THE UNIVERSITY
OF THE WEST INDIES
MONA, JAMAICA

RESEARCH FOR DEVELOPMENT 2013

RECOGNISING OUTSTANDING RESEARCHERS

CONTENTS

PRINCIPAL'S MESSAGE

CONGRATULATIONS TO OUR COMMUNITY OF RESEARCHERS.

You continue to demonstrate the power of research and ingenuity in transforming lives. You can take pride in the fact that application of your work will help us tackle a range of societal challenges relating to health, preservation of the environment, public sector reform and entrepreneurship, among other areas.

Your work is testament of the robust research culture that we foster here at The University of the West Indies (UWI), Mona Campus. Indeed, you are helping to maintain that strong track record in research.

While we issue plaudits to Group Leaders for their rigorous pursuit of knowledge and innovation, we also acknowledge the support of associates and students who help to create such a dynamic and exciting presence within our university.

We also thank wholeheartedly our stakeholders and benefactors who continue to fund some of our most complex research projects to the tune of hundreds of millions of dollars. Without resources our talented staff could not access the requisite tools to conduct enquiries, analyse and store research data.

As many of you are well aware, the long period of economic difficulty being experienced across the Region continues to have a devastating effect on the University's finances. Without your continuing generosity, the future of the next generation of researchers and innovators is one of uncertainty. We sincerely hope the work displayed by our elite researchers in this publication encourage that support going forward, as we continue the pursuit of knowledge to improve human health and societies in general, in our Region.

Once again, I congratulate you our outstanding researchers and look forward to another successful year of research here at The UWI, Mona Campus.

Gordon Shirley
Pro Vice Chancellor & Principal
The University of the West Indies, Mona Campus

UWI MONA

FACULTY OF HUMANITIES & EDUCATION

DR CHERRELL SHELLEY-ROBINSON

The Research Project with the Greatest Business/Economic/Development Impact

PROJECT: Survey of Media Information Literacy Among Teachers, In-Service and In-Training, in Four Caribbean Countries: Antigua & Barbuda, Guyana, Jamaica and Trinidad & Tobago

Media and information literacy represents the convergence of two previously discrete concepts, namely, information literacy and media literacy. Information literacy was formerly seen mainly as the purview of librarians who coined the classic definition as being able to recognize when information is needed and having the ability to locate, evaluate and effectively use the information and, thereby, empower people of all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals. By so doing, it was regarded as one of the fundamental means for creating an informed citizenry capable of actively participating in the democratic process. Furthermore, it was also seen as being at the core of lifelong learning as it taught people how to learn. In light of the foregoing, the United Nations Educational Scientific and Cultural Organization (UNESCO) declared information literacy as a basic human right and recommended that governments seek to have it integrated within all levels of the education system.

On the other hand, media literacy, briefly defined as the ability to access, analyze, evaluate, and create media in a variety of forms, was initially associated mostly with the study of films, but as the society became saturated with all types of media formats and with the mass media becoming increasingly influential in shaping people's perceptions and beliefs, the concept expanded to embrace all types of media -from print to video to the Internet- and an understanding of the role of media in society as well as the essential skills of inquiry and self-expression necessary for citizens in a democracy.

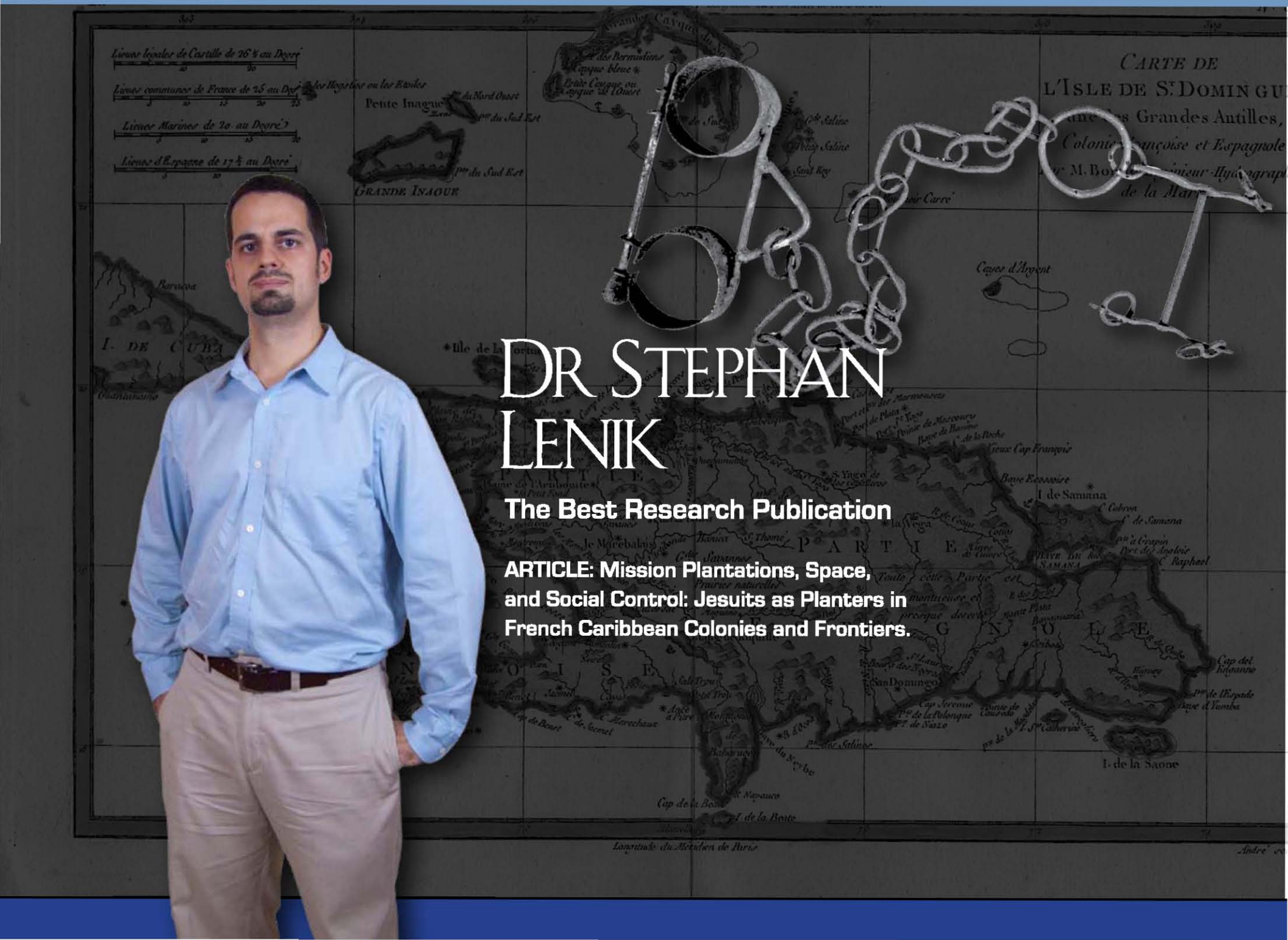
The two concepts of media and information literacy had a parallel existence for quite some time until UNESCO recognized their several areas of commonality and their logical convergence to form a set of holistic skills needed by citizens to function effectively in the 21st century. In addition, UNESCO views these skills as being central to democracy and good citizenship. According to UNESCO, there is the need for citizens to be equipped with the essential competencies and skills to engage with media and information systems effectively and to develop critical thinking and life-long learning skills to socialize and become active citizens. In essence, people need to be both media and information literate and since there is much overlapping within the two sets of skills, it was decided to merge both concepts from henceforth referred to jointly as media and information literacy.
In light of this decision, UNESCO has embarked on a mission to foster media and information literate societies by encouraging the development of national information and media literacy policies, including policies in education.

UNESCO has therefore commissioned a series of studies to determine media and information literacy levels of educators in various regions of the world, and the Department of Library and Information Studies was requested to undertake the study for the Caribbean region. The focus was on trainees and in-service teachers as well as teacher educators from four countries namely: Antigua and Barbuda, Guyana, Jamaica and Trinidad and Tobago.

Overall, the findings from the survey revealed a lack of basic knowledge about various aspects of media and information literacy on the part of the educators, and further analysis of the results showed that even though there were very few available courses on media literacy, the educators were knowledgeable about more aspects of this than they were about information literacy. The need for formal education in media and information literacy was obvious and this was overwhelmingly endorsed by the participants themselves in their response to a question about the matter.

This study is significant because the findings are to be used to inform the decision-making of UNESCO and other stakeholders, including media and information professionals, educators, citizens media groups, policy and decision makers, about the need for media and information literacy training for teachers within the Caribbean.

Dr Cherrell Shelley-Robinson, Department of Library and Information Studies



DR STEPHAN LENIK

The Best Research Publication

ARTICLE: Mission Plantations, Space, and Social Control: Jesuits as Planters in French Caribbean Colonies and Frontiers.

The major contribution of "Mission Plantations, Space, and Social Control: Jesuits as Planters in French Caribbean Colonies and Frontiers" in the Journal of Social Archaeology is that these data reveal that the missionary communities which initiated mission programmes and religious ideals in frontiers and colonies ordered space and shaped social relations in ways which diverged from secular regimentations of the economy. It is these secular, profit-motivated approaches to plantations as units of economic exploitation which form the primary source of data which has shaped understandings of space, power, material and economic practices on plantations. Scholars have interpreted the characteristics of secular, privately-owned plantations as "modern" units of industrial production which utilized enslaved or coerced labour to produce commodities for export to processing facilities and markets. According to this model, plantation owners and managers were motivated by profit to improve technological adaptations and to adopt principles of industrial organization while managing plantations and organizing labour. But this study of French Jesuit plantations in Dominica, Martinique and French Guyane finds evidence to suggest that plantations were used for purposes other than amassing personal fortunes, and that the priorities based on the modern plantation model such as profit-making or the surveillance of labourers do not apply in all cases. Excessive profit-making was forbidden for the Jesuits, and their labourers were simultaneously property and targets of mission work through a curé des nègres who oversaw their practice of Catholicism. Thus for these institutionally-owned Jesuit properties, labour was organized and commodities were produced to fund proselytizing, or to build and operate parishes. The three Jesuit mission outposts studied in the article reveal alternative forms of economic production which have not previously been studied in depth, and the findings suggest that approaches to plantations as "modern" may need to be re-evaluated.

This article is a key study for the archaeology in Dominica, where the majority of the previous archaeological work has focused on the indigenous population in the pre-Columbian period, or the Kalinago or Carib. Plantations in Dominica have only begun to be studied by historical archaeologists in the last five years. By studying the Jesuit plantation and parish in Grand Bay, which dates to the post-Columbian period but before the start of formal colonization in 1763, there is now a much better understanding of the forms of colonialism and economic practices which shaped daily life in this period, and how these relate to regional processes of imperialism and social control at other Jesuit plantations.

This article traces a path for future studies which could examine the relations of religious communities involved in economic production and the people who were the targets of mission work, be they enslaved or wage labourers, or converts who joined and sustained these communities. While this article has revealed ways in which space was manipulated as a means of social control, there is also the potential for investigating the material culture used during daily life by the missionaries and enslaved and wage labourers, and to engage in detailed studies of the missionaries' written accounts of their plantations. These ideas could be tested in a variety of contexts where mission outposts were established. In the Caribbean, this might include Moravian communities in the former English and Danish colonies, French Dominican sites in the eastern Caribbean, or Jesuit sites throughout the Atlantic world.

Dr Stephan Lenik is a Lecturer in the Department of History and Archaeology at The University of the West Indies, Mona. Dr Lenik received a PhD and B.A. in Anthropology from Syracuse University and a M.A. in Anthropology from the University of South Carolina, and he has participated in archaeological research throughout the Caribbean and eastern North America.

DR MARIE-JOSÉ NZENGOU-TAYO

The Best Research Publication

ARTICLE: The Haitian Short Story: An Overview

This article presents a broad overview of the Haitian short-story genre, based on the analysis of stories published from the end of the 19th century to 1991 and compiled by Pierre-Raymond Dumas. In the first section, the author identifies the main features of the genre. She then undertakes a case study of two contemporary novelists who are considered masters of the genre, Gary Victor and Yanick Lahens.

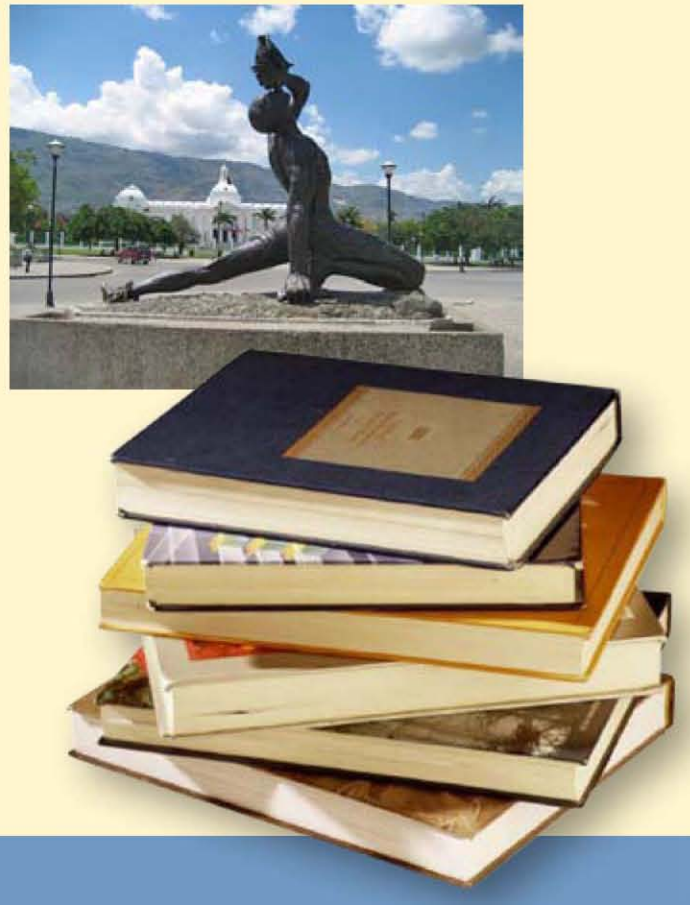
This review of Haitian short-stories helps to identify a broad range of themes, from social criticism to personal and sentimental testimony. Vodou mythology offers a wealth of material for stories and from the early days of Haitian literature till today, writers have been mining the Vodou imagination for their fiction.

A surprising finding in these short stories is the excessive sensitivity and sentimentality of male writers more often known for their social and political activism, which brings irrefutable evidence of the deep-seated influence of the French Romantic Movement on the Haitian imagination.

Gary Victor and Yanick Lahens were chosen for a study of recent developments of the genre in Haiti because their stories reveal a common obsession with the future of Haiti and the living conditions of its people. Yet, each writer occupies a specific space in the Haitian literary landscape and, in his/her particular way, contributes to the diversification of the genre. While Victor's stories comment on Haitian reality with dark humour or hilarity, Lahens' tone is more intimate, more serious, melancholic and at times tragic. She offers a female perspective on Haitian society and the events of the past 20 years. She exposes women's strategies of survival. She shows how young women from impoverished areas are fighting by all means necessary to escape squalid conditions and denounces the weight of traditional beliefs and the psychological damage inflicted on women by patriarchal values in the countryside.

Beyond their stylistic differences, Gary Victor's and Yanick Lahens' short-stories show their authors' obsession with the living conditions in Haiti from the Duvaliers to the post-dictatorship era. Their stories indicate their concern for the degradation of moral values, loss of civic sense, and the growing corruption. The author of the article posits that through Haitian short-stories, readers are given access to a broader and more complex representation of Haitian politics and society which allow for a better understanding of the country.

Dr Marie-José Nzengou-Tayo is a Senior Lecturer in the Department of Modern Languages and Literatures, The University of the West Indies, Mona.



DR PAULETTE KERR

The Best Research Publication

ARTICLE: Explicit Goals, Implicit Outcomes: Information Literacy Education in Developing University Graduate Attributes

Higher education institutions are increasingly addressing the issue of graduate attributes holistically, as they strive to prepare students for the world of work and as citizens of a globalized information environment. The UWI Strategic Plan 2007-2012 Strategic Transformation for Relevance, Impact, Distinctiveness and Excellence (STRIDE) states that graduates of the UWI will exemplify attributes of creative and critical thinking; problem solving; effective communication; IT and information literacy; social and cultural responsiveness; and be ethical and lifelong, self-motivated learner. This begs the question as to which constituent in the university has the responsibility to develop these competencies.

This essay brings to the fore the integral role of one major, constituent and stakeholder in the university – the academic library – in shaping university graduate attributes via information literacy education.

This paper documents the important role of information literacy education in developing students' graduate attributes by highlighting explicit teaching goals of information literacy programmes of select academic institutions and concurrent realization of these goals as demonstrated in learning outcomes of online resources developed by these institutions. Objectives of advancing knowledge, lifelong learning, and critical thinking as well as developing institutional values and social responsibility in students are explicated by these academic libraries. While outcomes and strategies for realizing these goals via instruction initiatives were less explicit, they demonstrate a range of essential competencies including critical thinking, lifelong learning, accessing and using information effectively and ethical and social values.

Information literacy is defined and generally understood as the ability to access, evaluate and use information effectively towards a specific purpose and in varied contexts. While there are multiple understandings and models of information literacy, it is widely recognized as being foundational for effective engagement with information in academia, the workplace, for citizenship and daily living. Information literacy education has therefore, become more widespread in all types of academic environments as it seeks to develop a range of competencies including accessing, evaluating and using information to create new knowledge, critical analysis of information and sources, ethical use of information and academic integrity and lifelong and independent learning, which are competencies needed beyond the academic environment as global citizens.

This paper draws on select findings from an extensive in-depth study by the author, which investigated the practice of information literacy in academic libraries in the USA. The research employed a rigorous qualitative (constant) comparative analysis of concepts as expressed in 60 official mission documents and 150 exemplar online tutorials of best practice information literacy programmes of 11 academic libraries, as well as transcripts from in-depth interviews with key information literacy educators. The findings revealed the practice of information literacy as multidimensional, complex and contradictory with implications for practice in areas of pedagogy and instruction design towards consistency and congruence.

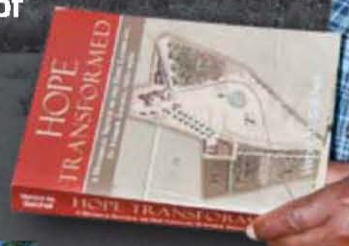
While the author's research findings confirm that information literacy education supports missions of universities in developing global citizens, the reach and integration of information literacy competencies in academic discourses remain limited. While universities explicitly state attributes and competencies that graduates should display, there is a need to explicitly address the implementation of these goals and objectives. The findings suggest a need for academic institutions to address widespread integration of information literacy competencies in academic offerings. While information literacy education is espoused mainly in academic library communities as being critical in supporting students' academic achievement, its wider significance in determining how graduates function in a global information-rich environment should also be explored.

Dr Paulette A. Kerr is tActing Head of the Department of Library and Information Studies.

PROFESSOR VERONT SATCHELL

The Best Research Publication & The Most Outstanding Researcher

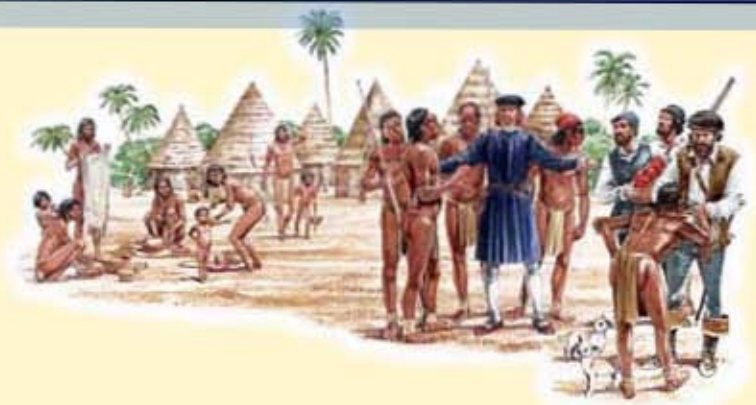
BOOK: Hope Transformed: Historical Sketch of the Hope Landscape, St. Andrew, Jamaica 1660-1960



The concept landscape is often misconstrued to mean the aesthetics of the countryside, or that which is picturesque. However, since the late 1950s with the evolution of Landscape History as a discipline, landscape has come to mean the interaction of humans with land.

Thus landscape encapsulates the social, economic, political life and ideology of each generation that settles upon a piece of land. Since residues of past generations [palimpsests] are often visible on the surface of the land, landscape provides excellent primary sources for the historian interested in analysing the socio-economic and political ideology of a society. The book Hope Transformed, A Historical Sketch of the Hope Landscape in St. Andrew Jamaica, 1660-1960, moulded in the theory and methodology of landscape history provides an analysis of the socio- economic and political ideology that shaped the landscape of the former Hope sugar estate lands, so named after its English owner Major Richard Hope that evolved between 1660 and 1960.

