THE CARIBBEAN ACADEMY OF SCIENCES IN COLLABORATION WITH UNIVERSITY OF GUYANA

22ND BIENNIAL *Virtual* CONFERENCE

BOOK OF ABSTRACTS

August 9 — 14, 2021, Georgetown, Guyana

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The University of Guyana

EDITED BY:
Department of Events, Conferences and Communications (DECC)

UNIVERSITY of GUYANA

Mid-Atlantic Oil & Gas Inc.

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ACP MEAs 3

“We must acknowledge the challenges of achieving sustainable development in order to embrace the sacrifices we must make.

Our world is dying and we must preserve the resources that we have before it is too late… we must use them in a careful manner.”

Honourable Vickram Bharrat,
Minister of Natural Resources,
Guyana

“When when we think about the Caribbean, you know I think about our music, I think about our track and field and other sports.

You don’t think science, [off the top of your head] and that’s something we need to address…We need to make science sexy.”

Dr. Parris Lyew-Ayee,
Science Adviser to the Minister of Science, Energy and Technology, Jamaica

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CONFERENCE ORGANIZING COMMITTEE

In February 2020 a new executive body of the CAS Guyana Chapter was elected. The current composition of the CAS Guyana Chapter Conference Planning Committee is:

- Ms. Elena Trim – President
- Dr. Anna Perreira – Vice President/Conference Chair
- Ms. Heetasmin Singh – Treasurer
- Dr. Dawn Fox – Secretary
- Ms Kezia Bess – Assistant Secretary/Treasurer (ag)
- Dr. Jacqueline Murray – Programme Officer
-
- Ms. Medeba Uzzi
- Prof. Raymond Jagessar
- Ms. Petal Jetoo
- Prof. Neela Badrie
- Dr. Temitope Oyedotun
- Prof. Kit F. Pun
- Dr. Patrick Chesney
- Mr. Stennard George
- Ms. Penelope De Freitas

THE CARIBBEAN ACADEMY OF SCIENCES IN COLLABORATION WITH UNIVERSITY OF GUYANA

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SCHEDULE

AUG 9

10:00 HRS — **CARIBBEAN ACADEMY OF SCIENCE (CAS) OPENING CEREMONY**

Chairperson: Prof. Raymond Jagessar, President, CAS Central; Prof. Paloma Mohamed, Vice-Chancellor, Xi, University of Guyana; Ms. Elena Trim, President, CAS Guyana Chapter; Dr. Parris Lyew-Ayee Jr; Hon. Vickram Bharrat, M.P, Minister of Natural Resources; Dr. Anna Perreira, Vice-President, CAS Guyana Chapter

13:30 HRS — **WOMEN IN STEM FORUM**

AUG 10

10:00 HRS — **PLENARY SESSION 1**

Chair: Dr. Dawn Fox, *University of Guyana*
Presenter: Prof. Maya Trotz, *University of South Florida*

11:05 HRS — **TECHNICAL SESSION**

ROOM 1 - Pure & Applied Science; ROOM 2 - Medical & Pharmaceutical; ROOM 3 - Renewable Energy; ROOM 4 - Education, Humanities & Social Sciences; ROOM 5 - Pure & Applied Science; ROOM 6 - Education, Humanities & Social Sciences

13:30 HRS — **PLENARY SESSION 2**

Chair: Dr. Anna Perreira, *University of Guyana*
Presenter: Dr. Devon Dublin, *Hokkaido University of Education*

14:10 HRS — **YOUTH IN SCIENCE FORUM**

AUG 11

10:00 HRS — **PLENARY SESSION 3**

Chair: Dr. Jacqueline Murray, *University of Guyana*
Presenter: Prof. Percy Hintzen, *Florida International University*

11:05 HRS — **TECHNICAL SESSION**

ROOM 1 - Pure & Applied Science; ROOM 2 - Pure & Applied Science; ROOM 3 - Environment & Ecosystems; ROOM 4 - Education, Humanities & Social Sciences; ROOM 5 - Medical/Pharmaceutical Sciences + Pure & Applied Science + Education, Humanities & Social Sciences

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SCHEDULE

AUG 12

10:00 HRS — **PLENARY SESSION 4**
Chair: Dr. Temitope Oyedotun, *University of Guyana*
Presenter: Dr. Patrick Chesney, *Guiana Shield Facility*

11:05 HRS — **TECHNICAL SESSION**
ROOM 1 - Pure & Applied Science; ROOM 2 - Pure & Applied Science; ROOM 3 - Environment & Ecosystems; ROOM 4 - Education, Humanities & Social Sciences; ROOM 5 - Pure & Applied Science; ROOM 6 - Environment & Ecosystems

AUG 13

09:00 HRS — **PRESENTATIONS BY CARICOM**
UNEP ACP MEAs Program Presentation; Caribbean Hub ACP MEAs Phase III Presentation; Presentation on the Minamata Convention on interim storage, disposal of waste in mercury added products findings for the Caribbean

Session Chair: Professor Emeritus Winston Mellows

09:55 HRS — **PLENARY SESSION 5**
Chair: Prof. Neela Badrie, *The University of the West Indies (St. Augustine)*
Presenter: Dr Shirin Haque, *The University of the West Indies (St. Augustine)*

10:35 HRS — **CLOSING REMARKS**
Prof. Emeritus Winston Mellowes

10:45 HRS — **VIRTUAL TOURISM**
REEL Guyana

11:05 HRS — **ANNOUNCEMENT OF WINNERS**
Dr. Mark Wuddivira, *The University of the West Indies (St. Augustine)*

11:15 HRS — **ANNOUNCEMENT OF CAS FELLOWS**
Prof. Raymond Jagessar, *University of Guyana*

11:20 HRS — **VOTE OF THANKS/OFFICIAL CLOSE**
Prof. Raymond Jagessar, *University of Guyana*

For more information email casgychapter@gmail.com

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WOMEN IN STEM FORUM PANELISTS

Career Trajectories: Overcoming Barriers and Advancing to Leadership

Dr. Shirin Haque is an Astronomer at the University of the West Indies, Trinidad. Her areas of research include cosmology, astrobiology and observational astronomy. She is the recipient of several local, regional and international teaching and Science awards and is the first woman to receive the CARICOM Science Award and is the 2020 laureate of the prestigious Anthony N. Sabga Caribbean Award for Excellence in Science and Technology.She has produced several Caribbean Science documentaries and produced and hosted two television series on Science. She is the editor and producer of the magazine "The Intellectual - art, science and architecture".

Dr. K Renee Horton is an advocate for diversity and inclusion in Science, Technology, Engineering and Mathematics (STEM), and works diligently in the community for STEM education and STEM outreach. Renee believes in changing the face of STEM. She is the founder of Unapologetically Being, Inc., a nonprofit for advocacy and mentoring in STEM and serves as a quality Engineer for NASA in New Orleans. Dr. Horton is the past president of the National Society of Black Physicists and the author of a children's series titled Dr. H Explores the Universe.

Dr. Malika Grayson is the founder of STEMinist Empowered LLC. Her work in STEM has led to her being named one of Trinidad and Tobago's 40 Under 40 Youth Influencers by the country's Ministry of Youth and Sports Affairs. Fortune 100 global speaker, bestselling author, and mechanical engineer, currently, Dr. Grayson is a Computer Systems Architect at Northrop Grumman Corporation where she is the Applications Portfolio Manager in the IT Organization. Over the past few years, she has had experiences in systems engineering, software development, R&D portfolio management and strategy.

Dr. Mayrose Salvador received her B.Sc. in Chemistry from the University of the Philippines and her PhD in Physical Chemistry from the University of Toronto. She is the co-founder of Pueblo Science, a Canadian charity that has provided training to over 3,900 science teachers and has engaged over 400,000 students in science. In collaboration with the Impact Centre at the University of Toronto, she helped deploy affordable solar lighting to the indigenous communities of the Philippines.

Prof. Neela Badrie is a Lecturer and Researcher in microbiology and food safety at The University of the West Indies, St. Augustine, Trinidad and Tobago. She is also an attorney at-law at the Supreme Court of Trinidad and Tobago. Dr. Badrie is a Fulbright scholar, a fellow of The World Academy of Sciences (TWAS, Italy) and the Caribbean Academy of Sciences (CAS). At present, she serves as the Caribbean focal point for women in science on the InterAmerican Network of Academy of Sciences (IANAS), on the biosecurity working group of the InterAcademy Partnership (IAP) and as treasurer for CAS Central.

YOUTH IN SCIENCE FORUM PANELISTS

Career Trajectories: On the Shoulders of Giants

Dr. K Renee Horton is an advocate for diversity and inclusion in Science, Technology, Engineering and Mathematics (STEM), and works diligently in the community for STEM education and STEM outreach. Renee believes in changing the face of STEM. She is the founder of Unapologetically Being, Inc., a nonprofit for advocacy and mentoring in STEM and serves as a quality Engineer for NASA in New Orleans. Dr. Horton is the past president of the National Society of Black Physicists and the author of a children's series titled Dr. H Explores the Universe.

Ms. Farnaz Baksh was a freshman at the University of Guyana in 2016 when she established the University of Guyana Robotics Club - Guyana's first makerspace, helping students innovate by freely expressing their ideas. She later led the national robotics team to rank in the top ten globally at the inaugural FIRST GLOBAL Challenge 2017. For her selfless efforts, she received the 2019 Guyana's National Youth Award for advancing youth development in Science & Technology. Ms. Baksh graduated with a Bachelor in Computer Science and is pursuing a Masters of Robotics at the University of Tartu, researching how affective computing will help students overcome learning disabilities.

Ms. Lois Oliver has worked in various areas in manufacturing and the science policy sector for the last 20 years. Her first role fresh out of UWI Cave Hill campus was with Banks (Barbados) Breweries Ltd. as a laboratory technician, where her love for manufacturing was born. She moved on from manufacturing and eventually to STEM policy and curriculum reformation and advocacy as the Assistant Director at the Caribbean Science Foundation. Manufacturing remains her first and true love, and she has returned to that field as manufacturing manager with oversight for quality assurance and R&D for a Barbadian food and cosmetics company.

Mr. Dave Sarran is a lecturer within the Department of Computer Science at the University of Guyana and serves as the Assistant Dean within the Faculty of Natural Sciences. Mr. Sarran lectures in the areas of information systems design and deployment, information systems project management and information and communication technologies for development (ICD4D). His research interests encompass the transformative potential of ICTs, e-governance and ICT policy development, and sustainability of ICT strategies in developing countries. Mr. Sarran holds a BSc, MBA and MSc. from the University of Guyana, Australian Institute of Business and the University of Sheffield, respectively.

Dr. Claire Nelson is the architect of the successful Campaign to declare June as National Caribbean American Heritage Month in the U.S. A renaissance woman, she is a Development Engineer, Social Entrepreneur, and Futurist. The first Jamaican woman to earn a Doctorate degree in an engineering discipline and the only black in her graduating class, Dr. Nelson holds Industrial Engineering Degrees from the State University of New York at Buffalo, Purdue University, and a Doctorate in Engineering Management from George Washington University. Recognized as a White House Champion of Change, she is sought after as a speaker on issues pertaining to economic development, globalization, and issues concerning the Caribbean and its peoples.

PLENARY SESSIONS PANELISTS

Dr. Maya Trotz is a Guyanese born professor of Civil and Environmental Engineering at the University of South Florida. She directs STRONG Coasts, a National Research Traineeship program to foster food, energy, and water solutions with coastal communities, and leads the knowledge management component of a Green Climate Fund project, "Water Sector Resilience Nexus for Sustainability in Barbados." She is a past President of the Association of Environmental Engineering & Science Professors and a board member of Fragments of Hope Corp, a coral restoration NGO in Belize. She holds a BS in Chemical Engineering from MIT, and MS and Ph.D. degrees in Environmental Engineering from Stanford University.

Dr. Devon Dublin is a Guyanese born and Cuban trained Veterinary Doctor and Zootechnician. He holds a Masters in Marine Life Sciences from the Graduate School of Fisheries Sciences and a PhD in Environmental Science Development from the Graduate School of Earth Sciences, both from Hokkaido University in Japan. He has been involved in the management of international developmental projects in Latin America and the Caribbean, Asia and Africa. He is involved in multidisciplinary research related to sustainability, One Health, Socioecological production landscapes and seascapes (SEPLS), and human-nature interaction. Dr. Dublin is a world traveler and an ardent scrabble enthusiast.

Dr. Percy C. Hintzen is Prof. Emeritus at the University of California Berkeley where he taught for 33 years. He earned his Ph.D. in Comparative Political Sociology from Yale University in 1981. He is currently Prof. of Global and Sociocultural Studies at Florida International University. While at Berkeley he served as Director of the Center for African Studies, Chair of African American Studies, Director of Peace and Conflict Studies, and Acting Director of the Center for Race and Gender. His research and scholarly production examine relationships among modernity, globalization, and postcolonial political economy.

Dr. Patrick Chesney is renowned for his work on the Guiana Shield having co-founded and led the Guiana Shield Facility (GSF) for the promotion of, and delivery of support to, the conservation and sustainable development of the Guiana Shield ecoregion, one of three ecoregions of the Amazonian biome. The work of the GSF eco-regional platform has been recognised by the Convention on Biological Diversity, the European Parliament (E-013974/2013) and the Amazon Cooperation Treaty Organisation (ACTO 2017; ISBN 978-85-61873-09-7). He is a graduate of the University of Guyana (B.Sc. Agriculture), University of Puerto Rico (M.Sc. Horticulture) and Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Costa Rica (Ph.D. Agroforestry).

