Journal of Arts Science and Technology

Supplement

Volume 6 (Supplement 1), June 2012
ISSN: 0799-1681

Faculty of Science and Sport

Proceedings of the 2nd International Scientific Conference

"Linking Science, Technology and Innovation to Economic Development"

June 5 – 7, 2012

Kingston, Jamaica

A PUBLICATION OF THE UNIVERSITY OF TECHNOLOGY, JAMAICA

University of Technology, Jamaica

Faculty of Science and Sport

2ND INTERNATIONAL SCIENTIFIC CONFERENCE

June 5 – 7, 2012

"Linking Science, Technology and Innovation to Economic Development"

Conference Organising Committee:

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Published by the University of Technology, Jamaica

ISSN: 0799-1681

Welcome Message from the President

The University of Technology, Jamaica (UTech) welcomes local and overseas participants and delegates to the staging of our 2nd International Scientific Conference. Participants can expect a very engaging and fruitful three-day discourse on critical issues related to the alliance of science, technology and innovation (STI) for economic development.

There is no aspect of our development that can be propelled without an understanding of the relevant scientific underpinnings, particularly in today's dynamic knowledge-based global economy where innovation and change are constant. UTech is therefore pleased to be contributing to the advancement of public awareness of Science, Technology and Innovation in improving the human condition in Jamaica, the Caribbean region and beyond. Additionally, the cross-disciplinary nature of STI means that the conference deliberations will be useful to developments taking place across almost any industry.

We look forward to your participation in an enriching exchange of ideas and to the forging of partnerships that will serve to influence the creation of new innovations and opportunities for economic development.

My very best wishes for a successful conference.

Prof. the Hon. Errol Morrison OJ
President
University of Technology, Jamaica (UTech)

Welcome Message from the Dean

It is with a sense of pride and satisfaction that I welcome you to the 2nd International Scientific Conference of the Faculty of Science and Sport (FOSS). Our Scientific Conference is the continuation of a dream which was realised last year with the staging of our first. This conference is a direct product of the Faculty's vision: "To be an internationally renowned centre of excellence for the development of Science, Technology and Sport, incorporating teaching, research and service to the community". Our theme: "Linking Science, Technology and Innovation to Economic Development", aims to highlight our vision and enhance our achievement of these goals.

The University of Technology, Jamaica (UTech) has been accepted as the "Home of World Class Athletes". It should also be noted that under the leadership of our visionary President, Professor the Honourable Errol Morrison, the University is on its way to being simultaneously known as the "Home of World Class Minds". Our athletic prowess was underscored by UTech's performance at the 2008 Beijing Olympics and the 2009 World Championships, becoming the most successful university worldwide in terms of its medal contribution to the success of its national team. That excellence was continued at the 2011 World University Games.

Through this our 2nd International Scientific Conference we intend to continue our journey of claiming our rightful place in the scientific world and in so doing aid in the development of our country, the region and the wider world. Investment (monetary and academic) in science, technology and innovation acts as an engine for long-term development, and is an essential ingredient to achieving many developmental goals set by our country. The spending on science and technology research in universities must be escalated, and top science graduates must be retained, encouraged and supported if Jamaica and the Caribbean are to become competitive in the global economy.

Food security is increasingly becoming a concern the world over and science and technology has a critical role to play in advancing agricultural methods. Countries are looking for alternative energy sources, including technology-intensive nuclear power, in a greening world and Jamaica is no different. Indigenous knowledge needs to be harnessed and developed, with benefits accruing to the country's people through usage of the products, earnings for the people and savings. Our own Dr. Andrew Lamm is currently researching the properties of some of our natural products while Research Fellow Maurice McGlashan-Powell is doing research on the cutting edge of optics, photonics and computer technology. We support these efforts and those of their scientific colleagues here at UTech and elsewhere.

The exposure afforded to our staff members and the interaction and collaboration with our international colleagues can only serve to enhance our efforts and elevate our standards and reputation as an institution and a country. We trust that you will open your minds and walk with us into the new dimension where 'world class' will be our definition.

Welcome and best wishes.

Associate Prof. Colin Gyles
Dean, Faculty of Science and Sport
UTech

Message from the Conference Chair

Welcome to the 2nd International Scientific Conference being hosted by the Faculty of Science and Sport at the University of Technology, Jamaica. This year's conference is being held under the theme "**Linking Science, Technology and Innovation to Economic Development**", and we think that this theme is very relevant especially as Jamaica celebrates 50 years of Independence this year.

In the present economic climate in Jamaica, the region and the world, continuous development and research have to be encouraged in order to address the current challenges and propel future planning and vision. Science, technology and innovation (STI) has always been a critical driving force for improving economic and social welfare. Research and innovation have led to great industrial, technological, social and medical transformations and there is no denying that local and regional research and entrepreneurial initiatives have contributed greatly to these successes. The Faculty of Science and Sport at UTech intends to play an integral role in continued development throughout the region.

This year's conference will provide a forum for researchers, entrepreneurs and practitioners in the region and abroad to meet and discuss their current areas of scientific research, discoveries and innovations toward the advancement of economic development. The first day will feature a keynote plenary address by Prof. Mohamed Chouikha, Chair of the Department of Electrical & Computer Engineering at Howard University and member of the US National Science Foundation Review Board. Oral presentations will continue on the first day including a second plenary lecture in the afternoon by Dr. Andre Jones, chemist, entrepreneur and CEO of Yono Industries Limited, a Jamaican manufacturing company. A third plenary lecture by sport scientist Dr. Francois-Xavier Li of the University of Birmingham will kick off the second day, followed by parallel oral sessions to accommodate all participants. Overall, the conference will feature more than 20 oral presentations from academic staff and students from UTech, UWI, NCU and the University of Guyana, as well as local and overseas public and private sector institutions. Presenters are encouraged to submit full papers to the Journal of Arts, Science and Technology (JAST), a multidisciplinary peer-reviewed publication of UTech.

We invite you to join us for the conference reception on Tuesday evening at the "Talk of the Town" on the 17th floor of the Jamaica Pegasus Hotel where you will be delighted by an evening of cultural and social activities at a location that boasts some of the most spectacular views of Kingston. We also hope that you will not miss the environmental field trip on Thursday morning (Day 3) to Dunn's River Falls and Green Grotto Caves located on Jamaica's north coast.