Hope has had a long history of human settlement beginning with the Tainos who settled in the 7th century along the banks of the Hope River in the area known today as Hope Tavern, until around the mid-17th century when they were annihilated by the Spanish invaders who captured the island in 1494. The Spanish immediately introduced a colonial landscape, typified by large privately- owned estates using coerced labour, including black enslavement. In 1655, the English captured and occupied the island, with the several invading officers claiming thousands of acres. In 1656, Major Richard Hope, one of these officers took more than 2,600 acres of land on the Liguanea Plains, St. Andrew, bounding north on the Liguanea range [Jacks Hill], through either sides of the Hope River into Kintyre, Hope Tavern, and Elletson Flats, westerly on Barbican and Widcombe, easterly, on the eastern side of Old Hope Road to include Blue Castle, down to the old Hinton East House below Matilda's Corner [Liguanea Terrace] which forms its southern border. By 1660, Major Hope successfully established a small farm of indigo and sugarcane. From this humble beginning the Hope estate grew to become one of the largest, most productive and most technologically advanced slave sugar estate in the island by the mid 1700s.



By 1848, Hope was in total ruinate and the nearly 200-year stranglehold this family had on Hope begun to be broken with the selling of 648 acres. In 1874, the government gained a foothold on the estate and became the owner of the entire property. Under government ownership the direction of the evolving Hope landscape was to be changed in favour of the Jamaican people. By 1960, the Hope landscape was totally transformed from one of harsh oppression and terror to one of liberty and gratification.

Hope landscape undoubtedly tells a very rich and intriguing history, one that spans centuries, and covers important eras and events in Jamaica's history. A study of the Hope landscape history is invariably a microscopic examination of the Jamaican landscape. Prior to the publication of Hope Transformed, there was no work that substantially addressed Jamaica's landscape history. This comprehensive text relieves that dearth, by providing landscape history material for both students and the general reading public, and paves the way for subsequent research.

Professor Veront M. Satchell is a Senior Lecturer in the Department of History and Archaeology.

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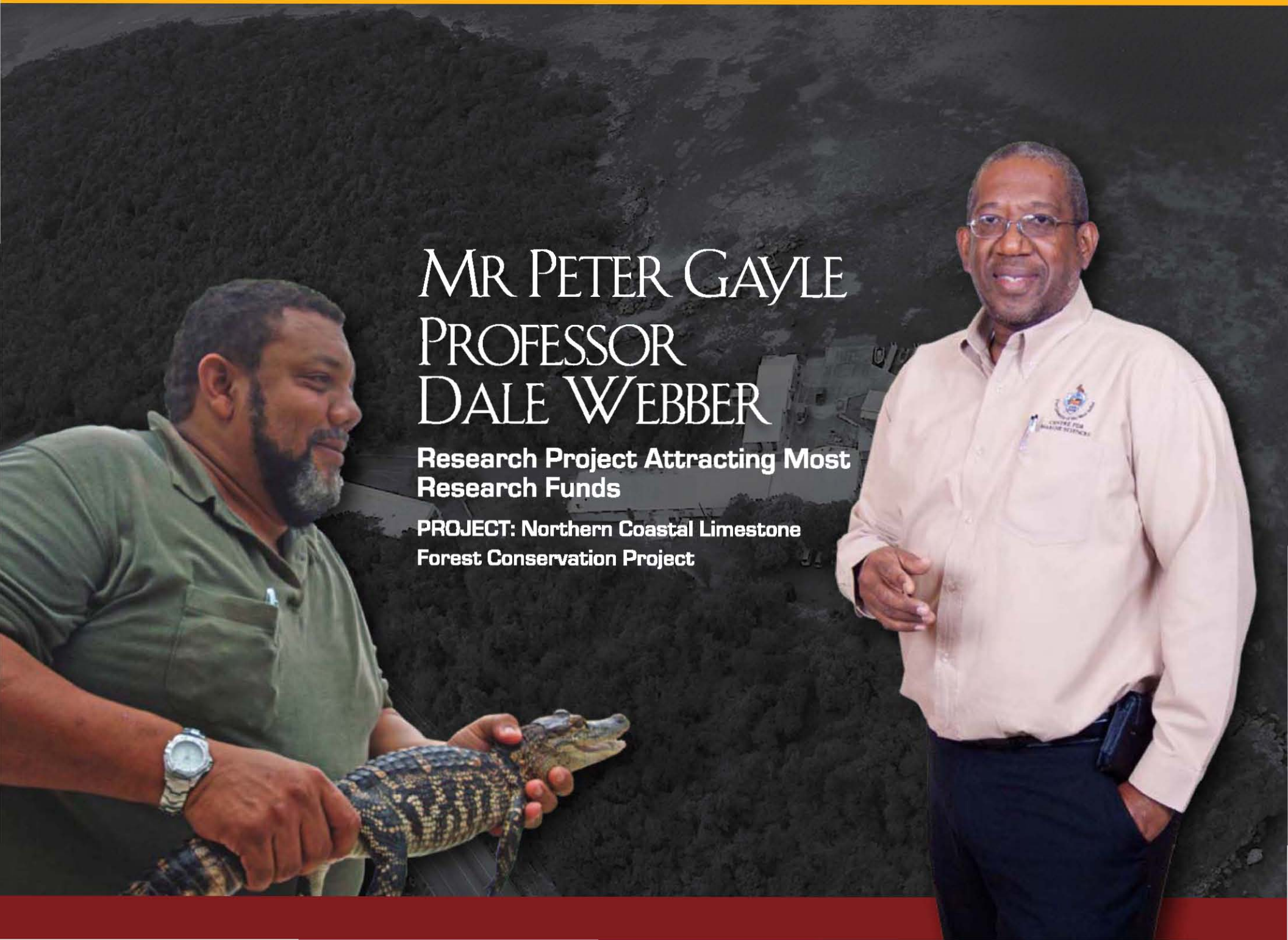


Mr Peter Gayle
Professor Dale Webber

Research Project Attracting Most Research Funds

PROJECT: Northern Coastal Limestone Forest Conservation Project

Since the 1970s Jamaica has lost approximately 40 per cent of its coastal forests to developments for tourism and housing. The sensitive limestone forests dominating St. Ann's coastline are under increased scrutiny for development as more accessible, easily manipulated beach areas are taken. Land uses for waste management, uncontrolled settlement/squatting, deforestation (coal production, scaffolding and fish pot sticks) have increased significantly in the last 15 years. These pristine forests that are being destroyed are rich in plant/animal endemism and diversity; [including the Jamaican yellow boa, endemic frogs (Osteopylus & Eleutherodactylus spp.), 6 spp. of Anolis lizards, birds, bats and plants (Laphantes orchids)]. They also serve as sources of groundwater and are important buffer zones between strong ocean waves and the land.

The present situation calls for the conservation of threatened and increasingly fragmented primary limestone forest habitat combined with the rehabilitation of impacted coastal areas. These activities may be enhanced by the implementation of an environmental education programme that targets coastal ecosystems, their functions and exploitable resources so as to encourage alternative development and employment options that demonstrate sustainable uses of pristine or threatened coastal resources.

Discovery Bay Marine Laboratory (DBML) contains approximately seven acres of pristine coastal limestone forest on the western side of the facility and immediately adjacent the Queens Highway in St. Ann which forms part of the north coast tourism corridor. This forest contains many of the protected animals and endemic plant species noted above. DBML has received funding (J$21.3 M) from the Forest Conservation Foundation to develop and implement the Northern Coastal Limestone Conservation Project.

Specific activities within this project will deal with the construction of a Coastal Forest Interpretive/Visitor Facility that utilizes environmentally-friendly construction techniques, materials and alternative energy sources. Key terrestrial features of this Facility will include an 18m diameter wooden gazebo (as a display

and teaching area) outfitted with audio-visual presentation equipment and display terrariums and aquaria; a raised 2m wide, 300m long boardwalk/ trail through the forest. Plants associated with commercial, medicinal and folk uses are labelled using common and scientific names.

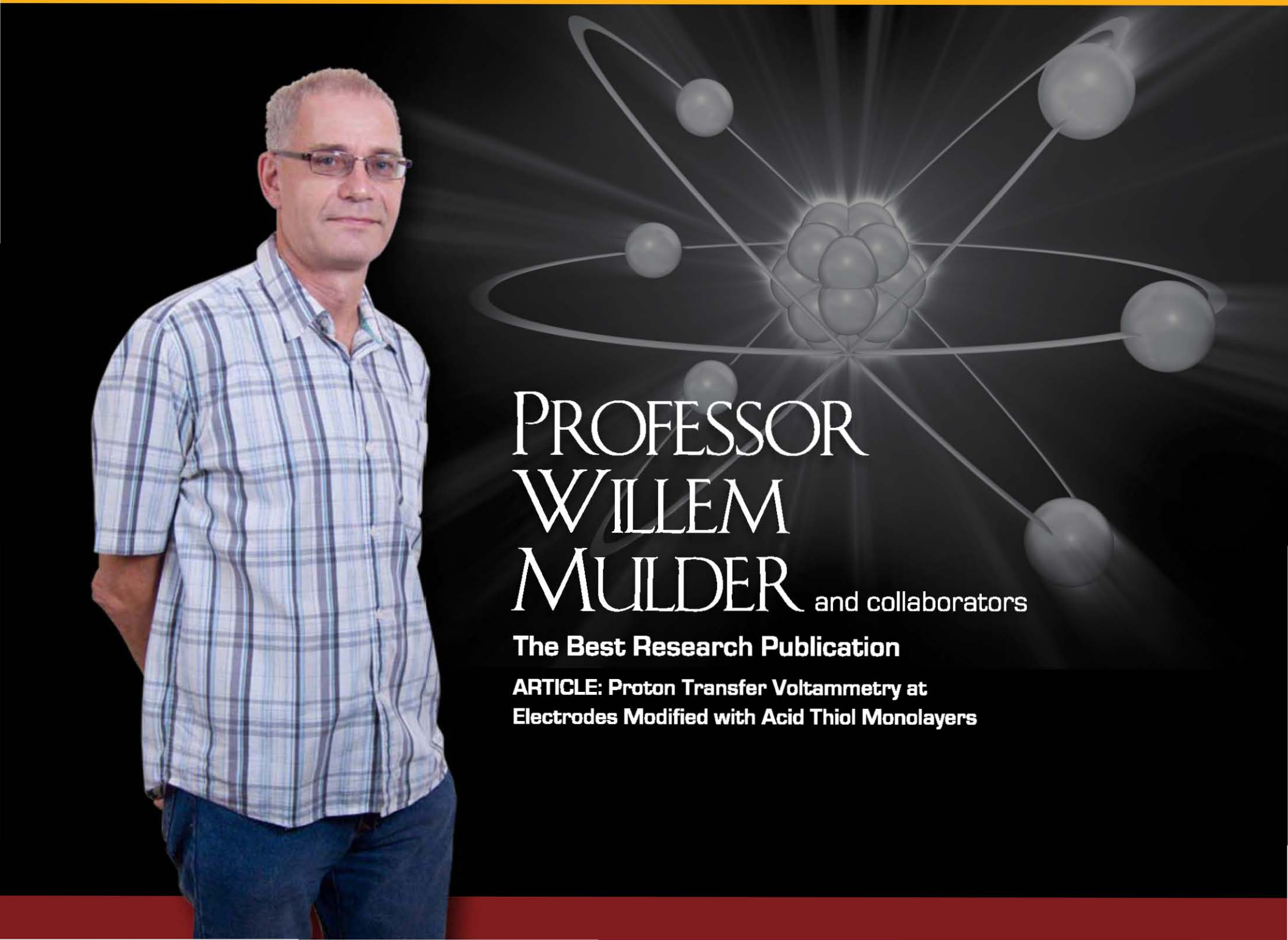
This unique project will fulfill five main objectives. First, it will assist the development of a comprehensive set of guidelines that will detail the best strategies for protecting and rehabilitating threatened coastal resources containing endemic and protected species (e.g. orchids, snakes – the Jamaican Boa, birds, frogs).

Second, this project will seek to conserve habitat biodiversity along Jamaica's north coast, and in particular, its remaining forested areas. The third objective recognizes the continued trend for increased coastal population densities and will therefore highlight options for sustainable use of coastal resources by preserving their basic structure and function. To achieve this calls for the provision of livelihoods linked to an "ecotourism based attraction" as a means of changing negative attitudes to the need for conservation. The fourth objective will see a concerted effort to create alternative and increased employment opportunities for residents from the surrounding community by focusing on those with skills and knowledge bases capable of highlighting coastal forest areas. Any successful ecosystem intervention also creates opportunities for scientific (research) and educational-based activities. This not only increases the stock of knowledge about local habitats but generates educational opportunities for impacting local and eventually international visitors.

Achieving this fourth objective opens the way for the realization of the fifth, namely showcasing ecosystem function. This conservation project will begin with terrestrial but extend to marine ecosystems and demonstrate the peculiar interdependence of coastal habitats and the dependence of the built environment on the natural. Best practices which encompass not only terrestrial activities but enlarge the concept to include coral reef preservation, restoration and fisheries management techniques can serve as a distinctive blueprint for the development of other types of eco-tourism destinations in Jamaica.

Mr Peter Gayle is a Co-Manager of and Principal Scientific Officer at the Discovery Bay Marine Laboratory. His current research interests relate to ecosystem rehabilitation, restoration and fisheries enhancement techniques.

Professor Dale Webber is Director of the Centre for Marine Sciences and the Discovery Bay Marine Laboratory. He holds the Grace Kennedy Foundation funded UWI Chair in Environmental Management named after James Moss-Solomon Snr.



PROFESSOR WILLEM MULDER and collaborators

The Best Research Publication

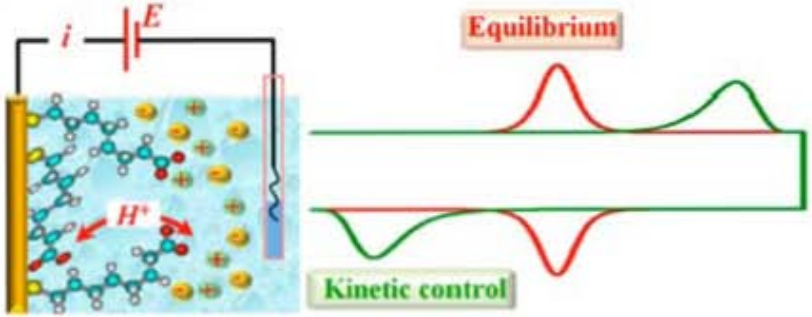
ARTICLE: Proton Transfer Voltammetry at Electrodes Modified with Acid Thiol Monolayers

Nanoscience is the study of objects with at least one dimension in the range from 1 to 100 nanometer (1 nm = 0.000000001 m). These objects exhibit interesting and unusual properties, in comparison with bulk materials, associated with the confinement to this scale, in particular quantum mechanical effects such as electron tunnelling through electrically insulating films. Peculiar phenomena such as these have found applications in diverse fields of technology, from computers (in the fabrication of giant magnetoresistance-based hard drives for reading and storage) to medicine, such as in drug delivery, cell repair and nanoelectronic biosensors.

Organic compounds with surfactant-like properties, typically hydrocarbon chains with a sulphur at one end, preferentially attach themselves to the surface of various types of metals, especially gold, through the formation of a strong chemical bond between the metal atoms and the sulphur (or "thiol") end group. Thus, layers of one molecule thickness are readily formed using techniques such as vapour deposition or electrolysis (via oxidation of sulphur). The resulting interfacial systems are commonly referred to as "self-assembled monolayers" or SAMs, for short. They are key elements in the manufacture and study of systems and devices in the field of nanotechnology.

The metallic nature of the substrate renders these systems suitable for use in analytical applications, in the form of electrodes. Since the properties of the bare metal surface are altered by the presence of the organic film, these electrodes are referred to as "modified electrodes".

The self-assembly of organic sulphur compounds offers a convenient route to impart functionalities to the metal surface, that will render it suitable for a wide range of applications such as bio-sensing and cell adhesion. This is achieved through the inclusion of chemical compounds at the other end of the hydrocarbon chains, such as oxidising or reducing ("redox") agents, which exchange electrons with the electrolyte solution present (in a galvanic cell), or protons, if the compound is an acid or base. (The proton, a building block of atomic nuclei, carries the smallest unit of positive charge, e, and is about 2,000



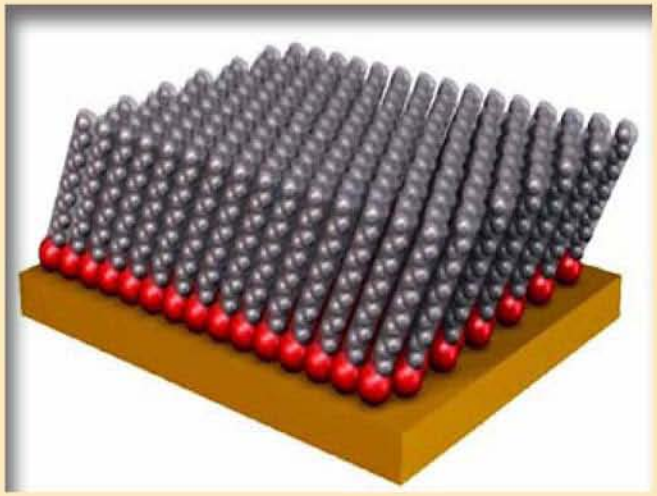
times heavier than an electron, the carrier of the elementary negative charge, –e). The nature of these terminal groups thus determines the (electrochemical) response of the electrode to various chemical and physical stimuli.

Despite the progress that has been made in the knowledge and application of these molecular assemblies, a fundamental understanding of their physical, chemical, and structural properties has remained elusive.

This paper describes a contribution towards the elucidation of some of these issues, summarising the recent outcomes of an ongoing collaboration between the UWI Chemistry Department and the Departamento de Química Física at the University of Sevilla (Spain), which focuses on the properties of modified electrodes. More specifically, the paper describes an experimental and theoretical study of the exchange of protons between a thin layer of chain-like organic molecules deposited onto metal electrodes and a, slightly alkaline, electrolyte solution.

The model system used in this study consisted of a single-crystal gold electrode coated with a compound known as "11-mercaptoundecanoic acid" which has a weakly acidic ("carboxylic") end group that has essentially the same structure as acetic acid (the main component of vinegar).

The electrode was used in an electrochemical cell configuration, connected to an auxiliary electrode via a device known as a potentiostat, which was used to control the voltage between the electrodes. Typically, the voltage is varied at a constant rate and the electric current that flows through the measuring circuit in response to this signal is measured simultaneously. The technique that was applied in this study is known as "cyclic voltammetry", where the voltage cycles back and forth at a constant rate between two extreme values.



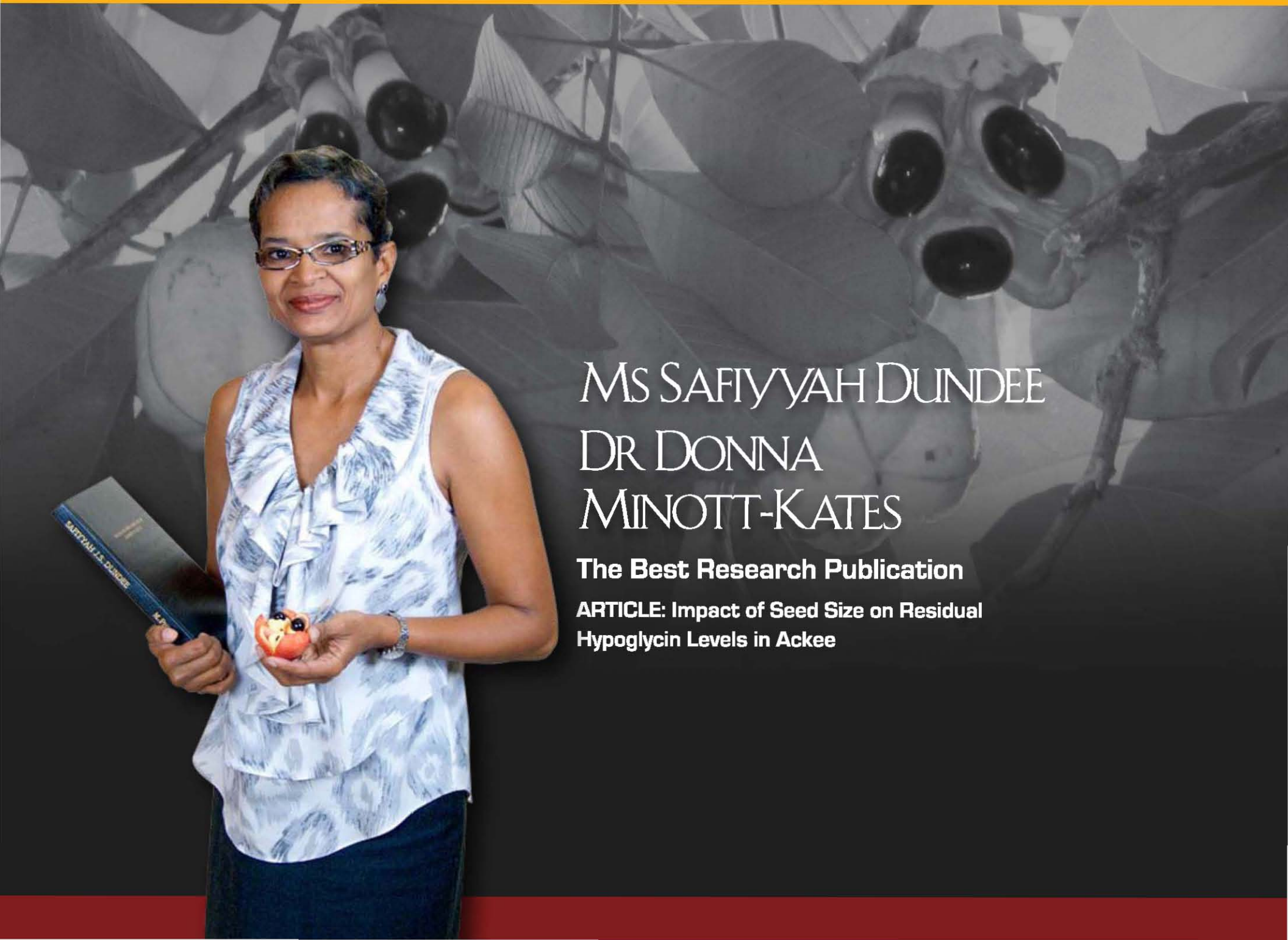
The experimental results have shown that only about 1% of the carboxylic groups are involved in the voltage-induced proton transfer between film and solution, that these groups are buried in the organic film, and that they lie close to the metal surface. The remaining groups are in direct contact with the alkaline medium, and permanently stripped of their protons (and hence electrochemically inactive).

