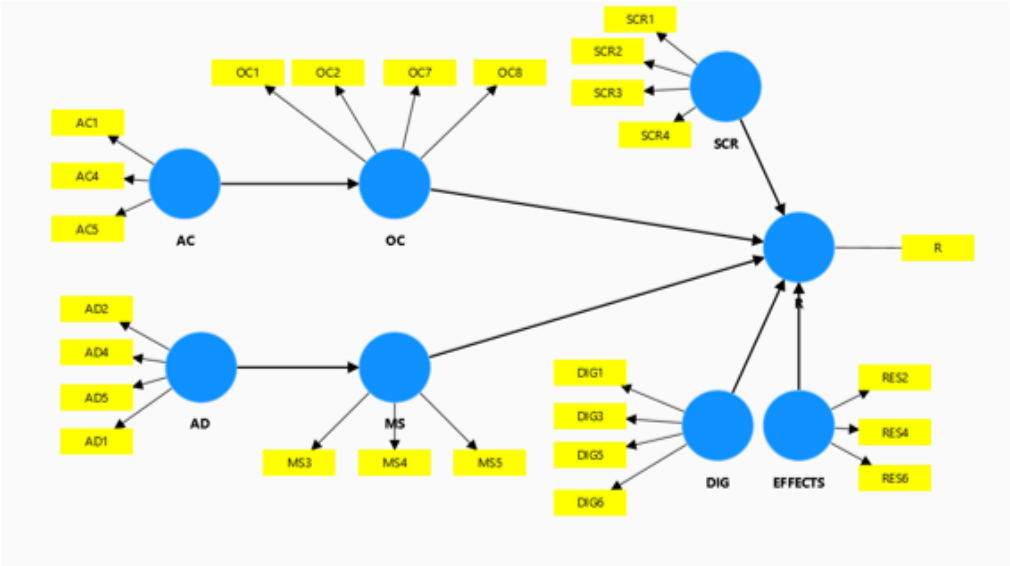


Figure 2. SmartPLS Model

Table 4. P-values using SmartPLS 4

	T Statistic	p-values	Accept Null Hypothesis?
AC-OC	7.679	0.000	No
OC-R	1.739	0.041	
DIG-R	0.351	0.363	Yes
SCR-R	1.736	0.042	No
AD-MS	8.091	0.000	Yes
MS-R	0.634	0.263	

Table 5 provides the confirmed results of hypothesis testing. The hypotheses path SCR-R, AC-OC-R and OC-R are supported by SPSS AMOS and SmartPLS4. Therefore, confirming that a resilient supply chain, organisation culture for resilience and an adaptive capacity will strengthen manufacturers' capabilities of organisational resilience.

Table 5 Confirmed Results of Hypothesis Testing

	p-value AMOS	*p*-value SmartPLS4	Hypothesis Test
SCR-R	<0.001	0.042	Supported
AC-OC-R		0.0509	Supported
OC-R	<0.001	0.041	Supported
AC-OC	<0.001	0.000	Supported
AD-MS-R		0.27	Not Supported
MS-R	0.223	0.263	Not Supported
DIG-R	0.216	0.363	Not Supported

Conclusion

Through mediation with organisation culture for resilience and supply chain resilience, adaptive capacity will strengthen manufacturers' capabilities of organisational resilience (at a 90% confidence interval). It was found that several factors can strengthen organisation resilience of manufacturers in T&T. These factors include trust and information sharing, visibility, SC agility and collaborative planning (supply chain resilience); innovativeness/creativity, de-centralised structures, openness to change and collaboration/cooperation/communication/coordination (organisation culture for resilience) and agility, internal collaboration and external collaboration (adaptive capacity). Results also show that digitalisation, anticipating disturbance and management systems and their respective factors, may not strengthen manufacturers' capabilities of organisational resilience.

Many manufacturers in T&T are not persuaded that anticipating a disturbance may strengthen OR capabilities possibly because predicting and preparing for a disturbance like the pandemic is viewed as unattainable and once in a lifetime experience. They do not have and are not aware of digitalisation methods or at the very least are in the early stages of comprehending digitalisation, therefore they have not experienced the full benefits of digitalisation. Moreover, many manufacturers have reservations on whether management systems such as ISO 9001: 2015 (ISO 2015), ISO 31000: 2018 (ISO 2018) and ISO 22301: 2019 (ISO 2019) can strengthen OR capabilities. ISO 9001: 2015 (ISO 2015) is mainly utilised by local manufacturers to improve business operations to remain competitive but not for resilience against disturbances, additionally most organisations awareness of ISO 31000: 2018 and ISO 22301: 2019 is at early stages so have not experienced the benefits associated with these standards.

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LIVESTOCK ADAPTATIONS TO CLIMATE CHANGE

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Over the past decade, climate change has become of increasing concern as its effects can be felt throughout the world, especially in small island developing states. In the Caribbean, livestock farmers have been exposed to extreme heat, heavy rainfall along with frequent flooding, and landslides. These changes result in an overall reduction in the health and productivity of livestock. However, farmers are increasingly using strategies, traditional and innovative, to protect their livestock and ensure sustainability of the industry.

Heat Stress and Its Effects on Livestock

Heat stress, one effect of climate change, affects the health and productivity of livestock. Cattle, for instance, have lower milk production and reduced finisher weight at extreme temperatures (1). Poultry has reduced egg production, and slower growth (2). Swine are particularly vulnerable due to not having sweat glands, making them susceptible to heat exhaustion and respiratory issues (3).

To counteract heat stress, farmers are investing in cooling systems, such as fans and misting systems, and installing them in pens to lower indoor temperatures (1,2). Some have built shade structures over outdoor areas (4), and some have been practicing selective breeding to produce heat resistant livestock, making them more suited to the Caribbean's warm climate (5).

Heavy Rainfall and Nutrient Leeching in Soil

The Caribbean's heavy rainfall during the wet season has resulted in nutrient leeching in the soil, reducing its nutrition. This nutrient loss results in nutrient deficiencies in livestock leading to stunted growth, weakened immune systems, and lower productivity (6). To address this, farmers use soil management techniques such as crop rotation, where they change the type of crop grown in a field seasonally, preventing the depletion of specific nutrients. Cover cropping, where crops like legumes or grasses that protect the soil are planted, can reduce erosion and keep nutrients intact. Farmers can also enrich the soil using organic matter, such as compost, which boosts nutrient levels and helps retain moisture and some are implementing rainwater harvesting systems which capture and store rainwater managing runoff, reducing erosion, and keeping nutrients within the soil (6).

Flooding and Loss of Livestock

Heavy rainfall can result in sudden flooding, potentially sweeping away animals and damaging pens and pastures. Landslides are also a possibility and can trap animals in mud and ruin grazing areas. To prevent this, farmers build pens and animal enclosures and use pastures on higher ground providing a safer environment for their livestock (7). Drainage systems around fields and pastures were implemented to guide water away from critical areas, reducing the risk of waterlogging and protecting soil structure (7). Also, some farmers are working with local authorities to establish early-warning systems to notify farmers in advance of extreme weather, allowing them to move their animals to safer locations before flooding or landslides occur (7).

Looking Forward: A Resilient Future for Caribbean Livestock Farming

Despite ongoing challenges, Caribbean livestock farmers are showing resilience through these adaptive strategies. However, increased access to financial resources, on-going development of relevant innovative strategies and a technical workforce to implement the changes are needed to build a sustainable foundation for the future of livestock farming in the region. Government support and public-private partnerships can assist farmers to afford to introduce the required changes. More regional research is also needed on resilience strategies for livestock farms, for example, in areas such as cooling equipment, soil restoration initiatives, and infrastructure to counteract flooding. In addition, regional dissemination of innovative solutions through technical education and training should be a priority.

Drs Benjamin (lisa.benjamin@uwi.edu) and Mohammed welcome research collaborations on topics related to livestock adaptations as climate change is a pressing issue for our Small Island Developing States in the Caribbean and elsewhere.

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LET'S TALK ABOUT SCIENCE AND SKIN COLOR: THE CASE OF CUBAN WOMEN SCIENTISTS

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Abstract:
The authors work on a necessary research and report some results and reflections on the presence and participation of Afro-descendant women scientists in the economic and social development of Cuban society. Dedicated for decades to research in the Cuban science sector, from history, social sciences, science management and, in general, with an integrated vision of the panorama of science from the Academy, their central objective is to make visible the potentialities of mestizo women or women of color with black skin in the sciences. The concepts of "race," (now in disuse) and gender are discussed to identify biases and discrimination in different spaces of science, also taking as a reference what was published in a very recent United Nations report on Gender and the Sustainable Development Goals 2023, [1]. Its results contribute to supporting, among others, the Program for the Advancement of Women in Cuba, [2], where it is proposed to redefine and increase the indicators to measure this progress, from all Agencies and institutions to provide statistics, but also qualitative analysis using modern techniques for the study. A first approximation to a feminist vision at the racial problem in Cuban science is presented. This initial contribution is a propitious space to report and discuss interesting results and reflections.
Keywords: Women scientists, Afro-descendants, skin color

1. Introduction

In Cuba, the debate on discrimination based on skin color in the most diverse spaces has offered light, illuminated those corners of society in its historical evolution. Just to name a few and from scientific research we refer to the contributions of Don Fernando Ortiz, [3, 4], Esteban Morales, [5]. Don Fernando Ortiz defined Cuban society as "a great ajiaco", composed of the most diverse cultural influences, revealed valuable keys to understanding the meaning of the word identity and made notable contributions to the social sciences with his research.