Dr. Shirin Haque is an Astronomer at the University of the West Indies, Trinidad. Her areas of research include cosmology, astrobiology and observational astronomy. She is the recipient of several local, regional and international teaching and Science awards and is the first woman to receive the CARICOM Science Award and is the 2020 laureate of the prestigious Anthony N. Sabga Caribbean Award for Excellence in Science and Technology. She has produced several Caribbean Science documentaries and produced and hosted two television series on Science. She is the editor and producer of the magazine "The Intellectual - art, science and architecture".

2021

CARIBBEAN ACADEMY OF SCIENCES FELLOWS

Prof. Kit Fai Pun is the current president of the CAS - Trinidad and Tobago Chapter, and have been serving as the Chairperson of the Technology and Engineering Management Society Chapter of the IEEE Trinidad and Tobago Section since 2003. He has also held several academic positions at The City University of Hong Kong, and worked in industry as operations executive, researcher, engineer and consultant, in Hong Kong and the United Kingdom. He is a Chartered Engineer and Chartered Marketer in the UK, as well as Registered Professional Engineer in Australia, Europe, Hong Kong, and The Republic of Trinidad and Tobago. A Fellow of the World Academic of Science (TWAS), and several professional bodies and learned societies (including IET, IEAust, HKIE, HKSQ, and APETT). Was the Chair of the Mechanical & Industrial Division of the Association of Professional Engineers of Trinidad and Tobago (APETT) from 2004 to 2009, and the Chair of the Port of Spain Section of the American Society for Quality (ASQ), Trinidad and Tobago (2016-2019).

Dr. Mark Wuddivira is the Dean of the Faculty of Food and Agriculture (FFA), The University of the West Indies, St. Augustine Campus, and a Senior Lecturer in Environmental Soil Physics. Before becoming the Dean, he acted as the Manager of the University Field Station, after which he was appointed as Deputy Dean (Undergraduate Student Affairs). After a three-year stint as the Deputy Dean, he was appointed as the Head of the Department of Food Production until his recent appointment as the Dean of the FFA.

He obtained his BSc in Agriculture and MSc Soil Science from Ahmadu Bello University, Zaria, Nigeria, and Ph.D. Soil Science from The UWI, St. Augustine. He has completed several research projects. His research has been in the area of agricultural and environmental soil physics, geophysical imaging, soil and water management, and soil natural capital and ecosystem service assessment with a focus on the management and sustainable use of humid tropical ecosystems under intense rainfall and the impact of deleterious land-use practices. He has contributed more than 110 academic publications, 44 of which have appeared in high-impact refereed journals. He served as the treasurer of CAS regional and currently serving as the PRO.

Dr. Thomas Forissier is a Senior Lecturer at the University of the Antilles (Since 2011)

- Lecturer at the University of the Antilles (2011-2018)
- Lecturer at the University Institute for the Training of Masters of Guadeloupe. (2004-2011)
- ATER in science teaching (Biology) at LIRDHIST (University Claude Bernard Lyon I). (2003-2004)
- Teaching assistant in science teaching (Biology) at LIRDHIST (Lyon I). (2000-2003)

Responsibilities

- Director of the Center for Research and Resources in Education and Training (CRREF, EA 4538)
- Member of the Caribbean Academy of Sciences (CAS). President of the French Departments of America Chapter (2016 - 2018)
- Responsible for the research course (CDEF then PIDC) of the Masters in teacher training. (2011-2020)
- Responsible for the year of preparation for CAPES SVT (2005-2011)

THEME: EDUCATION, HUMANITIES AND SOCIAL SCIENCES

A Framework for a University-Based Enterprise: Case of the Prototyping and Engineering Training and Research Incubator Enterprise (Petrie)

Cilla Pemberton[1A], Renique Murray[2B], and Robert Birch[3C]

[1, 2, & 3] *Department of Mechanical and Manufacturing Engineering, University of the West Indies, Trinidad and Tobago*

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Abstract:

In Small Island Developing States (SIDS), rapid monetisation of university birthed innovations could potentially lead to economic opportunity for the university, researchers, students, graduates, island nations and the region served by the institution. Desk research, interviews, and a case study were used to investigate the current situation of major institutions in four (4) SIDS and identify barriers to commercialisation. It was found that universities in these territories do not have a strong history of commercialising research and innovation and do not benefit from the funding and support available to universities in more industrialised developing countries. The Prototyping and Engineering Training and Research Incubator Enterprise (PETRIE) framework combines mild to aggressive tactics from diverse sectors and is presented as a means of generating a steady income stream for the institution. It aims at providing employment opportunities for graduates, high quality labs and rapid prototyping activities in support of research and entrepreneurial activities, training and mentoring of highly skilled technical workforce, useful service to the host country and region while potentially increasing research and publication volumes. It will not be popular with all members of the university community because it is focused on the commercial value of activities and not on the core university activities of teaching and publications.

Keywords: Small Island Developing States, University, Rapid Prototyping, Innovation. Economic opportunity

A Survey of the Perceptions of Medical Students About Online Learning During the Covid-19 Pandemic and Their Attitudes Towards Flipped Classrooms in the 2020/2021 Semester

Valini Maraj[1A]; Karanand Maharaj[2B]; Karuna Maharaj[3C]; Sarah Maharaj1[4D]; Vishalla Maharaj[5E]; Jayda Maingot[6F]; Leanndra Mangalsingh1[7G]; Neha Rao Manchikanti[8H]; and Lisa Benjamin[9I]

[1, 2, 3, 4, 5, 6, 7, and 8] School of Medical Sciences, the University of the West Indies, Trinidad and Tobago; [9] School of Veterinary Medicine, the University of the West Indies, Trinidad and Tobago

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Abstract:

Similar to other tertiary institutions globally, the University of the West Indies (The UWI), switched course delivery modality from face-to-face to online in response to the COVID-19 pandemic. Online surveys were administered to students in Years I to V of the Bachelor of Medicine and Bachelor of Surgery programme at The UWI (St Augustine) to determine their perceptions about the emergency switch to online learning and their attitudes to the proposed adoption of blended learning in Semester I of 2020/2021. Questionnaire topics were relevant to student practices and experiences during online learning. Most of respondents were enrolled in Basic Health Sciences (Years I to III), owned a working device to attend classes, 98% (189/190), and had a stable internet connection, 75.9% (145/191). Although, interaction and participation in online classes proved to be easier than in face-to face classes for 57% (108/191), punctuality to classes was worse for 11% (21/191) and only 26.3% (45/191) of students were motivated or highly motivated to undertake schoolwork during the pandemic. Most students, 70.1% (134/191) agreed or strongly agreed that a flipped classroom should be adopted in 2020/2021. Information from this study can be used to increase student participation and to identify targeted support services.

Keywords: online teaching; flipped classroom; COVID-19; perceptions; and medical students

Capacity Building in Science Education in Rural Communities

Mayrose R. Salvador[1A] and Alon Eisenstein[2B]

[1 &2]Pueblo Science, Canada

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Abstract:

The importance of youth participation in science professions is consistently increasing with awareness of challenges people face around the world. However, chronic infrastructure under-investment and lack of effective science teacher education in rural and remote communities has resulted in a disadvantage for youth living in such areas. For the past decade Pueblo Science, a Canadian-based charity, has delivered professional development programs for science teachers in remote communities in the developing world. These programs include geographically specific curriculum content development, with a focus on hands-on learning methodology. We have also mentored and initiated out-of-school science activities, enabling youth to consider science as more than a school subject and use their acquired knowledge to undertake challenges meaningful for them and their community. In this presentation, we will share our experience working with teachers and students in the Philippines and in Guyana. We will showcase some of the activities that were developed and rationalize their relevance to the local communities. We will also present how we successfully transitioned our programs online during the pandemic and share the best practices we've learned from training science educators and outreach instructors on how to engage students during synchronous or asynchronous learning.

Keywords: hands-on science, teacher education, synchronous learning, asynchronous learning

Codybot: A Virtual Peer Assistant for Introductory Programming Knowledge

Stephanie J.T. Simon[1A], Juanelle Marks[2B], and Penelope DeFreitas[3C]

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Abstract:

Secondary school students pursuing Computer Science related courses typically encounter the challenge of grasping basic programming concepts such as constructs, variable types and declarations. Factors that contribute to this challenge include: 1. a general negative attitude towards Computer Science, and 2. minimum attention span when working in large groups. This research sought to investigate the extent to which the virtual peer assistant, Codybot, can be used to help students to understand fundamental concepts of programming. Codybot's design was influenced by the theory of Pragmatism and has as its core features, the use of animation for pedagogy and a chatbot for providing clarity on programming concepts. Python, which has a Natural Language Processing library installed for conversational maturity and animation, was the dominant programming language used to develop Codybot. An evaluation of students' interactions with Codybot revealed positive attitudes towards learning to programme. Furthermore, the majority of the students (90%) were comfortable using Codybot. The findings in this research indicate that the application of Artificial Intelligence to pedagogical approaches in teaching fundamental concepts of programming has the potential to positively influence students' ability to grasp these concepts.

Keywords: Virtual Peer Assistant, Artificial Intelligence, Natural Language Processing, Chatbot, Programming Tools, Pragmatism

Computing Education in Guyana: State of Development, Challenges, Opportunities

Penelope DeFreitas[1]; Dave Sarran[2B]; Juanelle Marks [3C]; Aurel Liddell [4D]; and Lenandlar Singh[5E]

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Abstract:

Computing education at the primary and secondary levels are viewed as important for employability in technology-related jobs and readiness for higher education globally; however, computing education at scale is a challenge. These challenges relate to appropriate curriculum, teacher education, teaching and learning facilities, and students' indifferent perception of computing. In Guyana, there is a paucity of evidence on the state of computing education. This study explores computing education in Guyana, using a qualitative methodology. Online interviews were conducted with twenty two key stakeholders in computing education. Desk review of published reports complemented these interviews. The results show deliberate efforts to enhance internet connectivity in schools; however, many schools are still challenged by inadequate internet connectivity and computer laboratories. There was a consensus that graduates are not adequately prepared for work because of perceived inadequacies in curriculum and training. Teacher education remains a challenge as not enough teachers are trained to teach computing in schools. At the national level, there are deliberate efforts by government agencies, NGOs and other organisations to promote computing education but with limited reach. Though noticeable developments are observed, a coordinated national approach may facilitate the alignment of efforts to improve computing education in Guyana.

Keywords: Computing Education, Curriculum, Resources, Teacher Education, National Development

Developing an Integrated Framework for Cluster Value Creation (CVC) in the Maritime Services Sector in Trinidad and Tobago

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Abstract:

The need for diversification of the economy and for improvements of firms' productivity and competitiveness has become an imperative in developing economies. In Trinidad and Tobago (T&T), there has been a need for the value-creation cluster initiatives to drive small and medium-sized enterprises (SMEs) toward service diversification particularly in the maritime services sector. By integrating the concepts of Public Private Partnership (PPP) and Value Management (VM), this paper is intended is to develop a Cluster Value Creation (CVC) framework that addresses how SME service-providers could transform operational capabilities, drive service diversification and enter new export markets. Empirical evidence was acquired from the maritime services sector in T&T. SME management would make strategic decisions on combining operational resources and capabilities with that of other network members to ensure customer satisfaction, and maximisation of value capture. The two core features differentiate the CVC frameworks from existing practices are: firstly, a corporate-led PPP arrangement, and secondly, adoption of VM methodology geared towards transforming SMEs' operational processes. Proper adoption of the framework could help practitioners and policy makers in developing strategies for building value-creation clusters in the maritime services sector.

Keywords: Competitiveness, service diversification, cluster initiatives, value creation, SMEs, Maritime services, Trinidad and Tobago

Elaboration of a Digital Tool in a Perspective of Contextual Didactics Linked To Interculturality

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Abstract:

Two cohorts of secondary school students (middle school level) are confronted with three fictional scenarios related to survival. The students come from very different cultural backgrounds (Guadeloupe and Quebec). One scenario is culturally close to each cohort ("sea" for Guadeloupe and "mountain" for Quebec) and the third (desert) is far from both. The elaboration of a specific software allows each student, for each situation, to arbitrate, as the scenario unfolds, prioritized choices with regard to the multiple choices that are proposed. The tree structure of choices implicitly questions the construction of the mega-concept of living through, among others, thermoregulatory phenomena. The research hypothesis advances that the best survival strategy for each scenario would be elaborated by the cohort that is most culturally close to it (sea: Guadeloupe; mountain; Quebec) in an asynchronous way (separate cohorts). That the best survival strategy for the culturally remote scenario of the two cohorts would be developed synchronously (associated cohorts) From a practical point of view, the cross pooling of the data collected makes it possible - by comparing the differences observed in the students' responses - to initiate a collective debate between the two cohorts. These fruitful exchanges - in a socioconstructivist framework - are then used to feed the different stages of the investigative approach expected for science teaching. The elaboration of this software is conceived as being potentially generalizable to other teaching or training situations in order to promote the interactional phases that precede the problematization of knowledge and the elaboration of hypotheses that result from it.

Keywords: Contextual didactics; digital uses; interculturality; socioconstructivism; scientific concepts; realistic fiction.

Gender Inclusiveness in the Natural Resources Sector in Guyana: A Focus on Education and Employment

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Abstract:

To fully realize its sustainable development potential, Guyana - a country on the verge of major economic growth through the extraction and utilization of its natural resources, must include both male and female representation and involvement at all levels, especially in senior positions of leadership. This study investigated the gender inclusiveness within the Natural Resources Sector, with emphasis on education and employment. Methods included examination of data on pass rates at grades six and eleven, admission and graduation rates in the Faculty of Natural Sciences, University of Guyana (UG) for a 5-year period and, an online survey of graduates from the faculty for the period 2013-2017 (n = 99). Findings suggest that enrolment rates are higher for females, but males have higher graduation rates and higher pass rates with honours in degree programs. Males also obtain employment sooner after graduation and they hold more senior positions than females. A panel discussion with experts from the private and public sectors, UG academics and other stakeholders was held to obtain the perspective of the employers. The discussions led to a number of suggestions for, and several recommendations to address the gender disparity at senior management positions in the Natural Resources Sector.