I must express my appreciation to the conference organising committee for their hard work and determination to making this event a reality. Despite our difficulties and very busy schedules, we were able to pull this off yet again. I feel truly blessed to have the opportunity to work with such a great team. To our sponsors, we sincerely thank you for your continued support, especially during these hard economic times. Last but not least, we thank our presenters, session chairs, staff, students, colleagues and friends for participating in this event.

Dr. Debbie-Ann Gordon-Smith
Chair, Conference Committee

Acknowledgments

The organising committee wishes to thank the following organisations for their support:

Waters Technologies

Environmental Foundation of Jamaica

Isratech Jamaica Limited

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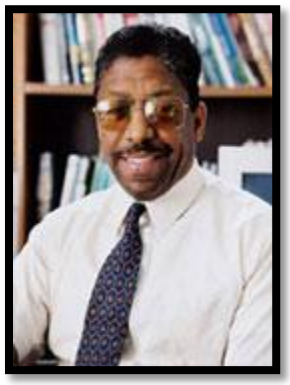
Keynote Speaker: Prof. Mohamed F. Chouikha



Mohamed F. Chouikha received a PhD degree in Electrical Engineering from The University of Colorado in Boulder in 1988. Since then, he has been with the Department of Electrical Engineering at Howard University. In July 2000, he became the Chair of the Electrical Engineering Department.

Prof. Chouikha's research interests include, among other areas, machine learning, intelligent control, multimedia signal processing and communications, image analysis; and intelligent systems application. Funded research based on these areas include: classification and visualization of breast and colon cancers, adaptive spectrum allocation -Cognitive Radio- for secure networks, data fusion and pattern recognition for UXV situation awareness and smart lighting communications and control systems. On the education/instruction side, Prof. Chouikha's focus is on enhancing the recruitment and retention of underrepresented minorities in the STEM areas in general and engineering in particular. To that end, he is working with colleagues from other institutions to develop new instruction delivery methods based on hands on learning. Prof. Chouikha is the Director of the Communications and Signal Processing Lab and the Director of the Center of Academic Excellence. He was the Founder and Director of the Center for Applied High Performance Computing and one of the founding directors of the Washington Academy of Biomedical Engineering.

In 2004, Prof. Chouikha led a team of faculty members in establishing a new Computer Engineering program within the Department of Electrical Engineering, since then renamed the Department of Electrical and Computer Engineering at Howard University. To date Prof. Chouikha has advised more than 40 PhD and Masters students, 5 Post-doc researchers and a larger number of undergraduate students. He is a senior member of IEEE and a member of Tau Beta Pi and KHN.

Plenary Speaker: Dr. Andre Jones

Andre Jones earned his doctorate in Organic Chemistry from Howard University in Washington DC. He is a trained synthetic organic chemist, which entails the analysis and synthesis of complex organic molecules that have a wide variety of application in medicine such as, pharmaceutical drugs, polymers and surfactants.

Dr. Jones worked for a pharmaceutical generic drug manufacturing company, Watson Pharmaceutical in the USA, where he was a Quality Control Chemist performing high pressure liquid chromatography, gas chromatography, infrared spectroscopy to test for impurities and product stability. He also performed dissolution studies of several brand name pharmaceutical narcotic analgesic drugs such as Oxycontin and Tramadol under specific conditions to see how fast these drugs would break down and be absorbed in the stomach.

Dr. Jones is currently the Chief Executive Officer and founder of Yono Industries Limited in Jamaica and Yono Corporation in the Unites States which was founded in 2000. In 2008, he relocated, installed and commissioned Yono Corporation manufacturing plant equipment from the USA to Jamaica to manufacture cosmetics such as lotions, hair shampoos, hair conditioners, body washes, body splashes and luxury bar soaps. The factory has the latest technology PLC controlled injection molding and blow molding equipments to manufacture bottles and caps from different plastic resins such as PET, HDPE and PP. The Yono Collection and Prince Collection of products is currently being marketed and sold both locally and overseas. The company also provides contract manufacturing services to other companies such as hotels, distributors and retailers that desire their own branded products.

Since the start of manufacturing in Jamaica in November 2009, the company recently won an award as one of the new bold manufacturers in Jamaica.

Plenary Speaker: Dr. Francois-Xavier Li

François-Xavier Li studied Sport Sciences, Psychology and Computer Sciences in Marseille, France, where he completed his PhD and HDR in sport sciences, before taking a post doctoral position in UK and then moving to Birmingham. Dr. Li is currently a Lecturer in Motor Control and Learning at the University of Birmingham. He has competed in a variety of sports, including sailing at international level. His research interests include the coordination and optimisation of movement in various sporting actions (running, cycling, triathlon, golf), perception-action coupling, affordances, movement coordination and motor rehabilitation in special population (e.g., obese and elderly), effects of fatigue on coordination and cognitive functions. The techniques used include 3D motion analysis, electromyography and ground force reaction. The experimental work in the laboratory is complemented by field studies at international competitions as race conditions cannot fully be replicated in the laboratory. Dr. Li is the Manager of the Kinesiology Laboratory in the School of Sport and Exercise Sciences at the University of Birmingham.

Conference Programme

DAY 1: TUESDAY, JUNE 5	
8:00 am – 9:00 am	Registration and Morning Coffee
9:00 am – 10:30 am	**Opening Ceremony** **Welcome and Introductory Remarks** Mr. Nodley Wright, Faculty of Science and Sport (Master of Ceremonies) **Greetings** The Hon. Phillip Paulwell, MP, Minister of Science, Technology, Energy and Mining Prof. the Hon. Errol Morrison, OJ, President, University of Technology, Jamaica Dr. Colin Gyles, Dean, Faculty of Science and Sport **Overview of Conference** Dr. Debbie-Ann Gordon-Smith, Chair, Conference Organising Committee **Introduction of Keynote Speaker** Mr. Maurice McGlashan-Powell, Research Fellow, Faculty of Science and Sport **Keynote Address – Plenary Lecture 1: International Educational Cooperation** **Professor Mohamed Chouikha**, Chair, Department of Electrical & Computer Engineering, Howard University, Washington, DC, USA
10:30 am – 10:45 am	Coffee Break
10:45 am – 11:30 am	***Session 1: Natural Products Research in Jamaica*** ***Chair: Dr. James Smith*** **Andrew S Lamm** – The Natural Products Research Laboratory (NPRL): Its objectives, potential and importance to Jamaica's development **Sheena Francis,** Damion Morris, Mario Shields, Helen Jacobs, Rupika Delgoda – Natural products from Caribbean plants as potential Anti-tuberculars and Chemopreventors
11:30 am – 12:00 pm	**Sponsor Presentation: Waters Corporation** **Mr. Joerg von Helden** – Screening, Quantification and the Study of Unknowns in the same Data Set of a modern LC-MS System
12:00 pm – 1:00 pm	Lunch
1:00 pm – 2:00 pm	**Plenary Lecture 2: Development of an Oleochemicals Industry in Jamaica** **Dr. Andre Jones** Chief Executive Officer, Yono Industries Limited, Jamaica
2:00 pm – 3:15 pm	***Session 2: The Business of Research*** ***Chair: Mr. Gustwell Weir*** **Paul Ivey,** Ruth Potopsingh, Martin Henry and Gossett Oliver – Advancing institutional research agenda through structured Research and Innovation Management **Janeen McNish**, Ashford Kerr, Ceretsie Campbell, Simone Walker-Barrett – HomeChef seasonings: "Taste is Everything" **Winston Buckley,** Oneil Harris, Sandun Perera – On the sensitivity of the Black-CAPM to the Market Portfolio