His writings helped to understand the characteristics of society regardless of the time, due to his perennial search for the roots, because for him inquiring about who we are and where we come from, was the first step to enjoy the freedom to choose our own future.

His greatest contribution lies in the concept of transculturation, a theme that he introduced in his well-known books “Cuban Counterpoint of Tobacco and Sugar” and “Los Negros Brujos”. His work continues to be valid thanks to the Fernando Ortiz Foundation, which also led to the incorporation of Cuba into the project “The Slave Route”, thus making visible how this mechanism of oppression and its consequences took place.

In 1939 Fernando Ortiz characterized Cuban culture as an “Ajiaco”: a rich stew that consists of a long variety of ingredients cooked until it takes on a dense consistency. This is the synthesis of the essence of Cubanness, encompassing and visualizing the very nature of the Cuban soul and revealing the depth of its expression.

Since the beginning of the twentieth century, the Annals of the Academy of Sciences and its Proceedings had included in the debates of the academicians on “the need for the whitening of the Island of Cuba”, showing from those initial decades of the Republic the growing racism and proposals of discriminatory ideas.

It brings us to the present and invites us to analyze and reflect on the reference of Esteban Morales, Cuban scientist, economist when he answered, to the question, before his death in 2022, in “The fight against racism in Cuba,”[5]:

“… In Cuba the subject of racial identity and racism was a taboo subject, declaring that racism had been overcome as a result of the fact that, through law, the country had been opened to all its citizens. Sixty-two years after the Cuban Revolution, are we at a critical moment, a new and unprecedented moment of discussions among Cuban citizens, ... about the nexus of racial and national identity, about anti-racism and the development of socialism? Is this a new and unprecedented moment in Cuba.”

2. Skin color, context and rationale for a debate

Among the foundations of the research project led by the authors, racial classification is considered to represent an obsolete approach to the general problem of differentiation within a species. Anthropology in its biological sense has discarded races and recognizes that there is only one: the human, and that as a result of the historical-social inheritances there are still strong discriminatory manifestations. In defense of this toxic manifestation at the international level, the United Nations General Assembly proclaimed the International Decade for People of African Descent (2015 – 2024) in Resolution 68/237, with the theme: “People of African descent: recognition, justice and development”, with the main objective of encouraging States to eradicate the social injustices inherited from history and to fight against racism. the prejudice and racial discrimination that people of African descent still suffering.

The term Afro-descendants was adopted in 2000 at the Regional Conference of the Americas, held in Santiago, Chile, and institutionalized at the Third World Conference against Racism, Racial Discrimination, Xenophobia and Related Intolerance, held in 2001 in Durban, South Africa.

The adoption of the agreement at that conference was aimed at the recognition of the descendants of African people who arrived during colonial times to the American continent and the Caribbean as part of the slave trade, and who historically suffered discrimination and the denial of their human rights.

According to a World Bank report (2018), the presence of people of African descent is significant in many countries, making it somewhat difficult to specify their demographic dimensions and distribution. Data available from the latest round of Censuses from 16 countries, declared around 133 million Afro-descendants in Latin America in 2015, about 24% of the total population; concentrating in Brazil, Venezuela, Colombia, Cuba, Mexico and Ecuador. One in four Latin Americans identifies as Afro-descendant. However, the Caribbean has been left out of these analyses.

The general panorama is materialized by statistics of a high degree of exclusion, showing the predominance of situations marked by poverty and extreme poverty, inequality, and marginalization, in the denial of quality education, access to health services, inequality in the distribution of income, precarious labor insertion, among others, which ruins the construction of the socio-cultural bases of prosperous and sustainable living conditions and that currently entails in addition to forced migrations.

It is known that "poverty has a woman's face," in Afro-descendant women this image is even more acute and the main aim will be making visible and recognizing the struggles of Afro-descendant women.

Academic Beatriz Marcheco, Director of the Center for Medical Genetics of Cuba shows us the Fan (Pantone) that shows us the entire range of colors, with more than 300 gradations of the color of the skin of human beings. See figure.

Fan (Pantone) that shows us the full range of colors, with more than 300 gradations of skin color.

3. Women and skin color in Cuba

The Academic María del Carmen Barcia, [7-8] has published the interesting book that makes visible the existence of a practice exercised by women in the spaces and scenarios of society in Cuba and that covers from the seventeenth to the nineteenth century, social work that has left its traces in our history and where black and mestizo women played a central role.

Figure: Book: Trades of women midwives, wet nurses and friends, public services in private spaces seventeenth-nineteenth century. by María del Carmen Barcia, from Editorial Oriente, Santiago de Cuba, 2015.

Another text of interest is the one entitled "Emerging from silence: black women in the history of Cuba", compilation by Oilda Hevia Lanier and Daisy Rivera Castillo, from the Editorial de Ciencias Sociales, Havana, 2016, [9], paying tribute and telling us the little-known stories of women who have remained anonymous in Cuba, either because of the color of their skin or their social condition and who played an important role from bringing a life to the world to being part of the economic, political and social growth of the Island of Cuba.

Unquestionably, the Cuban Revolution, under the ideology of Martí and Fidel, opened opportunities for everyone equally. The Federation of Cuban Women also done a great deal, but, although equal access has been guaranteed, men and women without discrimination based on skin color, there are still gaps referred to the skin color. Gaps in professions, gaps in positions of power, also gaps in the scientific sector.

María del Carmen Zabala, [10], in "Studies of inequalities by skin color in Cuba: 2008-2018", presented a compilation of data of great interest on equity gaps in different areas such as: access to higher education, equity and social mobility, social perceptions and representations, health and well-being, work/employment, race relations and poverty, vulnerability, social exclusion and marginalization.

4. In science, are there differences in terms of skin color?

The authors are currently developing a research project led by the National Program of "Cuban Society" entitled: "Presence and participation of Afro-descendant women scientists in the economic and social development of Cuban society", [11],

which aims to make visible the behavior of the Afro-descendant social group working in the science sector in today's Cuban society. The objective is to bring a perspective that contributes to the accompaniment of the awareness of their manifest potentialities, which unfortunately on repeated occasions see how their dreams are truncated, influenced by individual factors or by the prevailing objective conditions that surround the environment, directly or indirectly influencing thought, inferiority behavior, or by many other gender concepts that are studied in general,but not taking into account skin color.

For Science in Cuba, and probably many other countries, statistics are compiled for science and technology activities disaggregating Men and Women, but not skin color, so this problem is not revealed in the analyses.
In Cuba we have very recently approved the Programme for the Advancement of Women, the indicators to measure this progress will be redefined and increased, from all agencies and institutions, and this project aims to provide indicators for statistics, by sex, profession and skin color, using modern techniques for study. The project proposes a feminist vision at the racial problem in Cuban science, with a gender perspective.

We consider that this issue has been little addressed, perhaps making visible some individualities of mestizo or black women in Cuban Science, but not encompassing a current panorama based on data and reflections.

As expressed in the rationale of the project: In Cuba, research and development centers have been created and continue to be created, achieving the formation and consolidation of a critical mass of human resources with a high scientific level and ethical values.

Today, the Cuban scenario faces great challenges, and there has been a call from different spaces and levels to promote the performance of Science, Technology and Innovation.

In Cuba, we already have as a general framework the National Program against Racism and Discrimination approved by the Council of Ministers in 2019. We plan to investigate the visibility and empowerment of Afro-Cuban women scientists in our context has the Program for the Advancement of Women approved by the Council of Ministers in October 2021 to which it is proposed to provide statistics by sex, profession and skin color.

It should be noted that the National Programme against Racism, as the guiding principle of the issue on the island, among its objectives:

“The National Program against Racism and Racial Discrimination is everyone’s issue, blacks, whites, mulattos, are national issues. We need action on behalf of people who have been marginalized or mistreated in different contexts.”

In the national context, we find several initiatives that emphasize the issue of racial discrimination, the greatest exponents being:

- The “José Antonio Aponte” Commission, created in 2009, which leads the battle against racism and racial discrimination from an essential cultural perspective.
- The Network of Afro-descendant Women, founded on 14 November 2012, whose objective is to visualize the historical imprint and advance in the empowerment of black women.
- Other groups based in Havana include Afrodiverse; Afro-Cuban Alliance; Casa Tomada Mirarte, Alianza Unidad Racial; We; The Espendru Club.
- The Afro-descendant Neighborhood Network made up of ten neighborhoods in the Cuban capital, the Ebenezer Baptist Church and the La Marina neighborhood of Matanzas, whose themes focus on social activism, training to raise awareness of forms of discrimination and the opening of spaces for reflection and dialogue.
- Afro-Cuban Group as a forum for training, reflection and debate on current socio-cultural issues related to race, gender or sexuality of Cuban Afro- descendant women.

5. Some necessary data and reflections

For two years, the authors have been presenting partial results in different scientific events, exposing and disseminating, improving the perception of the need to show Cuban Afro-descendant women as role models before Cuban society, decision-makers, different scientific societies, Afro-descendant societies and above all make them visible to new and future generations of scientists in Cuba.

The questions for analysis and reflection are:

• What position does black women scientists play in the current socioeconomic challenge and Cuban perspective?
• What are the scientific preferences and main obstacles faced by Afro-Cuban women?
• Do they find opportunities, satisfaction, and visibility in the work they do?
• What do these women recommend for the scope of their participation and visibility in the impact on the economic scenario of the priority areas of Cuban development?