A mathematical analysis of this system in light of a novel physicochemical model has led to the conclusion that a well-established conceptual framework, known as "Marcus Theory", which was developed in the 1950s and 60s for the description of electron transfer processes, is equally applicable to proton exchange since the agreement between theory and experiment was found to be excellent. This theory emphasises the role of the medium (electrolyte solution, film and metal in this case) in determining the feasibility of charge transfer, and quantitatively expresses this in terms of a so-called "reorganisation energy". This refers to the amount of energy required to produce a configuration of the molecules surrounding the proton donor and acceptor such that the proton can jump between them without a net loss or gain of energy, which is a prerequisite for the reaction to occur. The occurrence of a favourable configuration is a random event, governed by thermal fluctuations. Its probability, which is a direct measure of the rate at which protons are exchanged, has been calculated and found to agree remarkably well with the experimental results. In particular, a peculiar phenomenon known as the "inverted region effect" (where, upon increasing the "driving force" behind proton transfer between film and solution, the cell voltage in this case, the process actually slows down) is implicit in this theory, and has been observed in the experiments (albeit indirectly).

The insights gained from the model description in conjunction with the experimental findings can be expected to significantly aid in the rational design of modified electrode surfaces for use in a wide range of analytical applications.

Professor Willem Mulder is Senior Lecturer in the Department of Chemistry


Au
Cu
500 nm
50



Ms Safiyyah Dundee
Dr Donna Minott-Kates

The Best Research Publication

ARTICLE: Impact of Seed Size on Residual Hypoglycin Levels in Ackee

Historically there have been periodic outbreaks of a "mysterious illness", designated the Jamaican Vomiting Sickness, which would result in numerous deaths in rural Jamaica, typically among children and the elderly. Symptoms vary in severity and include vomiting, lowering of blood sugar levels and, in extreme cases, death. Almost one hundred years ago ackee was implicated as the cause of Jamaican Vomiting Sickness following a report many years earlier by the Island Chemist of extraction of a toxin from distilled ackee. In the 1950s this link was confirmed by researchers at the University of the West Indies who isolated and identified the toxin and determined that these outbreaks could be attributed to the consumption of unripe ackees.

Although the populace knows that ackee which is not fully ripened should be avoided there are still reported cases today of ackee poisoning, the latest occurring over the period December 2010 to February 2011, with several confirmed fatalities. Ackee consumption in Jamaica dates back centuries. Despite this, much remains unknown about the poison which it contains. While the identity of the toxin in ackee (hypoglycin) is known, the various factors which periodically contribute to elevation of the levels of this toxin are yet to be delineated.

Role of the ackee seed in hypoglycin conversion

Hypoglycin, the poison in ackee, occurs in two forms. Hypoglycin A is found in the edible part of the ackee (the aril) and in the seed, while its derivative, hypoglycin B, is found only in the seed which is typically not consumed. Minott's research group previously demonstrated that as the fruit matures and the ackee pod opens the level of hypoglycin A in the aril is exponentially reduced and drops to a concentration which is negligible or safe for consumption. Simultaneously, the amount of hypoglycin B in the seed increases. Evidently, hypoglycin A in the aril is being translocated to the seed and converted to hypoglycin B; the seed thus plays an important role in detoxification of the fruit as the poison moves into the seed where it is stored as hypoglycin B. Following on this finding, the characteristics of the ackee seed were investigated to determine the influence of the seed on the levels of hypoglycin A in the fruit.

Relationship of ackee seed size to hypoglycin content

Mature, open ackees collected from several trees were shown, not unusually, to have seeds of different sizes including very small seeds embedded in the aril. These immature or aborted seeds varied in frequency from 5 to 18% per tree of the ackee fruit population sampled. Ackee seeds, categorized according to size (large, regular, medium, very small), were analyzed using the technique high pressure liquid chromatography, wherein, an extract of the seed was separated into its components and the hypoglycin concentration measured. Levels of the stored toxin, hypoglycin B, in the very small or aborted seeds were less than half that

found in the regular seeds and in some cases hypoglycin B was not detected. This indicated that fruits with aborted seeds had a lower capacity to assist in natural detoxification through the translocation route.

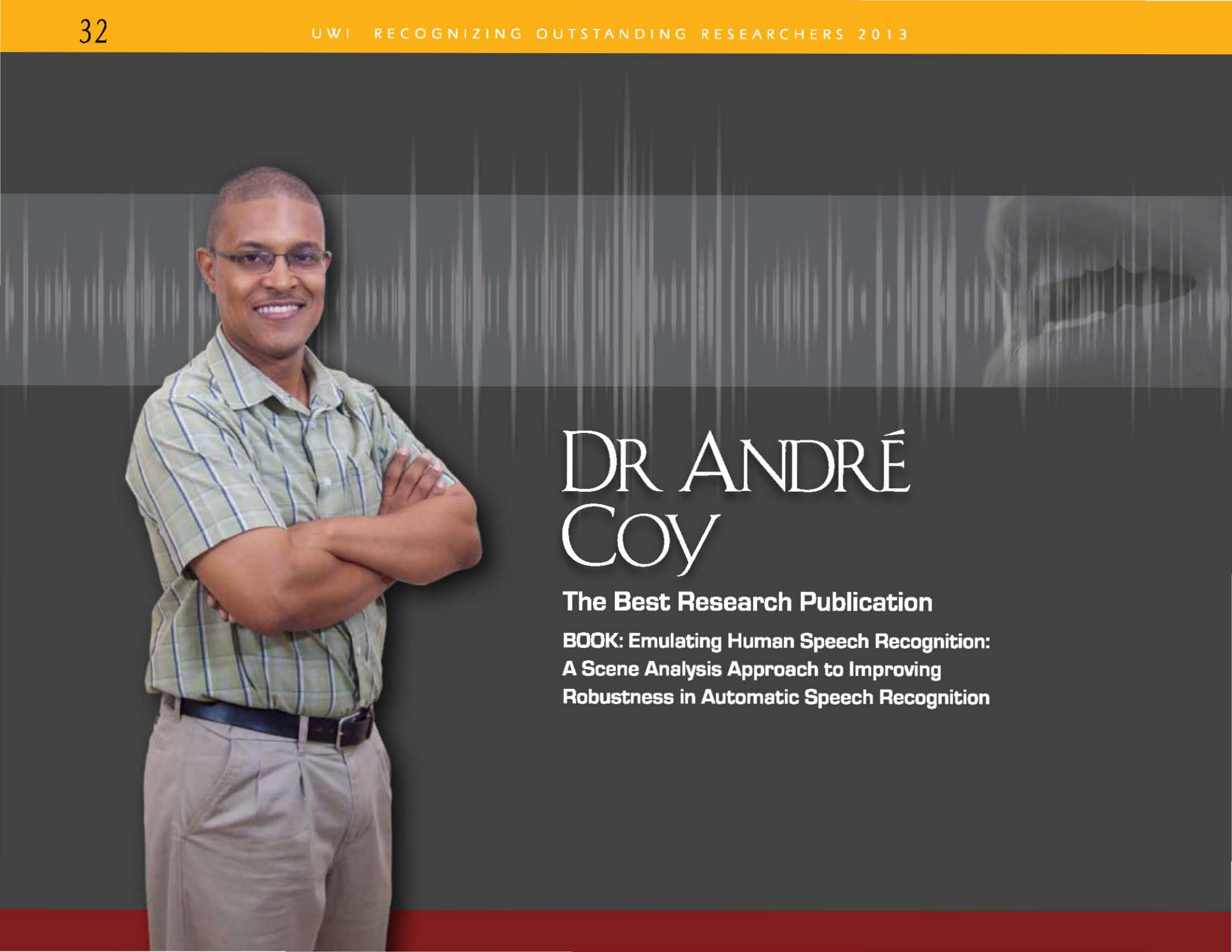
When the associated edible part of the fruits were similarly analyzed, the amount of the toxin hypoglycin A in arils from which aborted seeds had been removed were found to be significantly higher than in arils which had borne regular seeds. Fruits from one tree had much higher hypoglycin A concentration than other trees sampled, demonstrating the existence of natural low and high hypoglycin ackee varieties. Arising from this work, efforts should be directed towards identification of suitable low hypoglycin ackee varieties for propagation.

Implications

While it is known that only naturally opened mature ackees should be eaten, the findings adduced by Dundee and Minott suggest that ackee consumers could be well recommended to limit their consumption of arils from which embedded, very small or aborted seeds have been removed. It is advisable therefore, that food processors avoid including significant amounts of ackee aril from very small seeds in order to reduce the residual hypoglycin concentration in the product. Processed ackee is an important foreign exchange earner, ranked in the top five for the agricultural sector. Hypoglycin content in processed ackee is strictly regulated and measures that may be instituted to reduce the residual levels are actively being explored. It is recognised that several factors contribute to an increase in the levels of hypoglycin in ackee, seed size being only one. The possibility exists that these factors might vary at different times and seasons, according to environmental influences, and could act synergistically. This study by Dundee and Minott contributes to the limited information available on factors that are responsible for elevated levels of toxins in the ackee fruit.

Dr Donna Minott-Kates is a Lecturer in Food and Applied Chemistry and Coordinator of the Food Chemistry programme in the Department of Chemistry. Her current research interests include characterization of toxins and other components/ properties of Jamaican foods.

Ms Saflyyah Dundee (MPhil) is a graduate of the Department of Chemistry and is currently an entrepreneur pursuing research leading to potential commercial products of local origin.



DR ANDRÉ COY

The Best Research Publication

BOOK: Emulating Human Speech Recognition: A Scene Analysis Approach to Improving Robustness in Automatic Speech Recognition

Advances in Automatic Speech Recognition (ASR) have made it possible to dictate documents directly to a computer or smart-phone. One can, order pizza using an automated telephone-based response system and control various devices using speech. In general, speech recognition has the capacity to positively impact our lives by allowing natural interactions with computers in order to simplify complex tasks.

However, despite these great strides, users of the technology will attest to the fact that the performance of these systems is not quite what they expect. Modern ASR systems still do not perform as well as humans do when operating in noisy conditions, especially where there are multiple individuals speaking at the same time. Most conversations take place in a social context in busy locations. The normal environment in which we would use speech recognition systems is full of unwanted sounds and noises, as well as the buzz of other people's conversations and activity. Human listeners are exceptionally good at recognising and understanding what is said to them in these conditions, yet contemporary ASR is very fragile when placed in such circumstances and recognition accuracy deteriorates dramatically. This has significant implications for the ease of use of the technology as well as its acceptance as a tool for everyday use.

The research conducted in this project presents a systematic approach to the automatic recognition of speech signals from overlapping speakers using techniques inspired by what we know of human hearing. The outcome is a comprehensive insight into the mechanisms required if ASR is to approach human levels of performance. Experimental results prove that developing speech recognition systems that mimic human speech processing increases the robustness of these systems to noise, even when the noise is speech from others.

The potential benefits of this new approach are tremendous as it moves the technology a step closer to the goal of seamless, natural interaction between humans and machines. This enables us to use ASR to tackle real-world problems. Consider two potential applications for Jamaican society: literacy education and assistive technologies for the disabled. Speech recognition can be employed to assist in the drive to have 100% literacy in the future. By developing an automated literacy tutor that is augmented with speech recognition technology, it is possible to reach large numbers of struggling readers to provide the individualised assistance that is needed, but that cannot be delivered given the limited resources in our schools. The Ministry of Education has given permission to conduct a pilot project in 10 Corporate Area Primary Schools. The aim is to record the speech of 450 literate boys in grades 4-6. These recordings will be used to create models of Jamaican speech to be used in the

literacy tutor, which needs models of correct pronunciation in order to recognise when errors are made by struggling readers. With additional funding the project will expand into rural schools.

The independence of members of our disabled community can be fostered with the use of speech recognition technology. Take for instance, the current practice of using a sighted individual to transcribe the utterances of a visually impaired student during an exam. The potential exists for the visually impaired to work independently using software developed to perform the transcription directly. If the software is developed using local expertise , the issue of recognising local accents, which commonly arises when using commercially available software, will be eliminated. This could pave the way for greater intake of disabled students and a reduction in the cost of scribes.

The outcomes of the research also have international relevance with the potential for the development of solutions that are applicable worldwide. The approach suggested in the book form the basis of a project currently being undertaken to develop intelligent hearing aids. Currently hearing aids blindly amplify or remove sounds in a certain frequency range, which can sometimes also remove important information. In collaboration with partners at the University of Sheffield, the project which began in September 2012 aims to use techniques based on human speech processing to distinguish between relevant and unwanted sounds in such a way that the hearing aid can remove those sounds that are not relevant to the user, allowing him/her to attend to the source of interest.

These applications are just a few of the many potential uses for the techniques developed in the work. The examples highlight the fact that speech recognition technology is not only useful for popular recreational applications, but it also offers the opportunity for the development of directly applicable solutions to some of the issues facing the most vulnerable in society. .

Dr André Coy is a Lecturer in the Department of Physics. His current work includes the development of automatic speech recognition systems for practical applications.

Professor Noureddine Benkeblia

Most Outstanding Researcher

Physiology, Biochemistry and Metabolomics of Fresh Crops

There are probably 1,000 to 2,000 crop species which contribute to man's diet. But little or next to nothing is known about many others because they are not extensively cultivated or known by local populations of small countries or regions. For example in Jamaica, fruits such as noni, ribena and 'stinking toe' are not well known. Because of the number and complexity of these crops, most aspects of biochemical and physiological changes as they relate to primary, and even secondary metabolism, in postharvest crops are at best incompletely understood, and even events of fairly general importance and which represent major change, such as starch-sugar transformations, are not fully understood at the biochemical level.

Postharvest technology should be given more emphasis, to prevent crop losses and promote the efficient use of agricultural products to meet demands for fresh crops. The development of postharvest technology is one of the contributing factors to securing a stable supply of food products in addition to increasing agricultural income and improvement of diet, especially in many developing countries. Postharvest losses are estimated at more than 45% in some developing countries while the acceptable level should not be more than 10-15%. Even though financial support for agriculture is increasing in a majority of countries, the investment in postharvest technology is still very low compared with other sectors, and this is contributing to negligible interest in this research work.

Postharvest physiology and biochemistry of fresh crops affect quality and storability of crops. This postharvest research aims to determine which factors are responsible for postharvest losses and how these factors link to a systems approach to deal adequately with the problem. The goal is not only to extend the storability of postharvest crops which varies considerably because of the specific physiology and biochemistry of each crop, but also to satisfy the consumers' demand for greater variety and better quality of fruits and vegetables.

So how can metabolomics be combined to conventional physiology and biochemistry of crops? From the last two decades, postharvest science has been using emerging technologies, such as genomics, and more recently transcriptomics and proteomics. Crops stresses resulting from natural processes, plant-microbe interactions, physiological disorders and biotic or biotic stresses or other inducing phenomena, trigger many biochemical reactions leading to the formation of hundreds of different molecules. Besides being specific to biochemical reaction, some of these molecules have a very short life and are indicators of specific reactions. Indeed, many molecules are well known to be

elicited during specific stresses, and these components could be involved in accelerating undesirable processes, or to the contrary, trigger certain resistance of commodities to these undesirable processes. Metabolome profiling of the system biology constitutes a good survey of different molecules resulting from different reactions of different biochemical and enzymatic reactions. Profiling the molecules preceding, during and/or following the stresses or any other process, would indicate the behaviour of the produce not only at the whole level, but also at the cellular, even the compartmental (cell organelles) levels. This understanding would likely help to determine the appropriate conditions of storage, the physical treatments, such as modified atmosphere/controlled atmosphere, to divert the biochemical reactions towards the desired way, or at least slow down the production of the undesirable molecules by reducing the speed of the respective reactions. This will also help to make commodities acquire a self-defense biochemical system, extending the shelf-life of commodities with less stress and better quality attributes for preservation.

Fresh crops are very rich sources of bioactive compounds such as phenolics and organic acid. Biochemistry combined with metabolomics assay as a new dimension, are also focusing on the biochemical contents of tissues, and are gaining a rapidly increasing knowledge on the value of fresh crops value to human health. Thus, bioactive crops compounds, their characterization and utilization as functional foods, and assessment of their antimicrobial properties, are among the major targets of contemporary research that biochemistry and metabolomics of fresh crops aim to achieve.

The laboratory of Crop Science, in the Department of Life Sciences, UWI, Mona, is developing this research programme: "Physiology, Biochemistry and Metabolomics of Fresh Crops" which include three main topics: (i) The development of storage technologies by understanding physiological and biochemical behaviour of fresh crops during their postharvest life, (ii) the metabolome of postharvest life of fresh crops, and (iii) the profiling of the natural biological active compounds (NBAC) of Caribbean fresh crops and assessment of their biological activities for application as food preservatives and nutraceutical agents.

Professor Noureddine Benkeblia is a Professor of Crop Science in the Department of Life Sciences.

DR KURT MCLAREN

Most Outstanding Researcher

Tropical Forest Ecology and Regeneration

The continuous destruction and degradation of natural habitats and, as a cosequence, the increasing number of threatened species, is particularly severe in developing countries such as Jamaica. Furthermore, it now appears to be a certainty that existing impacts on natural ecosystems will be exacerbated by climate change. Jamaica, like many islands of the Caribbean is highly vulnerable to the impacts of climate change, and especially vulnerable to the effects of sea-level rise. Not surprisingly, the predicted impact of climate change on small island states in the Caribbean has been addressed.

However, many predictions of global climate change are made at the regional scale, and there is a lack of adequate observational data and models of sufficiently fine resolution to provide specific information for individual islands. These deficiencies need to be addressed, so that remaining uncertainties can be reduced or eliminated, and national and local-scale adaptation strategies for small islands can be more precisely defined.

Jamaica, like many other countries in the Caribbean, has been slow to assess the impacts of global climate change due to the same factors that have also inhibited assessment efforts in other countries within the region. These factors include insufficient funding, and most critically, basic data and the required technical expertise. In 2004, we (Prof Byron Wilson and I) embarked on research aimed at tracking biodiversity changes (specifically frogs and trees) in four important terrestrial ecosystems in Jamaica (a moist, wet and dry forest over limestone, and a herbaceous wetland) where we established and assessed a network of plots, and later expanded to include the landscape-level components.

Our current research agenda focuses on (1) generating comprehensive status assessments of biodiversity and habitats/ecosystems, (2) determining habitat specific deforestation rates and habitat fragmentation patterns from 1941 to present, and their effects on biodiversity, (3) assessing the impacts of socio-economic parameters and environmental policies on deforestation and habitat fragmentation, (4) assessing the impact of invasive flora and fauna on native species, (5) increasing local capacity to collect and analyze habitat and biodiversity information, and to use this information to inform conservation and management decisions, and (6) providing a framework for future long-term monitoring of species and habitats.

A more recent (funded) thrust seeks to build on previous initiatives. Specifically, we plan to (1) quantify and valuate the services provided by both ecosystems, using a combination of traditional and emerging technologies, (2) build local and regional capacities by providing training to individuals at the graduate and post-doctorate levels, including the development of a formal curriculum focused on the valuation of ecosystem services, (3) assess the impacts of sea level rise on the vegetation and local communities found within the herbaceous wetland, and (4)

incorporate the resultant information into a web-based decision support system (DSS). This initiative has allowed us to invest in cutting edge, state-of-the-art equipment and expand a recently established 'Conservation GIS, Remote Sensing and Ecological Modelling' computer lab (which was established using funding granted by the MacArthur Foundation in 2007). This technology, together with emerging techniques, will be used to generate data and information essential for habitat and biodiversity status assessments, terrestrial and aquatic habitat monitoring, and ecosystem services quantification.

Our research to date has shown that local anthropogenic (human) effects have had significant impacts on these ecosystems. Deforestation in the Cockpit Country for the period 2001 to 2010 is at its highest level since 1941. The threats to the existence of the Black River Lower Morass (BRGM) remain unchecked, resulting in the continued loss or degradation of various habitat types. The Hellshire Hills is under constant assault, and we are yet to determine the impact of 40 years of unchecked cutting of trees for charcoal production at the level of the entire ecosystem. We have quantified some of the services provided by these ecosystems, and this research is ongoing. Also, we hope to determine the impacts of climate change on the provision of these services within the next year.