Keywords: Gender inclusiveness, Natural Resources, employment, education

Gender Wage Disparities in Trinidad and Tobago: Why it Hurts More for Minority Women in Stem

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Abstract:

The primary goal of this article is to examine the wage returns and the gender wage gap of ethnic minority and majority groups in Trinidad and Tobago, who are trained in the fields of Science, Technology, Engineering and Mathematics (STEM), and employed on a full-time basis within the private and public sector. Using data from the Continuous Sample Survey of Population (CSSP) for the period 1991-2015, the Mincerian earnings function is estimated to observe their wage returns across the wage distribution, while the Blinder-Oaxaca decomposition is used to determine how the gender profile of these groups of workers drives their wage gap. This study finds that the wage returns of minority workers in STEM have improved over the wage distribution for timeframe, with the highest returns being experienced when employed in high income jobs. A similar pattern emerges for majority workers in STEM; however, their overall earnings are higher and tends to benefit those employed in middle-high income jobs. The gender wage gap between male and female minority workers in STEM fields, appears to be much larger than majority workers. This implies that the issue of gender inequality in STEM is more prominent amongst male and female minority workers.

Keywords: STEM, Quantile regression analysis, Counterfactual decomposition, Blinder-Oaxaca Decomposition, Mincerian Earnings Functions.

Geodiversity and Outreach in Guadeloupe, F.W.I.: Getting on the field despite COVID-19 with Virtual Reality

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Abstract:

Geology is all about getting on the field. Like all environmental Sciences, it requires direct and precise observation of the scientific items. For geologists, it's rocks, and although small samples can be brought to the lab, outcrops and landscapes require *in-situ analysis*. Fieldwork is also an essential part of the student's formation; it is on the field that they learn best how to observe with precision, extract information from raw and unsorted material, synthesize and build scientific models that are based on their own data. Unfortunately, it is getting harder and harder to bring large groups on the field, since the pandemic but also because of a general trend of funding reductions. To still be able to access the most important outcrops, we have built 3D models using drone surveys. These models have a resolution ranging from 5 to 10cm and are easily accessible via an internet browser or virtual reality applications. They also present the advantage of being accessible to all, so everyone can have the benefit without traveling and hiking (people with disabilities or people living abroad). Here we present a 3D model of the cliffs in La Desirade island, which exhibits spectacular geological formations, as well as some associated possible outreach examples.

Keywords: Geodiversity, virtual reality, geological field work, outreach, diversity and inclusion

Impact of COVID-19 on Social, Economic, Health, Education Sectors and Ethical issues

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Abstract:

Coronavirus disease 2019 (COVID-19), is a contagious disease induced by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2). The first case was identified in Wuhan, China, in December 2019. It has since spread worldwide and became a pandemic in March 2020. Added to this, is the emergence of a mutant SARS-COVID-2-viral strain (B.1.1.7) in the UK in December 2020. COVID-19, is spread between people during close contact via small droplets, produced by coughing, sneezing, talking and singing. Its also airborne, requiring particulate matter for transmission. A person can become symptomatic or remain asymptomatic. COVID-19 can be prevented by social distancing and the wearing of cloth face masks, surgical masks, respirators, or other face coverings to control droplet transmission. Even though a vaccine, manufactured by Pfizer and Moderna and approved by FDA, is now commercial, the entire world awaits widespread inoculation. COVID-19 has affected humanity in many facets: health, socially, economically and in education. In health, tremendous burden has been placed to save patients life as the number of mortality and morbidity cases increases across the globe. To date, 89,603,838 million cases have been reported with over 1,926,228 deaths with 49,708,126 recovered cases. The economy of every country has been affected, as there have been severe job cuts, lockdown, decrease in world trade, border shut down etc. Production and productivity have significantly fallen across the globe in every sector. In the education sector, many universities, primary and secondary schools around the globe have resorted to online teaching, as opposed to "Face to Face" teachings. While this, to a large extent, is effective at the University level, it's not so at primary and secondary schools. Covid-19 has dramatically changed the social fabric of societies around the globe. Social gathering is prohibited, as denounced by the World Health Organisation (WHO) and the United States Centre for Disease Control (CDC). Many restaurants and other business places, have been operating within the curfew periods. Church gathering have also been prohibited. At the moment, we must adhere to protocol enacted by WHO and CDC, whilst we await the confirmatory use of the vaccine. In addition, we need to take cognizant of the ethical issues involved.

Keywords: COVID-19, SARS-COV-2, health, social, economic, health sector

Improving Academic Quality of a Graduate Programme in Food Science and Technology

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Abstract:

The Food Science and Technology (FST) programme is one of the few programmes in the Faculty of Engineering that has not pursued programme accreditation. Accreditation is known to protect students' interests, academic institutions and their reputations, and potential employers by ensuring that programmes offered and graduates have attained a level that meets or exceeds standards developed by experts in the field. Research shows that accreditation contributes to improving programme course components, staff and student morale. This study evaluated the value-added impact of programme accreditation with the Institute of Food Science and Technology (IFST) on the FST graduate programme established in the 1970s within the Chemical Engineering Department of the University of the West Indies (UWI). Data was collected by a Quality Assurance Team focused on compiling and assessing evidence required by the IFST. Programme accreditation application included entry requirements, breadth and depth of study, practical and research skills, individual study and transferable skills, work-based experience, internal and external quality assurance, infrastructure and finances to support effective teaching, learning, research and outreach. Feedback from the Quality Assurance process to support IFST accreditation highlighted curriculum review, programme revision and improving transferable skills as key recommendations from the student body and the Industry Advisory Board (IAB). The accreditation process is a work in progress with the outcome pending.

Keywords: IFST, accreditation, Food Science and Technology, UWI

Investigating and Designing an Ad-Hoc Network-Based Anti-Theft Model for Personal Digital Devices

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Abstract:

Citizens of modern society have realized the growing importance of Personal Digital Devices (PDDs). Whether for business or personal usage, losing such a device can create frustration. If stolen, the various types of information stored on these devices can cause severe setbacks to persons' lives. Historically, several systems have been engineered to counteract theft. However, in many cases, these systems are only available to the premier user and feature overhead costs. This study produces a model termed Anti-Theft Ad Hoc Wi-Fi System (ATAWS), to mitigate this issue of theft in Guyana through the use of networking technologies. The model is designed to offer tracking and monitoring of PDDs to consumers. The ATAWS was modeled to utilize the existing Wi-Fi infrastructure in cities by tapping to the miniscule bandwidth from the mass surrounding Wi-Fi signals emitted from antennas and mobile Wi-Fi cards that are in close proximity. The model builds on existing systems and technologies along with minute modifications to hardware, protocols and standards to accomplish its objective. Preliminary simulated experiments produced favorable results indicating that an implementation of the model could help to identify and recover stolen devices. Experiments further concluded that while an implementation of the model may not convey extensive tracking details, it can produce analytical data that would help law enforcement develop maps to highlight areas of interest or hotspots to combat theft.

Keywords: Personal Digital Devices, Anti-theft, Networking model, Wi-Fi

BEST PRESENTATION

Investigating the Usability of Augmented Reality Against Conventional Micro Navigation

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Abstract:

Navigation is the process of ascertaining one's position within an environment, and planning and following a route. This concept is commonly tied to macro-navigational tasks like finding a destination or micro-navigational chores such as locating a product within a store. With respect to the latter task, shoppers have reported that they often find themselves repeating routes while trying to locate items, which results in exhaustion and wastage of time. This study examined various micro-navigational methods, as well as their strengths and weaknesses. In addition, an Augmented Reality (AR) prototype which utilized the A* algorithm, was designed and implemented in the form of a mobile application. Within the context of a supermarket, the prototype was tested against the conventional shopping method to determine effectiveness, efficiency and user satisfaction. Key findings revealed that most shoppers preferred the prototype, due to its novel design and efficiency. This was an indication that AR is indeed a useful advancement in the area of micro-navigation.

Keywords: Augmented Reality, Human-Computer Interaction, Micro-navigation, A* Algorithm

Making Classrooms Engaging for Nursery School Students with Autism inGuyana – an Application of the Technology Enhanced Inclusive Design Model

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Abstract:

Autism Spectrum Disorders (ASDs) affect social interaction, communication and behaviour of children; consequently, hindering early childhood learning. To improve the communication of children with ASDs within the classroom, computer aided learning was introduced as a complementary educational method and have received positive results. In this study, we created a Technology Enhanced Inclusive Design Model tailored for visual and auditory ASD learners at the nursery level. The model is game-based and comprises an educational teaching component, interactive and stimulating activities, evaluation schemes and rewards mechanisms. The model was adopted to create a mobile prototype known as 'Peter the Science Teacher' geared at promoting social interaction and learning. The prototype was evaluated by special needs teachers in Guyana, who made assessments based on its effectiveness, quality and ability to promote social interaction. Within the area of effectiveness, the mobile prototype was rated high for its design, performance, reliability, guided instructions and for being bias-free; however, the mobile prototype lacked error recovery mechanisms and catered to a few levels of difficulty. On average the mobile prototype was rated as "good" for quality and promoting social interactions. This study represents an important milestone for involving local teachers in the assessment of computer aided learning for special needs education.

Keywords: Autism Spectrum Disorders, social interaction, game-based approach, technology enhanced inclusive design

Teachers' Experiences Introducing the New CXC CSEC Information Technology Syllabus in Guyana

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Abstract:

Globally Information Technology and related areas have become an important element of school curriculum as they are viewed as foundational to the development of modern societies. However, teachers globally face several challenges teaching these curriculums because of inadequate pedagogical and content knowledge. Computer programming in particular has traditionally proven problematic for both teachers to teach and students to learn. Teachers in the Caribbean face similar challenges. In 2018 the Caribbean Examinations Council (CXC) released an updated Caribbean Secondary Education Certificate (CSEC) Information Technology (IT) syllabus. This syllabus includes new topics such as web development and offers a greater flexibility in the choice of programming languages to teach computer programming.

This qualitative interview study explored the experiences of nine (9) high school teachers in Guyana who introduced the new CSEC IT syllabus. Teachers used training sessions and prior knowledge to implement some aspects of the syllabus. However, several topics challenged teachers without the required pedagogical content knowledge. These include web page development, Microsoft Excel, and programming. Teachers also experienced a dilemma in selecting a new programming language. Overall teachers enjoyed the challenges of introducing the new syllabus. However, more professional development opportunities to address pedagogical and content deficiencies are needed.

Keywords: Computing, Information Technology, Teacher, Professional Development, Curriculum

The Conceptions of Natural Risks in an Archipelagic Tropical Environment: Example with the Perceptions of Hurricane and Earthquake Risks in La DésiradeIsland, Guadeloupe, F.W.I.

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Abstract:

Because of their Geographical and Geological situation, Caribbean islands are regularly subjected to natural hazards such as hurricanes, earthquakes, tsunamis, volcanic eruptions, floods, coastal erosion, landslides, sea level rise, depending on their own specific context. Their population is therefore continuously exposed to natural threats and likely to experience natural disasters during a lifetime. Consequently, natural risks mitigation is a priority. The effectiveness of natural risk-reduction policies is actually closely linked to the population awareness and preparedness level as well as the sustainability of its risk culture. However, each island population has its own local specificities (whether social, environmental, historical or cultural) that should be taken into account to design efficient risk mitigation plans. Here, we first propose the principles of a general methodology to model each individual context, whatever the island of residence. By focusing on the interactions between each individual and several elements of his/her context (such as family, religion, political environment, housing, habitat, etc.), we seek to establish specific individual profiles that quantify the strength of the interactions we studied. We then present the results of a field survey carried out on the *La Désirade* island (Guadeloupe archipelago). *La Désirade*is a 12km long, 4km Wide Island located east of Guadeloupe, in a position described as Double Insularity. The 1500 inhabitants are commonly exposed to small-magnitude earthquakes and hurricanes. We collected data through interviews and field observations of building and infrastructure types in April 2021. This first study aims to find correlations between types of housing and risk conceptions of their occupants regarding seismic and hurricane hazards.

Keywords: Natural risks, Double insularity, La Désirade, Earthquake and Hurricane hazards, Conceptions

The Relevance of Context in Questionnaire Instrument Design: Examples from a Study Involving Learners from Guadeloupe and Quebec

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Abstract:

In this presentation, we discuss data issued from the project TEEC (Educational Technologies for Teaching in Context - Technologies Éducatives pour l' Enseignementen Contexte, funded by the ANR-FRQSC program). The project involves 10-year-old students from Guadeloupe and Quebec who collaborate on the study of the same scientific object, yet their social, scientific and identity representations may be different depending on the characteristics of their respective territories. This paper raises questions about the design of measurement instruments (quantitative and qualitative) in the social science studies and the existing relationships between contexts and the representations made by the students involved. During an experimentation, studying the "sugar" (cane sugar and its alternative, maple syrup) as a scientific notion, students were encouraged to work together, through synchronous and asynchronous sessions, in order to better understand various aspects of sugar such as biology, health, economy, agriculture, history, culture, etc. We have collected by using questionnaires, learners' conceptions, before and after the experimentation. Categorizing the contextuality of learners' conceptions remains a methodological challenge. Hence, is it possible to evaluate the contextual dimension of conceptions of students from various contexts through a uniformed categorization of responses? Or else, how to better develop a contextual survey analysis methodology allowing the comparison of heterogeneous samples? In order to answer these questions, we will discuss firstly the process of conceptualizing and developing questionnaires depending on the context. Then, we will discuss the specificities of the analysis and the treatment of contextual responses.