Some preliminary and even results from our perceptions are:

- In the current one, recently elected for the period 2024-2029, the Board of Directors, which presides over the Cuban Academy of Sciences, between Plenary and Plenary, women are 75%. Out of 12 Members, 9 are women! That is a very important achievement, but very few are mestizo, black, Afro-descendant.

-In the Membership of the Academy: of more than 400 members, less than 10% are black or mixed-race women.

-In decades of Academy Awards out of an average of 60 annual national Awards, only 5% or less have a mixed-race or black woman as their first author.

-In the membership of the Academy, throughout its history, very few Cuban Afro-descendant women have arrived as members, and those who have reached this elite – elected by direct and secret vote at the national level – the as very few who have arrived are from the Biomedical Sciences and the Social Sciences.

From gender studies, one of the current concepts experienced by Women in Science in general, but in particular mulatto, black, mestizo women is the "Impostor Syndrome." It is a psychological picture in which people feel unable to internalize their achievements and suffer a persistent fear of being discovered as a fraud. This concept applies to women scientists when presenting their results to various audiences, events, thesis defenses, even teaching. In addition to stage fright, the fear or insecurity that they are not expressing their contributions correctly, the originality of them. And if it is an Afro-descendant woman scientist, sometimes that Syndrome becomes more palpable, [12].

A more recent phenomenon is the so-called "Matilda Effect" which we have also seen as an obstacle for Afro-descendant women. The Matilda effect is a prejudice against recognizing the achievements of women scientists, whose work is often attributed to their male colleagues, [13].

There are many other barriers and stereotypes for Women in Science and from gender theories such as the Glass Ceiling, the Pink Collar Ghetto, the Pipeline Effect, already explained and better known published by other authors and in [14], [15], which also apply and sometimes with more force to mulatto, mestizo, black women and even in other regions, also for Latinos, indigenous women or descendants of indigenous people or other ethnic groups.

Conclusions

To send this contribution to the Caribbean Academy of Sciences Newsletter has as its central objective to focus on the theme of Women in Science and skin color, to draw attention and invite reflection and contributing ideas and proposals on how to improve and eliminate barriers and obstacles that allow a better use of women's talent in scientific, economic, social, and sustainable development in our States and small islands of the Caribbean.

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About the Authors:

Lilliam Alvarez Díaz, born 25 of December 1949, Cuban, graduated with a BSc in Physics, from Havana University, in 1971. MSc in Nuclear Physics, 1976. PhD Physics-Mathematics in Moscow, 1989. In 1986, she founded the Group of Numerical Analysis in the Institute of Cybernetics, Mathematics and Physics where she was also Deputy Director 1990-2002. In 1999 she became the official member of the Cuban delegation at the World Summit of Sciences in Budapest, especially participating in the issues of the importance of Basic Sciences and Women in Sciences. She was the National Director of Sciences of the Ministry of Sciences, Technology and Environment of Cuba between 2002-2010. In 2001, she was awarded the National Medal Carlos Finlay due to her contributions to the Cuban Sciences and was elected as a TWAS Fellow in 2008. She is the leader in the Iberoamerican Program of S&T, CYTED, and in the Network on Gender, Science, and Technology, as well as the Co-chair of the IANAS Program for Women of Sciences 2013-2017, contributing to the publication of two books on Women and Young women in sciences in the Americas. The focal point for the Surveys on the presence of Women in the Academies, in the IANAS Regional Survey for Latin America and the Caribbean, and the IAP World Survey. She is the author of a popular Book "Being woman in sciences or dying in the intent", Ser mujer científica o morir en el intento, Editorial ACADEMIA, La Habana, 2011. She has done more than 80 Seminars, Workshops, and Conferences in Applied Mathematics and has also given priority to Basic Sciences and Gender issues. Lilliam is the "soul" and a main activist in promoting Cuban Women in Sciences.

Mercedes Valero González

Born in Havana in 1952. Degree in History, University of Havana, Cuba in 1979. Master's Degree in History of Science and Technology -Researcher of the History of Science Group, Academy of Sciences of Cuba, since 2010. Current Vice-President of the Cuban Society for the History of Science and Technology. She is an active scientist, expert in issues of the historical evolution of Science and Technology in Cuba, covering a wide spectrum of topics such as the History of the Academy of Sciences of Havana from the nineteenth to the twenty-first century and the great founding personalities, the history of the Annals of the Academy Journal, the development and prestige of Medical sciences and Pharmacy in Cuba, of Cuban women in science, among many others. She is a prestigious and renowned historian who has also investigated the issues of race and racism in Cuba, such as her 1998 publication: "Anthropology, "race" and population in Cuba in the last quarter of the nineteenth century". Author of book chapters and numerous scientific articles, co-author of the book "History of Science and Technology in Cuba" which was the first monograph that summarized, in a systematized way, many of the important facts of scientific-technical history on the island, (History of Science and Technology in Cuba, Editorial Científica-Técnica, 2006). This book was recognized by the Cuban Book Institute as a Scientific-Technical Criticism Award for works published in 2001. Another book as co-author was entitled "100 Figures of Cuban Science" which constituted a magnificent contribution in making visible and making known important men and women, personalities who contributed to sowing and developing Science in Cuba.

Some relevant titles of his work are the following:

Science and Collecting in Cuba in the Nineteenth Century, 1999, Free Labour and Agricultural Diversification in Cuba, 1994, Studies of medicinal plants published by the Academy of Medical, Physical and Natural Sciences of Havana from 1899 to 1958, published in 1991, Pedagogical experiences in infant and primary schools in the province of Huelva with innovative methodology, 2018, History of the Botanical Garden of Havana, 2007, Historical approach to the presidents of the Academy of Sciences in Cuba, Annals of the Academy Journal, 2021. PRESIDENTES ACC Mercy y Lilliam.pdf

Mercedes Valero has systematically contributed to the organization, every two years, to the Colloquium European Presences in Cuba Impact of Scientific Thought on Cuba- Europe Relations, organized by the Office of the Historian of the City of Havana. Due to her diligent studies and research, she is a renowned historian, a very active member of the Cuban Society of the History of Science and Technology, trainer of several generations of students, organizer of events, seminars, congresses, for which she has been elected as Vice-President of this Society.

Dr. Milagros Sofía Cuesta Casañas

Bachelor's Degree in Economics, Specialization in Economic Statistics, Havana´ s University, 1981, Specialist in Rural Planning for the Environment, University of Alicante, 2004, Master's Degree in Statistics Applied to Economics, University of Havana, 2004

Expertise: Methodologist and Assistant Professor Professionalism, ethics, integration capacity, Consultant, Knowledge, technology, innovation and environment manager, Project formulation, evaluation and management, Territory management; Preparation of business and territorial strategies

Work Experiences: Professor in different Cuban and Angolan Universities, Executive Secretary and of the Group of Experts on National Programs and Projects (Cuban Economy: Challenges and Perspectives; Current Trends in International Economy and Systems of International Relations).
Member of: Cuban Academy of Sciences (Advisory Group, Analysis and prospective), Consultant to the Knowledge and Technology Management Company, Group of evaluators of the CYTED Program, Ministerial Commission of the Integrated Innovation Management System, National Commission for the evaluation of Innovation Awards, Human Capital Network Management Group, Collaborator of the Center for Research on the World Economy, Member of the Academic Committee of the International Meeting on Globalization and Development Problems, Member of the Expert Group of the Sectoral Programme on STI Management for Sustainable Development, Expert of the PALMA program, Member of the Faculty Collective of the Master's Degree in Agribusiness at the University of Benguela and ISP Kwanza SUL (Angola) Currently, Expert of the National Advisory Commission of Law 148/22 Food Sovereignty and Food and Nutritional Security, and Executive Secretary and of the Group of Experts of the National Program Local Development in Cuba.

FEATURE ARTICLES

CELEBRATING EXCELLENCE- DR. HOLLIS CHARLES AWARDED HONORARY MEMBER OF THE WORLD ASSOCIATION OF INDUSTRIAL AND TECHNOLOGICAL RESEARCH ORGANIZATIONS (WAITRO), NANJING, CHINA.

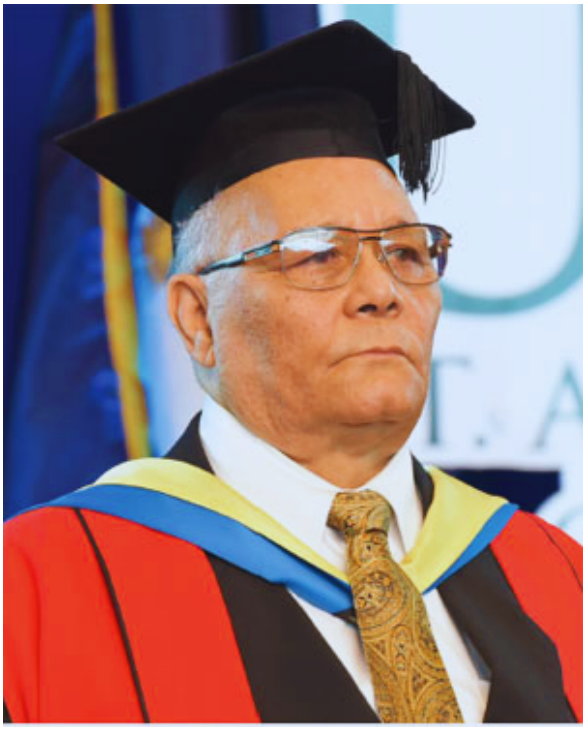
DR. HOLLIS CHARLES, HONORARY MEMBER, WAITRO.