Dr Kurt McLaren obtained a Double Major (Zoology and Botany) from UWI in 1995, a PhD from Bangor University (UK) in 2001 in Tropical Forest Ecology, an MSc in GIS and Remote Sensing from University of Leeds in 2007. His areas of expertise are Tropical Forest Ecology, Landscape Ecology, Remote Sensing, GIS and Ecological Modelling.

Dr Mona Webber | Mrs Sophia Davis
Mr Camilio Trench | Mr Hugh Small
Ms Sharda Spence

Research Project with the Greatest Business/ Economic/Development Impact

PROJECT: The UWI/EFJ Port Royal Marine Laboratory Biodiversity Centre Project

Coastal marine ecosystems are under threat worldwide with the negative effects from a range of activities destroying habitats, reducing biodiversity and removing ecosystem functions. Coastal and marine ecosystem research carried out by the University of the West Indies, (UWI) Department of Life Sciences at Mona, has documented the tremendous biodiversity associated with the Jamaican coastal area, the impact of pollution and human activities and ways to reduce and remove these threats.

The overall goal of the UWI, Environmental Foundation of Jamaica (EFJ), Port Royal Marine Laboratory (PRML) Biodiversity Centre project was to create a focal point to engage and educate Jamaicans about the habitats and biodiversity associated with mangroves, sea grasses and coral reefs and to show the importance and interrelatedness of these coastal systems.

To this end a grant of J$6,342,070 was obtained in 2009 from the EFJ to modify an un-used building at the PRML and carry out landscaping of the grounds to show natural coastal habitats. The Biodiversity Centre (BDC) was conceptualised as a visitor centre for environmental education and outreach using the research done at the UWI to educate and inform children and adults about these valuable coastal systems, and how their conservation and preservation can benefit us all.

The project had five specific objectives which are summarised into two main focus areas. The first was to design and present examples of mangroves and other coastal systems in indoor aquaria and through other visual and interactive displays. Another focus area was the creation of an outdoor display landscaped to show coastal forests (with emphasis on mangrove and sand dune environments). Scientific findings were converted into posters and visitor information guides which are displayed and used as part of the structured educational tour and visitor awareness activities. A typical visit to the facility may include a tour of the indoor and outdoor displays as well as a boat tour into the nearby Port Royal Mangroves or a snorkel over the reef and sea grass areas of Lime Cay.

The project objectives were fully achieved by January 26, 2010 when the UWI/EFJ/PRML Biodiversity Centre was officially opened to the public. The indoor displays included five main aquaria: mangrove tank, coral reef tank, fishes associated with coastal systems, a predator tank showing open water and benthic predators and a seahorse tank with seahorses grown at the facility. The aquaria are encircled by a touch-tank which houses harmless animals which can be handled by visitors, especially children. The display room has artwork that depicts the habitats and organisms associated with the live

display. The indoor displays are constantly modified with addition of new coastal/marine organisms and habitats. A terrarium with baby crocodiles, an octopus tank and a cylindrical jellyfish tank are recent additions.

The outdoor facility displays the typical dry-limestone cactus and sand dune coastal habitats transitioning into a mangrove tree/forest habitat with flowing water connected by a boardwalk. The PRML mini-mangrove forest has all four species of mangroves found in Jamaica (Rhizophora mangle- red mangrove; Avicennia germinans (Black mangrove), Laguncularia racemosa (white mangrove) and Conocarpus erectus (Button mangrove). The cactus and sand-dune area has a range of beach-strand plants such as Beach Morning Glory (Ipomea pes-caprae), beach grass (Sporobolus virginicus) and a range of Cacti: Stenocactus cerus, Melocactus communis (Turk's cap); Opuntia jamacanensis (endemic). That area also includes an iguana hut with two sub-adult Jamaican iguanas.

The BDC can accommodate 150 children per day (three days per week being ideal). Thus the facility can host just over 17,000 visitors yearly. The ability to expose students and adults to Jamaica's marine plants and animals will go a far way in sensitising our population to the value of Jamaica's marine habitats and promote conservation and wise use of the resources.

The BDC has had visitors from all parishes and many schools throughout the year. The children's ages 4 to 18 years and the Prep/Primary schools prefer indoor/outdoor tours, while students from the high schools often combine the BDC tour with a mangrove tour (MGR). Some high schools students visit over a two-week period to cover aspects of the CSEC and CAPE syllabi and the tours and exposure assist with the School Based Assessments (SBA's). Visitors from Teachers' Colleges concentrate mainly on pollution, sustainable tourism and the use of equipment to collect environmental data.

Requests have increased for the demonstration of equipment and carrying out of basic water quality tests and so a "Pollution tour/Lab-at-sea" was developed to demonstrate the equipment and techniques used to sample water quality of the Kingston Harbour. With sufficient notice and dialogue, schools are able to have specific elements and activities incorporated into the "tours" so information/techniques with direct bearing on aspects of the CAPE or CSEC syllabus can be obtained.

Although the BDC project came into being through a grant to Dr Mona Webber, the work to establish and maintain the Centre has been done by past and present employees of the UWI Mona, Port Royal Marine Laboratory. These include Mrs Sophia Davis chief artist and display manager, Mr Hugh Small, Mr Camilo Trench and Ms Sharda Spence who conducted dives, set fish pots and liaised with fishermen to obtain appropriate specimens for the displays.

The Biodiversity Centre Project officially came to an end in November 2011 after the generation of the final project report and financial statements for submission to the EFJ. The UWI Mona Campus

2011 – 2012 financial statement of income therefore indicates funds generated solely from visitors to the facility showed a profit of J$2,224,662.55, however, the potential income from an estimated maximum 17,100 student visitors per year ($800 per student for the combined Biodiversity Centre and Mangrove tour) is J$13,680,000.

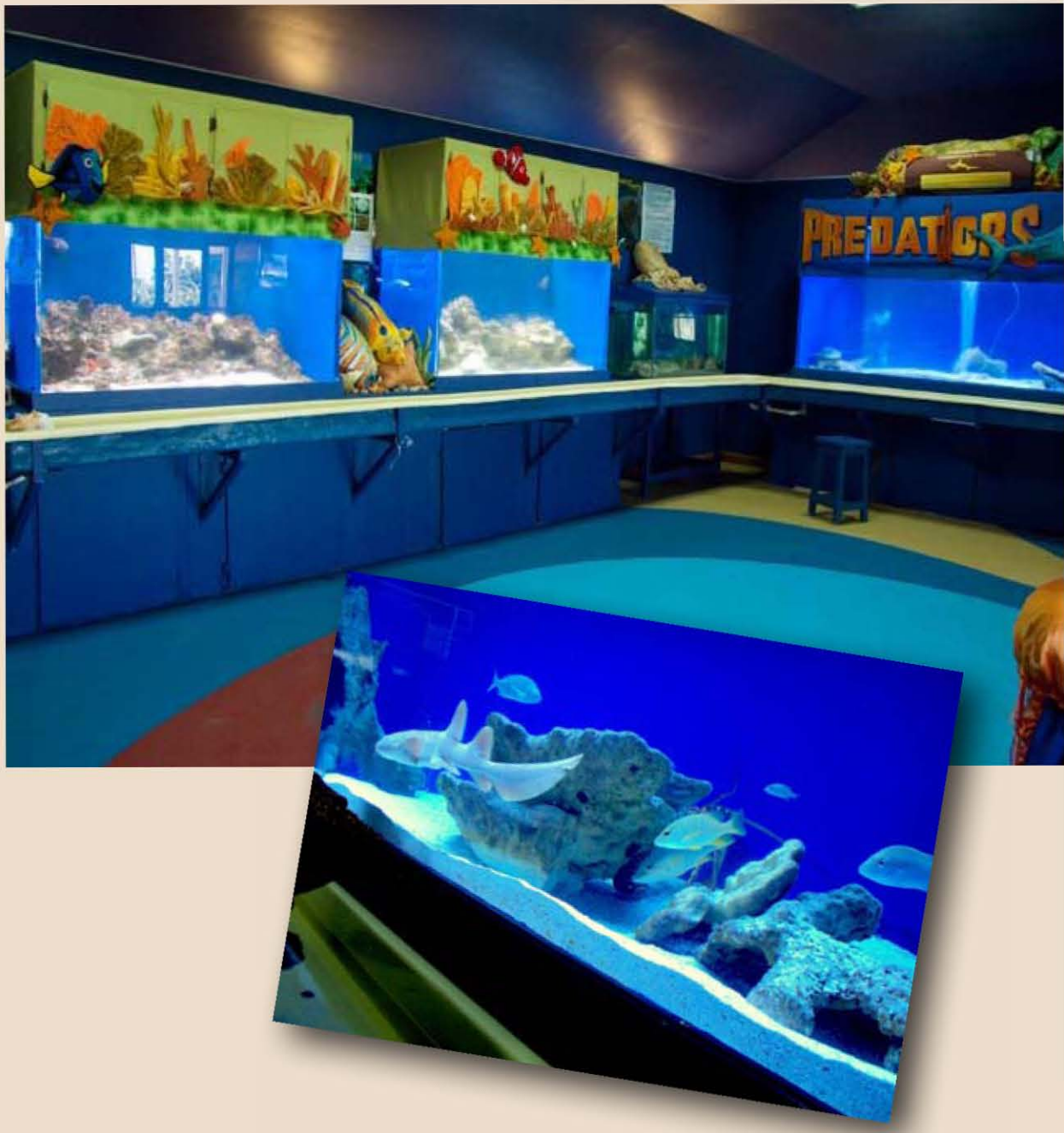
Dr Mona Webber is Head of Department of Life Sciences and Academic Coordinator of the Port Royal Marine Laboratory- PRML

Mrs Sophia Davis is Administrative Officer at the PRML and also a PhD student conducting research on the culture of the Jamaican seahorse found in mangrove areas.

Mr Camilio Trench is Senior Scientific Officer formerly at the PRML and now at the Discovery Bay Marine Lab. Camilio has an MSc in Marine and Terrestrial Ecosystems.

Mr Hugh Small is Chief Scientific Officer at The Port Royal Marine Laboratory. Mr Small has an MPhil in Marine Sciences.

Ms Sharda Spence was the first Outreach Officer employed to the newly launched Biodiversity Centre from August 1, 2010 – July 2011 helping to develop the tour packages and presentations. Ms Spence has a BSc degree in Marine Biology from Life Sciences.



UWI MONA

FACULTY OF SOCIAL SCIENCES

Professor Hopeton Dunn | Mrs Michele Thomas Ms Allison Brown

The Research Project Attracting the Most Research Funds

ARTICLE: Open Business Models: New Compensation Mechanisms for Creativity and Inclusion

Music is big business, generating billions in revenue and royalty payments, usually for large, well-established global music companies. But, we live in changing times, impacted by the Internet and new media technologies, platforms and services. These changes have profound implications for how music is recorded, distributed and performed all over the world. Newly emerging Jamaican artistes, producers, song writers and composers face the challenge of how to operate in this rapidly changing environment while continuing to generate a rich stream of creativity with international appeal and cultural influence.

How has the Jamaican sector approached the need for transitioning into the digital age? What is the music industry's relationship with the new global "click economy" where goods and services are marketed and distributed in an online environment? How do these changes influence intellectual property issues, the compensation arrangements for new artistes, and their creativity in the use of the new tools? These questions form the basis for new directions in academic research at the newly re-branded Mona ICT Policy Centre, UWI. A small research team from the Centre, supported by researchers such as the UWI's Dr. Michael Witter and well-known cultural industry analyst, Clyde McKenzie, will map the contours of the music industry in transition to the 'click economy'.

It is this project that copped this year's prestigious award for the research undertaking attracting the most funds in the Faculty of Social Sciences.

Funding for the Jamaican component of the project is being provided by the International Development Research Centre (IDRC) of Canada. In addition to the Mona ICT Policy Centre, other collaborating partners include the Center for Technology and Society (FGV) in Brazil, Fundación Karisma in Colombia, and the Program on Information Justice and Intellectual Property at American University's Washington College of Law in Washington D.C., USA. One key expected outcome of this two-year research study is to help find ways "to promote a fairer Intellectual Property system that includes new forms of compensation for creative work inside the network society, whilst promoting creativity and inclusion in developing countries".

Global dialogue on intellectual property issues related to the music sector is now focused on the impact of what is called Open Systems created by the Internet. This development has created opportunities for new forms of compensation and new criteria for claiming copyright. For example, artistes in Brazil are now requiring royalties from the Internet site YouTube for their music videos that are downloaded all over the world. This is especially important in light of reports of declining incomes from traditional sources of music sales, such as CD stores and the now virtually extinct DVD distributors.

A primary objective of the project is to investigate how the traditional royalty-collecting societies in Latin America and the Caribbean may be reformed, including the introduction of better mechanisms for compensation, accountability and service delivery to the creators of new or

re-mastered music content. A careful study of issues of policy, legislation and regulatory frameworks, will provide an in-depth analysis of the constraints emerging artistes face in order to sustain their creative work, their use of social media, and the barriers they face in becoming members of collecting societies. The Jamaican component further purports to develop a better understanding of the character of and current trends in the digital music economy. Importantly, it will explore the advances and impact in Jamaica of the use by emerging artistes of social media and other forms of music digital production and distribution, their attitudes to the Internet and to new approaches including more open business models.

The project has already delivered significant qualitative insights into the current state of the music sector, the impact of the new media environment, operations and attitudes towards Collecting Societies and how persons and institutions engage (or do not engage) with the click economy. The Internet makes being able to digitally download music easy and widely practiced on a global scale. Some emerging artistes in Jamaica and the region are already grasping the opportunities of new media for marketing and distributing and have taken advantage of platforms such as Facebook, Twitter and YouTube to promote and distribute their music. In the process, they are increasingly relying on live performances to generate additional income lost from the contraction of conventionally-recorded music sales. But some have still not learnt the tricks of the new trade, others are challenged technologically, some are unable to envisage the emerging landscape as the 'new normal', while others combine new and old technologies and marketing strategies.

Piracy and payola, through illegal digital downloads and bribes paid by some artistes to willing broadcast performers, continue to pose problems for artistes, composers and producers. Results from the project are already indicating that educational improvements among artistes, re-structuring of Collecting Societies, new areas of online training, business education for artistes, and wider public policy reforms are among the important adjustments that will be necessary to ensure that the economic and legal rights in the industry are protected, enabling artistes to thrive in a digital economy.

By providing an outlet for public policy dialogue and action, the hosting of seminars and conferences, and through the release of research findings and publications, the Open Business Models (OBM) project for emerging artistes will have a major positive impact among music stakeholders, governments and music lovers throughout the Caribbean.

It is expected that the resources garnered by the OBM Music project will also help the process of promoting creativity, entrepreneurship and socio-economic inclusion and assist in building a theoretical and multi-disciplinary framework to analyse and better understand the creative industries in Jamaica, Brazil, Colombia and other developing countries.

The UWI and the Mona ICT Policy Centre thanks the IDRC for its continued support of the research programme of the Centre and for providing funding for this two-year project in the sum of US$158,200.00.

Professor Hopeton Dunn is the Director Mona ICT Policy Centre, Mona School of Business and Management and Director of CARIMAC.

In-house Researchers and Project Administrators:
Mrs Michele Thomas, Research Fellow, Mona ICT Policy Centre.

Miss Allison Brown, Programme Coordinator and Researcher for the Mona ICT Policy Centre.

Professor Evan Duggan | Dr Maurice McNaughton
Professor Terrence Forrester

Research Project with the Greatest Business/Economic/ Development Impact

Mobile Financial Services

Use of the mobile phone, for the delivery of financial services such as bill payments and remittances, has captured the imagination of developing countries, businesses and academic researchers worldwide , as well as multi-lateral agencies such as the World Bank. The potential for mobile payments as a catalyst for greater financial inclusion has been demonstrated in countries like Kenya where one of the most celebrated success cases worldwide of ICT driving development (ICT4D), the MPesa mobile payment system is used by more than half of the adult population, the majority of poor (51%) and rural (59%) households. With its high customer penetration and ubiquitous network, MPesa's use has extended well beyond the initial use for mobile payments to provide access to a wide range of financial products, such as savings, insurance, and loans.

In 2011, the UWI through the Mona School of Business (now Mona School of Business and Management) in partnership with Solutions for Society, an emerging societal Think Tank established at the UWI, conducted a major research study into the prospects for mobile financial services in Jamaica. The primary objective of this study was to evaluate the economic potential for implementing a mobile financial system locally and to work in consultation and collaboration with policy-makers, the private sector and multi-lateral agencies to develop a comprehensive guide to determine the most appropriate framework for the broad-based introduction of mobile financial services here.

Global trends and other country experiences indicated that the degree of financial inclusion provides a major impetus for demand and the effective introduction of mobile finance. As a result, the research included a national survey to determine the level of access that Jamaicans have to financial services in the formal banking sector. Although various estimates and anecdotal claims have been made in the past, this was the first definitive national survey to be done of the financially excluded, i.e. persons without an account at a bank or other established financial institution, often referred to as the "Unbanked".

The findings of this study were interesting and instructive:

- 34 per cent of the adult population in Jamaica do not own bank accounts and must use cash and or the non-bank payment outlets at relatively high costs (Unbanked)
- Of the 66 per cent that own bank accounts, only 12 per cent own transactional accounts (money transfer accounts, checking accounts and credit cards – (Highly Banked)
- Therefore, more than 80 per cent of adult Jamaicans have limited access to low-cost, safe, payments channels.

These findings provide significant and compelling rationale for the likely benefits from the implementation of a mobile financial system, as an effective means of extending financial services to traditionally unbanked consumers, with the potential to drive financial inclusion, more efficient commerce, and, indirectly, job creation and innovation through a more vibrant, inclusive financial sector.

Other key recommendations of the study included adhering to the principle of interoperability, that is, the system should be implemented in such a way that commercial banks and other financial entities such as credit unions, bill payment and remittance companies can plug into a common mobile financial services ecosystem, so that costly duplication is avoided and consumers have the convenience of interacting with other consumers and businesses regardless of banking affiliation. The system should also accommodate the role of banking agents, registered entities that can carry out limited scope financial transactions such as enrolment, cash-in/cash-out outside of mainstream banks, in order to help with providing broad-based access to, and adoption of the services. A robust agency network backbone has been a critical enabler of successful mobile financial systems such as MPesa.

Implications for Practitioners

Given Jamaica's sound retail financial infrastructure, strong telecommunications sector and high mobile penetration (> 100%), a mobile financial system appears to offer enormous potential as a catalyst for financial inclusion and more efficient commerce through lower transaction costs, both critical enablers of economic development. The Bank of Jamaica has been relatively cautious in determining the rules and standards within which a mobile payment system will function, with a view to establishing the appropriate regulatory framework. While prudential integrity and stability of the financial system as well as consumer protection are paramount, it is also critical that the decision-makers ultimately determine the right balance for the role of Regulation in the introduction of mobile financial services - enabling versus constraining, developmental versus controlling, innovative versus lagging.

The BOJ has subsequently issued "Draft Guidelines for Retail Payment Services" that seek to facilitate the emergence of new innovative retail payment services such as mobile payment systems, which reflect consistency with many of the recommendations emerging from the UWI Study.

The Government of Jamaica (GOJ) also has a significant role to play in setting the tone and policy agenda that will signal to key stakeholders (i.e. regulators, banking & telecommunications sector) a strong commitment to realizing the potential benefits to be gained from the rapid deployment of mobile financial services. One significant opportunity that was recommended concerns the Programme of Advancement through Health and Education (PATH) through which GOJ makes payments to beneficiaries on condition that recipients make social investments in health and education. Currently PATH benefits are disbursed to a total of 377,709 beneficiaries using cheques (91%) distributed by the Ministry bi-monthly through the Post Office; and via debit cards (9%) administered by the National Commercial Bank (NCB). The adoption of mobile payments for the disbursement of PATH opens up the potential for a range of opportunities including: reduced labour intensity and cost of delivery of financial benefits as well as amplifying the developmental benefits associated with the conditional cash transfer schemes by facilitating access to a wider scope of financial services by the target beneficiaries. Follow-up studies currently being conducted by UWI will help to articulate the economic opportunity associated with such an undertaking.

Professor Evan Duggan is Dean of the Faculty of Social Sciences at UWI and a renowned Professor of MIS. He is the author, editor or co-editor of numerous scholarly publications including books, book chapters, and journal articles in leading IS and allied journals.

Professor Terrence Forrester is a Physician, Professor of Experimental Medicine and the Director of the Tropical Medicine Research Institute. His outstanding research record includes the role of environmental factors and nutritional metabolism in the pathogenesis of obesity, hypertension, diabetes and childhood malnutrition. He is also the convenor of Solutions for Society, a societal Think Tank established at UWI to investigate and propose tangible solutions to issues of national importance.

Dr Maurice McNaughton is Director of the Centre of Excellence for IT-enabled Business Innovation at the Mona School of Business and management, UWI. His current research interests span a range of emerging Open ICT's including open source software, cloud computing, open data and mobile computing.