Keywords: scientific survey, assessment, design, diversity, collaborative learning

THEME: ENVIRONMENT AND ECOSYSTEMS

A Value Management Approach to Reducing Climate Adaptation Deficit

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Abstract:

The climate is changing, and these changes are linked to an increase in the frequency of extreme weather events, mass coral bleaching and an acceleration of coastal erosion rates. These effects are expected to continue for several decades regardless of measures to curtail carbon dioxide emission rates. However, there is a deficit in the required adaptation measures in the Caribbean because of barriers to implementation. This study explores the use of value management (VM) principles and practices (BS EN 12973:2000) into the organizational climate change policy (ISO 14090:2019) decision-making process, in the implementation of climate change adaptation measures. It reviews the effects of climate change, discusses the barriers and identifies the factors affecting the adaptation measures. The VM methodologies and principles are also discussed in relation of their applications to facilitate the adaptation measures. This paper concludes by underlining a need and the importance of integrating a VM approach into climate change adaptation policy.

Keywords: climate change, adaptation measures, barriers, policy, value management

Are Dry Seasons Getting Longer and More Intense in Trinidad and Tobago?

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Abstract:

In 2019, Trinidad and Tobago experienced below average rainfall for several consecutive months during the official dry-season period (January to May). This led to the claim published in a daily newspaper, without any long-term empirical evidence, that dry seasons in Trinidad and Tobago are getting longer and more intense. I investigated this claim empirically by statistically analysing the available time series data of cumulative rainfall at Piarco, Trinidad, and Crown Point, Tobago, for the periods January to May (the official dry season, DS), December to May (early start to the official dry season, DSE), and January to June (late end of the official dry season, DSL) for the years 1946-2019 (Trinidad) and 1970-2019 (Tobago). The nonparametric Mann-Kendall trend test was used. The null hypothesis of this test is that the time series data are independent and identically distributed (no statistically significant trend present) while the alternative hypothesis is that there is a statistically significant monotonic trend (increasing or decreasing). In Trinidad, the Kendall tau and p-value for DS, DSE and DSL were 0.02 and 0.79, and 0.03 and 0.71, and -0.05 and 0.57, respectively. In Tobago, the Kendall tau and p-value for DS, DSE, and DSL were 0.18 and 0.07, 0.12 and 0.22, and 0.16 and 0.09, respectively. These results indicate that the six-time series for Trinidad and Tobago are all independent and identically distributed thereby demonstrating the lack of any statistically significant trends at the 5% level of significance. Thus, the claim that dry seasons in Trinidad and Tobago are getting longer and more intense is false and deceptive. It is therefore recommended that climate alarmists refrain from hoodwinking the public with bogus claims which could needlessly create a climate of fear, anxiety and hysteria in the country.

Keywords: Trinidad and Tobago, Piarco, Crown Point, climate change, climate alarmism, dry-season rainfall, rainfall trend, Mann-Kendall trend test

Characterization of Sediment Communities (Diatoms an Meiofauna) Living in a Geothermal Spring (Bouillante, Guadeloupe, French West Indies)

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Abstract:

The Lesser Antilles region presents an intense tecto-magmatic activity due to the subduction of North and South American Plates under the Caribbean one. Along the volcanic arc, the heat is currently transferred from the magma chamber to the surface via geothermal fluids circulating in fractures and faults. In this study, we focus on the Tahiti underwater spring, 6 to 7 m depth, where the geothermal fluid is drained by a fault covered with sand. At this locality, the seafloor is covered by an enigmatic orange deposit in the shape of a 50x50 m field of hexagons. In order to characterize this orange material and to understand the consequences of geothermal activity on living communities dwelling in sediment (diatoms and meiofauna), the first cm of sand have been strategically sampled. Lab investigations (macroscopic, microscopic, counting) reveal that inside the hexagons diatoms were nearly absent compared to large communities observed in the orange deposit and outside the zone with the patterns. Nematodes were less abundant in the polygonal fault sediment than outside. Reasons for those observed differences remain to be evaluated.

Keywords: polygonal fault system, diatoms, meiofauna, orange deposit

Evaluation of Mud-Bank Morphodynamics of Two Sites on Guyana Coast: A Remote Sensing Analysis of Synthetic Aperture Radar Images

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Abstract:

Mudflats, along with their dense mangrove forests and other coastal zone ecosystems, reduce wave energy efficiently and act as natural sea defenses. This study analysed and compared the inter-annual morphodynamics of mudflats along the coast of Guyana using time-series of Synthetic Aperture Radar (SAR). Imagery over a 6-year period (2015-2020) in two sites along the coast of Guyana were analysed. In this study, we demonstrated that recent advancement and availability of SAR remote sensing data allow for effective monitoring of mudflats formation. Sentinel-1 images collected over the study sites were processed and analyzed using SNAP and ArcGIS to observe the morphological evolution of mudflats and identify areas of erosion and accretion at the sampled sites. The results of the analyses also show that the dynamics of the mudflats are governed by feedbacks from various hydrodynamic and coastal processes, principally tidal currents and waves, operating over different temporal and spatial scales. Guyana's coastal zone is essential for economic and social development, ecological restoration and preservation of natural resources and vulnerable ecosystems that thrive in this environment. These results from this study highlight the role of mud-bank movement in mangroves colonization, coastal protection, nutrient cycling, alteration of hydro-morphodynamic and ecological processes, and by extension dynamic impacts on economic activities and environmental degradation and regradation.

BEST PRESENTATION

Experimental Growth and Bioerosion by the Excavating Sponge Cliona *Delitrix* in Barbados

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Abstract:

Recent degradation of coral reef ecosystems has provided opportunities for growth of other reef taxa. This has included increases in excavating sponges, which burrow into live coral and calcium carbonate reef substrates, obtaining shelter while simultaneously weakening the reef. The extent of this sub-surface growth can be difficult to characterize with non-invasive methods. *Cliona delitrix* is a common Caribbean excavating sponge species. Here, transplants of *C. Delitrix* were grown on experimental coral stone blocks for 13 months and used to provide estimates of surface area, lateral advance, depth of penetration into the substrate, and overall volume of substrate excavated. Bioerosion rates were calculated and linear models were used to assess the relationships between these metrics. Individual growth metrics varied among study sites. Overall, 76% of transplants (n=38) excavated into the substrate, up to 2.72 cm depth and 110 cm^3. Linear models showed that the volume of substrate impacted by *C. Delitrix* growth was best represented by combining surface area growth and penetration depth measurements. This relationship was then used to estimate the excavation volume of naturally occurring sponges. Erosion rates averaged 10.75 ± 8.13 $kg \cdot m^{-2} \cdot year^{-1}$among study sites. This study provides insight into bioerosion rates and the extent of *C. Delitrix* growth in Barbados which are important for monitoring reef carbonate budgets under changing environmental conditions.

Keywords: *Cliona delitrix*; bioerosion; excavating sponge; experimental growth; Barbados.

Interaction of Toxic Substitute Phenols with Metal Hexacyanoferrate (Ii) Complexes in Aqueous Medium: Impact on Environment

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Abstract:

Cobalt, nickel and tungsten hexacyanoferrate (II) complexes were synthesized and characterized by elemental and spectral studies. Removal of 2-nitrophenol, 2, 4-dinitrophenol and 2, 4, 6-trinitrophenol from aqueous solution through adsorption on synthesized metal hexacyanoferrate (II) complexes were studied in the pH range 1.0 – 10.0 and at a temperature of 30 ± 1º C. The progress of adsorption was followed spectrophotometrically by measuring the absorbance of phenol solutions at their corresponding λ_{max}. The Langmuir type of adsorption is followed in the concentration range 10^{-3} M to 10^{-4} M for 2-nitrophenol, 2, 4 – dinitrophenol and 2, 4, 6 – trinitrophenol solutions. The 2, 4, 6 – trinitrophenol and 2 – nitrophenol were found to have maximum and minimum affinity with all three metal ferrocyanides studied. Nickel and tungsten ferrocyanides were found to have higher and lower adsorption capacity with all three substituted phenols. The phenols react with soil to reduce their fertility and decrease crop production. Phenols are toxic also produce bad odour in environment. Therefore, toxic phenols should be removed from our environment. Rest will be presented.

Keywords*:* Interaction**,** removal, 2-nitrophenol, 2, 4-dinitrophenol, 2, 4, 6-trinitrophenol, adsorption, removal, environment

Investigation of Fe, Mn, Cd, and Pb in Agricultural Lands Used for the Cultivation of Rice in Berbice, Guyana

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Abstract:

Rice is a staple for many Guyanese and is a major industry contributing approximately 20% of the agricultural GDP and 12% of export earnings of Guyana. The soil composition on which rice is grown plays a central role in both nutrition and food safety. Heavy metals in soils are of concern but have not been investigated much in Guyana. The concentrations of four heavy metals (Fe, Mn, Cd, and Pb) bioavailable in rice paddy soils in Berbice were determined through Flame-AAS in this study. The results obtained revealed that the mean heavy metal concentrations for Pb, Mn, and Fe bioavailable were 0.08-6.82 mg/kg, 50.06-320.98 mg/kg and 5.00-311.18 mg/kg, respectively. The concentration of cadmium was below the limit of detection and quantitation. There was a significant variation of the mean concentration of metals among the various sampling sites while there was no significant difference in the mean concentration of metals in soil collected close to the road and away from the road at the different sampling sites. We conclude that the metals present in the soils sampled are within the prescribed limits for agricultural soil while the toxic heavy metals, Cd and Pb, do not pose a food safety threat at present.

Keywords: soil, heavy metals, rice paddy fields, food safety

Measuring Sustainability Pathways in a Developing Extractive Economy: A Case Study on the Future Outlook of Guyana

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Abstract:

Many developing economies that depend predominantly on their extractive economy often experience unsustainable economic growth; a phenomenon known in development economics literature as the 'resource curse'. This study wants to empirically explore and forecast the issue of unsustainability in the developing extractive economy of Guyana to determine if this is the case for the country. The paper analyzed a time-series of data looking at various measures of sustainability including the growth of Gross Domestic Production, Genuine Savings as a weak measure of sustainability, Carbon Emissions and Forest Cover. The data was also forecasted using auto-regressive integrated moving averages to show an expected trajectory for each sustainability measure expected with the current national policy environment. Trend analysis showed that Guyana has an upward trend and forecasts and upward trend in gross domestic production and carbon emissions. The time-series data on Genuine Savings shows a downward trend with the forecast showing a horizontal trajectory. The country shows a low rate of deforestation overall and projected indicating a good forest policy environment in place presently. Overall Guyana is on an unsustainable pathway based on weak measures of sustainability and its policy environment needs to stimulate more diversification in green industries.

Keywords: Forecast, Genuine Savings, Resource Economy, Sustainability Pathways

Occurrence and Type of Microplastics in Selected Commercial Fish Species of Guyana

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Abstract:

Microplastic ingestion in fish has been reported in previous studies around the world due to the negative impacts they have on marine life. Although it is an increasing concern, no attention has been given to alleviate this problem here in Guyana. This study assessed the occurrence and type of microplastics in three commercially important fish species from three different landing sites along Guyana's coast. Visual examination of gut content and microscopic examination was done to determine shape, type, color and size of microplastics present in different organs of fishes. 40% of the fish examined had microplastics present in their bodies. A total of 112 particles were collected from 90 specimens and most microplastics were found in *Bagrebagre* and the lowest was found in *Macrodonancylodon.* Themajority of the microplastics ingested were pellets. In relation to color, white was the most dominant found, followed by transparent, red, blue, black, green and silver. The attractive colors make these materials easily accessible for fish and they often consume them by mistaking them as natural preys. Most of the collected materials were large microplastics and from a primary source. This study provided first-hand evidence that plastic pollution presents a prominent threat to commercial fishes and public health. It also highlights the need for further research and actions to prevent plastics from entering our oceans.

Keywords: Microplastics, plastic pollution, commercial

Studies of the Influence of Biosourced Insulation on the Thermal Comfort of Buildings Under Humid Tropical Climate: Case of Banana Leaves

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Abstract:

Global warming is a subject that worries the whole world. Its consequences have been felt for several decades by building occupants, who consume 40% of the total energy and emit 20% of CO_2. The use of air conditioning requires a lot of energy and also emits a lot of CO_2 for this consumption. The goal of using banana fibers as solar protection for the roof is in line with the logic of energy control and environmental protection, the approach is to make the occupants of buildings comfortable through an analysis of the comfort index and reduce their energy consumption. In this work we will present the results of studies carried out on thermal comfort indexes adapted to humid tropical climates as well as the influence of insulation thickness on air conditioning and CO_2 emissions. The calculation of the comfort indexes was performed using data from thermal simulation of a building cell of 16m^2 by varying the partial pressure of saturated vapor at skin temperature according to the hourly variation of humidity in Guadeloupe. Finally, we will end our presentation with a critical analysis and a comparison with the existing thermal comfort indexes and a new one proposed in this study.

Keywords: comfort indexes, banana fiber, saturation vapor pressure, humidity.

The Effects of Forest Edges Surrounding Gold Mines on Tree Species Composition

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Abstract:

Forest edge, the interface formed between forested and non-forested ecosystems, has become a pressing environmental concern in Amazonia. In fact, from 2001 to 2015 some 177,000km^2 of forest edges were created within a 120m buffer around the deforested patches in the region. While forest edge creation declined significantly in countries such as Colombia and Brazil, the opposite trend was observed in Guyana. In Guyana, the operation of gold mines is a major source of forest edge; yet the response of tree communities to forest edges has infrequently been studied. In this study 50 x 10m forest plots were used to assess edge effects on tree species composition at Karrau, Guyana. I predict that forest edge and forest interior will differ significantly in terms of species composition. Results show that pioneers and small seeded species dominated forest edges while large, seeded climax species were mainly concentrated in forest interior habitats. Altered species composition in the forest edge can have implications for carbon storage, food and habitat availability and plant-animal interactions.