The Caribbean Academy of Sciences extends our congratulations to Dr. Hollis Charles, on his recent appointment as an Honorary Member of the World Association of Industrial and Technological Research Organizations (WAITRO) at the recently concluded 27th General Assembly of WAITRO held in Nanjing, China in November 2024. Hollis R. Charles is a Fellow, former Foreign Secretary and Past President of the Caribbean Academy of Sciences [CAS]. He graduated from the University of the West Indies (UWI), St. Augustine with a B.Sc. in Engineering and obtained a M.Sc. in Management as a Sloan Fellow at the Graduate School of Business of Stanford University, USA. In 1987, on the occasion of the 25th anniversary of the Faculty of Engineering - UWI, he received a Certificate of Award – "in recognition of the contribution to National Development within the Caribbean." In 2015 he was awarded an Honourary D.Sc. by UWI, St Augustine, "for contributions in Science, Technology and Engineering". In 2017 Dr. Charles was inducted into the Hall of Honour of his high school alma mater Queens Royal College. Dr. Charles is a former Chairman of the Board of Engineering of Trinidad and Tobago (BOETT). A Fellow and past President of the Association of Professional Engineers of T&T (APETT). In 2011 APETT granted him its highest award, that of Career of Excellence in Engineering.

He is a former Chairman of the Board of Governors of the National Institute for Higher Education, Research, Science and Technology (NIHERST) and in 2013 he received a NIHERST Individual Award for Outstanding Leadership.

He is a Past President of the T&T Group of Professional Associations (TTGPA). He was the T&T representative on the Commonwealth Science Council, a Founding member of the Commonwealth Partnership for Technology Management Ltd and a member of the Committee for S&T in Developing Countries (COSTED) of the International Council of Scientific Unions (ICSU) In 1970 he joined the newly formed Caribbean Industrial Research Institute (CARIRI) as Founding Co-Director and led the Institute for the next 20 years.

During that sojourn he planned and directed the execution of industrial development projects and technical assistance for the private sector and Regional Governments and advised on science, technology and industrial development policy nationally, regionally and internationally.



In1970 he represented CARIRI as a Founding Member of the World Association of Industrial and Technological Research Organisations (WAITRO) and was President of the World Association from 1986 to 1990. In 2002 WAITRO gave him its Award of Honour in recognition of his "contributions to the advancement of industrial research and technology and its application to development."

In 2022 The General Assembly of WAITRO unanimously voted to elect him to lifetime individual honourary membership in WAITRO, in recognition of his contributions to the Association. This was only the second time in its history that WAITRO has made such an award.

Since 1990 he has developed two consulting organisations, which have supplied services to UNDP, the World Bank, IADB, UNIDO, UNECLAC, OAS, EU/ACP, the Commonwealth Secretariat, the Caribbean Community (CARICOM) Secretariat, the Caribbean Development Bank, to name a few. He is currently a Member of the Board of the Caribbean Consulting Group (The CCG) Ltd.

As a student at UWI, Charles captained the rugby team and was elected President of the Students Guild. Subsequently he became President of the UWI Rugby Club and is a former President of the T&T Rugby Union. He is also a former President of the T&T Squash Association.

He has been a founding member of at least two Community Based Organisations, the T&T Citizens Agenda Network (T&T, CAN) and the Association of Civil Society Organisations of T&T (ACSOTT). He has also had a long and continuing relationship with the Network of Organisations for the Advancement of Women.

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THE DEVELOPMENT OF NOVEL BIOACTIVE GLASS ENHANCED WITH CERIUM OXIDE

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Abstract:
Bioactive glasses, prominent in regenerative medicine, form a hydroxyapatite-like surface layer upon interaction with biological fluids, facilitating bond formation with living bone and tissue and offering utility in bone repair and dentistry. This study explored the enhancement of bioactive glasses for antibacterial applications with future plans for working in the field of oral health. Glasses were synthesized via the melt-quenching method, and their bioactivity was improved by doping with Cerium Oxide at varying concentrations (1-4% weight).

Physical parameters were calculated to highlight the structural differences resulting from doping, and the chemical structural compositions were analyzed using Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS). Raman Spectroscopy and Fourier Transform Infrared Spectroscopy (FTIR) were used to observe the structural modification of the doped glasses. The EDS graphs illustrate the presence of cerium oxides only in the doped glasses and the changes in the oxygen content of each dopant. UV-Vi absorption spectra indicated that the optical bandgap of the doped glass system was reduced by increasing Ce doping. FTIR spectroscopy showed an increase in the structural disorder of the glass network and by extension the formation of the hydroxyapatite layer (HAP).

Future work should include synthesizing a Stimulated Body Fluid (SBF) to imitate human plasma as a means of in vitro observation and further chemical structure composition analysis using X-ray Diffraction Analysis (XRD). Bioactive glasses are the future and based on the elements used for this specific glass, these glasses should be able to limit bacterial growth and reduce the use of metal in dental applications but more soluble and biocompatible alternatives.

1. Introduction

Bioactive glasses (BAG) are a class of materials that have been extensively studied over the past few decades due to their unique properties and biomedical applications. These glasses can bond with bone tissue, which makes them attractive for use in bone regeneration applications (Kumari et al., 2018; Nicolini et al., 2015). When bioactive glasses interact with human plasma they create a hydroxyapatite (HAP) layer that enables a strong reactive bond with the tissue or bone and the glass implant. This HAP layer has similar or identical chemical and structural properties as the mineral found in bone (Cilt ; Karasu et al., 2017; Satyanarayana et al., 2017) , which is why the bond between the bone tissue and the implant is strong. The biocompatibility and bioactivity of bioactive glasses are attributed to their unique compositions and structures, which usually consist of a network of SiO_2, CaO, Na_2O, and P_2O_5 (Cilt ; Karasu et al., 2017; Satyanarayana et al., 2017).

The glass composition depends on the intended purpose of the BAG. Some glasses bond to the bone, some to tissue, some to both, and some do not bond at all(Karasu et al., 2017). The main components of BAG (SiO_2, CaO, and P_2O_5) can be altered to create various forms of bioactive glasses and yield encouraging properties such as antibacterial properties and degradability(Cannio et al., 2021). Another way to enhance these qualities is the addition of dopants such as cerium oxide. These dopants can enhance the bioactivity of glass, improving its performance in tooth regeneration applications. Cerium oxide is a promising dopant for bioactive glasses because of its ability to scavenge free radicals and reduce oxidative stress(Kargozar et al., 2022). Additionally, cerium oxide has been shown to improve bone formation(ZHANG et al., 2010), enhance osteogenesis(Li et al., 2018) and angiogenesis, and has anti-inflammatory effects(Celardo et al., 2011).

Periodontal Disease (PD) is a severe form of gum disease. As the gum decays, the tooth becomes exposed to multiple bacteria and acids found in the mouth, causing tooth disintegration and decay. Sawant et al. reviewed the major developments in various compositions of BAGs in medicine and dentistry, which highlight all the products, surgeries, and regeneration currently possible because of continuous work in the field; however, they recommend more in vivo and clinical trials(Sawant & Pawar, 2020). They associate the failure of periodontal treatments with the failure to control the bacterial count that causes infection and the failure of dental implants with the degradation of the coating over time(Sawant & Pawar, 2020),(Winter et al., 2013). In this article, we discuss the synthesis and characterization of novel silicate-based calcium phosphate-sodium-bismuth bioactive

glasses doped with cerium oxide. We evaluate this novel glass along with the effect of the dopant on the bioactivity, mechanical properties and possible bioactive properties. Overall, this research represents an important step towards the development of novel bioactive glasses with possibilities of use in regenerative medicine.

2. Methodology and Materials

2.1 Preparation of novel silicate-based calcium-phosphate-sodium-bismuth bioactive glass samples

For this current study, the glass compositions $41SiO_2$-$(22-x)CaCO_3$-$22NaCO_3$-$6P_2O_5$-$9Bi_2O_3$: $xCeO_2$ ($1 \leq x \leq 4$ wt.%) is chosen. The details of the compositions and corresponding appellation are as follows:

Ce_1: $41SiO_2$-$21CaCO_3$-$22NaCO_3$-$6P_2O_5$-$9Bi_2O_3$: $1CeO_2$
Ce_2: $41SiO_2$-$20CaCO_3$-$22NaCO_3$-$6P_2O_5$-$9Bi_2O_3$: $2CeO_2$
Ce_3: $41SiO_2$-$19CaCO_3$-$22NaCO_3$-$6P_2O_5$-$9Bi_2O_3$: $3CeO_2$
Ce_4: $41SiO_2$-$18CaCO_3$-$22NaCO_3$-$6P_2O_5$-$9Bi_2O_3$: $4CeO_2$

The raw materials, including calcium oxide, sodium oxide, bismuth oxide, silicon dioxide, and phosphorus pentoxide, were selected and weighed in 30g batch mixtures. They were thoroughly mixed in a mortar and melted in a platinum crucible; the mixture was heated to 1000 °C at a rate of 20 °C/min. They were stirred and placed in the furnace and allowed to heat up to 1430 °C at the same rate. The melt is rapidly quenched on a copper wheel to obtain glass "beads", which are then ground into a fine powder. The glass samples were annealed at 541°C for 4 hours to release any residual stresses and improve its mechanical properties. Cerium oxide is added as dopants to enhance the glass' bioactivity and other properties. The density calculations were done using oxylene as the immersing liquid. The QE65 pro spectrometer was used to obtain the Raman shifts in a range of 100 – 1400 cm^{-1}. Fityk software was used for deconvoluting the Raman spectrum, it separates overlapping peaks to better interpreting the different vibrational modes in the glass while optical absorption was measured using a Cary 5000 UV/Vis/NIR spectrometer between 350 and 2000 nm using the polished samples. The Bruker LUMOS II FT-IR microscope was used for collecting FTIR data.