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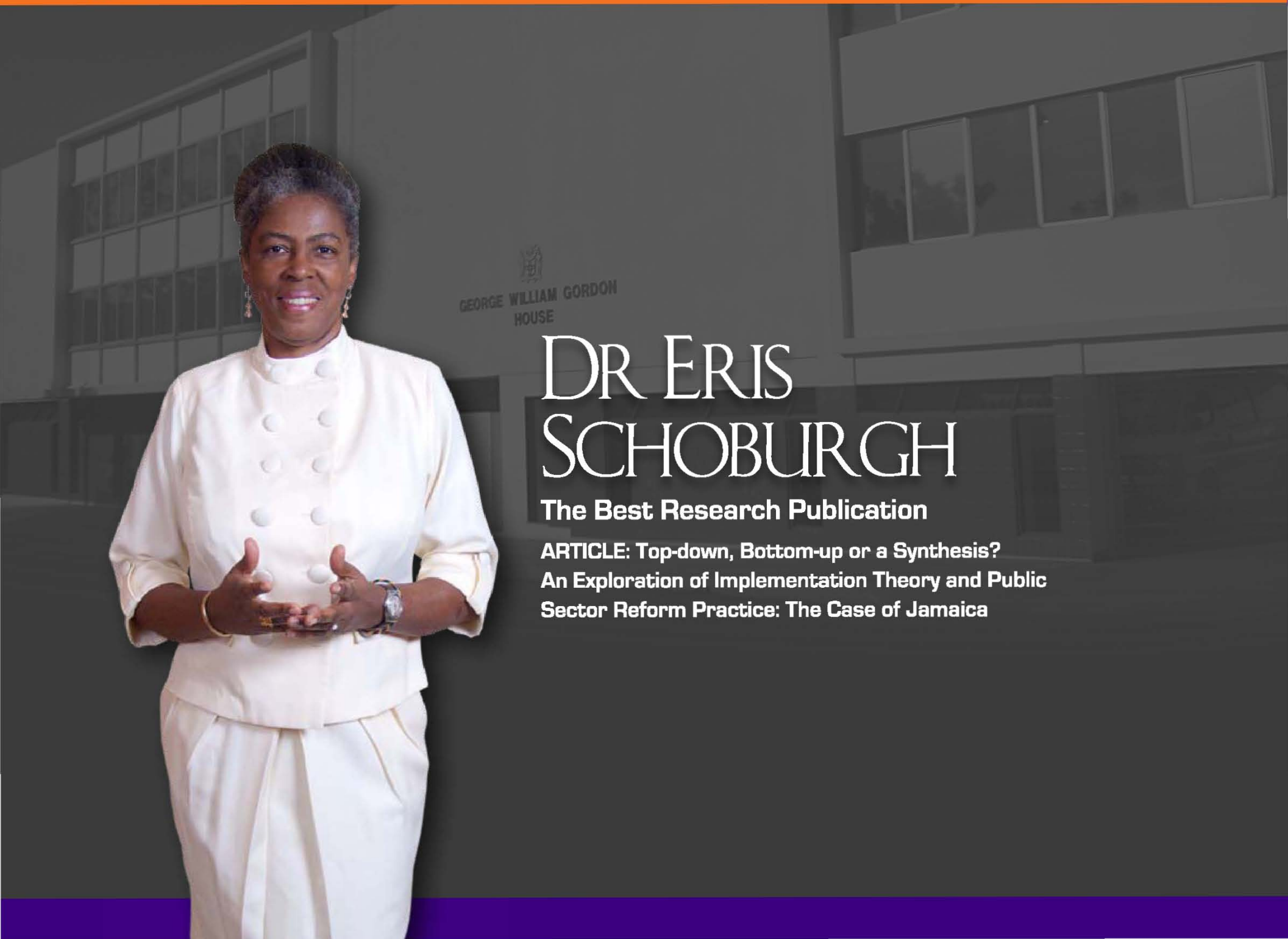


DR ERIS SCHOBURGH

The Best Research Publication

ARTICLE: Top-down, Bottom-up or a Synthesis? An Exploration of Implementation Theory and Public Sector Reform Practice: The Case of Jamaica

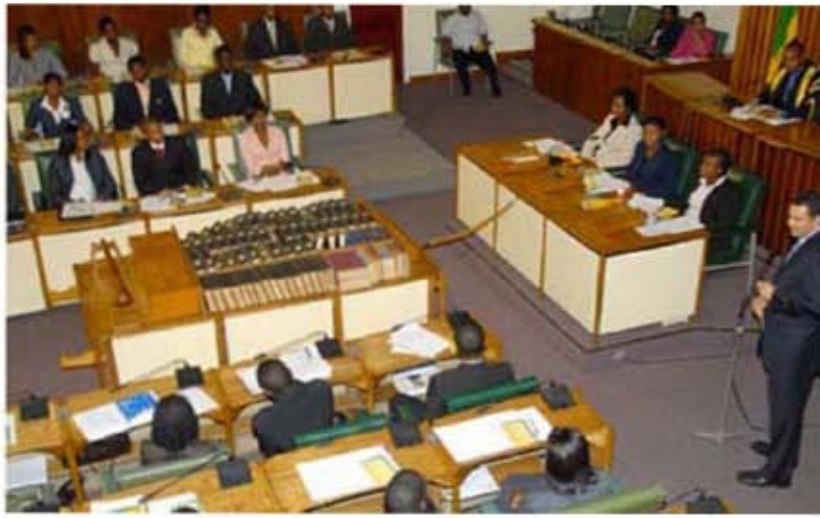
In the current discourse many perspectives contend on how to achieve development. Economic growth, social development with the reduction of poverty as a critical goal, and the reform of trade regimes, identified as important goals of the developmental era still remain policy priorities. But since the watershed years of the 1970s, the reduction of international debt, democratization and sustainable development have been added. Kothari and Minogue (2002, p. 2) characterize the present development discourse as "the practical agenda set out in the programmes of major multilateral and bilateral aid donors", this means essentially that policy implementation in developing countries like Jamaica must meet the criteria espoused by proponents of neoliberalism, the new orthodoxy of development. A set of universally applied prescriptions, with priorities such as good governance, privatization and economic transition, define the context of policy formulation and implementation (Cammack, 2002; Kothari & Minogue, 2002).

The Research Problem

Even though policy principals are clear about the new theoretical norms against which policies are adjudged this clarity does not transfer automatically to policy implementation. Policy implementation is still an arena of intense dissensus, providing little practical direction for policy managers (see e.g. Lane, 1987; Linder & Peters, 1987, Schofield, 2001). However, given their status as instruments of development, reform policies will be formulated and there is an expectation that they will be implemented. Herein lies the challenge.

Research and Analytic Methods

Implementation analysis provides the missing link by explaining why policies fail or succeed or why there is a variance between policy expectations and outcomes. Public sector reform policies and programmes exemplify a range of conceptual and practical challenges leading this research to argue that implementation outcomes are a function of the nature of the task environment more than the content of the policy or the type of strategy. Relying on a case research design, the study sought to answer two main questions: Are policy managers captives of certain social, political and economic circumstances that subvert successful policy efforts? Irrespective of 'space,' are there specific organizational imperatives for 'successful' implementation?



Reform Episodes and Ideas

Implementation of public sector reform in Jamaica has evolved through different episodes, each responding to the prevailing doctrines of state and governmental organisation. Each reform interlude is demarcated by a label that tells little of the overlapping and untidy series of actions and decisions.

Implementation of first wave public sector reforms was less concerned with administrative structures than it was with achieving macro-economic objectives such as redefining the core functions of the state to allow norms associated with marketization and deregulation to flourish. The top-down approach to implementation of these early reforms and the swift and non-routine manner in which decisions were taken, removed the leverage of particularistic interests and gave reform elites the decisional space to act.

First wave reforms left the administrative machinery of the state devoid of the requisite capacity to undertake developmental tasks. Policy capacity was reduced and the capability of performing routine functions such as collecting taxes, maintaining economic stability and ensuring law and order, was weakened. New and different tasks were added to the functions of the depleted administrative systems with regulation being one, and environmental protection under the rubric of sustainable development, being the other. These new functions added to the complexities inherent in state and governmental restructuring aimed at assuring global competitiveness.

Current reforms are influenced by the ideas of New Institutional Economics (NIE). NIE assists development analysts to understand the challenges developing countries, particularly those of the South, face in their adoption and implementation of policies and their inability to achieve intended outcomes (Clague, 1997, p.1). NIE offers alternative approaches to policy formulation and implementation by raising the importance of the self-reinforcing triadic relationship among actors and institutions, viz., the public (state), private (market) and civil (community). NIE brings to the fore the neglected area of administrative capacity of government as critical for creating the institutional environment for business (Clague, 1997, p. 3) and ultimately development.

The fundamental question that has seized reformers of the public sector is how to modify bureaucratic behaviour to create greater degrees of synchrony between organizational and developmental goals and the actions of bureaucrats or policy managers. It advocates reduction of transaction costs and minimization of rent-seeking behaviour thus invoking models of policy reform that aim at reduction in the size of the state and a redefinition of its role.

Imperatives of 'Successful' Implementation

The National Development Plan Vision 2030 Jamaica is the background to Ministry Paper 56/2002 that outlines a comprehensive reform policy and which references other policy priorities articulated by the government. Ministry Paper 56/2002 is the frame of analysis for the research and the findings are instructive. A few summaries are provided:

- Policy implementation and risk management

Macroeconomic stability of the state poses the greatest threat to policy implementation generally and reform of the public sector specifically. The fiscal climate has meant limited financial outlay to drive implementation, build incentive structures or expand public sector priorities. The reform policy is disadvantaged by its context. The impact of global recession may be outside of the control of reformers. However, given that the domestic economy is subject to the vagaries of fluctuations in the international market, reformers might not have accounted sufficiently for risks to the sustainability of reform programmes. Successful implementation is akin to effective risk management.

▪ Policy feasibility
Feasibility is not seen as an intrinsic value of policy design but a function of contextual variables and in which case connotes "loosely coupled administrative processes" that enable implementers to innovate and adapt activities. It may also be interpreted as the output of the "interaction among the implementation organization, the substance of the policy and the environment" (Linder & Peters, 1987, p.126). Reformers must account for both technical and political feasibility and set thresholds that may be counted as 'small wins' to keep the implementation momentum and to reduce 'reform fatigue.'

▪ Policy cognition and management of reform meanings
The symbolic use of reform language which underpins technocratic speech and political rhetoric must at some point make the transition to a system of management of meanings to assure consistency in reform values and effective information flow among actors. The level of policy cognition illustrates social learning, which results from analysis of institutional transformational processes, and reflection on errors that have occurred through reform. It is also an outcome of systematic research and development from within the organisation leading the reform and those being reformed.

▪ Implementation plan
Such a plan accounts seriously for action changes, actors and relationship among actors relative to the impact on implementation and is not simply an enumeration of activities. The plan should utilise forecasting as well as backward mapping. Backward mapping permits a definition of success that is conditional on institutional variables. Through this approach reformers take into consideration the limited ability of actors at one level of the implementation process to influence the behaviour of actors at other levels and on the limited ability of public organizations as a whole to influence behaviour (Elmore 1979-1980).

Potential Impact
This research adds a Caribbean perspective to the debate on state and governmental reorganisation. It expands policy research and analysis through its concentration on implementation issues, an under-researched area in public management. . The conceptual and practical information as well as the arguments and findings will be of interest to: policy reformers, researchers and practitioners; academic researchers and university students. The 'imperatives' of successful implementation are relevant and easily adaptable to the public sector. Industry leaders may find the analysis useful especially for informing their commentaries on government policy performance.

Partnerships
The most recent partnership that has emerged because of this particular research focus is that with academic colleagues at Brock University, Canada that will result in a wide dissemination of my findings.

Dr Eris D. Schoburgh is Associate Dean in the Faculty of Social Sciences and Senior Lecturer in The Department of Government where she coordinates the Public Sector Management Unit.

Professor Rupert Lewis

Professor Hopeton Dunn

The Best Research Publication

EDITED COLLECTION:
Communicating Pan-Africanism: Caribbean Leadership and Global Impact

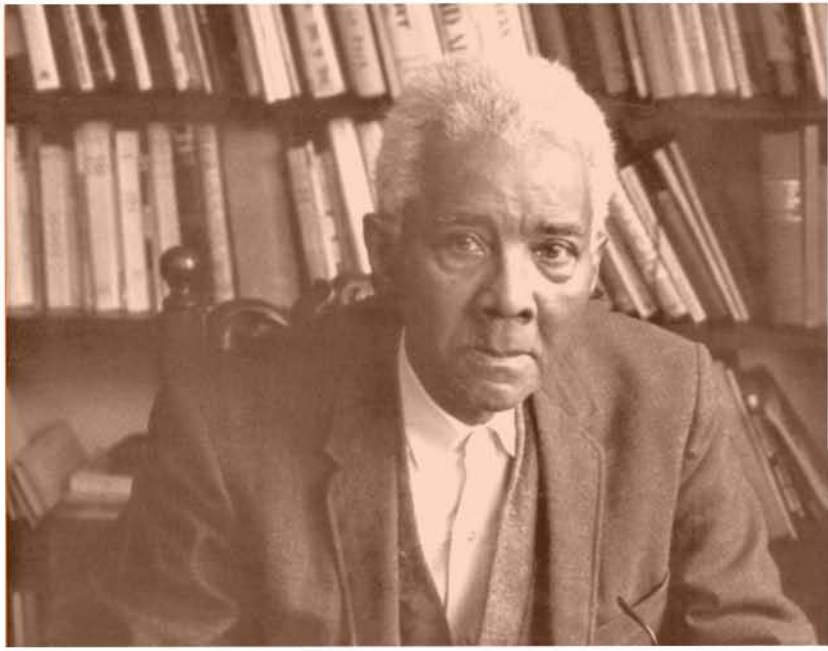
A mysterious, colourful and enthralling cover image acts as an invitation to take a closer look at a copy of this year's recipient for "Best Research Publication" in the Faculty of Social Sciences. The award-winning publication is a special Caribbean Issue of the refereed international culture Journal Critical Arts.

The cover picture interlaces the bright colours associated with Afro-centrism: red, green, gold, black and hints of blue here and there. The image is of "Mbumba" the patron god of the Haitian Revolution which serves as a fitting icon for an issue which represents the seemingly never-ending struggle for the emancipation and independence of African peoples. The journal issue, titled "Communicating Pan-Africanism: Caribbean Leadership and Global Impact" is co-edited by two leading scholars at the UWI's Mona Campus, Professor Hopeton Dunn from the Communication discipline and Professor Rupert Lewis from the Political Science department. In this interdisciplinary issue they documented the seminal and perhaps unheralded role of the Caribbean intellectual in the construction and dissemination of ideals of Pan-Africanism over the last century.

Among the central questions posed by the Editors are: What is the shape and quality of the Caribbean's contribution to Pan Africanism? And what indeed is the future of Pan-Africanism in an era of global dominance of neo-liberal political movements, economic globalization and extraordinary technological advances encompassing all cultures?

The Contributors

This special issue highlights Caribbean scholarship with articles from seven regional academics, including the editors. It is appropriately dedicated to two of the region's distinguished advocates of this area of scholarship from UWI, Professor Rex Nettleford and Professor Barry Chevannes, who both passed away while the publication was being edited. Indeed, the compilation includes Chevannes's last known academic work, with his article being submitted just weeks before his passing. The image which graces the cover of the book is a painting by the UWI's Dr Clinton Hutton, who also contributed an article. Other contributors are UWI scholars Mawuena Logan and Professor Maureen Warner Lewis as well as Brown University's Professor Anthony Bogues of Jamaica.



Publication Overview

The articles foreground the contributions of three leading exponents of Pan Africanism: Marcus Garvey, CLR James and Peter Abrahams, but their scope is much broader. They offer deeper insights into the close collaborative role played by the region alongside other Pan Africanists from the United States, the United Kingdom and from Africa itself, in forging the alliances of resistance that hastened the arrival of decolonization and civil rights in the affected countries and regions. The edition also encompasses contributions on Pan-African movements such as the Haitian Revolution and the Rastafari Movement of Jamaica whose indelible imprints extended from the Caribbean to audiences and activists all over the world.

Article Contents

The volume begins with the role of pre-eminent Pan- Africanist, Marcus Mosiah Garvey of Jamaica, in the "re-mapping of Africa and its Diaspora". Writing just over 70 years after Garvey's death in 1940, Rupert Lewis reflects on his impact on anti-colonial and nationalist movements in Africa. This includes the importance of his writings in forging a solidarity which was manifested in, among other avenues, the Universal Negro Improvement Association and African Communities League (UNIA & ACL).

Anthony Bogues elaborates on key aspects of the contribution of Trinidadian historian and political activist Cyril Lionel Robert (CLR) James to Pan-Africanism and the black radical intellectual tradition. This essay chronicles his political work and ideas during his second American sojourn in the late 1960's which, as Bogues argues, consolidated James' reputation as a leading Pan-African figure of the 20th century.

Hopeton Dunn brings to light the political thought, profile, and literary relevance of another leading Pan- African intellectual, Peter Henry Abrahams. Dunn offers a political profile of Abrahams in an introductory narrative and an extensive interview conducted by the author several years earlier. The article assembles the life story and reflections of an icon, elucidating his worldview and evolving perspectives on momentous global occurrences in the process of African and Caribbean de-colonization.

A second contribution on Peter Abrahams focuses on his literary contribution to the anti-colonial and independence struggles, especially of his native South Africa. In this article, Mawuena Logan, himself of West African origin, dissects Abrahams' literary contribution in a quest to discover the "essential message" in the work of this Pan- African icon.

The Haitian Revolution (1791–1804) stands as the unequalled symbol of the triumph of black colonized people over oppression and external domination. It is appropriately regarded as a defining moment in the history of Africans in the New World. In the article entitled, "The Haitian Revolution and the Articulation of a Modernist Epistemology", political scientist, artist and cultural historian, Clinton Hutton analyses the discourses of selected 20th century scholars in their treatment of the Revolution.

The cultural impact of Africa on the Caribbean, a small part of the wider African Diaspora, has been profound. In her article, Maureen Warner Lewis, Professor of Caribbean Language and Orature, examines the residual art, artefacts and ideas of West Africa in the Caribbean. They doubtless reflect the continuing social and cultural affinities between the African mainland and the Diaspora.

The final article examines Rastafari and Pan-Africanism. It traces the origin of the political ideology of Rastafari to the inspirational Pan-African ideas of Marcus Garvey. However, it departs significantly from Pan- African practices common in other popular contemporary religious observances. The article is authored by the late political anthropologist, Professor Barrington Chevannes.

The Journal Critical Arts: South-North Cultural and Media Studies is a notable South African Journal published by Routledge through its Taylor and Francis imprint in the UK, and the University of South Africa (UNISA). The Journal's Editor in Chief is Keyan Tomaselli of the University of KwaZulu Natal in South Africa, with Hopeton Dunn serving as an Associate Editor of the journal for the past decade. This special Caribbean Issue of Critical Arts, Vol. 25 no. 4 was published in December 2011.

Professor Hopeton Dunn is the Director Mona ICT Policy Centre, Mona School of Business and Management and Director of CARIMAC.

Professor Rupert Lewis is a retired Professor of the Department of Government, UWI.

Dr Lila Rao-Graham
Dr Gunjan Mansingh

The Best Research Publication

ARTICLE: Building Ontology Based Knowledge Maps to Assist Business Process Re-Engineering

Business Process Re-engineering (BPR) involves analyzing and designing workflows and processes within and between organizations to improve the efficiency of these organizational processes. Although there were high expectations for the improvements in performance that BPR would bring about for organizations, in many cases these benefits were not realised and high failure rates have been reported. A number of obstacles have prevented its full potential from being realised. One of these obstacles is caused by the emphasis on the steps in the business process at the exclusion of the environment within which the process is carried out. In considering the environment, organizations will be faced with the challenge of making certain types of knowledge visible to relevant stakeholders. Another obstacle is that although there are a number of tools for modelling the business processes, many of these tools only support diagrammatic and mathematical modelling. While these models are useful for understanding the business processes, they do not support the automated analysis for identifying the cause of inefficiencies in the business process, which is considered to be one of the most time-consuming stages of BPR.