Keywords: Edge effects, Gold mining, tree species composition

THEME: MEDICAL/ PHARMACEUTICAL SCIENCES

A Survey of Potential Stakeholders for a Community of Practice for Antimicrobial Resistance in Caricom States

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Abstract:

Antimicrobial resistance (AMR) of bacteria is of increasing concern globally and it is important to build coordinated indigenous capacity within CARICOM states to respond to the AMR challenge. A disseminated online Community of Practice (CoP) is being designed for individuals in any of the 15 CARICOM states who are interested in research on AMR and the development of innovative solutions to prevent or control AMR in CARICOM states. This survey aims to identify gaps in research about AMR and the feasibility of an online disseminated CoP for AMR in bacteria. The gaps identified will serve as the central focus of the CoP. A list is being generated of selected stakeholders for AMR in the 15 CARICOM States. A pre-test of the questionnaire on ten individuals who will not be a part of the survey will provide information which can be used to improve the questionnaire. The online survey will be administered using Google forms. It is expected that participation in the CoP will lead to greater discussion and collaboration regarding AMR, higher relevant research output and the generation of innovative solutions to specific regional AMR challenges.

Keywords: antimicrobial resistant bacteria, Community of Practice, innovation, KAP, research output

Anticancer Effects of An Ethanol Extract of Momordica Charantia, Kuaguacin-J And Cisplatin on Healthy Mcf-7 And Mdamb-231 Breast Cancer Cell Lines In Vitro Assays

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Abstract:

This study investigated the anticancer effect of an ethanol extract of MC fruit, Kuguacin-J (K-J), an isolated compound from the leaves of Momordica Charantia (MC) and cisplatin, either alone or combination on healthy MCF-10A and breast cancer MCF-7 and MDAMB-231 cell lines. Cell viability was tested using 8 μg/mL and 80 μg/mL doses of MC extract, K-J and cisplatin individually or combined for 24 and 48 hours. Caspase-3- activity was measured in MCF-7 and MDAMB-231 using established methods. The results revealed that MC extract and K-J had no effect on healthy MCF-10A cell viability compared to cisplatin which induced dose and time-dependent cell death. Similarly, treatment of MCF-7 with cisplatin induced cell death at both time points, while MC extract and K-J only induce MCF-7 cell death at high dose after 48 hours. During combination, both doses of cisplatin enhanced MCF-7 cell death with MC extract or K-J after 24 and 48 hours. In MDAMB-231 cells, the three drugs, either alone or combined, evoked significant cell death at both doses and time points. All three drugs, at high dose, elicited significant increases in caspase-3- activity in MCF-7 and MDAMB-231 cell lines compared to untreated cells. The results revealed that MC extract or K-J alone or combined with cisplatin, can elicit significant increases in cell death and caspase–3-activity from MCF-7 and MDAMB-231cells compared to untreated cells.

Keywords: Breast cancer, Cisplatin, Momordica charantia, Kuguacin-J, cell viability, caspase -3.

Covid-19: Origin, Effects on Humanity, Prevention and in Pursuit of a Cure

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Abstract

Our world is in a chaotic state at the moment. This stems mostly from the current infectious, highly contagious viral disease, COVID-19, antimicrobial resistance and not to mention global warming and its catastrophic effects, intense yearly hurricanes, droughts etc. COVID-19 is caused by severe acute respiratory syndrome coronavirus 2, SARS-COV-2. It was first identified in Wuhan, China in December2019, though there is speculation that it may have originated elsewhere. It has resulted in a current ongoing pandemic. A person infected with the virus can be symptomatic or asymptomatic. Common symptoms include fever, cough, fatigue, and shortness of breath, loss of smell and taste, multi organ failure, septic shock, blood clots etc. The virus is spread primarily between people, during close contact via small droplets, produced by coughing, sneezing and talking; touching one own face after contact with a contaminated surface. It's also postulated that its spread may also be airborne, requiring particulate matter in the atmosphere for further transmission. Preventative measures for COVID-19, include frequent handwashing with soap, physical distancing of six feet from others, wearing a suitable mask etc, quarantine for those with symptoms, contact tracing etc. There is no known vaccine or specific antiviral treatment to date. Considering that viruses mutate, it would be best to use and explore drugs combination or herbal mixtures to control and eradicate this disease. A virus is not a bacterium, and so would require herbs that show strong and selective antiviral activity. Even though a vaccine, manufactured by Pfizer and Moderna are given approval by FDA, over seventy pharmaceutical research institutions are currently working to find a cure for this disease. This presentation outlines in detail, the origin, effects on humanity, prevention and in pursuit, cure for COVID-19.

Keywords: COVID-19, SARS-COV-2, Wuhan, symptomatic, asymptomatic, pandemic, mutate, eradicate

Haiti Country-Case Study on Maternal and Child Health 1990-2018: Progress and Challenges Towards the SDGS

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Abstract:

We assess progress made in coverage and equity in key Maternal and child health (MCH) interventions during that period and explore their main drivers. We applied a mixed methods approach. A qualitative approach based on collecting information about policies and programs related to MCH, carried out in Haiti since 1990. The quantitative approach includes analysis of national surveys data carried out in Haiti since 1990. We assess trends in both outcomes and independent variables and in maternal and child health inequality. We explored predictors of under-five stunting at departmental level using multilevel linear regression. Under-five stunting prevalence decreased by 40% from 1994 to 2016. Neonatal mortality rate decreased by 37% and under-five mortality rate by 54% from 1990 to 2016. We observed moderate progress in coverage of MCH interventions at national level and in each subgroup of the population and an increase in strategies and financial disbursement for MCH. Equity gap between subgroups of the population seemed to increase over time. Women's schooling, access to improved drinking water and antenatal care were key factors associated with reduction in under-five stunting. Despite moderate progress observed, multisectoral collaboration is necessary to achieve SDGs and reduce maternal and child health inequality in Haiti.

Keywords: Maternal health, child health, sustainable development goals

Acknowledgements

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BEST PRESENTATION

Microvascular Function in Sickle Cell Trait Carriers under Strenuous Exercise Conditions

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Abstract:

Sickle cell trait carriers (SCT) has typically been considered as a benign affection although this condition is strongly associated (without cause-to-effect demonstration) with the occurrence of serious events such as sudden death and vaso-occlusive crises during exercise. However, the pathophysiological mechanisms leading to these fatal events have poorly been defined. We have compared 1) the skin blood flow (SkBF) in response to exercise in SCT carriers and control performing a hard bout of exercise and after recovery, 2) hemorheological, hematological and oxidative stress markers. Twenty young males with SCT and 11 non-SCT (comparable in physical fitness and body mass index). A strenuous exercise was performed in a control (21°C) and warm (31°C) environment with pre- and post-exercise blood sampling. The 2-h recovery included a meal. No fatal events and similar hemorheological parameters were observed between AA and AS, but our result also shown a decrease hematological markers, higher oxidative stress and microvascular response for AS group suggested set up adaptations for to prevent occlusive crisis.

Keywords: Sickle cell trait, perfusion, warm environment, physical exercise

Real-time Quality Inspection of Chest X-rays using Computer Vision Systems

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Abstract:

Chest X-rays are the most frequently performed radiographic examination. They play an important role in the diagnosis and tracking of diseases by Radiologists and Clinicians. Technical errors such as over/under exposure and incorrect positioning can result in an image being rejected. This project proposed the use of Computer Vision as an automatic alternative to manual quality inspection to identify technical errors and decrease the rate of erroneously validated images. The approach was to create, train and test a Convolutional Neural Network (CNN) to identify valid and invalid Chest X-rays using a machine learning library. The first and second testing sets of X-rays were evaluated and placed into valid and invalid categories by a team of Radiologists and the CNN. The CNN also created heat-maps highlighting erroneous areas. The results of these comparisons were used to statistically evaluate and determine the rate of accuracy of the Convolutional Neural Network by calculating the model's F1 score. When compared to Radiologist-evaluated images, the Convolutional Neural Network was able to surpass the baseline accuracy percentage for Medical Imaging Technologists of 90%. Heat-map visualization was also successfully implemented.

Keywords: Quality inspection, Convolutional Neural Network, Chest X-ray, Technical errors, Computer Vision, F1 Score.

THEME: PURE AND APPLIED SCIENCES

A DFT and Experimental Study of the Hydrolytic Degradation Behaviour and Spectroscopic Properties of Some Benzylideneanilines

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Abstract:

Benzylideneanilines are commonly applied as optical sensors for the determination of various analytes, heavy metals being chief among them. However, the susceptibility of the C=N moiety to hydrolytic cleavage is limiting, therefore, it is crucial that the hydrolytic stability of potential sensors be considered, particularly those being considered for application in aqueous environments. Hence, a thorough experimental and Density Functional Theoretical (DFT) investigation of the hydrolytic degradation pathways of some simple benzylideneaniline derivatives is conducted, revealing that the 2-aminophenol derivatives undergo significantly faster hydrolysis than other derivatives due to differences in their hydrolysis mechanism. Nonetheless, in both cases hydrolysis occurs via a two-step process; an enthalpy-controlled hydration step followed by an entropy driven lysis step, both of which occurs via successive cyclic transition states, the energetics of which is controlled by the structure and hence, stability of the transitions state rings. Whereas for the o-hydroxaniiline derivatives the second step is rate limiting, for other adducts, the first step is slowest.

Keywords: Benzylideneanilines, Density-Functional-Theory, Hydrolysis, Schiff base, Imine

A Theoretical Model for Assessing End-users Adoption and Satisfaction of ERP Systems in Mid-sized Private Organisations in Guyana

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Abstract:

Enterprise resource planning (ERP) systems are business management systems comprising of a set of comprehensive software designed to automate, integrate and manage all business functions within an organization. Even though ERP systems promise several benefits, their adoption and satisfaction by end-users during implementation have not been problem-free. Hence, many organizations have failed to guarantee successful ERP implementation despite the investment of considerable resources. The study determined the key factors that impact end-user adoption and satisfaction of ERP systems in mid-sized private organisations in developing countries, precisely Guyana. A theoretical model was created from a comprehensive literature review, with fourteen (14) hypotheses being identified based on the model's constructs. Further, self-completion questionnaires were developed and administered to sixty-five randomly selected end-users from four mid-sized private organisations which had implemented ERP systems in Georgetown, Guyana. The empirical evidence showed that Management Support, Training, and System Quality were factors that significantly impacted end-users' adoption and satisfaction of ERP systems. It is believed that theoretical model can be further used to assist IT practitioners with implementing ERP systems in mid-sized private organisations in Guyana. However, more comprehensive testing with a greater spatial scope will be necessary to increase the model's explanatory and generalization capabilities.

Keywords: Enterprise Resource Planning (ERP), End-Users, Technology Acceptance Model (TAM), Adoption, Satisfaction, Technology, Critical Success Factors (CSF)

An Investigation into the Levels and Sources of Contamination by Escherichia Coli on Lettuce Produced by Farmers and offered for Sale at Selected Markets Within Region Six

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Abstract:

Vegetables, especially those that are consumed raw, have been recognized as important vehicles for the transmission of pathogens that can cause severe illnesses. This research investigated Escherichia coli contamination of lettuce (Lactuca sativa. L.) in the farm-to-market continuum in Region Six. A total of ninety - six lettuce samples were purchased from eight registered farmers and eight vendors at markets within Region Six. The total number of Escherichia coli colonies was determined for each lettuce sample. Samples were cultured on the MacConkey agar and the indole spot test was conducted to confirm the presence of E. coli. The average numbers of E. coli colonies among farms were 5.98 logCFUg-1 and 4.97 logCFUg-1 among vendors, with a range of 5.10 to 6.49 logCFUg-1 and 4.23 logCFUg-1 to 5.56 logCFUg-1 respectively. The results also revealed that E. coli levels were below the satisfactory levels of the Public Health Laboratory Services Guidelines and there were no significant differences in the average amount of E. coli colony forming units between five farmers and vendors.

Keywords: Escherichia coli, Contamination, Lettuce

An Investigation of the Safety and Suitability of Drinking Water in Guyana from Catchment to Consumer

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Abstract:

Customarily associated with the state of drinking water at the household tap is negative consumer perception, resulting in bias against its use for drinking purposes. This study was therefore undertaken to determine the safety and suitability of drinking water, in accordance with National and World Health Organization's Guidelines for Drinking-water quality (GDWQ) standards, from catchment to consumer in Guyana. Analysis was performed on data (4475 samples) provided by Guyana Water Incorporated (GWI), taken over 44 sampling days, from January 2018 to August 2019. Data included results of the bacteriological (total coliforms, E. coli), chemical (Al, Cl, Fe, pH) and physical (apparent color, true color, turbidity) parameters outlined in Guyana's water-safety plan, at pre-treatment, treatment plant, and closest and furthest consumer households from treatment plant. Data was analysed using SPSS version 25 descriptive statistics, Univariate ANOVA and percentiles, and safety and suitability determined by percentage conformance. Safety of water for consumption throughout study was 100 % for all parameters, except E. coli (90%-95% safe) in accordance with both standards and overall suitability was 74.4% and 66.1% (in accordance with National and GDWQ standards, respectively) for all other drinking purposes.

Keywords: Water quality; Guyana; GWI; drinking water; safety; suitability.

Assessing the Potential of Aloe Vera *(Aloe Barbadenisis Miller)* Gel to be used as an Edible Coating for the Preservation of Fresh Fruits and Vegetables

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Abstract:

The use of edible films and coatings has gained prominence due to relatively low cost, simple technology and natural preservation treatment. A study was conducted on mature harvested tomatoes coated with 100% *Aloe vera* gel, and gel in combination with added acidulants of 1% w/v of citric, lactic, and tartaric acid for quality improvement and extension of shelf life. Tomatoes were stored at 25°C for 21 days and tested weekly for physiochemical changes in weight loss, colour, firmness, total acidity, total soluble solids, ascorbic acid content, visual decay index and microbial surface load. Significant differences *($p<0.05$)* were observed between control and coated tomatoes for firmness, ascorbic acid content and colour change with no other differences in other quality attributes. Coatings of 100% *A.vera* gel were most effective result in suppressing microbial surface growth, with no visible signs of decay while the gel-acid combinations performed poorly. In assessing the 'edibility' of the film using a five point Hedonic scale found that control tomatoes scored higher for acceptability than *A.vera* coated samples which had a distinct, bitter aftertaste. *A.vera* gel may be used as an effective bio-preservative however its suitability as an edible film requires further work to improve consumer acceptance.