3. Results and Discussion

3.1 Physical Properties

The density of the glass increases with each concentration which indicates that by mitigating the $CaCO_3$ and replacing with CeO_2 the average molecular weight of the oxides are increasing (Bhatia et al., 2015). The thickness of the doped glass is significant for coating on the bone or tissue. With increase in dopant percentage the thickness of the glass decreased. The thinner the coat the better the rate of degradation of the glass resulting in the bioactivity being increased (Kaou et al., 2023). Given that the average molecular weight and molar volume have increased it can be inferred that the density had a dependent relationship due to the glass network becoming more tightly packed. When the CeO_2 concentration is increased the increasing rate of molecular weight is greater than that of density. A decrease in oxygen molar volume from CeO_2 weight % 2-4 is observed and can be attributed to the decrease in interionic distance of the glass network which impacts the glass structure's compaction as the CeO_2 addition allows a large number of oxygen ions in the Ce-BGs' structure[16]. Increased in OPD indicates higher concentration of oxygen atoms per unit volume, which speaks to greater structural integrity in the glass (Abdel-Baki et al., 2014). However, with an increase in the weight % of CeO2, the interionic distance and polaron radius both had a decreasing trend, which could be the consequence of a structural degree of disorder indicating a loosely packed glass network (Satyanarayana et al., 2017).

3.2 Raman Spectroscopy before immersion of SBF

The spectral range 200-1200 cm^{-1} was chosen as the main peaks of silicate as the HPA layer can be seen in this range. For a closer analysis, the spectra for each glass sample was deconvoluted, Fig. 1, shows the deconvolution of CeO_2 2wt% for no specific reason other than illustration(Cannio et al., 2021). The intensity of the peaks gradually decreased as the weight percentage of CeO_2 increased, indicating that CeO_2 broke down the silicate glass network (El-Damrawi & Behairy, 2018; Goharshadi et al., 2011). As a glass modifier, CeO_2 disrupts the Si-O-Si network by breaking Si-O bonds and forming non-bridging oxygens (NBOs)(El-Damrawi & Behairy, 2018). Therefore, this reduction in peak intensity signifies a reduction in the number of vibrationally active Si-O groups owing to the formation of NBOs. The glass samples have maximum peaks in the range of 950-1000 cm^{-1} which are typically associated with the symmetric stretching of Si-O bonds in the glass network (Atkinson et al., 2019). The spectra displays prominent peaks at approximately 450 cm^{-1} and 1100 cm^{-1}, which are assigned to the bending and

stretching vibrations of the Si-O-Si linkages, respectively. The presence of these bands confirmed the integrity of the silicate network within the glass matrix(Abou Neel et al., 2005).

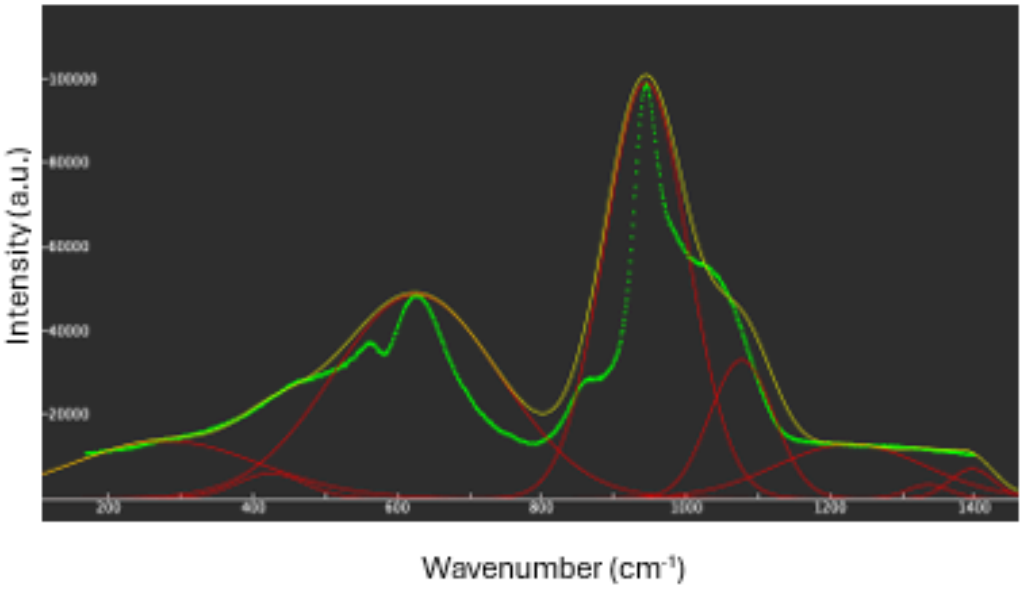

Fig. 1 Deconvolution of the CeO2 (2) wt% Raman Spectroscopy peaks

3.3 Fourier Transform Infrared Spectroscopy (FT-IR) before immersion of SBF

The Fourier Transform Infrared Spectroscopy (FTIR) is an effective analytical method for determining the chemical bonds and functional groups found in materials, particularly bioactive glasses. The degree of absorbance in bioactive glass, especially cerium-doped bioactive glass, can show subtle yet significant information about the material's bioactivity. The FTIR spectra of Ce-doped bioactive glass exhibited a notable shift in the Si-O-Si band from 1000 cm^{-1} to 1100 cm^{-1}, which indicates a depolymerization of the silica network (Atkinson et al., 2019) . This structural change enhances the release of Si^{4+} and Ce^{2+} ions in physiological conditions, promoting the formation of HAP layer as confirmed by the appearance of more defined peaks at 3200 to 3500 cm^{-1} which is an indication of Hyrdoxyl (-OH) groups and at 1400 to 1500 cm^{-1} indicating the presence of carbonate groups (CO_3^{2-}). As the glass deteriorates, the absorbance of the Si-O-Si stretching bands varies(Pal Singh et al., 2012). The gradual increase in the absorbance of these peaks may indicate more disorder in the glass network and a HAP formation enabling bioactivity(Satyanarayana et al., 2017).

3.4 Optical Absorption before immersion of SBF

Table 3 Bandgap for direct allowed transitions, Bandgap for indirect allowed transitions, Refractive indexes for both direct and indirect allowed transitions and Urbach energy.

Sample code	Bandgap for direct allowed Transitions E_g (eV)	Bandgap for indirect allowed transitions E_i (eV)	Refractive index n (direct)	Refractive index n (indirect)	Urbach energy ΔE (eV)
C1	3.421	3.059	2.292	2.381	0.188
C2	3.315	2.986	2.317	2.401	0.181
C3	3.234	2.889	2.337	2.428	0.198
C4	3.212	2.845	2.342	2.440	0.191

With increasing Ce concentration, the band-edge of the UV-Vis absorption spectra of the doped glass system shifts to longer wavelengths. This indicates that the optical bandgap of the doped glass system is reduced by increased Ce doping. Network modifiers create non-bridging oxygen (NBO) by breaking crosslinks in the glass system. These NBOs apply less Coulombic force to their electrons relative to regular bridging oxygen, reducing the bandgap. Indirect allowed transitions would likely be the most dominant mode of optical transition [33], [34], [35], [36].

UV-Vis transmission was lowest in sample C3 with the rest of the samples, including the base sample, having similar transmission spectra.

Ce caused the refractive index of the doped glass system to increase, due to the reduced optical bandgap. This indicates that the glass system attenuates UV-Vis radiation more with Ce doping. The refractive index is associated with various optical properties of a material such as polarizability, optical basicity, reflection loss and dielectric constant. (Bhatia et al., 2015; Marzouk et al., 2016; Saddeek et al., 2019)

$$n = [3(20/E_i)^{1/2} - 2]^{1/2}$$

When comparing the doped glass samples, Urbach energy increased with greater Ce concentration. This shows that there is an increase in the structural disorder of the doped glass network system with the introduction of greater amounts of Ce, likely due to the increased number of NBOs which are more disorderly than bridging oxygen. The Urbach energy values indicate that the doped glass system is a semiconductor (Marzouk et al., 2016;

Thakur et al., 2019). Urbach energy was derived using methodology taken from previous literature (Devaraja et al. 2021; Halimah et al. 2017).

3.5 Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS)

Scanning Electron Microscopy (SEM) technique was used to observe the particle size distribution and morphological features of the Ce-BGs. Fig. 2 shows the morphologies of the glasses, with the base glass (a) and the doped glasses (b-e) having formed crystal grains. The images show that the Ce-BGs possess a predominantly irregular shape with a rough surface texture, indicating the typical amorphous nature of bioactive glasses. A more concentrated crystal grain embedding was observed on the surface of the CeO_2-doped glasses.

The slight increase in surface roughness observed in cerium-doped samples could be beneficial, as increased surface area can enhance the bioactivity and cell attachment properties of the material (Cengiz et al., 2021). The maintenance of porosity in the presence of Ce suggests that the doping process does not compromise the structural integrity required for bioactivity.