DAY 1: TUESDAY, JUNE 5 (continued)		
3:15 pm – 3:25pm	Tea Break	
3:25 pm – 5:00 pm	***Session 3: Green Technology*** ***Chair: Mrs. Nadia Watson-Spence*** **Homero Silva-Serrano –** A Negacarbon approach in UTECH for the reduction of carbon and environmental footprints and the strengthening of community resilience in Jamaica **Keroma Bernard** – Assessing the indoor environment as a method of designing energy efficient office buildings in Jamaica **Ewan Pitter** – Automation of a greenhouse hydroponic system, using microcontroller based technology for the production of food and food security in the Jamaican society **Raymond Martin** – Innovation in Organic Crop Production Systems in Jamaica	
5:30 pm – 8:00 pm	Reception – Venue: The Talk of Town, 17th Floor, Jamaica Pegasus Hotel "Jamaica Night"	
DAY 2: WEDNESDAY, JUNE 6		
8:30 am – 9:00 am	Morning Tea and Coffee	
9:00 am – 10:00 am	**Plenary Lecture 3: Advancing Sport in the Caribbean: Opportunities from Science and Technology** **Dr. Francois-Xavier Li** Lecturer in Motor Control and Learning, School of Sport and Exercise Sciences, Birmingham University, UK	
10:00 am – 10:30 am	**Sponsor Presentation: Victoria Mutual Building Society** **Mrs. Vivienne Bayley-Hay**	
10:30 am – 10:45 am	Coffee Break	
10:45 am – 12:00 pm	***Session 4A: Innovative Systems I*** ***Chair: Dr. Colin Gyles*** **Tania Henry –** Recent breakthroughs and development in Nanoscience and Nanotechnology, and its implications for the developing world **Maurice McGlashan-Powell –** An Integrated Optics and Photonics Research Laboratory (IOPRL) at the University of Technology Jamaica: Its implications for economic growth for Jamaica and the Caribbean. **Barrington Brown,** Fassil Muddeen – Technological Innovations: Autonomous Rain Gauge	***Session 4B: Health Issues*** ***Chair: Mrs. Beverly Myers*** **Olusegun A Ismail**, Chiranjivi Potu, Edwin Tulloch-Reid, Dainia Baugh, Ernest C. Madu – Echocardiographic Partition values and prevalence of Left Ventricular Hypertrophy in Hypertensive Jamaicans **Dorothy Akindele** – Is there a link between Human Capital Development and Maternal Depression? **Cecelia A Waugh-Hall**, John F Lindo, Jacob Lorenzo-Morales, Ralph D Robinson – Wild rats (*Rattus rattus* and *R. norvegicus*) as a Zoonotic Risk in Jamaica
12:00 pm – 1:00 pm	Lunch	

DAY 2: WEDNESDAY, JUNE 6 (continued)		
1:00 pm – 1:50 pm	***Session 5A: Innovative Systems II*** ***Chair: Dr. Kamilah Hylton*** **Debbie-Ann Gordon-Smith,** O'Neill Gordon-Smith, Rajiv Bakshi – Waste-to-Energy: A viable solution for waste disposal and energy issues affecting Small Island Developing States (SIDS)? **Delroy Green** – Evaluation of an Intelligent Integrated Renewable Energy Management System for electricity generation in equatorial developing countries	***Session 5B: Technology in the Caribbean*** ***Chair: Dr. Cecelia Waugh-Hall*** **Kemuel Gaffar,** Lenandlar Singh, Troy Thomas – Mobile Learning: Lecturers versus students on Usage and Perception using the UTAUT Model **Everton Lewis** – Technological Literacy: A Critical Path towards economic development
1:50 pm – 2:20 pm	**Sponsor presentation: Isratech Jamaica Limited** **Mr. Jason Williams** – Energy sources of the future	
2:20 pm – 2:50 pm	Tea Break	
2:50 pm – 3:20 pm	**Sponsor Presentation: Environmental Foundation of Jamaica** **Mrs. Karen McDonald-Gayle** – The Role of the EFJ in linking Science Technology and Innovation to national development	
3:20 pm – 4:10 pm	***Session 6: Innovative Systems III*** ***Chair: Dr. Sheena Francis*** **Michael Prescod**, Dayne Robinson, Ervin Lyle **–** A PLC Based Weight Processing & Sorting system for industrial applications **Robert Johnson**, Nonata Maia – Technological developments in rocess Intensification	
4:10 pm – 4:30 pm	Closing Ceremony	
DAY 3: THURSDAY, JUNE 7		
7:30 am – 5:00 pm	Environmental Field Trip: Green Grotto Caves and Dunn's River Falls, St. Ann, Jamaica (Buses leave UTech Campus at 7:30 am and Jamaica Pegasus Hotel at 8:00 am)	

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ABSTRACT – Plenary Lecture 1

International Educational Cooperation

Tuesday, June 5, 2012 at 9:00 am

Professor Mohamed Chouikha

Chair, Department of Electrical & Computer Engineering
Howard University, Washington, DC, USA

In this talk, the speaker will present an overview of efforts and initiatives taken by universities in the United States to 1) improve technology transfer programs within the US and 2) implement sustainable international educational and research programs. Examples drawn from experiences at Howard University will be used to show existing collaborations between Howard University (HU) and universities in developing countries. Increasing Howard's international footprint is part of the university vision. To this end, faculty members at HU are looking for enhancing existing collaboration and developing new ones. The presentation will include ideas and strategies on how to achieve these goals.