In this research we propose a methodology for BPR that overcomes these two obstacles through the use of a formal organizational ontology and knowledge structure and source maps. The methodology involves the following steps:

Step 1: Adopt/Develop a high quality formal organizational ontology
Step 2: Use the ontology to facilitate the identification and prioritization of the business processes that need to be re-engineered
Step 3: Create the knowledge source map and the knowledge structure map from the ontology
Step 4: Analyze the maps to assist in identifying the causes of the inefficiencies in the process
Step 5: Modify the business process(es) and/or the environment
Step 6: Update the organizational ontology and process models to reflect these changes

Organizational ontologies provide a framework for facilitating effective and efficient knowledge-sharing by formally modelling a given domain. A number of benefits of developing an ontology have been noted, they include: (1) facilitating

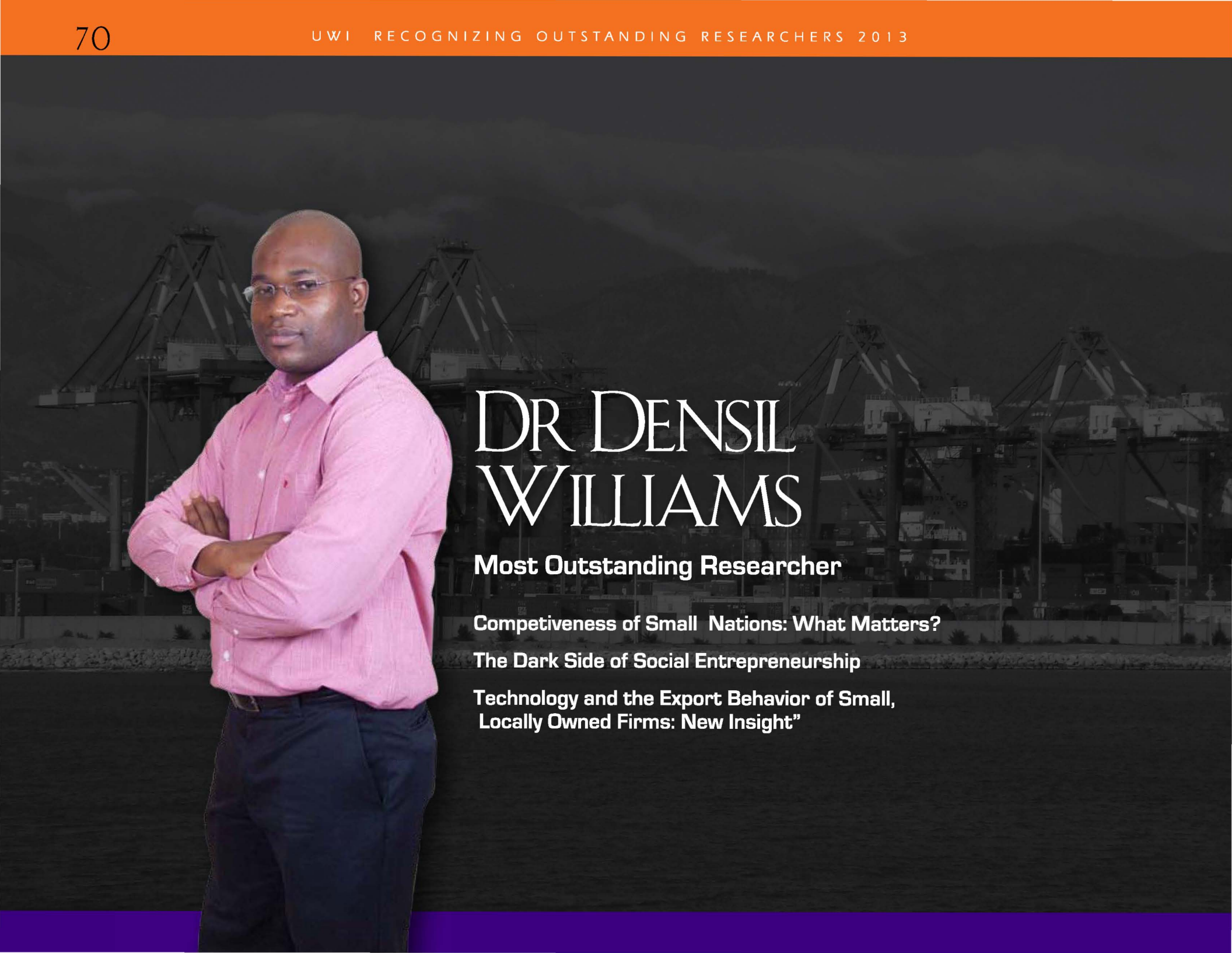
the sharing of a common understanding of the structure of information among stakeholders in a domain; (2) facilitating more effective communication and idea-sharing, and (3) generally supporting the analysis of domain knowledge. Knowledge maps reveal the underlying relations between various knowledge components within the organization. For example, a knowledge structure map defines the different roles that interact to perform a set of tasks so they can be used to identify the know-what, know-where and know-how within the business processes. These formal representations facilitate an inferencing mechanism which helps to automatically identify the causes of the inefficiencies and inconsistencies. We demonstrate the applicability of this methodology through the use of a case study of a local university domain.

The methodology proved useful in identifying a number of inefficiencies in the University's processes. Although we applied our methodology to a university domain the steps are not specific to a particular organization or entity, they are generalizable and might be applied to other sectors or institutions (e.g. disaster recovery planning or the healthcare sector). Therefore we expect that decision makers who adopt this methodology will be able to identify the inefficiencies in their processes.

Dr Lila Rao-Graham is the Director of (E)MBA, MBM and Diploma programmes and Lecturer at the Mona School of Business and Management at The University of the West Indies, Mona. She holds a PhD in Information Systems from The University of the West Indies, Mona. She currently does work in various areas including: Ontologies, Business Intelligence, Information and Knowledge Quality, Decision Support Systems and Technology Adoption.

Dr Gunjan Mansingh is a Lecturer in the Department of Computing at The University of the West Indies, Mona. She holds a PhD in Information Systems from The University of the West Indies. Her research interests are Data Mining, Decision Support Systems, Knowledge Management Healthcare, Expert Systems and Technology Adoption.

Professor Kweku-Muata Osei-Bryson is Professor of Information Systems at Virginia Commonwealth University, USA. He holds a PhD in Applied Mathematics (Management Science & Information Systems) from the University of Maryland at College Park. He has also worked as an Information Systems practitioner in industry and government (in the U.S.A.).



Dr Densil Williams

Most Outstanding Researcher

Competiveness of Small Nations: What Matters?

The Dark Side of Social Entrepreneurship

Technology and the Export Behavior of Small, Locally Owned Firms: New Insight"

Competitiveness of Small Nations: What Matters?

Singapore's remarkable economic success stands in stark contrast to that of many other former colonies of Britain. Many have asked what is behind Singapore's economic success story. The body of work presented in Competitiveness of Small Nations: What Matters? supplies some answers.

Drawing on copious time series data for Jamaica, Barbados, Trinidad and Tobago and, Singapore, a benchmarking study was done to see how these Caribbean economies match-up with that of Singapore. Using historical insights and qualitative analysis, the work tried to understand the lessons that poor performing economies could learn from Singapore.

The study showed that for small economies to improve their growth performance, some critical factors must be in place.

- High quality institutions including schools, universities, judiciary, economic institutions such as national- planning agencies and an effective central bank.

- High quality infrastructure such as seaports and airports, road networks and telecommunication systems.

- Macro-economic stability in the form of low interest rate, sustainable government balances, stable exchange rate and low inflation to prevent un-anticipated costs of doing business in the domestic economy.

- Adroit leadership - is central to everything as the Singaporean story shows. Leadership in the private, public, and non-governmental sectors such as academia is important to ensure that all the elements in the growth equation come together.

The work is critical for public policymakers in small economies who are struggling to find ways to grow their Gross Domestic Product (GDP). This is especially

true in the Caribbean where economic growth performance has been unimpressive. Singapore gained independence from Britain in the same period as many countries in the region and its economic indicators were worse than many of those countries.

However, Singapore has become the most celebrated case of an economic success story of the 20th century. In 1960, Singapore's per-capita income was US$395 while Jamaica had per-capita of US$ 429. Today, Singapore's per-capita is over US$43000 while Jamaica's per-capita income is merely US$5000. The lessons learnt from Singapore are important to help Jamaica and other similar small economies, fashion a growth strategy.

This work fills an important gap in the public policy discourse on economic growth and competitiveness in small economies. The discourse on competitiveness and economic growth generally makes the assumption that policies for growth can be easily replicated. The work in this volume argued strongly that context matters in designing growth strategies for an economy. This is why the benchmarking approach compared apples with apples. As such, Singapore was used as the benchmark, not large and developed economies like the USA which have a different economic structure and significantly more resources. The approach used in the benchmarking exercise added some novelty to the work.

The policy lessons identified in the book, if applied properly, could have a significant impact on the growth performance of the small economies of the Caribbean and similar economies. Most of the economies of the region suffer from poor infrastructure, low quality institutions, high levels of macro-economic instability and generally poor leadership. The lessons from Singapore can serve as policy prescriptions for small economies seeking to achieve economic success.

THE DARK SIDE OF SOCIAL ENTREPRENEURSHIP

The paper provides a conceptual outlook on an emerging field of study in the area of Entrepreneurship. It provides a new lens through which scholars in the emerging field of Social Entrepreneurship should view the concept in order to come to a better understanding of the field. It raises the question as to whether or not all enterprises that deliver a social service can be duly classified as social enterprise and be linked to the wider field of social entrepreneurship. Context matters in social entrepreneurship.

The line between violence as a business, which generate funds to support enterprises that deliver social services and, social enterprise, which deliver social services to transform lives through the creation of social value, has become blurred. To describe this blurring of the line, we coined the phrase, dark side of social entrepreneurship.

This paper can be accessed at: International Journal of Entrepreneurship volume 16, pp 69-82.

TECHNOLOGY AND THE EXPORT BEHAVIOUR OF SMALL, LOCALLY-OWNED FIRMS: NEW INSIGHT

This paper investigates the relationship between technology and the export performance of small, locally-owned firms in Jamaica. Technology is an important variable in influencing the export

performance of small firms given its (technology) ability to generate competitive advantage. However, the results from empirical studies are not always consistent. To investigate this issue, the paper uses survey data collected through face to face interviews of 92 exporters and non-exporters to estimate a logistic regression model of the firm's export behaviour. The results revealed that firm size, not the social capital of the owner of the firm or the technological intensity of the firm; is the most critical factor that determines export performance. This result resonates with some aspects of the extant literature while dissimilar to others. The context specific nature of this result is what makes it novel.

This paper can be accessed at: Journal for the Advancement of Developing Areas. Volume 1, 1 pp. 3-23.

Dr Densil Williams is the Deputy Director of the Mona School of Business and Management and Senior Lecturer in International Business.

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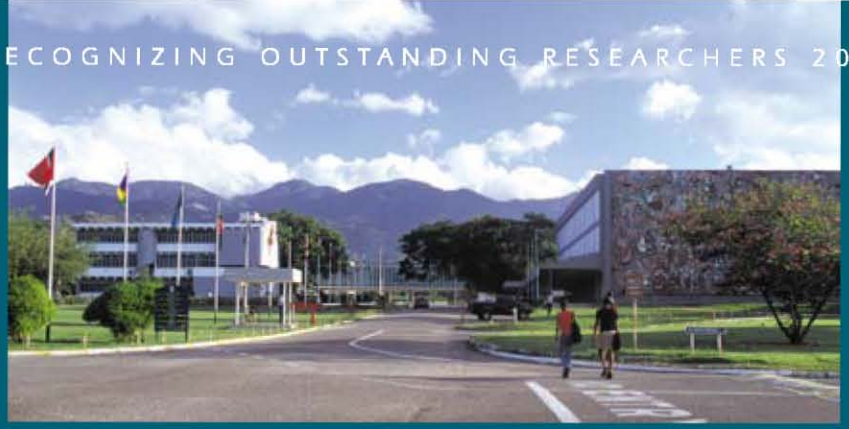


FACULTY OF MEDICAL SCIENCES

Dr Asha V. Badaloo | Dr Carolyn Taylor-Bryan
Dr Curtis Green | Professor Marvin Reid
Professor Terrence Forrester

(and collaborators)

The Best Research Publication

ARTICLE: Dietary Cysteine is Used More Efficiently by Children with Severe Acute Malnutrition with Edema Compared with those without

Cysteine is one of the amino acids present in dietary proteins and is used for the synthesis of body protein and other compounds such as glutathione (GSH) which is a major antioxidant/detoxicant in the body. Our research provides new and increasing evidence strongly supporting beneficial effects of cysteine supplementation in the treatment of edematous malnourished children.

Recent data by the World Health Organization (WHO) showed that malnutrition is associated with about one third of the 7.6 million deaths in children under 5 years each year. Childhood severe acute malnutrition (SAM) presents either as non-edematous (marasmus) or edematous (kwashiorkor, marasmic-kwashiorkor) forms. In addition to wasting, kwashiorkor and marasmic-kwashiorkor are characterized by abnormal accumulation of fluid called edema and other abnormalities carrying poor prognosis. So, whereas treatment of children with marasmus is straightforward, those with edematous SAM are difficult to treat and have higher morbidity and mortality. Furthermore, it is still not known why children develop different types of malnutrition. Hence, the focus of this work was to explore mechanisms underlying metabolic aberrations in SAM that could lead to improvement in treatment. This was done using stable isotope tracer methods to make direct measurements of rates of synthesis and catabolism of compounds in the body under different conditions.

It is well established that concentration of GSH is lower in edematous SAM compared to non-edematous SAM, and is associated with deteriorating clinical state. Previously, we have shown that this low concentration results from reduced GSH synthesis in association with low concentration of cysteine; and further demonstrated that GSH status was quickly restored with cysteine supplementation. Also, the resolution of edema was faster with cysteine supplementation. This led us to look at the overall body's demand for cysteine in SAM. The findings show that compared to non-edematous children, those with edema had slower cysteine production but higher utilization in synthetic pathways, hence better efficiency of utilization. Cysteine splanchnic utilization (gastrointestinal, liver, spleen, pancreas) was as much as 45% in both groups. Because proteins of the gut are rich in cysteine, and they turnover at extremely fast rates, cysteine deficiency may contribute significantly to intestinal atrophy and

impaired function that is more severe in children with edematous SAM. Also, they will need more cysteine to restore gut GSH, shown to be essential for intestinal protection. After splanchnic uptake, only 55% of the cysteine pool is available to meet the requirements of the other organs and tissues. This could have a negative effect on the overall synthesis of whole body GSH and proteins, especially those proteins rich in cysteine such as the skin and hair keratin; and may explain why the skin lesions of edematous SAM take such a relatively long time, 4 weeks to heal.

The body's pool of cysteine is supplied from the diet, de novo synthesis from methionine and from body protein. We have shown that slower total cysteine production in edematous SAM is because its release from protein is reduced and not because synthesis from methionine is decreased.

Potential impact on society

The results indicate that cysteine supplementation may contribute to earlier re-establishment of metabolic capacities and hence earlier resolution of symptoms in edematous SAM. The effect represents a reduction in morbidity that may extend to a reduction in mortality. This would not only confer health benefits, but the possibility of reducing hospitalization and overall treatment cost would be of important economic benefit because malnutrition is more prevalent in poor and developing countries.

Possible direct application of outcomes to industry and partnerships

The findings of this project strongly imply that the requirement for cysteine is not met by the quantity of protein provided by therapeutic diet in the acute phase of treatment. The recommended protein is restricted to meet the metabolic capacity of SAM and simply giving more protein can overwhelm the brittle metabolic state causing death. Therefore, feeds for the acute phase have to be specially prepared and this is often not convenient in non-specialized treatment centres. There is potential to partner with companies that make formulae for young children to develop a ready-to-use cysteine enriched formula for the critical period of acute treatment. This would warrant larger clinical trials. Although the prevalence of SAM in Jamaica has been significantly reduced, such clinical trials could be conducted in Haiti, a Caribbean country with high prevalence of SAM. Funding partnership with the private sector could be a start.

Dr Asha Badaloo is a Senior Lecturer in Metabolism. For over 20 years, she has been conducting nutritional metabolism research in different clinical states in children and adults.

Professor Terrence Forrester is a Physician, Professor and the Director of the Tropical Metabolism Research Unit. His outstanding research record includes the role of environmental factors and nutritional metabolism in the pathogenesis of obesity, hypertension, diabetes and childhood malnutrition.

Professor Marvin Reid is Physician, Professor of Human Metabolism & Community Health and Director, Sickle Cell Unit. His research interests are Clinical Trials of agents in Sickle Cell Disease as well as the metabolic adaptation of persons to chronic illnesses.

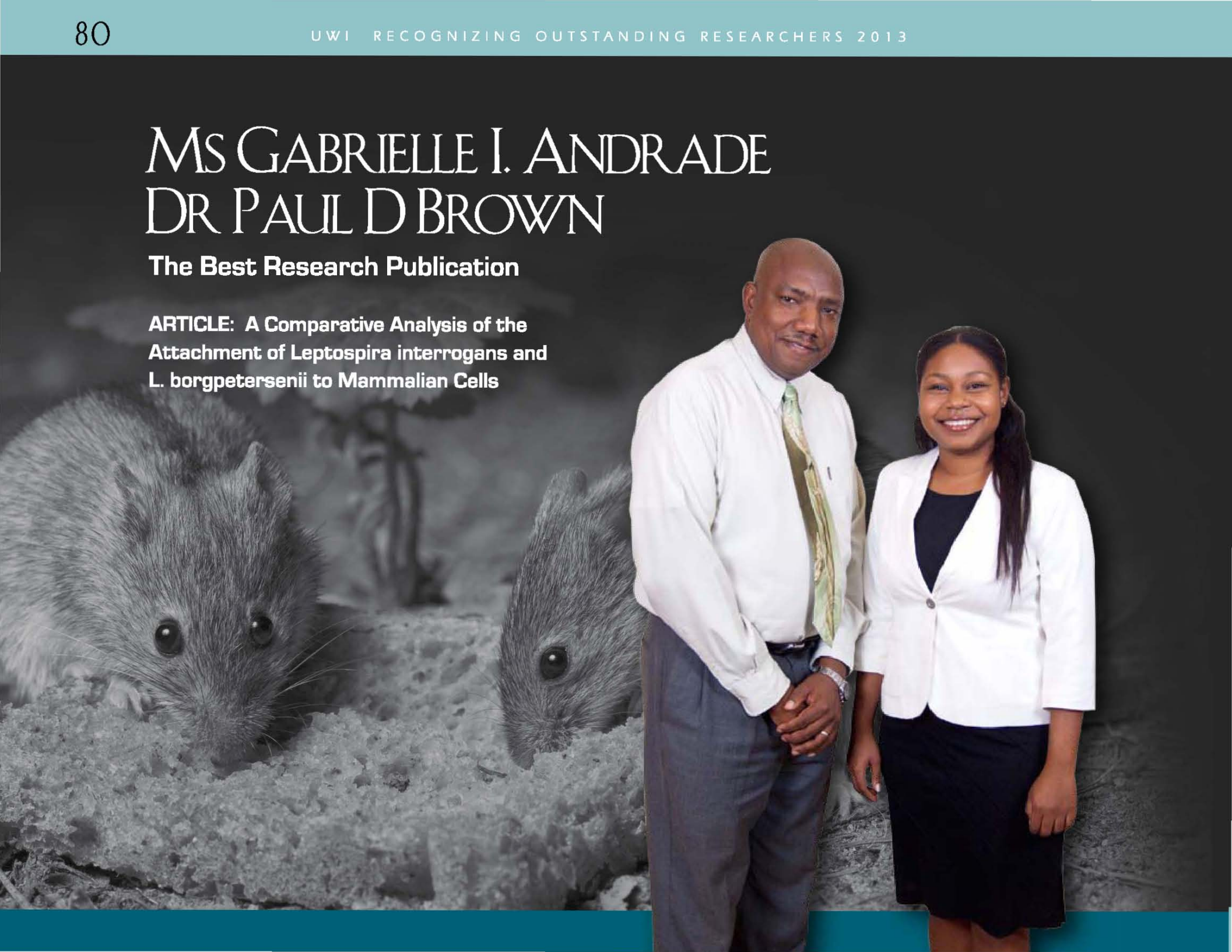
Dr Curtis Green is a Research Fellow. His primary areas of research include biochemistry, nutraceutical product development and nutritional metabolism.

Dr Carolyn Taylor-Bryan is a Paediatrician and Clinical Research Fellow. Her research interests include metabolism of macronutrients throughout the lifecycle.

Ms Gabrielle I. Andrade
Dr Paul D Brown

The Best Research Publication

ARTICLE: A Comparative Analysis of the Attachment of Leptospira interrogans and L. borgpetersenii to Mammalian Cells

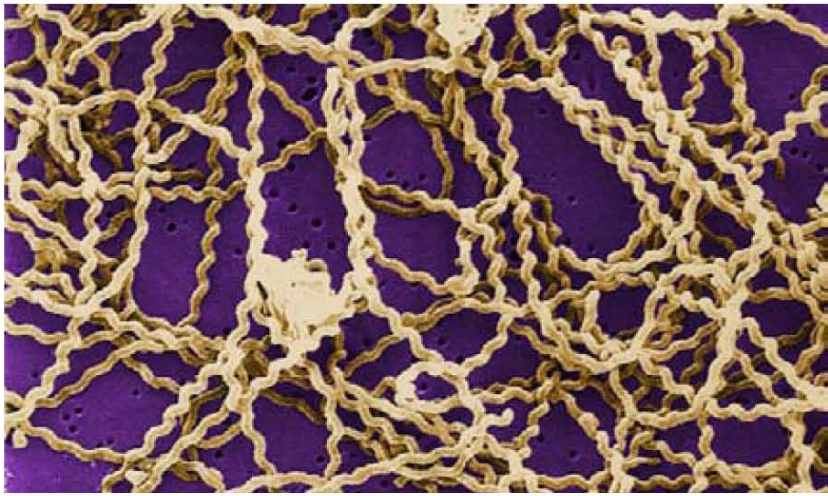


The captioned research paper evolved from the project entitled Investigation of the Basis of Attachment of Leptospira to Mammalian Cells, for which a grant was received from the Office of Graduate Studies and Research of the University of the West Indies, Mona Campus.