The EDS spectrum measurements in Fig. 3 indicated that oxygen weight % decreases with the increase in CeO_2 concentration. This has further implications such as the glass would be more durable and transparent as the concentration of CeO_2 increases(Bhatia et al., 2015). Therefore, having these favourable enhanced properties would be beneficial for the application purpose of this study. The SEM and EDS data collectively suggest that cerium-doped bioactive glasses maintain the essential characteristics required for effective biomedical applications. The enhanced surface roughness and porosity could improve cell attachment and proliferation (Cheng et al., 2016), while the presence of cerium could provide additional antibacterial and antioxidant benefits(ZHANG et al., 2010),(Celardo et al., 2011).

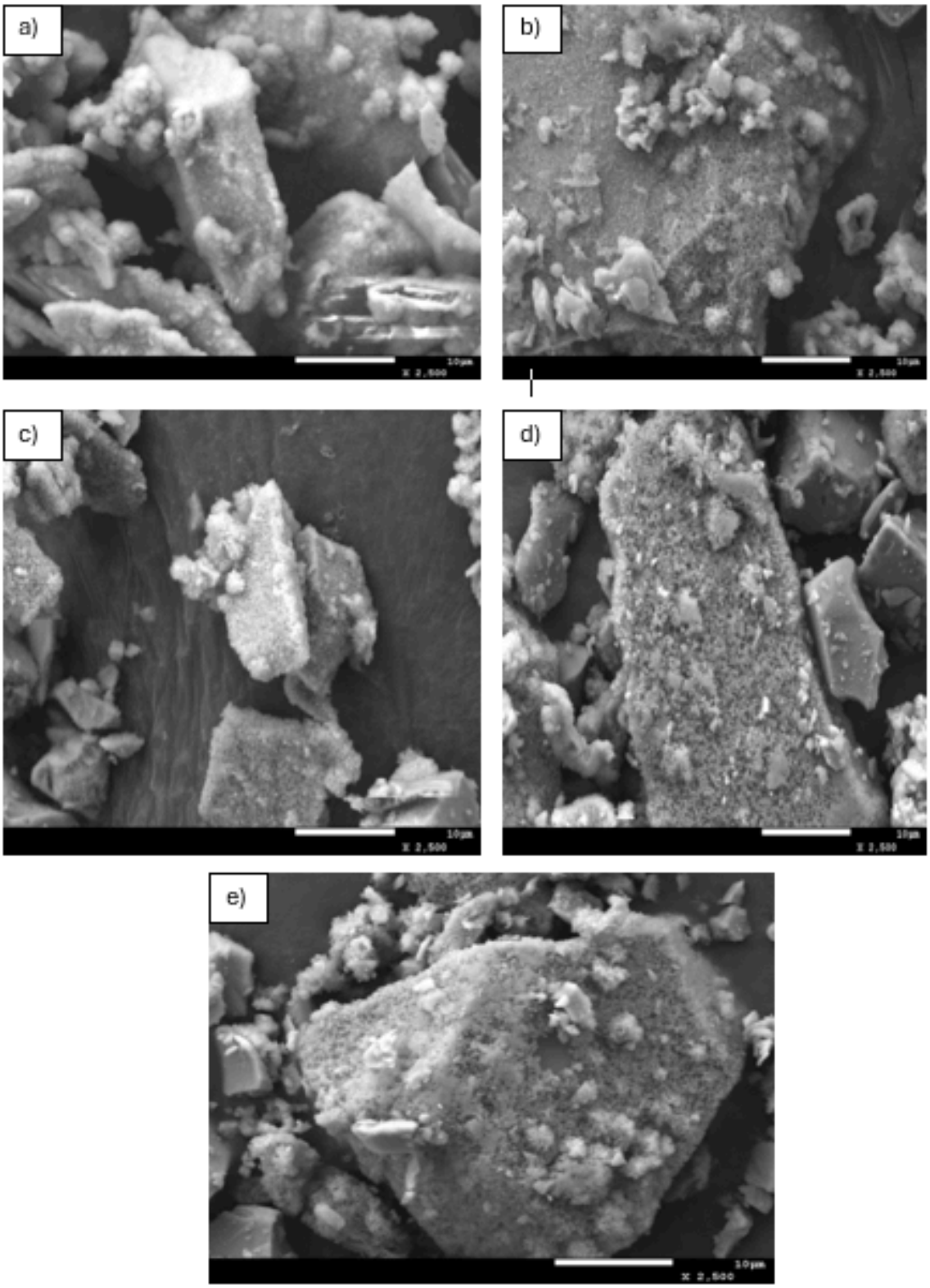

Figure 2 SEM images of the surface of a) the based glass and b) – e) glass doped in 1-4 wt% CeO respectively at x2500 magnification showing the HAP layer formed

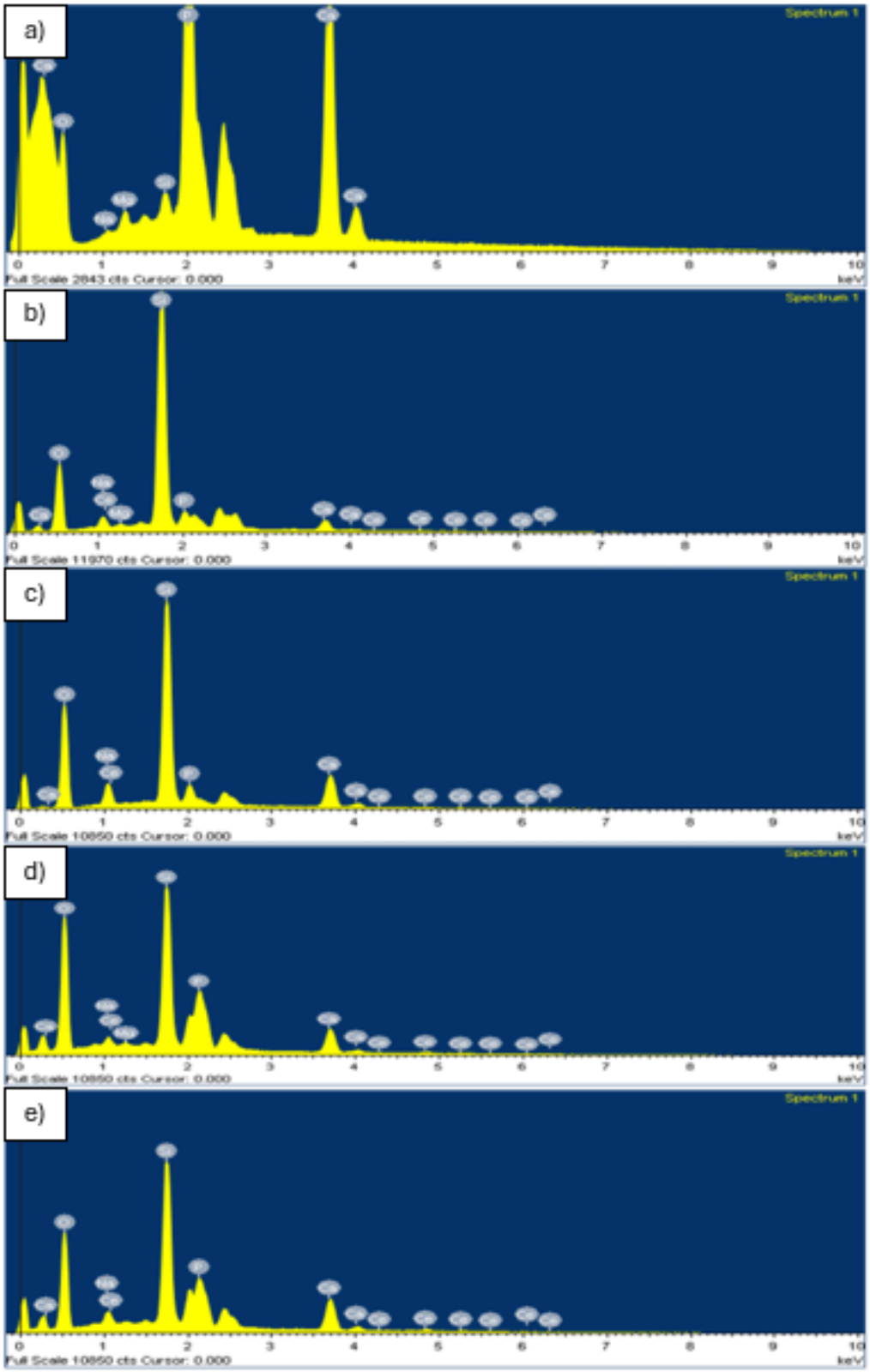

Figure 3 EDS images of the surface of a) the based glass and b) – e) glass doped in 1-4 wt% CeO respectively indicating presence of cerium and increased oxidation

4. Conclusion

In conclusion, the glass synthesized demonstrated bioactivity and the incorporation of bismuth and cerium dopant resulted in favorable morphological and compositional properties, potentially enhancing their functionality in biomedical applications. Further studies involving in vitro, and in vivo testing will be essential to fully elucidate the benefits and mechanisms of action of cerium-doped bioactive glasses in clinical settings. The structural alterations brought about by cerium doping in bioactive glasses have been better understood thanks to the use of Raman spectroscopy. The changes in the glass network that have been noticed point to increased bioactivity and possible multifunctionality, which calls for more research and optimisation for therapeutic uses.