ABSTRACT – Plenary Lecture 2

Development of an Oleochemicals Industry in Jamaica

Tuesday, June 5, 2012 at 1:00 pm

Dr. Andre Jones

Chief Executive Office, Yono Industries Limited,
St. Andrew, Jamaica

One of the major focuses of Yono Industries operations in Jamaica and its founder, Dr. Andre Jones, is the development of an oleochemicals industry (chemistry of oil seeds) in Jamaica. The oleochemicals industry in Jamaica is an unrecognised or an untapped resource in Jamaica's economic and human development. Since it is based on natural renewable raw materials such as palm oil, coconut oil, ethanol (from fermentation of sugar cane) etc., it offers opportunities for the producers of natural renewable products to manufacture products of industrial value. These include:

- Detergent
- Bio-fuels
- Cosmetics
- Lubricants
- Plastics
- Textiles

There are a number of reasons for the development of an oleochemicals industry because it offers tremendous opportunities in several areas: including commercial and financial.

Commercial: As petroleum supplies decrease and prices increase, there will be tremendous demands for vegetable oil feedstock to completely replace petroleum supplies or to serve as a cheaper substitute in the oleochemical industry and plastics industries. As in the case of fatty alcohol (used to manufacturer detergents) which is cheaper to produce from natural vegetable oils than to make it synthetically by the Ziegler Natta process using ethylene gas from petroleum. World natural fatty alcohol production as of 1983 was 260,000 tons per year compared to about 420,000 tons via synthetic linear alcohol from ethylene.

Financial: The greatest return on investment for Yono and Jamaica both in-terms of the billions of US dollars in revenue it can generate yearly as exemplified by the thousands of different products that can be manufactured from various oil seeds.

ABSTRACT – Plenary Lecture 3

Advancing Sport in the Caribbean: Opportunities from Science and Technology

Wednesday, June 6, 2012 at 9:00 am

Dr. Francois-Xavier Li

Lecturer in Motor Control and Learning, School of Sport and Exercise Sciences
Birmingham University, Birmingham, UK

Sport has put Jamaica on the world map for many people. The achievements over the past 50 years of the various generations of athletes have been increasingly impressive and are now second to none. Nevertheless, nobody can win by being complacent, and Jamaica is facing three main challenges in sport. Firstly, the rest of the world is also progressing and in order to keep winning Jamaican athletes have to maintain their advantage over the competitors. Secondly, the number of disciplines where Jamaica is a key world player is still limited in number. Thirdly, in spite of its tremendous advantages the region is also facing a certain number of challenges, economics and localisation being probably the biggest. Can Science and Technology help Jamaica overcome these challenges?

ABSTRACTS – Oral Presentations

Session 1:

The Natural Products Research Laboratory (NPRL): Its objectives, potential and importance to Jamaica's development

Andrew S. Lamm
University of Technology, Jamaica

Jamaica and other countries around the world are faced with the threat of devastating climate change along with other economic and social omens. Protected areas like the Cockpit Country, in central Jamaica are constantly endangered and yet remain relatively unexplored. The *Karst* topography of the area, with its numerous round-topped, conical hills and sinks, is a haven for many endemic species. This unusual landscape creates vastly different, isolated microhabitats which support many unique organisms, most of which have unexplored phytochemical and medicinal properties. The Natural Products Research Laboratory (NPRL) at the University of Technology, Jamaica was recently established through grant funding from the Global Environmental Facility/Small Grants Programme/United Nations Development Fund (GEF-SGP-UNDP) and the Environmental Foundation of Jamaica (EFJ). This presentation will highlight the novelty of the region while showcasing the diversity of species, ethnomedicine, and bioactivities. The laboratory's objectives, methodologies and relevance to Jamaica will also be discussed.

Natural products from Caribbean plants as potential Anti-tuberculars and Chemopreventors

Sheena Francis[1,2], Damion Morris[2], Mario Shields[2], Helen Jacobs[3], Rupika Delgoda[2]
[1]University of Technology, Jamaica; [2]Natural Products Institute; [3]University of the West Indies, Mona, Jamaica

Approximately 2 million lives are claimed yearly by tuberculosis. Compounded by its prevalence in HIV sero-positive patients, developing countries accounting for over 95 percent, is the emergence of multiple drug resistant strains. Hence the necessity for drug development against novel strains. Arylamine *N*- acetyltransferase (NAT), a drug metabolising enzyme found expressed in *M.tuberculosis* and responsible for the metabolism of the frontline anti-TB drug isoniazid has also been identified to play a significant role in its cell wall lipid synthesis, thus a useful target in the search for anti-tubercular therapy. In this study, we employed this molecular target in an *in-vitro* assay, to search for natural products with potential for future *in-vivo* examinations. Eleven known compounds previously extracted and purified from five rare endemic and/or indigenous Caribbean plants, *Spathelia sorbifolia*, *Esenbeckia pentaphylla*, *Peperomia amplexicaulis*, *Hortia regia* and *Clusia havestiodes* were examined for their inhibitory properties using heterologously expressed NAT from *M.Smegmatis*, a homologue of *M.tuberculosis* NAT. Greatest inhibition was obtained for the chromone and alkaloids extracts, whereby noticeable differences in inhibitory factors could be seen in relation to side-chain extensions and orientations. Anhydrosorbifolin, the chromone compound with greatest inhibition (65%), had a linear side chain compared with its derivatives, alloptaeroxylin which has no side chains (displayed 25% inhibition) and spatheliabischromone which has a cyclicized side chain (displayed 42% inhibition). These compounds were also examined for their inhibition of human cytochrome P450 (CYP) 1, a class of enzymes known to activate of polyaromatic hydrocarbons to their carcinogenic precursors. The alkaloid dictamnine revealed greatest inhibition a CYP 1 enzyme, CYP1B1 with a potent IC_{50} value of 0.27µM. These studies show natural chromones and alkaloids as potential anti-tuberculars and chemopreventors worth further analysis.

Session 2:

Advancing institutional research agenda through structured Research and Innovation Management

Paul Ivey, Ruth Potopsingh, Martin Henry and Gossett Oliver
University of Technology, Jamaica

By highlighting how building staff capacity and implementing research management initiatives were followed by the securing of a highly competitive research grant, this presentation seeks to show that structured research management interventions and support have begun to bear fruit at UTech. Research and innovation play an important role in underpinning a country's economic and social welfare and universities are at the centre of the research, innovation, and human capital development process. Furthermore, it is generally agreed that research output is one of the key indicators that set a university apart from other post-secondary institutions. Having been accorded University status in 1995, it was important for the University of Technology, Jamaica (UTech) to establish and implement a coherent research agenda and supporting infrastructure. Accordingly, the Office of Research and Graduate Studies (ORGS) was initially established. In 2007, it was replaced by the School of Graduate Studies, Research, and Entrepreneurship (SGSRE) as the unit responsible for Research & Innovation Management (RIM) at UTech. This was in keeping with an understanding of the fact that "research management" comprises a distinct suite of activities separate from the conduct of research itself. A trend of increasing research activity has emerged at UTech within an environment that has seen the implementation of various initiatives aimed at encouraging and promoting research.

