



## DEPARTMENT OF CHEMISTRY

Dr. Donna Minott-Kates · Head Of Department

### OVERVIEW

During the past academic year, 2021-2022, the Department of Chemistry continued to grapple with the challenges wrought by the Covid-19 pandemic but nevertheless sought to ensure quality in instruction delivery. Laboratory sessions were offered primarily in face-to-face mode with some virtual simulations. Lectures remained mostly online, however the Department grasped the opportunity to offer face-to-face lectures to small, advanced Chemistry classes. This resulted in improved student interaction and engagement. Work-study/internship programmes and research requiring field access continued to be affected by limited access to companies. The Department is grateful to its industry partners who remained loyal to our internship programmes and enabled student placements.

Research progression was hindered by severe financial constraints, declining instrument viability, and reduced bench-time of graduate research students who had transferred to part-time registration in part due to delays in receiving stipends. Publication output saw a downturn with only 9 journal articles being produced (2 with graduate students). A resurgence in activity was however signalled by visits of several international researchers to engage in some funded projects, in collaboration with members of the Department. We were pleased to host Fulbright Scholar, Dr. Patrick Gordon from the Massachusetts College of Pharmacy and Health Sciences, USA, for six (6) months, who was involved in shared research with the Organic Chemistry division. Two visiting students (Ms. Alexandra Söderholm and Mr. Alexander Kyriakidis) from Chalmers University in Sweden worked on a waste management project focusing on the Riverton City waste site with Dr.

Michael Coley. Other visitors to the Department included Dr. Rowan Martindale, Dr. Ashley Matheny, Estefania Salgado-Jauregui, Myriam Loving, Claire Williams and Suvan Cabraal from The University of Texas at Austin, USA who are studying the impacts of freshwater inputs and other environmental factors on the water quality and mangrove and coral reef health in East Portland and Bogue, Montego Bay with Dr. Debbie-Ann Gordon-Smith.

Our weekly seminar series continued online, remained robust, and attracting widespread participation. A special Chemistry Department Seminar in honour of the late Professor Kenneth Magnus was held in June. A joint production of the Department and its alumni (CHEMSAF), entitled "The Legacy of Professor Kenneth Magnus: Transforming Lives, Institutions and The Economy", the seminar which was also live streamed, was well attended by past students and colleagues of the late professor. Professor Emeritus Kenneth Eugene Magnus, CD, was a former Head of the Department & former Dean of the Faculty of Natural Sciences (now Faculty of Science and Technology) and was among the first batch of students to graduate from the University.

A donation of J\$3,0005,847.81 was received from the Dean's office (FST), being funds allocated from the discontinuation of the Mechanical Engineering Workshop (MEW), an entity previously managed by the late Professor Tara Dasgupta, former Head of the Department. The funds were in honour of the late professor and, in keeping with his thrust to acquire instrumentation for the Department, the donation, supplemented with additional departmental funding was used to purchase a Fourier Transform InfraRed (FT-IR) spectrometer valued at J\$4,978,738.00. The acquisition was quite timely as the equipment is critical to research and teaching in Chemistry and the one previously in the Department was outdated and had become non-functional.

At the end of the academic year, forty-one (41) students graduated with a BSc in one of several majors from the Department, of these, one received first class honours, and fifteen graduated with upper second class honours. In addition, twenty-five Chemistry minors were awarded. Sixteen students completed the requirements for higher degrees; there were two (2) PhD, two (2) MPhil, eleven (11) MSc graduates, plus 1 student with a postgraduate Diploma.

## **WORKSHOPS**

### **CAPE Chemistry Workshop 2022**

The Chemistry CAPE Spectroscopy Workshop was again hosted in a virtual mode, as part of a Faculty-wide initiative. Approximately 450 students attended over the course of one week.

### **The Better Process Control School 2022**

Another staging of the US FDA-approved Better Process Control School (BPCS) certification course was held in January for processors of low-acid canned food and acidified food. Thirty seven participants from 14 Jamaican & Trinidadian companies who were in attendance (face-to-face or virtually), successfully finished the course and were awarded Certificates of Satisfactory Completion, which is a mandatory requirement by local and US regulatory authorities.

### **Chemistry Festival**

Another in the series of ACS Chemistry Festival (CHEMFEST) activities, geared towards primary level students from rural areas of Jamaica, was hosted in December 2021 at Turnberry Infant & Primary (face to face), Windsor Castle All Age (face to face), and Buff Bay Primary (virtual). The activities, sponsored by the American Chemical Society (ACS), were hosted over a three day period, under the theme, "Chemistry in the World Around Us". Students were exposed to fun science experiments using everyday household items. Prof Melvin Pascall from Ohio State University was the guest speaker (virtually).

### **One Love, One Portland Community Workshop**

Chemistry lecturer, Dr. Debbie-Ann Gordon-Smith, in collaboration with the University of Texas at Austin, conducted the "One Love, One Portland" Community Workshop, East Portland Conservation and Education in Earth Sciences (CEES) Project, at the Alligator Head Foundation in Portland, Jamaica, during November.

## **STAFF MOVEMENTS**

Two academic staff members were promoted to the rank of Senior Lectur-

er, namely, Dr. Marvadeen Singh-Wilmot and Dr. Mark Lawrence. Four members joined the Department's staff complement with permanent appointment in the Service staff category: Mr. Delroy McDermott, Ms. Alese Edwards, Ms. Carla Phipps, and Ms. Christine Bender. During the course of the year, the following staff members bid the Department farewell: Ms. Toni-Ann Pinnock, Ms. Reena McKenzie, Ms. Waveney Warrick, Mrs. Gloria Webster, Mr. Winston Smith (retired). The Department was saddened by the passing of Professor Gerald 'Bunny' Lalor in August. Professor Lalor was one of the stalwarts of the Department of Chemistry being amongst the first sets of graduates of the then University College of the West Indies.