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AFRICAN DUST HAZE: OUR WORST ENEMY AND BEST ALLY

PROFESSOR THOMAS PLOCOSTE
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African dust haze consists of clouds of fine sand particles that can be carried by wind over long distances. The mineral dust deposited in the Caribbean basin mainly originates from African deserts, where dry soil, sparse vegetation, bouncing particles, and strong winds create an atmosphere laden with dust year-round. Every year, millions of tons of this mineral dust are transported across the Atlantic Ocean within the Saharan Air Layer, eventually settling in the atmospheric boundary layer through dry and wet deposition (see Figure 1).

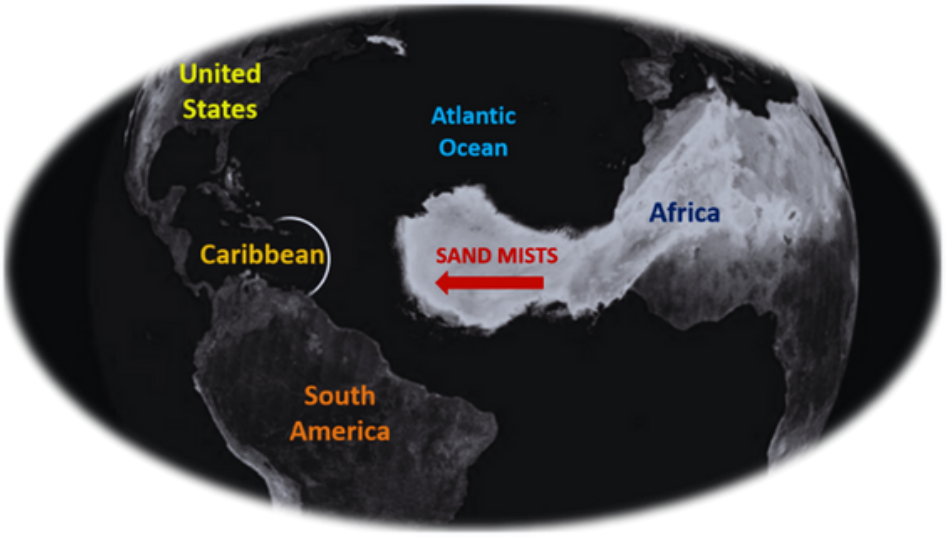

Figure 1. Satellite view of a sand haze moving from the African coast towards the Caribbean basin, passing over the Atlantic Ocean.

Did you know that these dust hazes are both our worst enemy and best partner? Indeed, they have numerous negative effects, particularly on human health and the efficiency of renewable energy sources. However, they also provide many benefits to agriculture and marine ecosystems. Due to the increasing desertification in Africa caused by climate change, it has become crucial to better understand and manage the effects of this natural phenomenon.

About KaruSphère (KS)

KaruSphère (KS) is a private research laboratory based in Guadeloupe, dedicated to the scientific study and analysis of air pollution and climate change in tropical regions. KS serves as a bridge between fundamental research and the business world, providing innovative solutions through applied research. The lab's mission is to produce scientific knowledge and develop cutting-edge tools to better understand and predict the health, environmental, and economic impacts of dust haze in the Caribbean, Africa, and Latin America.

To achieve this, KS offers a wide range of services, including:
• Consulting and coordination of on-site measurement campaigns
• Numerical modeling and computer programming
• Research project development
• Scientific report and article writing
KS is an active player in Deep Tech and Climate Tech, catering to both private and institutional clients.

Innovative Solutions and Their Impact

The solutions developed by KS will have a positive impact on multiple sectors:
• Public health improvement
• Protection of biodiversity (flora & fauna)
• Increased resilience to natural disasters
• Science-based decision-making support for environmental policies
• Optimization of renewable energy efficiency and agricultural productivity

Scientific Achievements and Recognition

Since its creation in November 2018, KS has produced 38 scientific works, including 27 high-ranking articles published in international journals, 2 book chapters, and 9 international conference proceedings. Thanks to its strong scientific expertise, KS has received several awards and recognitions:

🔹 October 2021: Dr. Lovely Euphrasie-Clotilde received the Young Talents France 2021 Award from L'Oréal-UNESCO's "Women in Science" program, highlighting the originality and societal importance of KS's research. This award provided national and international visibility.

🔹 December 2022: Prof. Thomas Plocoste obtained his Habilitation to Direct Research (HDR) at Université Littoral Côte d'Opale, in front of a prestigious jury, including the President of the French Academy of Sciences. This highest-level academic qualification in France demonstrates KS's scientific excellence and its impact on air pollution research.

🔹 October 2023: KS was a finalist in the 8th edition of the "Innovation Outre-Mer" (IOM8) competition at Station F, the largest startup contest for overseas territories.

🔹 June 2024: Under the supervision of Prof. Thomas Plocoste, Esdra Alexis obtained his PhD in Applied Mathematics for Environmental Sciences from the University of the Antilles, marking the first doctoral thesis supervised by KS.

🔹 October 2024: KS's DeepTech subsidiary won the MétéoFab competition, an incubator program by Météo France.

🔹 November 2024: KS's DeepTech subsidiary won the IOM9 competition in the "Honneur" category.

Raising Awareness & Scientific Outreach

To raise environmental awareness in the Caribbean, KS actively shares scientific insights in French and English through these "KaruSphère" media:

- Website: www.karusphere.fr
- Mobile application (Google Play (https://play.google.com/store/apps/details?id=com.karuspher.karuspher&pli=1)) & Apple Store (https://apps.apple.com/fr/app/karusphere/id1637340643))
- Social media (Facebook (www.facebook.com/KaruSphere) , Instagram (www.instagram.com/karusphere), Twitter/X (http://x.com/karusphere))

KS also contributes to the advancement of Caribbean research by editing international scientific journals. These accomplishments led to KS being officially recognized as a "Research Unit" in the National Directory of Research Structures (RNSR) by the French Ministry of Higher Education, Research, and Innovation. Furthermore, KS is a proud member of the prestigious France DeepTech association.

Interreg Project

KaruSphère is leading the innovative CARIAN (CARIbbean Atmospheric Network) project, funded under the Interreg Caribbean 2021-2027 program, covering Guadeloupe, Trinidad and Tobago, and the Dominican Republic. This project aims to develop a next-generation atmospheric measurement network, powered by solar energy, to address the lack of metrological data in the Caribbean region. CARIAN will monitor air pollutants, weather conditions, and climate trends, while also analyzing the link between atmospheric properties and soil quality. By leveraging solar energy, the project promotes a sustainable and innovative approach to environmental monitoring. Expected impacts include improved public health, strengthened resilience to climate change, better environmental policies, and enhanced regional cooperation. The project also aims to expand across the Caribbean, fostering job creation and scientific collaboration.

KaruSphère is working closely with esteemed partners to bring this project to fruition: MYDITEK (Guadeloupe); the University of the West Indies at St. Augustine (UWI, Trinidad and Tobago) and the Instituto Tecnológico de Santo Domingo (INTEC, Dominican Republic).

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Thomas Plocoste is a professor of physical science and a qualified research director (HDR) with over 15 years of experience in air pollution and the atmospheric boundary layer in tropical environments. He specializes in signal processing, statistics, stochastic methods, atmospheric turbulence, multifractal and multi-scale analysis, entropy, and artificial intelligence (machine learning, deep learning). As the founding president of KaruSphère, a private research laboratory, he is dedicated to the scientific analysis of Caribbean geoscience. Email: thomas.plocoste@karusphere.com

CAS

MEMORIAM TRIBUTE

IN REMBERANCE OF PROFESSOR EMRITUS HAROLD RAMKISSOON

DR. ROSHNIE DOON
SECRETARY, CAS REGIONAL EXECUTIVE

With deep sorrow, the Caribbean Academy of Sciences (CAS) announces the passing of our esteemed founding colleague, fellow and past president, Emeritus Professor Harold Ramkissoon. In 1966, Professor Ramkissoon obtained his Bachelor of Science degree with Honours in Mathematics from The University of the West Indies, Mona. After attaining his Doctorate, he commenced his professional career as a Lecturer in Mathematics at the St. Augustine Campus in 1976. Throughout his tenure, he diligently taught and mentored students until his retirement in 2017. Professor Ramkissoon has established himself as a prominent figure in advancing science and technology within the Caribbean region. He has frequently been invited to disseminate his expertise at various institutions, conferences, and symposiums worldwide, where his research focused primarily on micropolar fluids, viscoelastic fluids, and stability analysis.

Professor Ramkissoon held many esteemed positions within numerous organizations, reflecting his significant contributions to science and academia. In particular, he served as an independent senator in the government of Trinidad & Tobago, a Fellow of the Academy of Sciences for the Developing World (TWAS) and played a pivotal role as a founding member and former president of the Caribbean Academy of Sciences. He was an active member of the European Academy of Sciences and Arts, a Foreign Fellow and corresponding member of both the Cuban and Venezuelan Academies of Sciences, and the executive secretary of CARISCIENCE.

Throughout his extensive career, Professor Ramkissoon earned numerous accolades such as an honorary doctorate, readership & personal chair in Mathematics from the UWI, St. Augustine Campus, the Academic Gold Medal from the Simon Bolivar University and the Key to the City of Havana, the Chaconia Medal Gold (Trinidad & Tobago), and the CARICOM Science Award.

The Caribbean Academy of Sciences (CAS) extends its deepest condolences to the family, friends, and colleagues of Emeritus Professor Harold Ramkissoon. His passing is a monumental loss to the scientific community, but his legacy will continue to inspire and guide future generations.