HomeChef seasonings: "Taste is Everything"

Janeen R.M. McNish, Ashford A. Kerr, Ceretsie D. Campbell, Simone Walker-Barrett
University of Technology, Jamaica

The underutilisation of Jamaican's traditional herbs and spices as value added global product was the driving force behind the conceptualization and ultimate creation of this product line, HomeChef Seasonings. The company's growth and phenomenal development over a one year period has motivated the researchers to carry out intensive research on its operational activities. It is hoped that by doing this the growth path will be clearly defined in order to leave a sustainable legacy for generations to come.

The conditions that brought about the creation of this unique product line and its' level of acceptance to local home makers, chefs and members of the Diaspora will serve as a catalyst in propelling the success of this product. Findings obtained from promotional activities at food fairs and major super markets all over the island, showed that there is a significant relationship between the range of products marketed and their acceptance levels. This emerging product line from HomeChef Seasonings has tremendous potential and should be supported by all as the innovators whole heartedly support the theme, 'Eat Jamaican'.

On the sensitivity of the Black-CAPM to the Market Portfolio

Winston Buckley[1], Oneil Harris[2], Sandun Perera[3]
[1]University of Technology, Jamaica; [2]East Carolina University; [3]University of Texas at Dallas

We show that the Black Capital Asset Pricing Model (CAPM) is extremely sensitive to the choice of the "market" portfolio and becomes unstable as portfolios approach the Global Minimum-Variance portfolio. When market portfolios approach the minimum-variance portfolio, the expected return on the zero beta asset approaches negative infinity and its variance increases rapidly. Moreover, expected return on a fixed portfolio becomes indefinite (i.e., takes infinitely many values), and betas of all portfolios approach one. Unlike the Sharpe-Lintner CAPM, the market risk premium in the Black CAPM always has a positive minimum, while beta has a negative minimum value, dependent on the underlying covariance matrix.

Session 3:

A Negacarbon approach in UTECH for the reduction of carbon and environmental footprints and the strengthening of community resilience in Jamaica

Homero Silva-Serrano
University of Technology, Jamaica

UTECH has a high carbon and environmental footprint, due to: 1) a high consumption of electricity for air conditioning and 2) solid waste and wastewater management malpractices which is not morally acceptable for an educational institution that should lead with example.

Outdoor temperatures are unpleasant for students and do not allow them to concentrate for studying or homework. Additionally, heat stress makes them more irritable and more prone to violence. Environmental illiteracy is rampant among students and high consumption of goods with a high carbon footprint is observed. Healthy lifestyles are not practiced by students: physical activity and healthy food habits are almost inexistent. These conditions lead to an obesity problem among students and staff, affecting the former in their school performance. Finally, surrounding poor communities do not benefit of UTECH's presence.

The paper presents how the above issues can be solved using a new concept, the "Negacarbon" approach for carbon footprint reduction. It represents a theoretical unit of carbon footprint saved, as a direct result of energy conservation, increased efficiency and no consumption of high demand carbon goods and services (virtual carbon). Virtual carbon can be defined as the amount of carbon emitted in the production and proper disposal of a good or service.

Assessing the indoor environment as a method of designing energy efficient office buildings in Jamaica

Keroma Bernard
Scientific Research Council; University of Technology, Jamaica

A substantial portion of the average life span of man is spent in his working environment. This has become more so in today's fast-paced modern office work, which often obliges people to work long hours, particularly within Latin American and the Caribbean regions where work competition and pressure for family survival and coping with higher living standards are on the rise. There is an increasing demand for higher quality office building in Jamaica. As a developing country, the Jamaican economy is characterised by high intensity and low efficiency and is almost completely dependent on imported oil for energy. A comprehensive program of efficiency improvement and energy diversification is urgently required for Jamaica to provide high quality, affordable, environmentally friendly office buildings and reduce the country's dependence on high cost imported oil. Two office buildings in Kingston, Jamaica were investigated using field studies. The research findings revealed that because of the thermal uniformity of the outdoor temperature in Jamaica from the mean daily temperature we can easily incorporate the micro-climate in the design of energy efficient office buildings and control the indoor temperature within the suitable thermal comfort standard range. Both buildings were operating at extreme temperature from the standard comfort range recommended by the ISO and ASRAE which causes a high level of discomfort for its occupants.

Automation of a Greenhouse Hydroponic System, using Microcontroller Based Technology for the production of food and food security in the Jamaican society

Ewan Pitter
University of the West Indies, Mona, Jamaica

The agricultural sector in Jamaica is facing some major problems in that farmers are losing their crops due to inclement weather conditions, such as floods, frost and drought. In addition, to other factors such as pests, the high cost of productive land space, high human labour cost and high fertiliser cost are also problems. In order to produce healthy vegetables, technology has been incorporated into the agricultural sector and new means of producing healthy vegetables are now the focus. With this implemented, anyone no matter age, gender and infirmity can now practice farming at their own convenience with the opportunity of producing healthy vegetables using an automated

hydroponic system at the lowest cost and with little or no human intervention. This is achieved through careful programming of a microcontroller, which makes all the necessary decisions and take corrective action in order to maintain healthy plant growth until maturity. This presentation will discuss the details of designing and building such a system as well as the system operations.

Innovation in Organic Crop Production Systems in Jamaica

Raymond Martin
University of Technology, Jamaica

Food security is a concern for many nations. Jamaica is no exception. Organic production systems are being used worldwide as a solution to food security. However, growth of the Jamaican organic sector has been slow and farmers face many constraints including low access to capital, weather related risks, praedial larceny and low government support. In spite of these constraints there are innovative farmers who are making progress in overcoming these constraints. This paper reports on the use of innovation to solve constraints to organic production. It also proposes options for future development of the sector.