Leptospirosis is a globally re-emerging disease caused by pathogenic Leptospira. Since its characterization as an infectious disease in humans by Adolf Weil in 1886, annual cases of severe leptospirosis have reached 500,000, making it the world's most common zoonosis with a mortality rate of 5-20%. The disease is usually contracted through direct contact with urine, blood and organs from infected animals. Over 250 serovars that are causative agents of the disease make the development of suitable and affordable human and animal vaccines challenging for developing countries. Further, the lack of rodent pest control in slums and overpopulated urban areas, poor garbage collection, flooding, and the dependency on locally-produced agricultural products like rice and sugarcane leave third world countries at a disadvantage.

Jamaica's first reported case of leptospirosis occurred in 1953. Since then, the disease reached epidemic proportions in 1979 after heavy June floods, and a decade later serological studies showed predominant serovars to be Portlandvere, Jules, Canicola and Icterohaemorrhagiae. At the time, Jules had only been reported in Jamaica and more recent data show it has a seroprevalence of 25%, while Portlandvere has a seroprevalence of 12%. Disease incidence in Jamaica is 6 per 100,000 population, with a peak in reported cases during the second rainy season of the year, between October and December.

Clinical manifestations range from subclinical infections to full-blown Weil's disease characterized by bleeding, jaundice and kidney failure, creating a potentially fatal scenario if multiple organ failure sets in. Though recognized in Jamaica as endemic and a serious infectious disease, cases are frequently misdiagnosed and reports to the Ministry of Health are not mandatory which implies the incidence rate is grossly underreported. Leptospira borgpetersenii serovar Jules and Leptospira interrogans serovar Portlandvere are two of the bacteria that cause leptospirosis in Jamaica.



Study Rationale

The bacteria which causes leptospirosis use several known but poorly understood mechanisms to cause disease, including heat shock (or stress) proteins, lipopolysaccharides (molecules consisting of lipids and carbohydrates) and haemolysins (which cause destruction of red blood cells). Leptospira are not intracellular bacteria and attachment to the host tissue has been shown to be a key characteristic of the more dangerous species. In fact, because important interactions with host tissues are specific in the disease process, it is likely that there are several molecules mediating attachment of the Leptospira to mammalian cells. Consequently, the attachment and subsequent colonization of target organs by Leptospira involve a great number of interacting surface molecules on both the bacteria's surface as well as receptors on the host cell.

The Approach and Results

In this project, we assessed the attachment of the bacteria to specialized molecules known to be involved in scaffolding in tissues (such as integrins, lectins, and carbohydrates) using the human cell line HEp-2 as a model. We used a deconstruction approach for determining whether particular molecules were involved by removing them individually and checking whether that affected attachment in any way. We found that serovar Jules demonstrated better attachment to integrins tested and was not inhibited by the lectins when compared to serovar Portlandvere. Incubation with carbohydrates resulted in a decrease in attachment of the bacteria to the host cells with the exception of D-mannose in the case of serovar Jules. Both serovars generally showed a significant increase in attachment to cells after the mammalian cells were treated with enzymes.

The findings of this study suggest that some carbohydrates, including D-mannose, have an inhibitory effect on binding, which begs the question whether they could be useful in treatment of leptospiral infection in a similar way that D-mannose has been shown to be effective against urinary tract infection caused by E. coli. This warrants further study.

Conclusion

Taken together, these results indicate that serovar Jules tended to exhibit traits of a more dangerous strain when compared to serovar Portlandvere. When analyzed with local epidemiological data, this may explain the resurgence of serovar Jules as a leading cause of leptospirosis in Jamaica. While many will argue that clinically there is no species relatedness, epidemiologically it is critical to be able to understand trends or variations in the level of the causative agent in the environment and in clinical cases.

Ms Gabrielle Andrade is a PhD student in Molecular Biology in the Deapartment of Basic Medical Sciences.

Dr Paul Brown is a Senior Lecturer in the Department of Basic Medical Sciences (Biochemistry Section), UWI, Mona. A Fulbrighter, he is the American Society for Microbiology Ambassador to Jamaica and is a Council Member of the International Society of Infectious Diseases.

Dr Loxley R. Christie | Dr John A. Harriott
Dr Vernon E. DaCosta | Dr Shaun H. Wynter
Ms Denise M. Everett | Ms Rochelle A. Foster

The Best Research Publication

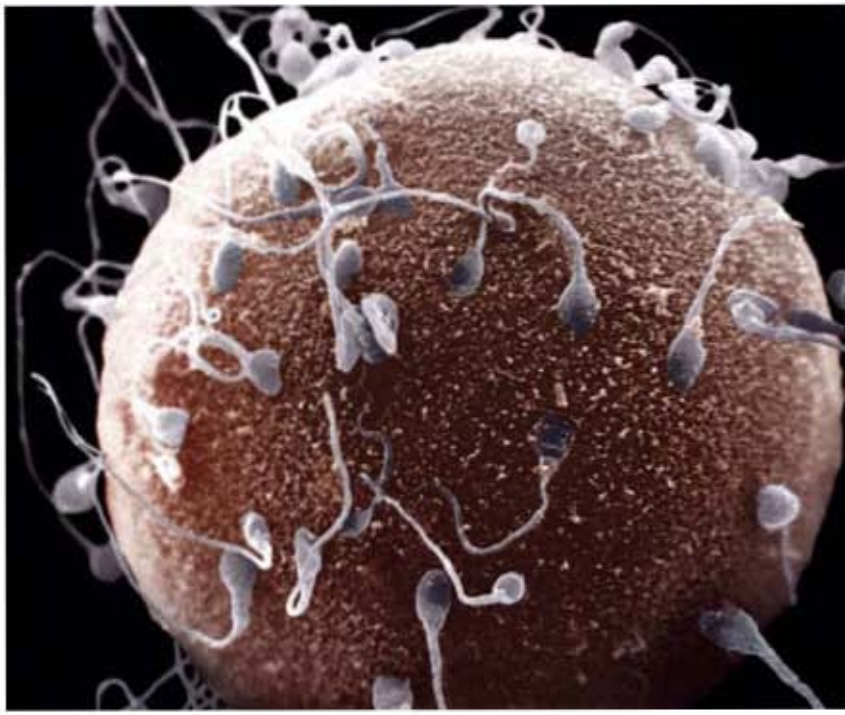
ARTICLE: Intrauterine Insemination in Jamaica as a Low-cost Subfertility Treatment in Low-resource Region

Infertility affects 15% of all couples. Up to 92% of couples will conceive after a year of unprotected intercourse, the rate falling precipitously thereafter. The social burden of childlessness in resource-poor regions is clearly documented in international literature, especially on women issues. Infertile women demonstrated great risk of self-depreciation and isolation in Jamaica, were threatened with divorce in 67.7% of relationships in Pakistan and in Gambia were 3.69 fold more likely to have depression as well as being victims of abuse in up to 16.5% of relationships with husbands or in-laws. Ironically, male factors contribute to infertility as a sole cause in 28% of cases; another 28% of couples have unexplained or idiopathic infertility.

The financial burden of infertility management can also be overwhelming as no aspect of infertility investigation or treatment is currently covered by medical insurance in Jamaica. In resource-poor regions such as the Caribbean, this sentences many subfertile couples to involuntary childlessness and the associated social stigma. Provision of minimally invasive, cost effective and safe treatments is therefore a priority in these regions; Intra uterine Insemination (IUI) represents one such treatment. In vitro fertilization (IVF), an invaluable fertility technique for many couples has been available in Jamaica since 2000; however, the cost of a single IVF cycle is more than 10 times that of an intrauterine insemination (IUI) cycle.

All couples undergoing IUI cycles at the Hugh Wynter Fertility Management Unit (HWFMU), UWI, Mona from 2001 to 2005, were reviewed with intent to assess success rates and identify factors associated with successful outcomes. The couples had tried to conceive for at least one year, women had one or both fallopian tubes confirmed as being open and the men had semen analysis prior to commencing the study. Over this period, 110 couples completed a total of 161 cycles. Only patients with unexplained infertility or mild to moderate male factor infertility were chosen.

The women underwent ovarian stimulation and development of the eggs was monitored by ultrasound until they attained maturity. Semen preparation comprising a 2-step density gradient technique was conducted on specimens produced onsite. The women were inseminated with prepared sperm 36 hours after ovulation was induced. Only pregnancies confirmed by ultrasound were considered successful.

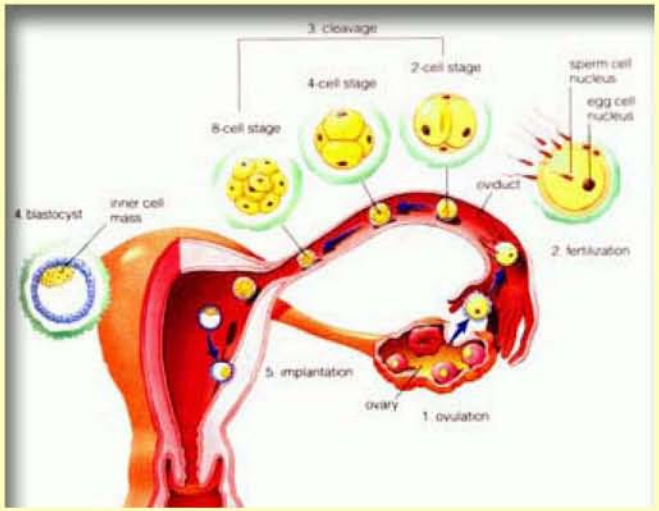


At the HWFMU, the clinical pregnancy rate (CPR), live birth rate (LBR) and cumulative pregnancy rates were 10.1%, 8.8%, and 13.9%, respectively. These rates are consistent with CPR reports of 8.7%–18.9% from leading centres worldwide. The mean period of infertility of the patients who conceived via IUI at HWFMU (3.1 years) was mathematically significantly shorter than those who failed to conceive (5.2 years).

Women younger than 40 years of age had improved successes. Many international centres refuse to offer IUI to women over 40. In Jamaica, however, this policy has not been adopted due to the expense of IVF. At HWFMU, 23.9% of the women were over 40 years old and this negatively affected the overall success rates. Their exclusion allowed the CPR to improve to 14.9% and at the upper spectrum of results of international centres.

Males whose sperm quality improved after preparation with regards to motility and progression were found to be significantly more likely to have a successful pregnancy. Increased pregnancy rates were found among patients undergoing up to 2–3 cycles with cumulative pregnancy rates as high as 22 per cent.

The study explored the question as to whether IUI is effective in the management of subfertility or whether it serves only those who would have conceived anyway with additional time. The monthly chances of a fertile couple conceiving normally range from 15%–20%. This rate is accepted as 4%–5% among couples experiencing infertility for fewer than 3 years.

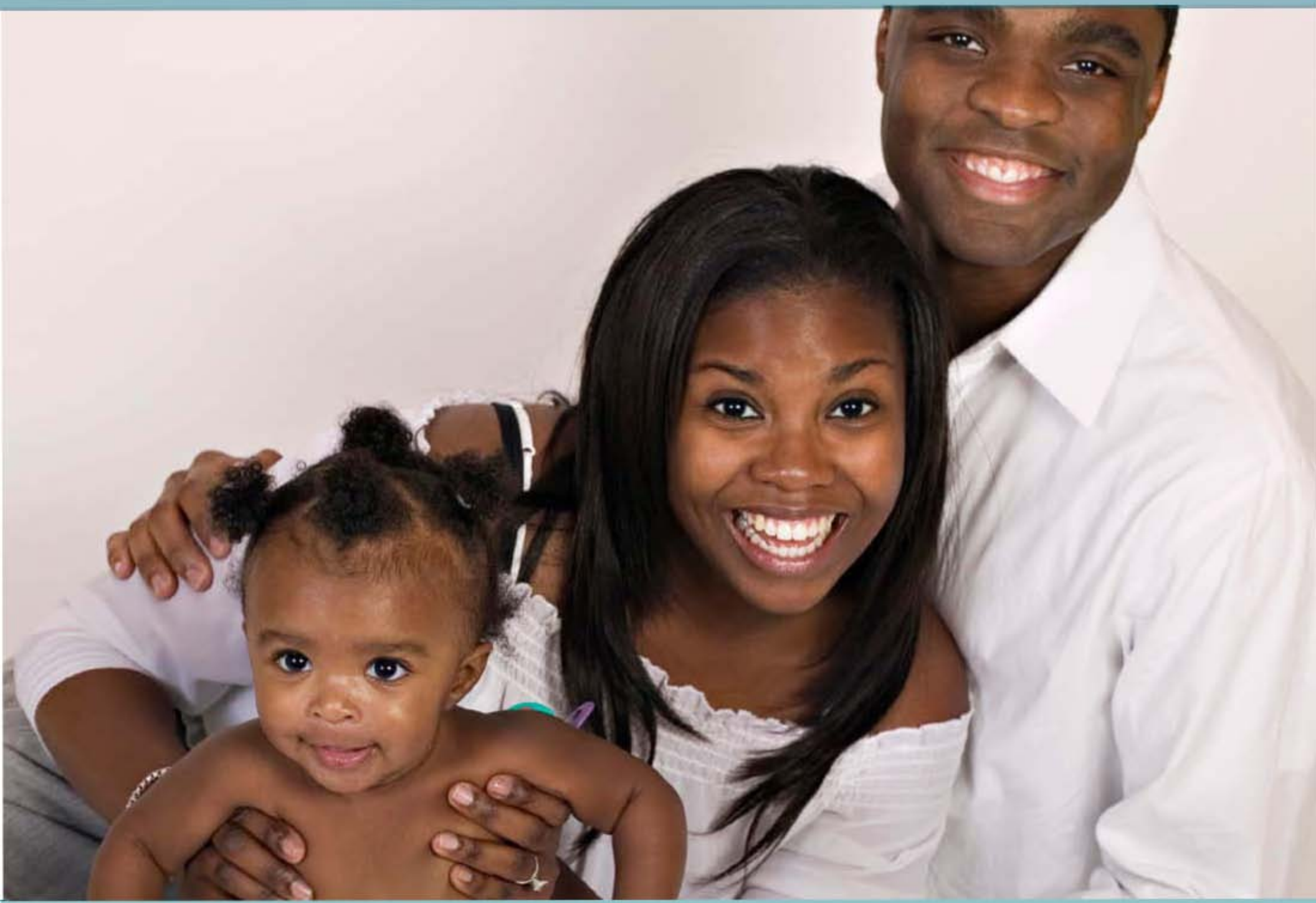


At HWFMU, the monthly fecundity rate following IUI improved to 10.1% overall and 14.9% among women younger than 40, a 2-3 fold improvement implying that IUI works. We conclude furthermore, that even if IUI serves only those who would have become pregnant anyway, it clearly results in earlier pregnancy. For couples experiencing the social burden of infertility, this may assist in saving their relationships. Failure of a series of IUI may serve to identify earlier those who may benefit from IVF.

The findings of this study allow for better patient selection which will improve healthcare delivery. It allows for proper counselling of patients based on local evidence and provides clear patient selection guidelines to local doctors. It suggests IUI as an effective, safe, relatively inexpensive fertility treatment for correctly chosen patients. IUI cannot replace IVF; failure of IUI acts as a guideline for selection of patients who may benefit from IVF.

This paper received an Honourable Mention in the 2011 John J. Sciarra Prize Paper Award in the category "Best Clinical Research Article from a Low/Middle-Income Country" by the International Journal of Gynaecology and Obstetrics (IJGO), the official journal of the International Federation of Gynaecology and Obstetrics. This international recognition serves to highlight the endeavors of clinicians at the University of the West Indies, limited by resources but not by intellectual and clinical capacity. This will hopefully open the prospects for further research and funding with international agencies and institutions.

Dr Loxley Christie is a consultant Obstetrician and Gynaecologist and a graduate of The UWI, Mona, who along with colleagues at the Hugh Wynter Fertility Management Unit aims to provide excellence in fertility management through research, teaching and clinical practice.



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The Best Research Publication

ARTICLE: Associations of Whole-blood Fatty Acids and Dietary Intakes with Prostate Cancer in Jamaica

Prostate Cancer in Jamaica

Prostate cancer is the most common cancer and the leading cause of cancer deaths in Jamaican men. Worldwide, active research efforts are taking place to identify possible causes of prostate cancer including the influence of diet and behaviour. We decided to investigate whether factors in the Jamaican diet could be associated with an increased risk of prostate cancer. However, because they rely on memory, studies of diet have been regarded to be less informative than those based on biological measurements. Measurements of certain nutrients in the blood can provide an alternative to patients' recall of dietary intake.

Does Diet Influence Prostate Cancer in Jamaica?

In this study we investigated patients' recall of their diet to determine fat intake and measured fat levels in blood as an objective measure of fat intake. We evaluated both for their association with prostate cancer.

How was this study done?

We compared 209 men, aged 40 – 80 years who were newly diagnosed with prostate cancer with 226 men of similar age who were cancer free. Both groups attended the same urology clinics. A food frequency questionnaire was used to assess dietary intake while whole-blood fatty acid composition was measured by gas chromatography.

What were the findings?

▪ Associations of whole blood fatty acids

High whole-blood monounsaturated fat (oleic acid) and moderate concentration of saturated fat (palmitic acid) were associated with reduced risk of prostate cancer whereas men with high concentrations of polyunsaturated fat (omega-3) were at increased likelihood of prostate cancer. Other fatty acids in blood were not associated with prostate cancer.

▪ Dietary intakes – nutrients

Our results showed that men who reported high intakes of monounsaturated fat (MUFA) were less likely to have prostate cancer. The principal source of MUFA was avocado. Dietary intakes of other fats did not appear to influence prostate cancer risk.

▪ Dietary intakes - select foods and food groups

Specific foods or food groups hypothesized to be associated with prostate cancer were examined also. Foods were grouped as unprocessed- and processed meat, seafood, fruits, dark green leafy and yellow vegetables, other vegetables (such as tomato, cabbage, string beans and cauliflower), ackee (Blighia sapida), avocado, beans and legumes and dairy. With the exception of intake of avocado, patients with prostate cancer reported that they consumed similar amounts of foods or food groups as did the controls. Examination of foods and food groups for their association with prostate cancer revealed that men who reported high intakes of avocado (> 60 g/day) were less likely to have the disease.

Our analysis of selected foods, food groups and nutrients hypothesized to be related to prostate cancer, found that greater intake of avocado and monounsaturated fats were associated with reduced risks of prostate cancer. We also observed that men with a higher level of monounsaturated fat in blood were less likely to have prostate cancer. These findings are biologically plausible but need to be further studied. These findings, if confirmed, may be used to inform interventions aimed at modifying the risk factors for prostate cancer.

Acknowledgements: This work was supported by the National Health Fund, CHASE Fund and the Planning Institute of Jamaica. The authors thank the staff and participants of the study for their important contributions.