Keywords: Aloe vera, acidulants, edible film, bio-preservation, sensory analysis.

Characterization of Bacterial Ectosymbionts Colonizing Gills of Four Caribbean Crabs

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Abstract:

We have investigated four brachyuran crabs belonging to various families: Ocypode quadrata (Ocypodidae) from beaches, Callinectes sapidus (Portunidae) from marine environment, Eurytiumlimosum (Panopeidae) colonising mangrove mud, and Dissodactylusprimitivus (Pinnotheridae) as parasite of sand dollar sea urchins. Ectosymbionts were observed using scanning electron microscopy on gills lamellae for all the species examined. Different sizes of rod-shaped bacteria were observed for each individual examined. They form either bacterial biofilm or they form patches irregularly distributed on the gill surface. Crude DNA extractions were made from gills. PCR using universal bacterial primer sets targeting 16S rRNA-encoding genes, and high-throughput amplicon sequencing, confirmed the occurrence of multiple bacterial taxonomic units. Alphaproteobacteria and Bacteroidetes represent the main bacterial group for each species. However, dominant bacterial phylotypes were not shared between the four crab species. This suggests that each species of these crabs may harbor a specific bacterial community. Despite the environment plurality, all crabs studied here presented ectosymbiotic bacteria on their gills. Thus, they should have an interest to collaborate with such bacteria. Further investigations are needed to address metabolic capabilities and exchanges occurring between the two partners that will allow us to better qualify this relationship.

Keywords: Crabs, Bacteria, Symbiosis, Crustaceans, Gills.

Comparative Analysis of Liquid Fish Silage Fertilizer Versus Urea on The Plant Vegetative and Yield Performance of Pak-Choi (Brassica Rapa Subsp. Chinensis)

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Abstract:

Large quantities of Seafood Processing By-Products (SPBPs) are carelessly dumped in open rivers. SPBPs can be used as an alternative organic fertilizer in the form of liquid fish silage (LFS). The effectiveness of LFS of bangamary (Macrodonancylodon) as a fertilizer was compared to urea for pak-choi production, using two different concentrations of 5% and 10% and urea at a rate of 160 kg/N ha -1. Plant vegetative (leaf length, number of edible leaves, leaf area index (LAI), pigment content) and yield performance (head weight) were assessed. After 14 days of fermentation the LFS pH value was within range of 3.4-3.6 and contained 1.85% N, 3.12% P and 0.13% K; with no heavy metals or E. coli detected. Results indicated that plants treated with 5% LFS produced the highest plant growth, yield, LAI and pigment content comparable to urea. While tissue analysis in plants treated with 10% LFS had highest percentages of N, P, K. This study concludes, SPBPs can successfully be converted into LFS and used as a plant fertilizer; it recommends the use of 5% LFS since pak-choi production was the greatest. However, further studies are recommended to substantiate these results.

Keywords: Liquid fish silage, pak-choi, seafood processing by-products, organic fertilizer, yield performance

Data Integrity Testing in Randomized Controlled Experiments Using the Carlisle P-value Distribution Method

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Abstract:

The integrity of the data in randomized controlled experiments is an essential element of the scientific method. Testing the integrity of data from randomized controlled experiments is therefore advisable since the results are often used to guide decision makers and other stakeholders responsible for implementing sustainable development policies, programmes and practices. There are various statistical methods available to test data integrity. They do so by detecting anomalies and unlikely or unusual patterns in the data that would suggest error or fraud such as data fabrication and falsification. One such method is the Carlisle p-value distribution method which uses the summary statistics (mean and standard deviation or standard error of the mean) of baseline variables (e.g., age, weights) before the application of treatments to calculate p-values by comparing the randomized groups. Under the null hypothesis of no difference among groups because of random sampling, the p-values are expected to follow a uniform distribution over the interval [0, 1]. P-values that do not follow a uniform distribution but cluster closer to 0 (more than expected dissimilarity among groups from random sampling) or 1 (more than expected similarity among groups from random sampling) are likely due to error or fraud. The Carlisle p-value distribution method has been employed in thousands of published peer-reviewed randomized clinical trials resulting in the retraction of hundreds of papers because of error or fraud. It is also now routinely employed by several medical journals to assess data integrity in submitted manuscripts. To the best of the author's knowledge, it has not been applied to non-medical areas of research such as agriculture. In this article, the method is demonstrated by means of an example using published agricultural summary statistics as well as simulated data to highlight its utility in flagging suspicious results that would suggest the need for critical scrutiny of the raw data. It is recommended that the method be employed in agriculture, where applicable, by researchers, reviewers and journal editors to assess data integrity in the same way that checking for plagiarism is now routinely performed.

Keywords: Carlisle method, p-value distribution, data integrity, data fraud, data fabrication, data falsification, randomized controlled experiments, random sampling

Extraction of Specialty Subset Collections of Local Cassava (Manihot spp.) Landraces from Core Gene Banks

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Abstract:

Short-to-medium term recurrent gene banks for cassava, in the main, provide recurrent field storage conditions for cyclic regeneration events that offer good opportunities to extract germplasm diversity-related information. One such opportunity was offered in this study to super-imposed morphological characterization and agronomic evaluation studies on duplicated core gene banks of local cassava landraces at two of NAREI's out-stations. Data recovered allowed us to demonstrate a simple method to preliminarily extract specialty subset collections (SSCs) for further advanced evaluations. Since we have come to understand the scientific basis of the inexorable regeneration of cassava genetic diversity in indigenous hinterland communities, it was our notion that there could be valuable components of cassava yields, stress attributes and agronomic characteristics that could be sustainably utilized for hinterland food security as well as commercial benefits. This study uses a sample of accessions from NAREI's cassava core gene banks to introduce fellow researchers to the tremendous diversity in yield-shattering components, formidable drought tolerance, quality root type attributes, growth habit diversity, extensive field cultivation persistence, etc. The flexibility of combining these attributes (SSCs) helps us to optimally maximize the utility of local cassava diversity.

Keywords: Cassava (*Manihot spp.*), specialty subset collections, core gene bank, morphological characterization

Evaluation of Key Success Factors Affecting Project Productivity in Industrial Firms: A Conceptual Paradigm

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Abstract:

The downsides of project delays are plentiful and oftentimes result in project failure. To foster project success, productivity interventions are required during the planning and execution of projects in industrial firms. By incorporating desk research findings along with the empirical data acquired from a recent project productivity (PP) study in Trinidad and Tobago (T&T), this paper aims to identify the key success factors (KSF) and discuss how PP could be enhanced with better management of these factors. A conceptual productivity paradigm was then developed, and individual building blocks and components were elaborated, gearing towards the execution of capital investment (CI) projects in industrial enterprises. The formation of the paradigm is the foundation for a larger cross-disciplinary study involving productivity and project management (PM). Besides, there is an existing need to explore the possibility of enriching the theories and extending the knowledge and applications of the productivity paradigm measures in industrial firms. Future work would validate the KSF and other productivity performance criteria identified for large enterprises versus small and medium-sized enterprises (SMEs), separately and collectively in T&T and the wider Caribbean context.

Keywords: Project Management, Success Factors, Project Productivity, Paradigm, Industrial Firms

Exploring Value Creation and SME Competitiveness in the Export of Maritime Services: Some Findings in Trinidad and Tobago

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Abstract:

Four issues distilled from the literature that can influence sustainable development in a Greener Caribbean are: servitisation in a circular economy, diversification during periods of uncertainty, value creation; and cluster initiatives as a stimulus for enhancing Small and Medium-sized Enterprises (SMEs) competitiveness. The multifaceted composition and preponderance of participating SMEs of the services sector create unique challenges for productivity, specialisation, and innovation particularly in the export of maritime services. This paper examines whether SME service-providers in the export of maritime services could improve competitiveness through value creation and cluster initiatives if they effectively utilise value management approaches and techniques to drive service diversification. A survey of thirty-one SME Service Providers in the Yachting Services Cluster in Trinidad and Tobago was conducted and data on five value creation determinants: repair accuracy, concurrent engineering, quality standard, quality assurance and quality control was analysed using Statistical Package for the Social Scientists (SPSS). A reliability coefficient of .70 or higher was considered "acceptable". Only repair accuracy and quality standard had positive estimates. The application of cluster initiatives to support the development of a value management program that enhances repair accuracy is therefore recommended.

Keywords: Diversification, Value creation, Sustainable Development, SMEs, Maritime Services, cluster initiatives.

Functional Group Gating of Dibenzo-18-Crown-6 towards the Development of Lead (Ii) Ion Sensing Electrodes

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Abstract:

Lead ions are environmentally abundant arising from many natural and synthetic processes leading to its' accumulation in the environment which when combined with its' toxicity results in adverse physiological effects. As such, tremendous research efforts have been invested into developing methods for its' analysis and sequestering, however affordability, sensitivity and selectivity still remain formidable challenges in this area and as such dibenzo-18-crown-6 (DB18C6) and 4 strategic derivatives (-$COCH_3$, -NO_2, -Br and -$N{=}NC_6H_5$) were synthesized and probed via Density Functional Theoretical (DFT) modelling, absorption spectroscopy (Uv-Vis spectroscopy), Differential Pulse Anodic Stripping (DPASV), Cyclic (CV) and Square Wave (SWV) voltammetries, to determine their Pb^{2+} binding behaviour. The exergonic, entropy driven, interactions between DB18C6 derivatives and Pb^{2+} are such that they form 1:1 metal-ligand complexes *via* coordination with the ether cavity in the case of -H and -$COCH_3$ derivatives but 1:1 exo-cavity binding with –NO_2 derivative and 2:1 Metal Ligand complexes via the crown cavity as well as the high electron density exo-cavity bromine and nitrogen atoms for -C_6H_5NN derivatives, allowing the preparation of modified electrodes capable of quantifying aqueous Pb^{2+}, via DPASV, at concentrations below 10 mg L^{-1} with minimal interferences from of Al^{3+} and Hg^{2+}.

Keywords: Ion selective electrodes; Dibenzo-18-croown-6; Density Functional Theory; lead(II) ions

Haiti Country-Case Study on Maternal and Child Health 1990-2018: progress and challenges towards the SDGs.

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Abstract:

We assess progress made in coverage and equity in key Maternal and child health (MCH) interventions during that period and explore their main drivers.

We applied a mixed methods approach. A qualitative approach based on collecting information about policies and programs related to MCH, carried out in Haiti since 1990. The quantitative approach includes analysis of national surveys data carried out in Haiti since 1990. We assess trends in both outcomes and independent variables and in maternal and child health inequality. We explored predictors of under-five stunting at departmental level using multilevel linear regression. Under-five stunting prevalence decreased by 40% from 1994 to 2016. Neonatal mortality rate decreased by 37% and under-five mortality rate by 54% from 1990 to 2016. We observed moderate progress in coverage of MCH interventions at national level and in each subgroup of the population and an increase in strategies and financial disbursement for MCH. Equity gap between subgroups of the population seemed to increase over time. Women's schooling, access to improved drinking water and antenatal care were key factors associated with reduction in under-five stunting. Despite moderate progress observed, multisectoral collaboration is necessary to achieve SDGs and reduce maternal and child health inequality in Haiti.

Keywords: Maternal health, child health, sustainable development goals

Acknowledgements

This study was made possible thanks to the contribution of Countdown to 2030, the International Center for Equity in Health, the Pan American Health Organization and the Haiti Ministry of Health.

Microbiological Evaluation of Fresh -Cut Watermelon (Citrullus Lanatus "Sentinel"): Road-Side Watermelon Vendors' Knowledge and Practices

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Abstract:

Being quite popular, watermelon is usually sold either whole or cut into quarters and halves. The objectives of this research were to assess the food safety knowledge, hygienic practices of roadside watermelon vendors and the microbial quality of fresh-cut fruit sold to the public in Trinidad. A structured-- administered questionnaire was prepared using Codex Code of Hygienic Practice for Fresh Fruits and Vegetables. Using an observational checklist, the hygienic practices of the vendors, availability of facilities at vending site and sanitation conditions of the environment were assessed. The sample size was 97 roadside vendors. Chi-square analysis ($P < 0.05$) between variables of vendor handling and hygienic practices and sanitation conditions of the environment was applied. Significant associations between the vendors' knowledge of the handwashing and practice ($P< 0.01$) and self-reported knowledge of food safety and handling practices ($P< 0.05$) were found. Total aerobic plate count ranged from 5.3x102 –3.0x105 CFU/g, Escherichia. coli from 1.0x101–3.0x105 CFU/g and Staphylococcus aureus from 0.0–3.0x105 CFU/g. There was a significant correlation between total aerobic plate count to the time the cut watermelon was kept at 29-32°C. The results highlighted the need for vendors to be adequately trained in fruit safety.