Session 4A:

Recent breakthroughs and development in Nanoscience and Nanotechnology, and its implications for the developing world

Tania Henry

Nanotechnology involves research and technology development at atomic and molecular levels on the nanometer scale. The creation and applications of functional nanoscale devices include the use of structures such as nanowires, nanotubes, and quantum dots, due to the novel functions associated with their size. Semiconductor nanowires have unique properties, can perform a variety of functions, and have applications as photo detectors, nanowire field effect transistors (FETs), and nanowire based-sensors.

Approaches to forming functional nanoscale devices including, nanowire synthesis and characterisation will be discussed. The electrical properties of gallium nitride (GaN) nanowires were characterised. Due to their light weight, on the order of femtogram (10^{-12} g), nanowires can also be used as mechanical resonators to detect masses at the zeptogram (10^{-21} g) level. The mechanical properties of nanowire cantilevers were tested and the results will be discussed. Research efforts continue to focus on the integration of nanowires into useful systems. Nanowires can act as active components of nanowire-based solar cells, nanowire light emitting diodes (LEDs), and nanowire networks in nanosensors.

In order for developing countries to reach the next technological frontier, access to the necessary infrastructure and resources needed for emerging nanotechnologies is important. A keen understanding of the socio-economic landscape and its influence on nanotechnology development in the region needs to be grasped for the success of any technological initiative that will be undertaken. Nanotechnology can potentially improve water, health, energy, and the environment. Applications such as drug delivery systems, water treatment, and energy storage have been realised.

An Integrated Optics and Photonics Research Laboratory (IOPRL) at the University of Technology Jamaica: Its implications for economic growth for Jamaica and the Caribbean.

Maurice McGlashan-Powell
University of Technology, Jamaica

In order to achieve a level of scientific and technological relevance necessary for economic growth it becomes crucial for Jamaica to implement substantial research programmes in the areas of Science, Technology and Innovation. This presentation delineates the implementation of such a research program and laboratory in the area of Integrated Optics and Photonics. Photonics and integrated optics is the science relating to the generation,

transmission, modulation, signal processing, switching, amplification, detection and sensing of light. The Integrated Optics and Photonics Research Laboratory (IOPRL) is a recently developed laboratory that is focused on the development of switches, routers, modulators, optical interconnect and optical backplanes based on magneto-optic Yttrium Iron Garnet (YIG) thin film waveguides. Discussed will be the capabilities of the laboratory, the recent developments in the field of integrated optics and photonics as it pertains to optical interconnect and the use of integrated optics in computer and communications systems. An in depth discussion on the primary research to be conducted in the area of magneto-optics and optical interconnect will be presented. Finally, issues of revenue generation from intellectual property (IP) and patents will be discussed along with the possibilities of creating small to midsize technology companies based on science, technology, innovation and IP generation.

Technological Innovations: Autonomous Rain Gauge

Barrington Brown, Fassil Muddeen
University of the West Indies, St. Augustine, Trinidad

The integration of technology into the daily routines of the average has increased drastically over the past 10 years. From the birth of typewriters, computers, smart phones technology seemingly develops faster than we can find uses for it. However is all instances technology introduces a solution to a problem or provides and easier and more convenient solution.

Through the use of sensors and actuators, technology has developed a means of interacting with it environment, observing the environment and acting on those observations. Technology can now obtain information from the environment and if necessary manipulate and control this environment to an extent.

This presentation details one such system, an "Autonomous Rain Gauge" which has the potential to become a critical early warning system. Through the use of microcontroller technology the system was designed to monitor flood levels and rainfall information. The information gathered is transmitted back to a base station to be analysed. The design process and considerations behind the system will be examined. The design and implementation of a preliminary system to test the initial design decisions chosen as well as the findings of the test will be discussed and the possible next steps will be looked at.

This form of innovation could propel the Caribbean on a whole to get actively involved in the development of new technology and encourage the use of local engineering and technology to the improvement of existing systems.

Session 4B:

Echocardiographic Partition values and prevalence of Left Ventricular Hypertrophy in Hypertensive Jamaicans

Olusegun A Ismail[1], Chiranjivi Potu[1,2], Edwin Tulloch-Reid[1,2], Dainia Baugh[1,2], Ernest C. Madu[1,2]
[1]University of Technology, Jamaica; [2]Heart Institute of the Caribbean

Left ventricular hypertrophy (LVH) detected by either electrocardiography or echocardiography has been shown to be an extremely strong predictor of morbidity and mortality in patients with essential hypertension and in members of the general population. Alternative to LVH, left ventricular geometrical patterns offer incremental prognostic value beyond that provided by the other cardiovascular risk factors including left ventricular mass (LVM). Combination of LVM and relative wall thickness (RWT) can be used to identify different left ventricular geometrical patterns. Various indexation methods normalised for LVM have been shown to offer prognostic significance. There was no prior study on the prevalence of LVH and geometric patterns in hypertensive patients in Jamaica using multiple partition values. Our study was designed to estimate the prevalence of LVH and geometrical patterns in a hypertensive Caribbean population in Jamaica using 10 different published cut-off values.

Is there a link between Human Capital Development and Maternal Depression?

Dorothy Akindele
University of Technology, Jamaica

Globally, women are twice as likely as men to suffer from depression and it has also been predicted that in the year 2020, the global burden of depression will rank first or second (World Health Organization 2001). Direct mortality from depression is low but it has a huge burden. Why is this so and how should this inform Research and Development? The impact of maternal depression on a child's physical growth, psychological development, intellectual capability, psychosocial functioning and predisposition to mental morbidity, are very well documented. Does any of the Millennium Development Goals directly address maternal depression?

According to the May 2011 World Bank Country Economic Memorandum**,** Jamaica falls short on Developing Human Capital. What is Human Capital? How does the development of family social capital relate to the development of human capital? Is there a link between maternal depression, family social capital and the development of human capital in Jamaica? How is all this tied to economic development?