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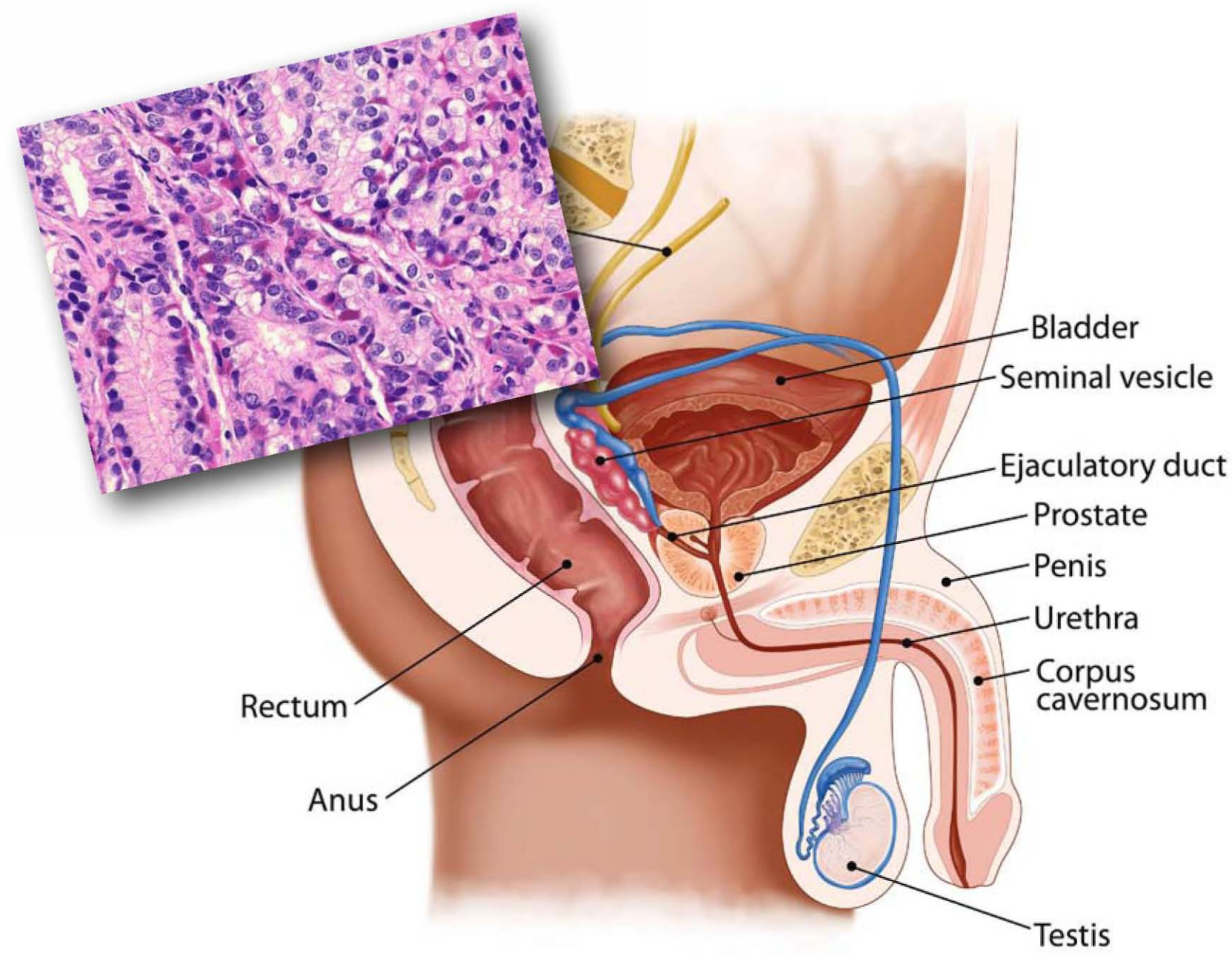

Bladder
Seminal vesicle
Ejaculatory duct
Prostate
Penis
Urethra
Corpus cavernosum
Rectum
Anus
Testis

Professor Brendan Bain | Dr Carol Ann Senah
Ms Natalie Irving-Mattocks | Dr Shelly Trim
Mrs Denise Minott | Dr Jacqueline Murdoch
Ms Sasha Martin

Research Project Attracting the Most Research Funds

Research Project with the Greatest Business/Economic/ Development Impact

CHART/RCU Vice Chancellery

A Significant Landmark

April 2012 saw the achievement of a significant landmark at UWI when the CHART Regional Coordinating Unit (RCU) received a five-year grant worth US$ 9M from the US-based Health Resources and Services Administration (HRSA) under the US President's Emergency Plan for AIDS Relief (PEPFAR). The grant, which is being called "CHART II", takes the form of a cooperative agreement with HRSA and is the first direct award from HRSA to an academic institution outside of the USA. The Unit has also received funding via regional grants to CARICOM from the Global Fund to fight AIDS, Tuberculosis and Malaria.

A Historical Note

The RCU was established in 2003 with the endorsement of CARICOM under the leadership of Professor Brendan Bain, Public Health and Infectious Disease Specialist who, at that time, was head of the Department of Community Health and Psychiatry. Since then, the Unit has grown from a staff of three to a team of 12 , which now reports directly to the Vice-Chancellor. It is the central entity in the Caribbean HIV/AIDS Regional Training (CHART) Network, which has taken in-service training programmes to health care workers in more than 20 Caribbean countries, covering themes related to prevention, care and treatment of the human immunodeficiency virus (HIV) infection, other sexually transmitted infections and tuberculosis. In 2008, the CARICOM-led Pan-Caribbean Partnership against HIV and AIDS (PANCAP) named the CHART RCU as the lead agency for coordinating its capacity-building initiative in the region.

The CHART Network Partnership with I-TECH

The CHART Network began with sub-awards and technical assistance from the International Training and Education Center on HIV (I-TECH), a consortium led from the University of Washington (UW) in Seattle. I-TECH has helped with organisational development, preparation and publication of curricula and clinical guidelines, orientation of staff, and training of trainers and mentors. The receipt of the HRSA grant in April 2012 marks a transition of leadership from UW to UWI, with I-TECH expected to play a diminishing role in the partnership as the baton is passed to the RCU.

RCU and CHART Network structure and function

The RCU has served as the secretariat of a regional Executive Council and as the hub for the first CHART training centres in The Bahamas, Barbados, Haiti and Jamaica. The current team includes a training and development unit, a clinical coordinator, health information and monitoring and evaluation expertise, a human resources advisor, together with administrative and financial support staff. In 2006, a sub-regional coordinating point was established within the HIV/AIDS Project Unit of the Organisation of Eastern Caribbean States (OECS) to service that cluster of countries. The Trinidad & Tobago Health Training Centre (TTHTC) was launched at the St. Augustine campus of UWI in 2007 and became the newest member of the Network.

Between 2003 and March 2012, the RCU and the training centres were sub-awardees of grants received by I-TECH. The focus in the first few years (CHART I) was on training for prevention, care and treatment related to HIV, other sexually transmitted infections, tuberculosis and other complications of HIV infection. The emphasis was on increasing knowledge and skills and reinforcing professional attitudes among frontline staff who needed to respond immediately to the emergency of HIV and related conditions. In 2008, PANCAP named the CHART RCU as the lead agency for coordinating capacity building in the region.

A Wider Scope – from HIV Training to Health Systems Strengthening

Under the new CHART II programme, the scope of work will expand to include systematic health workforce development in participating countries utilizing a road map developed by PAHO and this will not be limited to HIV. The plan includes capturing the results of health sector needs assessments and providing technical assistance to participating countries and institutions as they conduct training, recruitment, appropriate placement and retention of personnel. The aim is to work with Governments, the Pan-American Health Organisation, the Caribbean Public Health Agency and other regional and international agencies to build and retain a larger human resource pool as a key component of a broader approach to the strengthening of Caribbean health systems. The results of this work will be published in the health literature.

Professor Brendan Bain has been involved in pioneering the training and practice of Clinical Infectious Diseases in the Caribbean. For the last ten years, he has led the CHART project, which is overseeing the development, monitoring and evaluation of training for health workers in more than 20 countries in the region preparing them to provide competent and empathetic care to persons infected with and affected by the human immunodeficiency virus (HIV) infection.

Professor Maureen Samms-Vaughan

The Most Outstanding Researcher/ Research Activity

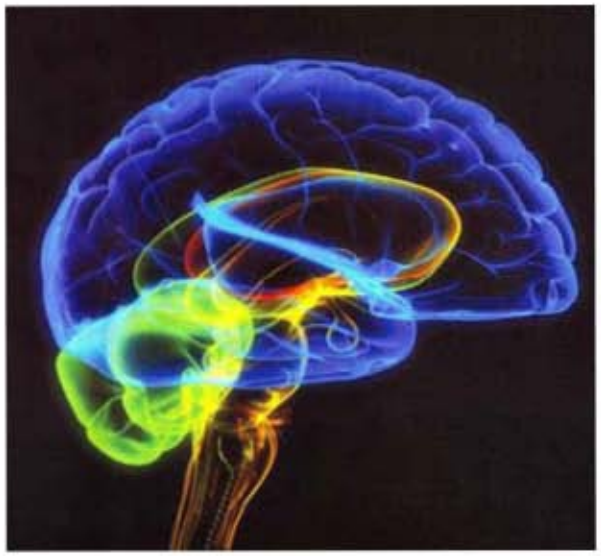
ARTICLE: Autism and the Associated Risk Factors

Autism is one of the most common developmental disorders of childhood affecting one child in every 88. As this disorder is almost 5 times more common in boys, it affects one in every 54 boys and one in every 252 girls. Children with autism have delayed communication and social interaction, and unusual repetitive and stereotyped behaviours. Two-thirds of children with autism are intellectually impaired and require special education, but all children require a range of individual therapeutic services, with significant cost to parents and/or the state. The tremendous social, educational and financial impact of autism on families and public services has led to considerable research worldwide. Early research has been focussed on identifying successful interventions that improve the outcome of children living with autism.

In keeping with this, prior research at the UWI has identified delayed diagnosis when compared with children in developed countries, suggesting a role for screening and early intervention. High levels of parental stress among parents of children with autism have also been identified, with the level of stress paralleling disease severity. This suggests the need for parental support and services. Children from higher social class homes had less cognitive impairment than those from lower social class homes, suggesting the importance of stimulation in reducing disease severity.

More recent research has been focused on the identification of the cause(s) of autism, with the aim of reducing its incidence. The cause of autism is currently unknown, but 1 in 7 children have been found in international studies to have a rare genetic mutation. Environmental toxins, including heavy metals, and social environmental factors, such as advanced parental age, have also been implicated. Further, complex interactions between genes and environmental agents have also been proposed as potential causes.

Research being undertaken at the UWI to identify factors associated with a higher risk of being born with autism in Jamaica has the potential to identify causative factors, which can then inform interventions to reduce the incidence. This research in developing countries, such as Jamaica, is important in the scientific



study of causation. The identification of similar associated factors across countries with varying physical and social environments, suggests that the environment plays a limited role or that there may be unidentified environmental protective factors. Divergent associated factors across countries, however, suggest that the environment may be significant or there may be different forms of the condition.

This research project utilised the Jamaica Autism Database (JAD), established in the 1990s, for studying autism in Jamaica. The JAD includes some 600 children who have been diagnosed at public and private referral clinics at the UHWI. Some 150 children, aged 2 to 8 years from the JAD and 150 typically developing children, of similar age and gender, who had no symptoms of autism (control group), were

invited to participate in the study. Social, dietary and environmental information was obtained. Additionally, salivary and blood samples were taken for genetic and heavy metal analysis, respectively. Heavy metals, including lead, mercury, arsenic, cadmium and manganese, have been found in higher than expected levels in Jamaican soil and consequently, in foods grown in the soil.

Research Findings and Implications

Genetic and environmental analyses have been completed for approximately half of the pairs of children in the study. Jamaican children with autism had similar genetic profiles for glutathione genes and similar blood levels of mercury, lead and arsenic as typically developing children, once diet was accounted for. The research, however, identified three times higher blood levels of lead and four to four and a half times higher blood levels of mercury and arsenic in Jamaican children, when compared with their peers in developed countries. There were also associations between blood mercury levels and dietary fish (saltwater fish, mackerel and sardines); between blood arsenic levels and dietary green leafy vegetables and non-piped water sources; and between blood lead levels and dietary shellfish and fried dumplings, as well as use of ceramic cookware and eating dirt.

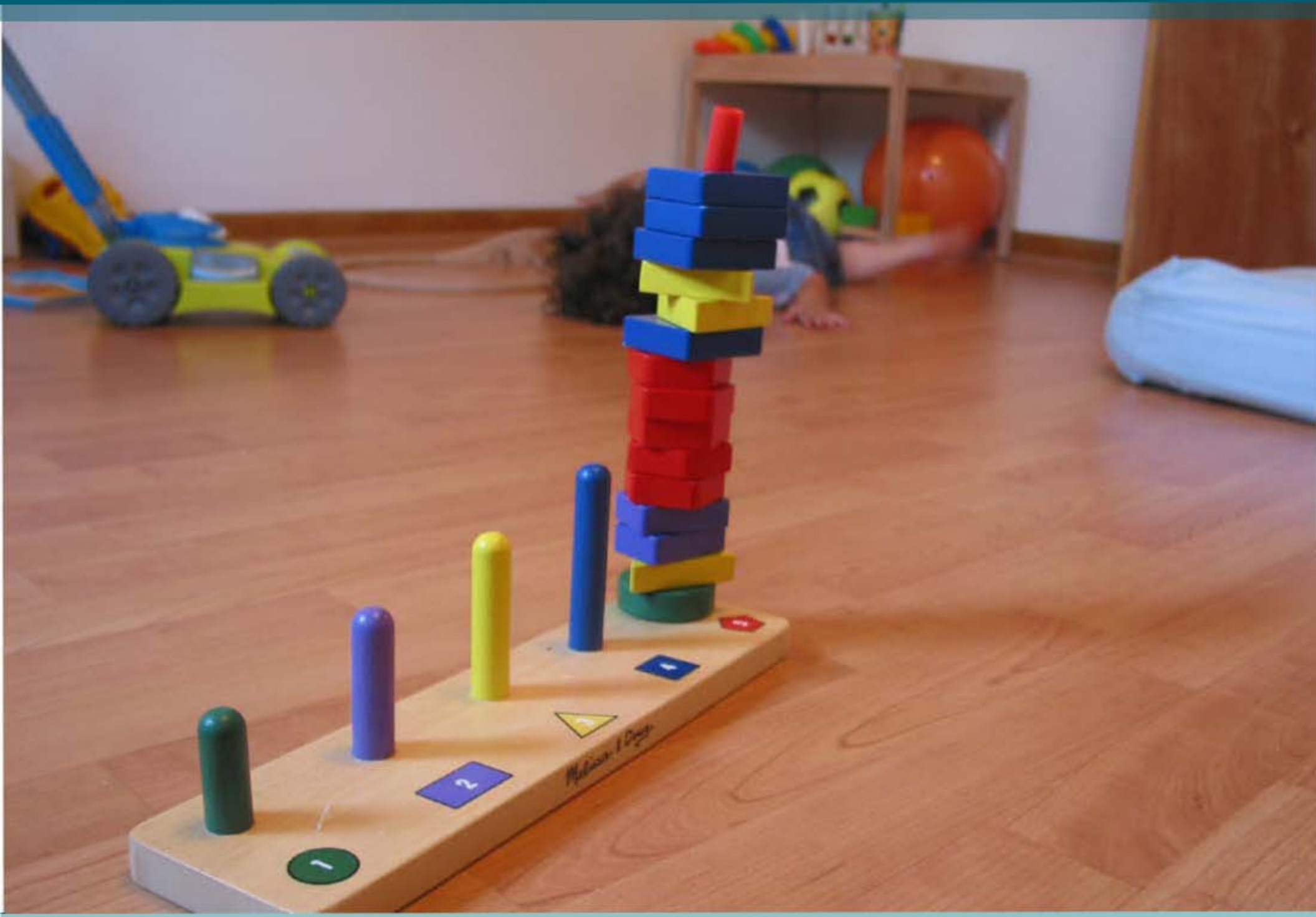
Among the social environmental factors, older maternal and paternal ages, particularly over the age of 35 years, have been identified as risk factors for having a child with autism internationally. The association with parental age was confirmed in the Jamaican study. Mothers and fathers of Jamaican children with autism were approximately six years older than those of children without autism.

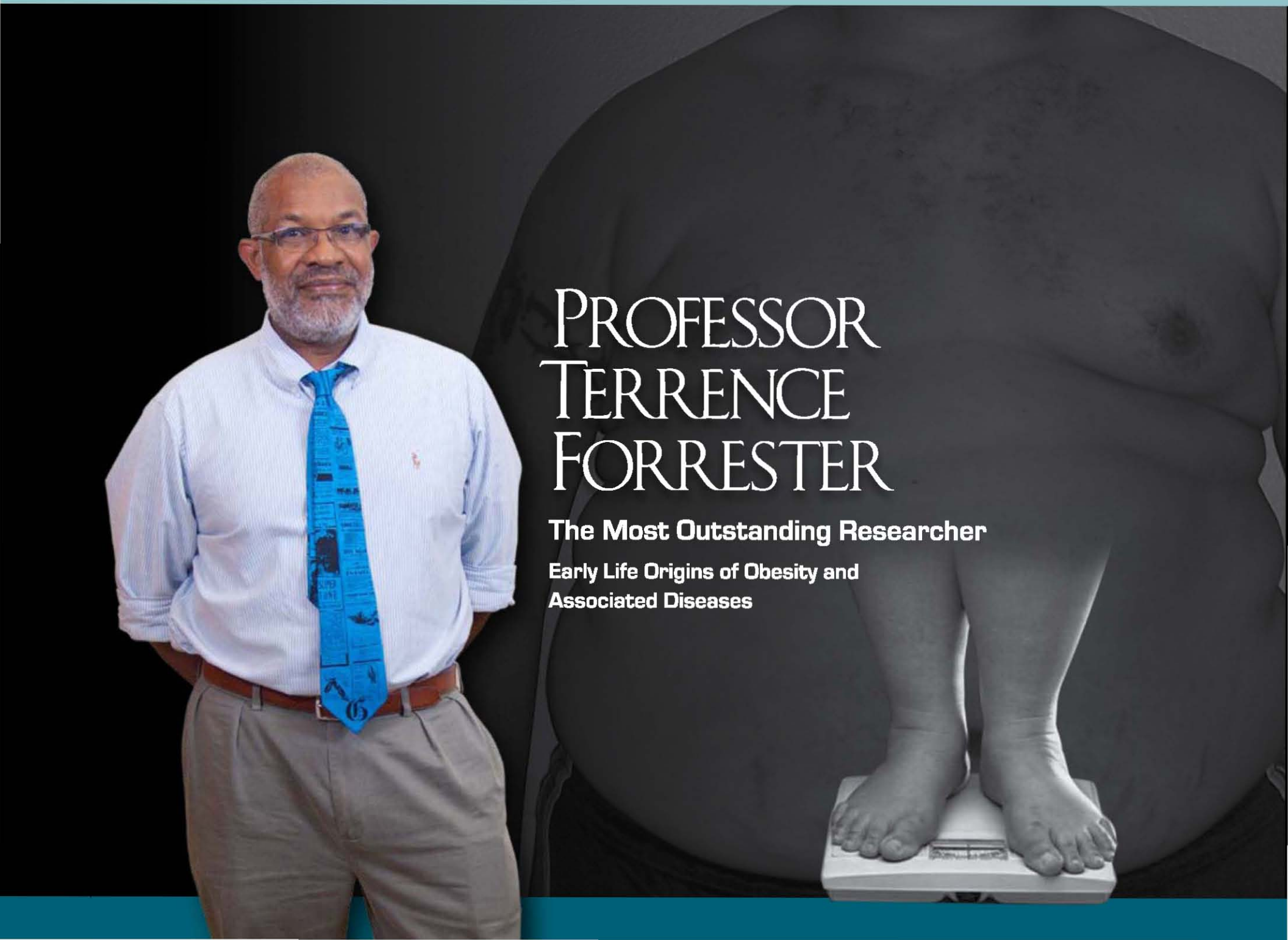
Public education on the increased risk of having a child with autism with advanced parental age could reduce the incidence of autism.

The research has so far identified no individual genetic or heavy metal association. Further research will investigate the gene-environment interaction and identify whether the presence of specific genes in association with heavy metal exposure increase the risk of autism. Importantly, the research has identified higher blood levels of heavy metals in Jamaican children. These heavy metals are known to be toxic to the developing brain and could impair children's learning and cognitive function. Further research to investigate any possible association between intellectual and learning disorders and blood heavy metal concentration is a priority.

The Jamaican team collaborated with researchers from the University of Texas. Some aspects of the research on autism in Jamaica were supported through grants from the NIH Fogarty International Centre and the NICHD.

Professor Maureen Samms-Vaughan is Professor of Child Health, Child Development and Behaviour, UWI; Consultant Developmental and Behavioural Paediatrician, UHWI; and Director of the Child and Family Clinic, UHWI, a referral centre for children with autism.





PROFESSOR TERRENCE FORRESTER

The Most Outstanding Researcher

Early Life Origins of Obesity and Associated Diseases

The context of our research programme is, populations living in developing countries which have had intergenerational malnutrition. The focus of our research programme is, discovering mechanisms underlying the propensity of such populations to rapidly become obese and develop diabetes and other cardiovascular diseases once their economies change towards a Western model. The strategies used to discover these underlying mechanisms employ the layering of ecological contrasts of populations of African origin living in different environments, developmental biology and epigenetics.

During the past year we published some key findings related to our research goals. These findings all relate to obesity. Together, they illuminate the underlying contributions of energy expenditure through everyday physical activity, and how this important part of our ability to maintain energy balance and thus maintain our weight is altered by urbanization. In addition, we along with collaborators in five countries with African origin peoples (South Africa, Ghana, Seychelles, Jamaica and USA) laid the foundations for answering this same question in these contrasting environments where rates of weight gain vary widely. We signalled the start-up of our five-country study, comparing energy expenditure and energy intake across these populations. From these data we expect to gain an understanding of the relative contributions of energy expenditure and intake to weight gain, and importantly, the type of physical activities retained or lost that directly affect weight maintenance.

Several groups have noted that when populations that have been undernourished over many generations become more prosperous and integrated into the global capitalist economy, there is an explosion in obesity rates. We constructed a theoretical framework to explain this phenomenon and provided key evidence in support of our theory. We utilised the long history of successfully managing children with severe malnutrition at the Tropical Metabolism Research Unit to make measurements on adult survivors of malnutrition and these supported our theory that the underlying propensity to rapidly develop obesity and its associated chronic diseases, resides in fundamental changes to metabolism, physiology, and anatomy. These changes to the structure and function of the body appear to be a consequence of undernutrition in the mothers while offspring were growing in the womb, and there are early indications that severe malnutrition in early childhood exacerbates these adverse changes.

Working with collaborators in New Zealand and Singapore, we are currently engrossed in unravelling the basic mechanisms for these changes at the levels of cell biology and gene control, while looking out for opportunities to develop novel interventions based on these discoveries.

Professor Terrence Forrester is a Physician, Professor of Experimental Medicine and the Director of the Tropical Medicine Research Institute. His outstanding research record includes the role of environmental factors and nutritional metabolism in the pathogenesis of obesity, hypertension, diabetes and childhood malnutrition. He is also the convenor of Solutions for Society, a societal Think Tank established at UWI to investigate and propose tangible solutions to issues of national importance.

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