Keywords: food handling; hygienic practices; fresh-cut watermelon; microbial quality

Physicochemical Analysis, Carbohydrate and Lipid Composition of *Rivina Humilis* Berries

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Abstract:

Rivina humilis L. belongs to the Phytolaccaceae family. The berries are bright red in colour due to the presence of betalains. Physicochemical properties of *R. humilis* berries were investigated, and primary metabolites within the fruit identified. Extracts of the fruit were analyzed utilizing Nuclear Magnetic Resonance Spectroscopy, Fourier Transform Infra-Red Spectroscopy and Gas Chromatography/Mass Spectrometry. The fruit is low acid (pH of 6.1 ± 0.01), has a moisture content of 84.1 ± 2.5 %, lipid content of 8.70 ± 0.3 % and a total sugar content of 6.9 ± 0.2 %. ^{1}H NMR spectroscopy indicated the presence of lipids, carbohydrates, and fruit acids. The major carbohydrate identified was galactose (11.1 ± 1.8 %), the main fruit acid, citric acid (9.7 ± 1.4 %) and oleic acid the main fatty acid (68.4 ± 1.1 % %). The berries are not utilized commercially and may be considered for use in the production of value-added products.

Keywords: Rivina humilis, dogblood, pigeon berry, lipid, sugars, fruit acid.

Production and Characterization of Novel Dasheen (Colocasia Esculenta) Wine

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Abstract:

The corms of dasheen have a high moisture content which makes them susceptible to spoilage. To mitigate this problem, dasheen was fermented into an alcoholic beverage known as Dasheen (*Colocasia esculenta*) wine. In this study, three Brix concentrations (18, 22, 25), each with two types of must (A and B) were used to develop a wine. From sensory analyses, the 25 °Brix A was favoured versus the other wines. Other quality indicators were pH, specific gravity (SG), total soluble solids (TTS), titratable acidity (TA) (% citric acid), alcohol content, the colour analysis (L*, a*, b*), the absorbance at 420 nm, and microbiological analysis. The 25 °Brix A wine exhibited a lower pH versus the other wines with an acceptable TA (0.75 %). The L* was higher, which indicated that the wine was clearer but, it exhibited lower red hues (a*= 0.13), yellow hues (b*=1.36) and an absorbance of 0.246 at 420 nm, which suggested that the wine was less prone to spoilage.The alcohol content was higher for the 25 °Brix A when tested by gas chromatography, (12.50 %) and the hydrometer (13.70%) methods respectively, however the value was lower for the TTS, (10.13) and the SG (1.005). There was a significant difference at $p < 0.05$, but both wines from must A and B were free from contamination. The 25 °Brix A wine was acceptable based on the consumer preference tests and other supporting data.

Keywords: Dasheen wine, dasheen (*Colocasia esculenta*), Fermentation.

Rare-Earth Metal-Organic Frameworks from Perhalogenated Terephthalate Ligands: Fluorescence Sensors for Iron, Copper and Nitroaromatic Explosives

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Abstract:

Metal Organic Frameworks (MOFs) are a new class of porous coordination polymers (CPs) with well-defined topologies that continue to intrigue scientists not only because of their appealing structural architectures, but also because of their potential applications in gas storage and separation, sensing of small molecules, catalysis, and biomedicine. The synthesis of MOFs using rare-earth (RE) metal ions is still relatively under explored when compared to transition metal-based systems, due to their unpredictable coordination chemistry. There are however significant advantages to be gained by combining the unique catalytic, magnetic, and light emitting properties of RE metal ions with the properties of CPs and MOFs. By combining rare-earth metal ions with tetrafluoro- and tetrabromo-terephthalate ligands we have been able to create 28 novel rare-earth CPs and MOFs having interesting structural features and promising luminescence sensing properties. We demonstrate the potential of these compounds as fluorescence sensors for Fe^{3+}, Cu^{2+} and explosive nitroaromatic compounds (NACs) such as 4-nitro-, 2,4-dinitro- and 2,4,6-trinitro-phenol.

Keywords: Rare-Earths, MOFs, Coordination Polymers, Fluorescence Sensing, Nitroaromatic explosives.

Sensory Evaluation of a Novel Sapodilla Candy

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Abstract:

The sapodilla fruit, *Manilkara zapota*, is found throughout the Caribbean, but its utilization is limited primarily to consumption in the fresh ripe state. The fruit can be used in the formulation of value-added products and thus reduce postharvest losses. The aim of this experiment was to create a candied sapodilla product similar to gumdrops and colloquially known as "JubJub" in Trinidad and Tobago. This was achieved using two methods: the sapodilla juice and the pulp of the fruit respectively. Products were made via the combination of a sugar syrup and unflavoured gelatine, then allowed to solidify prior to cutting into uniform pieces. Sensory analysis was conducted on both products using a 5-point Hedonic scale, by 22 untrained panellists who rated the appearance, aroma, taste, sweetness, and texture/mouthfeel. The juice and the pulp-based products received overall average scores of 4.26 and 3.96, respectively, indicating that the novelty of the product was well received. While panellists generally preferred the juice-based product, they commented that both lacked the unique, ambrosial aroma characteristic of the sapodilla fruit. Further testing and modification of the process would be needed to rectify this issue and improve the product acceptability.

Keywords: sapodilla, candy, Hedonic testing, sensory evaluation.

Supercritical Fluid Extraction of Bay Oil from Pimenta Racemosa Leaves and Its Uses

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Abstract:

Pimentaracemosa, also known as bay, is a tree native to the Caribbean and other parts of the Americas, that is usually grown for its use in cooking. The leaves of this tree contain an essential oil that has a wide range of uses that have not been greatly investigated. There are several varieties of this Pimentaracemosa tree, with some being Pimentaracemosa var racemosa and var ozua. This study, however, focuses on the var racemosa variety and the applications of its extract obtained via supercritical fluid extraction (SFE). SFE uses supercritical carbon dioxide as the extraction solvent and the extracted oil is then characterized by using Gas Chromatography/Mass Spectrometry (GC/MS) techniques. It was found that temperatures above 80°C degraded the oil and therefore, the operating temperatures should be below this value. Further investigation showed that the major components of the bay oil were eugenol and chavicol, which are contributing factors to its uses. The bay oil can be used for many purposes such as corrosion inhibition in pipelines and to control microbial growth in preserved foods, like fermented fish. However, more research is necessary before it can be commercially used for these purposes.

Keywords: Pimentaracemosa; eugenol; chavicol; supercritical fluid extraction; corrosion

The Application of Essential Oil Extract from Local Bay Leaves to Prevent Carbon Dioxide Corrosion

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Abstract:

Natural gas pipelines are highly susceptible to carbon dioxide (CO_2) corrosion due to the acidic environment formed when free water mixes with the CO_2 present in the transported natural gas. Currently, industrial inhibitors used to prevent this type of corrosion are either toxic and/or very costly, and more suitable ones are continuously being developed and tested. Literature shows that the essential oil extracts from many indigenous plants/leaves contain corrosion inhibition properties due to the presence of major adsorption centers within the molecular structure. The *Pimentaracemosa* speciesof bay leaves is abundantly grown in the Caribbean region but has never been tested before. This study found that approximately 60% of the oil extracted from local bay leaves is comprised of the chemical eugenol, which has the desired properties for corrosion inhibitor development. Gravimetric and electrochemical testing show an inhibitor efficiency in the range 82 to 91 percent (%) which is similar to that obtained from other indigenous plants found worldwide. In addition to this high inhibitor efficiency, further experimental tests show that the integrity of the coating makes oil extract from local bay leaves a suitable green chemical for corrosion inhibitor application in natural gas pipelines.

Keywords: Carbon dioxide corrosion, inhibitor efficiency, *Pimentaracemosa*, essential oil extract

The Impact of Alginate Physicochemical Properties on the Adsorption Performance and Reusability of Calcium Alginate Beads

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Abstract:

The establishment of a rigorous formulation methodology considering physicochemical properties of alginate systems has been widely overlooked within current biosorption research utilizing calcium alginate beads. Here, we present for the first time, the effects of molecular weight and viscosity on bead sphericity and its impacts on adsorption and regeneration efficiency using different calcium alginate sorbents. Findings show an increase in molecular weight (MW) results in increased viscosifying properties, which correlates closely to sphericity of the alginate bead. The relationship between sphericity and concentration followed a 2nd order polynomial, where maximum sphericity was maintained over an ideal concentration range of 2-6% (w/v) for respective brands of sodium alginate (MW 300-670 kDa). This increase in sphericity resulted in adsorption enhancement; 1-15%, 81-93% and 88-95%for Pb2+, Cu2+ and Cd2+ respectively over non-spherical counterparts. Furthermore, compared to a commercial resin (Amberlite), the beads showed similar adsorption performance for Pb2+ with reductions of up to 40% and 70% observed for Cu2+ and Cd2+ respectively. This decline was attributed to the opposing affinity of the resin (Cd>Cu>Pb), whereas the alginate beads had an affinity following Pb>Cu>Cd. These results aligned well with the findings for sorbent regeneration, with subsequent adsorption efficiency largely decreasing (>20% reduction), ascribed by the alginate mass loss due to chemical and mechanical instability. Thus, future work is needed to further optimize the formulation methodology to promote greater adsorption and regeneration considering key performance indicators established in this study.

Keywords: Calcium alginate; Beads; Sphericity; Regeneration; Adsorption; Rheology; Sargassum natans

The Ontology of Delays and the Emergence of Productivity Factors: A Framework for Enhancing Project Executions in Industrial Firms

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Abstract:

The philosophy of project delays incorporates its causes and its effects in the field, together with the concepts and practices adopted for its prevention. In project management (PM) practice today, productivity studies have been deficient in its direct application towards delay prevention. As such, the ontological view of delays requires objective reassessment. Moreover, more research is required to determine the role productivity can play in preventing project delays. Ergo, this paper aims to investigate the dominant causes of project delays, and to identify key success factors (KSF) that could safeguard and enhance project productivity (PP) in industrial firms. Based on the empirical data acquired in a recent PP study in Trinidad and Tobago, it was found that commonalities existed among the dominant delay causes; and could broadly be explained by five (5) delay factors categorised as follows: 1) poor workforce estimation, 2) unreliable supply chain channels, 3) lack of standard work schedules, 4) inefficient site layout, and 5) lack of worker motivation. Critical analysis of these delay factors would contribute to the identification of KSF for fostering project productivity and performance. The paper reports the main findings of the PP study and then incorporates them into a transformation process framework. It is anticipated that the findings and the proposed framework would shed light on addressing project delays and related issues of productivity improvements during project execution. Future work would verify these dominant delay causes and KSF with further empirical data acquisition, as well as the pragmatisation of the proposed framework for industrial applications.

Keywords: Project Management, Delay, Ontology, Productivity, Framework, Industrial Firms

The State of Open Data in Guyana

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Abstract:

Open data has the potential to improve accountability of public resources, enhance civic participation in governance, and stimulate economic development. In developing countries like Guyana, open data can motivate research and development to address national issues.

This study explores the status of open data adoption in Guyana. Data was gathered using online interviews with key stakeholders and desk reviews of reports, published papers, websites, and databases. Data collection occurred in 2020 as part of the Latin America and Caribbean (LAC) Open Data Barometer project. The subsequent LAC Open Data Barometer report also serves as a data source. The LAC Open Data Barometer ranks Guyana 19/24 in the LAC region with a score of 25/100. Guyana's overall open data impact is 1.67/100. Regarding readiness and implementation, Guyana scored 30.7/100 and 42.7/100, respectively. In specific areas: health (95), crime (80) and international trade (80), Guyana scored highly, while in others: public transport schedules (0), land ownership(5), public spending(5) and company registration(5), Guyana scored poorly. In the area of legislation, Guyana scored 35/100. Guyana's level of adoption of open data is average to low. A commitment by government to open data policies and legislation, infrastructure, technical skills, and awareness appears necessary for Guyana to benefit from open data.

Keywords: Open Data, Government, Development, Open Society

The Submarine Geological Heritage of Guadeloupe, F.W.I.: Exploration, Inventory and Valorisation

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Abstract:

The Geology of the Guadeloupe archipelago, F.W.I., is relatively well known and described, for it has been the subject of many studies since the 1980's. It is remarkably rich relatively to the size of the islands, with carbonate rocks and karstic landforms, a variety of volcanic formations (domes, lava flows, breccias, debris flows, pyroclastic, and strombolian projections), tectonic structures (fault scarps, tectoglyphs) and oceanic rocks, in La Desirade, which are the oldest geological formations of the Lesser Antilles. The CAS-DFA Chapter, in Guadeloupe, has been developing and promoting the Geological Heritage of Guadeloupe since 2018, in the frame of the French National Geological Heritage Inventory (INPG). 36 terrestrial and coastal geosites have been described so far. However, submarine geological objects have not yet been considered. In order to identify the most remarkable submarine geosites we are currently exploring the shallow waters of the Guadeloupe archipelago. For the inventory, we consider sites such as underwater cavities, bio-constructed reefs and barriers, underwater fault scarps or hydrothermal vents. Here, we present our methodology, exploration techniques and some examples of underwater geosites. Then, we present some outreach activities and examples.

Keywords: Geological Heritage, submarine geology, geological exploration, outreach.

The Use of a Computer Serious Game to Reduce the Latency of Emotion Recognition in Verbal Children with Autism Spectrum Disorders (ASD), ages 4 to 16

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Abstract:

Children with Autism Spectrum Disorders (ASD) are often challenged with recognizing emotions, resulting in impaired communication and social interaction. Evidence suggests that early interventions to improve this difficulty can help these children live a better social life.

This paper presents Básiemo, a computerized serious game developed to help children with ASD ages 4 to 16 recognize facial expressions associated with the six basic emotions: happy, sad, angry, afraid, disgust and surprise. For this study, a usability inspection was chosen from where an expanded and improved set of the Nielsen & Molich's (1990) heuristics was used. The usability inspection involved a small group of experts who assessed the user interface and provided feedback based on predetermined acceptance criteria. A total of twenty-three problems were identified, out of which twenty-one were unique problems. The most prominent issues were helping users recognize, diagnose, and recover from errors (30.43% of the total issues), error prevention (21.74%), consistency and standards (17.4%), user control and freedom (13.04%), recognition rather than recall (8.7%) and match between system and the real world (8.7%). Overall, the outcome of the evaluation showed positive results concerning the tool's attractiveness and intuitive nature, and its effectiveness in achieving the design and implementation objective of providing a hands-free, web-based game. Future work should include the refinement of Básiemo, followed by its introduction to an experimental and control group.