Wild rats (*Rattus rattus* and *R. norvegicus*) as a Zoonotic Risk in Jamaica

Cecelia A Waugh-Hall[1], John F Lindo[2], Jacob Lorenzo-Morales[3], Ralph D Robinson[2]
[1]University of Technology, Jamaica; [2]University of the West Indies, Mona, Jamaica; [3]University of La Laguna, Canary Islands

One hundred and thirty (29.7%) of the 437 wild rats captured island wide were infected with one or more of nine species of gastrointestinal helminths. One hundred and four (35%) of 297 *Rattus rattus* were infected compared with 26 (18.6%) of 140 *R. norvegicus.* The helminths recovered included *Raillietina* sp. (0.2%), *Trichuris* sp. (0.2%), *Rictularia* sp. (0.7%), *Syphacia obvelata* (1.1%), *Strongyloides ratti* (1.4%), *Hymenolepis diminuta* (3.8%), *Protospirura muricola* (4.3%), *Moniliformis moniliformis* (11.2%), and *Nippostrongylus brasiliensis* (14.2%). *Hymenolepis diminuta*, *M. moniliformis*, *Raillietina* sp., and *Rictularia* sp. are potentially zoonotic parasites. *Angiostrongylus cantonensis*, a naturally occurring nematode parasite of the pulmonary arteries of wild rats and a common infectious cause of eosinophilic meningitis (EM) in humans in the tropics, was also recovered from 32.6% of the rats (n = 437) with a mean intensity in the infected host sample (n=140) of 15.3 worms. As the wild rat population continues to grow in Jamaica, rodent surveillance and eradication programmes are warranted to prevent a disease outbreak.

Session 5A:

Waste-to-Energy: A viable solution for waste disposal and energy issues affecting Small Island Developing States (SIDS)?

Debbie-Ann Gordon-Smith[1,2], O'Neill Gordon-Smith[2], Rajiv Bakshi[2]
[1]University of Technology, Jamaica; [2]Garbage Disposal and Sanitation Systems Limited

Small island developing states (SIDS) are faced with many problems, among them is their limited capacity to process municipal solid waste. The limited availability of space and the environmental issues associated with the establishment of traditional "landfills" on small islands make it imperative for these states to consider alternative methods of waste disposal. To compound matters, many SIDS have seen changes in demographics and product delivery to the population which have resulted in substantial growth in waste generation. Additionally, the cost of energy in many SIDS is exorbitant because much of this energy is imported. This high energy cost increases the cost of manufacturing, making it difficult for local businesses to effectively compete in the global marketplace, which in turn negatively impacts economic growth and increases the cost of living in these states. Like many developed nations, SIDS have started to investigate the benefits of implementing alternative/renewable energy technologies as a solution to their high energy costs. One viable renewable energy alternative under consideration is the conversion of waste to energy as it can lead to significant savings over imported fossil fuels, both from the point of view of cost and environmental impact. In this presentation, we will discuss some of the current technologies

being used for waste-to-energy which can simultaneously address the problem of municipal solid waste disposal and the high cost of energy to SIDS.

Evaluation of an Intelligent Integrated Renewable Energy Management System for electricity generation in equatorial developing countries

Delroy E. Green
Northern Caribbean University, Jamaica

Solar, Wind and Bio-fuels electrical technologies are generating an increasing interest as alternative forms of energy in developed countries. Developing countries are slowly catching on; especially regions where the solar indices and wind energy are very high and the availability of bio-fuel producing plants and wastes; regions such as the Caribbean and the African continent. The consideration of moving industrial production to these regions requires the need for cheaper, cleaner and more efficient energy. However, the costs of these technologies are currently very high and not economically viable to produce and implement. New innovations, by way of aggressive research and development are needed to improve the technology and reduce the cost of production and implementation. The benefits will alleviate carbon pollution and tax levies, which can affect productivity in these regions. These countries can efficiently trade under the emission trading scheme and effect good environmental impact and reduce costs and dependency on fossil fuels. This study will examine the combination of renewable energy sources for electricity generation at the local level and in particular the case of equatorial regions such as the Caribbean. A computer model will be developed for the simulation of the operation of the integrated system. The energy supply side will include three renewable energy sources, namely wind solar and biogas in comparison to the conventional high-cost electricity supplied by the National Grid (Jamaica Public Services Co. Ltd.). The model is an intelligent electronic control system interfaced with a web enabled energy management application that monitors the most efficient combination of renewable electricity. Conclusions will be drawn on (a) the optimal combination of renewable energy sources to achieve economic viability of the system (b) evaluation of an energy policy.

Session 5B:

Mobile Learning: Lecturers versus students on Usage and Perception using the UTAUT Model

Kemuel Gaffar, Lenandlar Singh, Troy Thomas
University of Guyana, Tain Campus, Guyana

E-learning technologies are fundamentally changing the way we teach and learn. One area that has gained significant attention is mobile learning (m-learning). The rapid increase of ownership and use of mobile technology worldwide has resulted in the viability of mobile technologies for education delivery. This paper aims to compare lecturers and students at the University of Guyana on the factors of the Unified Theory of Acceptance and Use of Technology (UTAUT) model along with gender effects in relation to the use of mobile technology in education using a structural equations modelling framework. It also focuses on access to devices, skills levels, and nature of activities with the use of categorical data analysis methods.

Preliminary results for the students indicate that they generally have positive attitudes towards the use of mobile devices in education, but they tend to be neutral on the social factors and facilitating conditions. The most popular mobile devices are phones, specifically Blackberries and smart phones. However, MP3 players, PDAs and E-book readers are the most popular kinds of devices for a range of online and offline activities.

Technological Literacy: A critical path towards economic development

Everton Lewis
University of Technology, Jamaica

The implementation of technology in a society, and more so in a developing modern society such as Jamaica, is one of the driving forces of economic growth and an improved social welfare. Technology surrounds and impacts every

life on a daily basis and both solves and creates problems, aiding and hindering the economic development of any nation.

Technology, often defined as the knowledge and processes by which humans modify nature to create and operate their needs and wants, incorporates and implements the theories of science, and promotes creativity and innovation on the part of the technologist. Thus technology is a natural link between science and creativity and innovation on the pathway to economic development. However, most citizens are typically not equipped to make considered decisions, or to think critically about their use, and equally importantly, their abuse of 'Technology' on a daily basis.

This presentation argues that informed technological decisions require technologically literate individuals, individuals who possess the knowledge, skills, and dispositions required to enhance social, economic, and environmental development. Furthermore, being a democratic nation predicates that "the people" self-determine what actions serve their best interests. Without a conscientious implementation of widespread technological literacy across the population, our use of technology will not result in meaningful democratic national or economic development. In addition, without the ability of the masses to want to use our natural resources effectively, manage these resources efficiently, and evaluate their impact on the environment in general, long-term economic development will remain an elusive ideal.

Session 6:

A PLC Based Weight Processing & Sorting System for industrial applications

Michael Prescod, Dayne Robinson, Ervin Lyle
University of the West Indies, Mona, Jamaica

Jamaica's push to expand agricultural export and compete locally and internationally requires products that meet market expectation. An automated weight and process control system will reduce the labour force on the plant floor drastically increasing the efficiency of the plant and reducing operational cost. This ensures quintessential maximisation of a processing plant's competitiveness. The aim is to produce a locally built system that is affordable and can be serviced as well as maintained using local expertise.