May his soul Rest in Peace.

Remember
By Christina Rossetti

Remember me when I am gone away,
Gone far away into the silent land;
When you can no more hold me by the hand,
Nor I half turn to go yet turning stay.

Remember me when no more day by day
You tell me of our future that you planned:
Only remember me; you understand
It will be late to counsel then or pray.

Yet if you should forget me for a while
And afterwards remember, do not grieve:

For if the darkness and corruption leave
A vestige of the thoughts that once I had,
Better by far you should forget and smile
Than that you should remember and be sad.

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SPOTLIGHT

CAS-REGIONAL ANNUAL INITIATIVES

PREVIOUS CAS NEWSLETTERS:

Newsletter Archives:
https://casregional.org/newsletter/

April 2024-Volume 7, Issue 1:
https://casregional.org/wp-content/uploads/2025/02/CAS-Newsletter-issue-7-1.pdf

September 2024- Volume 7, Issue 2:
https://casregional.org/wp-content/uploads/2025/02/CAS-Newsletter-issue-7-2.pdf

CARIBBEAN ACADEMY OF SCIENCES (CAS) MEMBERSHIP SURVEY 2025.

The Caribbean Academy of Sciences (CAS) Regional executive is currently surveying members across all chapters. The Caribbean Academy of Sciences membership survey is a key tool for gathering member feedback, which informs strategic decisions and improves operations. By assessing member satisfaction and needs, the survey helps the academy tailor its programs effectively.
It also allows members to voice their opinions on pressing issues in the Caribbean scientific community, ensuring their input is included in decision-making. Overall, the survey enhances communication, transparency, and collaboration within the academy, supporting its mission to promote excellence in scientific research and education in the region.

To complete the survey, please see the following link:
https://forms.gle/tkgRESZ4gB7E9MTX9

CARIBBEAN ACADEMY OF SCIENCES (CAS) COMMITTEES 2025.

The Caribbean Academy of Sciences is delighted to unveil the creation of several dynamic committees dedicated to nurturing the growth and development of its Chapters throughout the Caribbean region. We are confident that this initiative will significantly enhance collaboration, foster innovation, and strengthen support within our vibrant scientific community.
Please complete the following form, to be considered.
To complete your application, please see the following form:
https://forms.gle/jyFsnsVcLCiBuGyk9

CARIBBEAN ACADEMY OF SCIENCES (CAS) MENTORING PROGRAMME 2025- COHORT 1

The Caribbean Academy of Sciences Regional Executive is committed to creating initiatives that our members can all benefit from. One such programme is the Caribbean Academy of Sciences Mentorship Programme.

The Caribbean Academy of Sciences Mentorship programme is a prestigious initiative aimed at fostering academic and professional growth among aspiring scientists in the region.

Founded on the principles of collaboration, knowledge-sharing, and excellence, this program pairs talented students (who must be pursuing either an MSc., MPhil., or PhD.) with experienced mentors (within academia or the industry) who provide guidance, support, and access to valuable resources.

Through regular meetings, workshops, and networking opportunities, mentees can enhance their research skills, broaden their perspectives, and build relationships within the scientific community. The mentorship programme not only promotes career development but also encourages innovation and critical thinking in various scientific disciplines.

To apply to be either a mentee or mentor, please complete the following form by April 30, 2025:
https://forms.gle/DnWzBC6gPYkrrqnV7

THE CARIBBEAN ACADEMY OF SCIENCES (CAS)

CALL FOR WEBINAR SPEAKERS

HELLO,

The call for virtual webinar speakers for 2025 is now open!

SHOWCASE YOUR EXPERTISE

This is your opportunity to share your insights, knowledge, and experience with the Caribbean Academy of Sciences (CAS) Community.

Live Webinar Opportunity: January-December 2025, once per month.

Platform: Zoom Webinar

Background

The CAS was inaugurated in May 1988. It is the primary Academy for Sciences in the Caribbean. It is an independent, non-governmental body registered in the Republic of Trinidad & Tobago.

Its primary objective is to provide a forum for interchange among scientists on important issues related to the application of science and technology to development.

The CAS serves as a source of advice to regional, governmental and non-governmental organizations in scientific and technology matters.

Target Audience

All Academicians, Scientists, Researchers, Specialists, Practitioners, and Industry Leaders worldwide are invited and encouraged to submit webinar proposals for the various webinars that the CAS offers throughout the year.

We are accepting proposals on a rolling basis until the end of 2025. Interested presenters are asked to please submit a 300-word abstract of the paper being presented and author biography. Further information will be provided upon acceptance.

Please feel free to forward to colleagues who you feel would be interested in taking part.

CONTACT US NOW

For Enquiries and Proposal Submissions, please contact:

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Dr. Roshnie Doon:
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The Caribbean Academy of Sciences (CAS)

Call for Graduate Student Webinar Speakers

BACKGROUND

The CAS was inaugurated in May 1988.
It is the primary Academy for Sciences in the Caribbean. It is an independent, non-governmental body registered in the Republic of Trinidad & Tobago.
Its primary objective is to provide a forum for interchange among scientists on important issues related to the application of science and technology to development.
The CAS serves as a source of advice to regional, governmental and non-governmental organizations in scientific and technology matters.

TARGET AUDIENCE

All MSc. and PhD. students in STEM fields (worldwide) are invited to present and discuss their ongoing research to receive valuable feedback from Academicians, Scientists, and Industry Leaders.
Students are encouraged to submit a 300- word abstract and their biography.
We are accepting abstracts on a rolling basis until the end of 2025.
Please feel free to forward to students who maybe interested in taking part.

LIVE WEBINAR OPPORTUNITY:

January- December 2025, once per month.
Platform: Zoom

Contact us now:

For Enquiries and Abstract Submissions, please contact:

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THE CARIBBEAN ACADEMY OF SCIENCES (CAS)

CALL FOR WORKSHOP PROPOSALS

Background

The CAS was inaugurated in May 1988. It is the primary Academy for Sciences in the Caribbean. It is an independent, non-governmental body registered in the Republic of Trinidad & Tobago. Its primary objective is to provide a forum for interchange among scientists on important issues related to the application of science and technology to development. The CAS serves as a source of advice to regional, governmental and non-governmental organizations in scientific and technology matters.

Target Audience

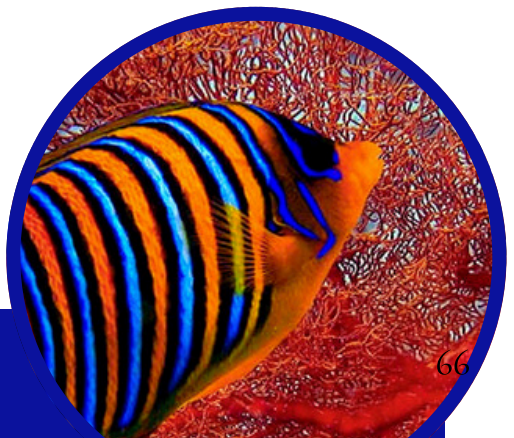
All Academicians, Scientists, Researchers, Specialists, Practitioners, and Industry Leaders worldwide are invited and encouraged to submit workshop proposals for the various online workshops that the CAS is hosting throughout the year.
We are accepting workshop proposals on a rolling basis until the end of 2025. Interested participants are asked to please submit their proposal and author biography. Further information will be provided upon acceptance.

Please feel free to forward to colleagues who you feel would be interested in taking part.

Contact Information

For Enquiries and Proposal Submissions, please contact:

- **Prof. Mark Wuddivira: Mark.Wuddivira@sta.uwi.edu**
- **Dr. Roshnie Doon: casexecutive2023@gmail.com**



Live Online Workshop **Platform: Zoom**

THE CARIBBEAN ACADEMY OF SCIENCES (CAS)

Call For Newsletter Articles

Call for Articles for the CAS Newsletter: 2025

BACKGROUND

The CAS was inaugurated in May 1988. It is the primary Academy for Sciences in the Caribbean. It is an independent, non-governmental body registered in the Republic of Trinidad & Tobago. Its primary objective is to provide a forum for interchange among scientists on important issues related to the application of science and technology to development. The CAS serves as a source of advice to regional, governmental and non-governmental organizations in scientific and technology matters.

THE CAS NEWSLETTER

The Caribbean Academy of Sciences (CAS) Newsletter is one which is driven by its members from the Trinidad and Tobago, Guyana, Jamaica, Guadeloupe, Antigua and Barbuda, and Barbados Chapters. We rely on your expertise in the various areas and sub-categories of Science, Technology, Engineering, and Mathematics (STEM), to share the most updated and relevant information from around the world with the STEM community in the Caribbean.

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- Articles must be 1.5 spaced, should be between 500 and 2500 words, and submitted as an MS Word file.
- An autobiographical note of 250 words of all authors and co-authors, as well as their full names, affiliations, and email addresses, must be included.
- The title and headings used within the article must be short and clearly defined.
- Figures should be submitted in its electronic form (jpg file with a dpi of 330) and be clearly labelled.
- References to other publications must be clearly cited using the APA reference style.
- Articles may be copyedited for clarity and style.

SUBMISSION PROCEDURE

To be considered, your article should be submitted to the Editor: Dr. Roshnie A. Doon, Secretary, Caribbean Academy of Sciences (CAS) Regional Executive, and the President of CAS Prof. Mark Wuddivira.

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