Keywords: Serious Game, Autism Spectrum Disorders (ASD), Emotion Recognition (ER), Natural-user Interface (NUI), Computer-aided Intervention (CAI)

Use of Biodynamic Preparation 500, Tank, Biodung and Vermiculture in Compost Production and Its Effect on The Cultivation of Tomato (Solanum Lycopersicuml.)

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Abstract:

A combination of different organic farming techniques can be used to overcome these and produce better quality of food in an environmentally acceptable manner. This study focused on the production, microbial composition and physico-chemical characteristics of compost from biodynamic preparation 500, biodung composting, tank composting and vermicomposting systems from sugarcane leaves (Saccharum officinarum), water hyacinth {Eichhornia crassipes (Mart.)} and Bermuda grass{Cynodondactylon (L.) Pers.}, and their subsequent application to tomato (Solanum lycopersicum L.) plant. Results indicated that biofertilizers are healthier, safer and beneficial to use as compared to chemical fertilizers. For microorganism colony count, Heterotrophic count on the PDA plate there was more colonies for the Biodynamic preparation 500 compost (>50 colonies), for the bacterial count they were more colonies in the tank compost (>250 colonies), and for the Aspergillus count showed more colonies present for the biodung compost {~25 colonies}. The Anova analysis at $p<0.05$ indicated that both F values (19.07, 83.72) >F crit (1.99, 1.94), indicating that there was significance in plant height with respect to treatment and growth period. Hence, compost produced does have a positive influence on soil and plant health.

Keywords: Biodynamic, biofertilizers, organic compounds, soil, organisms, nutrients

Using Creep Recovery Data to Improve the Postharvest Handling and Packing of Fresh Fruits: A Case Study of the St. Julian Mango (Mangifera Indica L. Var Julie)

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Abstract:

The postharvest handling of fruits involves the application of loads that can result in deformation such as blemishes, bruises, and punctures. A complete understanding of the changes in the physical properties of the St. Julian mango while under mechanical handling can prevent such occurrences. A constant 1kN load (creep) experiment was performed on the St. Julian mango for four hours. On removal of the load, the change in deformation was measured for an hour and a half and creep recovery behaviour was observed. These tests were performed over seven days and the rate of respiration was monitored. Creep recovery measurements indicated a mean permanent indentation of 0.06 mm and 2.75 mm ($p<0.05$) on the fruit's skin after 1 and 7 days of harvest respectively. Investigations were performed on changes in creep recovery, rate of change in creep recovery and recovery strain. Both changes in creep recovery and rate of change in creep recovery showed an exponential relationship with time. The relationship between rate of change in creep recovery against days after harvest showed that load removal within fifteen minutes of application could lead to a significant reduction of the onset of permanent deformation. Recommendations can be derived from these results that will assist processors and farmers in developing better handling and packing techniques as well as equipment and thereby reduce the postharvest loss which is a major concern for the industry.

Keywords: Postharvest, St. Julian Mango, Visco-Elastic Behaviour, Creep Recovery, Handling of Fruits

Using Magnetized Graphene Oxide to Improve Concrete-Steel Interfacial Adhesive Strength, with Reference to Oil Well Cementing

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Abstract:

Poor cementing among other factors of well integrity can lead to disasters like the blowouts at Deepwater Horizon in the Gulf of Mexico in 2010. Adhesive failure at the cement-casing interface was found to be one cause for well blowouts. A weak, almost 100-micron thick, interfacial transition zone (ITZ) in the cement-casing interface caused by excessive formation of CH crystals was found to be the cause of the low adhesive strength. The hypothesis is that adding a mixture of magnetized reduced graphene oxide and magnetized graphene oxide (~MRGO) to cement slurry would act as nucleation points to encourage the growth of CSH crystals as setting and hardening takes place. At the same time, a strategically placed static magnetic field should cause some or all of the ~MRGO to migrate towards the cement steel interface. This should cause CSH crystals to grow in the ITZ, causing an improved bond interface with the steel. The Brazilian push-out test and XCT showed that such a hypothesis was plausible when both concepts (~MRGO + magnetic field) were used, versus just one. However, this test was not able to make a distinction with the control sample of no nanoparticle and no magnetic field. Also, because the samples were relatively large, XCT pixels accounted for 14 microns, so pore variability within a sample was poor. The promise shown when samples were compared to one another warrants a repeat of this experiment. Making the samples smaller and modifying the method of computing pore area distribution could improve the accuracy of the results.

Keywords: nanoparticles, oil wells, cement-steel adhesion, magnetized nanoparticles

Utilisation Of Tamarind (Tamarindus Indica) Seed Waste to Produce Nutraceutical Tea Products

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Abstract

In Trinidad and Tobago, tamarind seeds are under-utilised by-products of the tamarind pulp industry. The objectives of the research were to dehydrate tamarind seed waste to produce tamarind powder tea; tamarind tea with bay leaf powder and tea with soursop powder tea and to determine the compositional and sensory characteristics. Proximate analysis was done using the AOAC methods and mineral analysis by Atomic Absorption Spectrophotometry. HACCP plan was generated for the process. Teas were evaluated by 51 panellists by 7-point Hedonic scoring and food action rating scale There were no significant differences ($P \leq 0.05$) among the three teas in proximate analysis comprising of dry matter (98.8-98.9 %) crude protein (13.1- 13.9%); crude fat (4.1-4.8%); total sugars (12-24%); magnesium (0.32-0.36 mg/l); Iron (0.17-0.21 mg/l) and potassium (0.42-0.44 mg/l). There was no significant difference ($P \leq 0.05$) for appearance, smell slurp/sound, taste, acceptance and willingness to purchase among the three tea treatments. Tamarind seed powder with bay leaf was most acceptable ($\mu = 5.13 \pm 2.55$ SD 0.37 SE) being neither liked nor disliked and was favoured to be purchased ($\mu = 5.43 \pm 2.35$ SD 0.33 SE).

Keywords: Proximate analysis; Mineral; Sensory evaluation; Bay leaf; Tamarind seed waste; Soursop, Tamarind teas; Trinidad

THEME: RENEWABLE ENERGY

A New Low Power Wind Energy Research Station and Performance Data for a Windy Nation Rover Wind Turbine

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Abstract:

The Research Station consists of a Wind Tower, with a 20′ high platform & an Instrumentation & Power Room located about 100′ away in a part of the University's low Maintenance Bldg nearby. A 5′ diameter Wind Generator was mounted on a pole on the platform at 41′ feet high, generating Electrical Power & was set up in August 2014. The Tower also has a Wind Anemometer (PEET Bros.) which captures wind speed & direction & is about 6′ away from the Wind Generator at the same height. The Instrumentation & Power Room houses a Wind Console displaying Wind Speed & Direction data at the Wind Generator height (i.e., 41′), and this data was logged at 1-minute intervals on a computer. The initial Wind Generator was the Windy Nation Rover Wind Turbine (USA made) and ran from August 2014 to Jan. 2018. The performance of this Generator is evaluated. The purpose of establishing this WIND ENERGY RESEARCH STATION is to test, evaluate and assist in the development of low Power (possibly medium Power) Wind Turbines for use locally (or overseas for that matter).

BEST PRESENTATION

Extraction of Sodium Alginate from Waste Sargassum: An Optimization Approach Using Response Surface Methodology

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Abstract:

Sargassum in the Caribbean region has affected the livelihood of several coastal communities due to the influx of large quantities of this pelagic brown seaweed in recent times. Sodium alginate can be extracted from the cells walls of this seaweed but is known to give relatively low yields of borderline quality. Therefore, this study seeks to further optimize the alkali extraction process using Box-Behnken response surface design coupled with multistage extraction to obtain a higher yield and purity of alginate. Furthermore, insight into the physiochemical properties of the extracted S.natans alginate that has never been reported is found. The variables investigated were extraction temperature, alkali concentration, and excess volume of alkali to Sargassum and extraction time. The obtained experimental data were successfully fitted to a second order polynomial equation. Optimum conditions were determined to be an extraction temperature of 80ºC, 3.75 % w/v Na_2CO_3, excess volume of alkali of 12.63 mL for 6 hours and confirmed through validation experiments. Multistage extraction at the optimum conditions gave a high yield (28%) and after bleaching, high purity alginate (92%) at an extraction efficiency of 86% was obtained.

Keywords: Pelagic Sargassum, Response surface methodology, Sodium alginate, Extraction, Optimization

Integration of Renewable Decentralised Production Into An Electricity Network In Guadeloupe

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Abstract:

For several years now, while fossil energy resources have been dwindling and the CO2 concentration rate has continued to increase due to the massive use of fossil fuels, reaching record levels and involving with it the global overheating that was threatening the existence of every living species on our planet. For this reason, the integration of renewable energy sources (RES) into the Electricity Grid has become a priority. This research work will consist of establishing solutions to remedy the constraints of centralised electricity production while maintaining the security of the Electric System (SE) at the level of the Island Electric Network (REI) of Guadeloupe through the integration of renewable decentralised production. The study will be based on the optimisation of conventional power flows (OPF) and the optimisation of power flows with integration of renewable energies (OPF-DG) which will be implemented on the conventional IEEE-30 network and that of Guadeloupe, while respecting the economic impact related to Network Management. These simulations will be carried out using MATLAB and MATPOWER software, which will enable us to analyse the behaviour of these generation sources on the Guadeloupe Electricity Grid.

Keywords: REI, IEEE-30, SE, RéseauElectrique de la Guadeloupe, OPF, OPF-DG, SEnR

Sustainable Power Generation in Trinidad and Tobago

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Abstract:

There is a global focus on developing more sustainable forms of power generation. This includes renewable forms of energy, more efficient processes, and reduction in environmental emissions. This study aims to develop and validate a model of existing power generation in Trinidad and Tobago. Additionally, alternative scenarios are to be developed and modelled. This includes upgrading any single cycle natural gas (NGSC) power plants to the more efficient combined cycle power plants (NGCC). These models are to be developed via the Generalised Algebraic Modelling System (GAMS) program. This program allows for the supply chain optimisation of these scenarios by using multi-objective formulation. Multi-objective formulation allows for both the levelized cost of electricity (LCOE) and global warming potential (GWP) emissions to be minimised, while still producing the required electricity for the national grid. Therefore, both economic and environmental factors will be considered in this optimisation. This study can further be developed to include renewable sources of energy like solar, wind and bioenergy in an integrated power grid for Trinidad and Tobago, thus providing options for more sustainable pathways in local power generation.

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Mid-Atlantic Oil & Gas Inc.

Mid Atlantic Oil & Gas Inc. (MOGI) is a Guyana Petroleum Exploration Company which was incorporated and registered in early 2013.

2013

On March 4, 2015, MOGI was awarded the CANJE Petroleum Prospecting License along with JHI Associates Inc., a privately held Canadian Company.

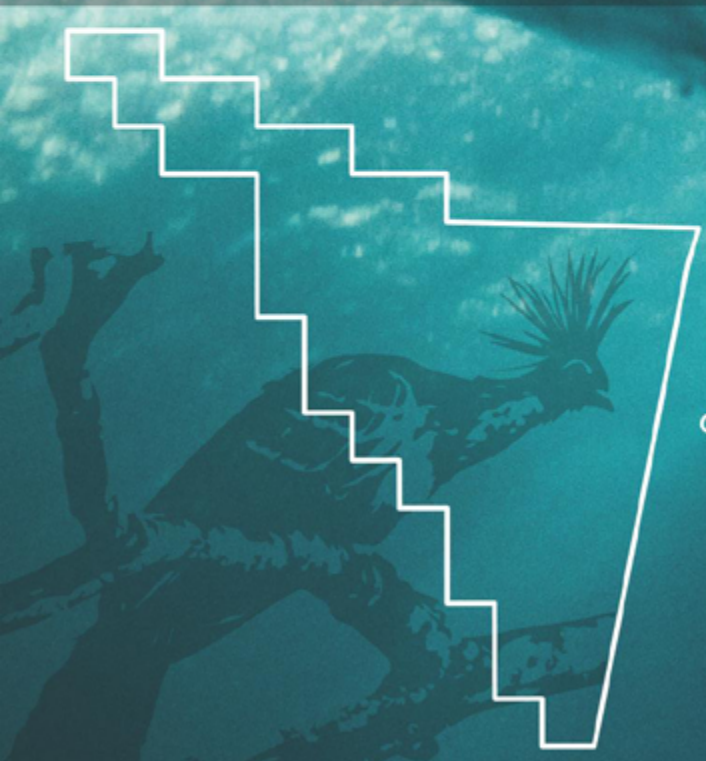
2015

In February 2016 ExxonMobil farmed into the CANJE PPL and was appointed Operator.

2016

In late 2018 TOTAL joined the Consortia.

2018



Our partnership is committed to an Exploration Program that is sustainable, local content oriented, with the highest levels of compliance to Health, Safety and Environment (HSE) requirements and adherence to the Laws and Regulations governing such licenses in Guyana.

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This Book of Abstracts is a collection of research emerging from the Caribbean Academy of Sciences' 22nd Biennial Conference which was held from *August 9 - 13, 2021*. This conference is significant because the COVID-19 pandemic has altered the manner in which traditional conferences were held. It is the first virtual conference for the association and is also hosted by the newly resuscitated Guyana Chapter which is housed in the University of Guyana.

Under the broad theme: ***"Science, Technology, and Innovation for Sustainable Development in a Greener Caribbean,"*** abstracts were submitted beneath the following sub-themes: Pure and Applied Sciences; Medical/Pharmaceutical Sciences; Renewable Energy; Environment and Ecosystems; and Education, Humanities and Social Sciences.

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