Possible users would include Industrial Processing Plants such as poultry producers. Such a system would involve steps such as 1) Mechanical Design and PLC Integration. Design continuous conveyor system to carry chickens/food items with integrated proximity sensors, load cells, solenoid vales and actuators, 2) Writing a PLC ladder logic program for conveyor speed control, data acquisition, data storage and automatic alarm for process variability, 3) Human machine interface design. Using appropriate HMI platform and software; design the interactive aspect of the Weight Processing & Sorting System including hand tools, machine operator controls, and process controls charts and 4) Real time data acquisition from PLC program controlling process, statistical process control charts displayed on interface and readily printed by the push of a button and graphical design of system.

Technological developments in Process Intensification

Robert Johnson[1], Nonata Maia[2]
[1]University of Technology, Jamaica; [2]Teclav Tecnologia e Lavagem Industrial Ltda, Brazil

Process Intensification provides radically innovative principles ("paradigm shift") in process and equipment design which can benefit (often with more than a factor of two) process and chain efficiency, capital and operating expenses, quality, wastes, process safety and more. Over the last two decades, technological innovations in catalytic, monolithic, spinning disk, multifunctional, and micro reactors have been at the forefront of this developments and are fast replacing conventional batch systems.

Jamaica, though not an industrialised economy, does have a few manufacturing plants which if intensified can benefit tremendously in a similar manner to other plants in such economies.

Current developments of ion-exchange membranes have enabled a new technology to produce cleaner chlorine. It is the most promising and fast-developing technique and it will undoubtedly replace the other two techniques (Mercury

Cell and Diaphragm Cell). Nowadays, the Membrane technology represents nearly 50% of installed capacity in Europe and the target is to convert all mercury cell plants to membrane technology by 2020.

This research in Process Intensification of the brine electrolysis plant (conversion of mercury cell plants to membrane technology) increased the concept about the safety of chlorine processing facilities (Low Hydrogen content in chlorine), and the Environment & Sustainable Development (avoiding any future losses of mercury to the environment and avoiding the use of Halogenated Hydrogen Refrigerants) have also induced substantial changes in the concept of chlorine processing installations in order to reduce the capital costs as well as increase the process efficiency and to reduce energy consumption.

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The Foundation promotes, supports and implements activities designed to conserve the natural resources and the environment of Jamaica and foster the well being of our children.

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Established in 1993 by formal agreement between the governments of Jamaica and the United States of America The Environmental Foundation of Jamaica is an independent Foundation which uses the proceeds from a creative debt-swap arrangement to promote sustainable development in Jamaica. This is done mainly through support to projects which address issues of the Environment and Child Survival and Development. Organizations of civil society with mandates in the targeted areas of environment and children are eligible for support.

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1. Dorothy Akindele: dakindele@utech.edu.jm
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2. Keroma Bernard: bernardkeroma@gmail.com
   Assessing the indoor environment as a method of designing energy efficient office buildings in Jamaica
3. Barrington Brown: barrington.o.brown@live.com
   Technological Innovations: *Autonomous Rain Gauge*
4. Winston Buckley: mrlovemath111@yahoo.com
   On the Sensitivity of the Black-CAPM to the Market Portflio
5. Sheena Francis: safrancis@utech.edu.jm
   Natural products from Caribbean plants as potential Anti-tuberculars and Chemopreventors
6. Kemuel Gaffar: kemuelgaffar@gmail.com
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9. Tania Henry: taniahenry09@gmail.com
   Recent breakthroughs and development in Nanoscience and Nanotechnology, and its implications for the developing world
10. Olusegun A Ismail: iafis@utech.edu.jm
    Echocardiographic Partition values and prevalence of Left Ventricular Hypertrophy in Hypertensive Jamaicans
11. Paul Ivey: paul.ivey@utech.edu.jm
    Advancing institutional research agenda through structured Research and Innovation Management
12. Robert Johnson: rjohnson@utech.edu.jm
    Technological developments in Process Intensification
13. Andrew S Lamm: andrew.lamm@gmail.com
    The Natural Products Research Laboratory (NPRL): Its objectives, potential and importance to Jamaica's development
14. Everton Lewis: elewis@utech.edu.jm
    Technological Literacy: A critical path towards economic development
15. Raymond Martin: rdmartinja@gmail.com
    Innovation in Organic Crop Production Systems in Jamaica
16. Maurice McGlashan-Powell: mmcglashan@utech.edu.jm
    Integrated Optics and Photonics Research Laboratory (IOPRL) at the University of Technology Jamaica: Its implications for economic growth for Jamaica and the Caribbean.
17. Janeen McNish: jmcnish@utech.edu.jm
    HomeChef seasonings: "Taste is Everything"
18. Ewan Pitter: epitter@utech.edu.jm
    Automation of a Greenhouse Hydroponic System, using Microcontroller Based Technology for the production of food and food security and in the Jamaican society
19. Michael Prescod: derealmccoy@hotmail.com
    A PLC Based Weight Processing & Sorting System for industrial applications
20. Homero Silva: hsilva10@hotmail.com
    A Negacarbon approach in UTECH for the reduction of carbon and environmental footprints and the strengthening of community resilience in Jamaica
21. Cecelia A Waugh-Hall: cwaugh-hall@utech.edu.jm
    Wild rats (*Rattus rattus* and *R. norvegicus*) as a Zoonotic risk in Jamaica

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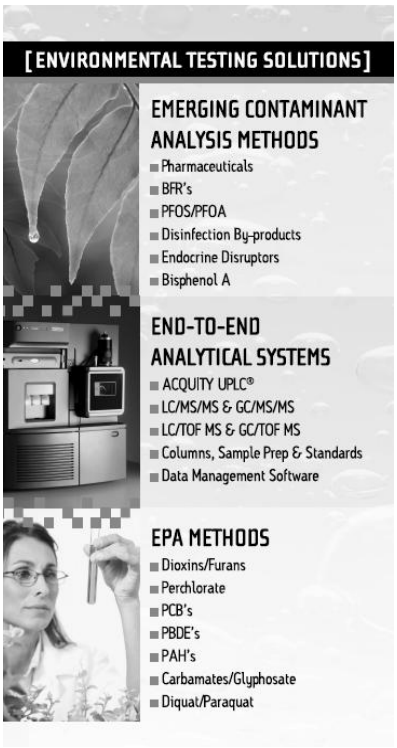

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