## **STAFF AND STUDENT ENGAGEMENT ACTIVITIES**

### **T&S Staff Appreciation Day**

In November the Department's annual Technical and Service Staff Appreciation Day was celebrated; members of the technical and service staff enjoyed available refreshments and were presented with tokens of appreciation.

### **Teachers' Day**

Lecturers were treated to small tokens of appreciation in celebration of Teachers' Day 2022.

### **End of Year Luncheon**

An abridged version of the Department's end of year luncheon was held in December. Special thanks was extended to two retirees and they were presented with tokens of appreciation for their years of service.

## **DEPARTMENT SEMINAR**

Dr. Winklet Gallimore assumed the role of Seminar Coordinator, organizing twenty-eight (28) engaging and informative seminars covering a wide range of topics, delivered by visitors, faculty and postgraduates. Some seminars delivered by visitors to the Department are listed below:

Dr. Patrick Toppin, Director, Critical Care Lecturer, Anaesthesia and Intensive Care, UHWI, "COVID Vaccines: Information and Misinformation".

Ms. Kimone Knight, Chemistry Alumnus, CEO, ChemQualCo, "Transitioning

from Chemistry to Entrepreneur”.

Mr. Errol Dakin, Veterinary Services Division, Ministry of Agriculture, “Jamaica’s Residue Monitoring Programme”.

Professor Alvin Holder, Old Dominion University, Virginia, “What I learned at UWI, Mona Campus; then applied with cobalt- and vanadium-containing compounds”.

Professor Charles Grant, FInstP, Professor of Applied Nuclear Sciences, Director General, The International Centre for Environmental and Nuclear Sciences (ICENS), “Professor Gerald Lalor: The Introduction of Nuclear Technology to the Caribbean and its Impact on Regional Development”.

Dr. Keriayn Smith, Founder, The Society for Scientific Advancement (SoSA), “A Journey in Omics and STEM Outreach”.

Ms. Kimberley Foster, PhD candidate, The Natural Product Institute, “Cytotoxic Extracts of *Annona muricata*”.

Mrs Marcia Henry, Manager, Project Management Unit and Acting Manager, Information Services Division, Scientific Research Council, “Science and Technology, The Heartbeat of National Development”.

Dr Andrew Lamm, Vice Dean, Faculty of Science and Sport, The University of Technology, “Pivoting Research from Biocatalysis to Plant Natural Products to Genomics”.

Ereca Peart, MSc FAPT Programme Graduate, Department of Chemistry, UWI Mona, “A preliminary investigation of the impact of cryogenic freezing at selected temperatures on the nutritional composition and sensory attributes of Ackee (*Blighia sapida*)”.

Professor Geneive Henry, Charles B. Degenstein Professor of Chemistry, Susquehanna University, USA, “Coming Full Circle: Synthesis and Biological Studies of Natural Product-derived Chromene Derivatives”.

Professor Timothy Ramadhar, Howard University, “The Crystalline Sponge Method: enhancing the Technique for Small Molecule Structural Elucidation”.

Professor Steven Cummings, Howard University, "Adding Steric Bulk to Antibiotics to Disrupt Cell-wall Formation"

Professor Karla-Sue Marriott, Director, Forensic Science, Roger Williams University, Rhode Island, USA, "An Adaptable Career in Science".

Dr. Jason Mighty, Associate Manager, Research Program Management, Regenon Pharmaceuticals, Inc., "A Mighty Journey Through the STEM Field".

Dr. Sanjay Campbell, McGill University, Montreal, Canada, "Approaches to Modulating Bacterial Response to Immune Attack".

Alexander Kyriakidis and Alexandra Söderholm, Masters Students, Chalmers University of Technology in Gothenburg, Sweden, "Swedes' field study in Jamaica: findings on waste management and experiences".

Professor Patrick Gordon, Fulbright Scholar, Assistant Professor of Chemistry in the School of Arts and Sciences at Massachusetts College of Pharmacy and Health Sciences, "My Chemistry Journey and the Serendipities that Followed".

### **Staff Awards**

Ms. Micketa Watson was recognised and awarded for excellence in the provision of support services (UAWU) at the annual Faculty of Science and Technology award ceremony. Dr Peter Nelson and his collaborators (Georgia Crawford Williams and Shannon Dacosta) were awarded the prestigious International Design Excellence Award (IDEA) for 2022 in the Short-Life Product category. The trio designed the LifeSavers wipes, which can change colour if abnormal levels of certain chemicals are detected in urine. The wipes currently target diabetics, but the intention is to extend it for detection of urinary tract infection and other abnormalities. Long service awards recipients were Prof. Willem Mulder, Dr. Donna Minott Kates, Dr. Paul Maragh, Ms. Dawnette Stephenson (30 years), Ms. Carlo Hall (21 years), Dr. Norbert Campbell, Dr. Nadale Downer-Riley, Dr. Ian Thompson, and Mrs. Tracia Johnson-Blair (15 years).

### **OUTREACH ACTIVITIES**

Chemistry ACS Student Chapter

The Chemistry ACS student chapter, along with international visitors to the

Department embarked on tours to several facilities to observe their process flow. Visits included Appleton Estate (Rum Tour), Alex Twyman's Old Tavern Blue Mountain Coffee Estate (Coffee Farm Tour), and Port Royal Marine Lab (Mangrove and Pollution Tour).

## ACCESS

### STUDENT AWARDS

The 2021/2022 AY award ceremony for the Faculty of Science and Technology was staged virtually in keeping with Covid 19 protocols. Scholarship and prizes for undergraduate students in the Chemistry Department were awarded as follows: Victoria Parague (The Cedric Hassall Scholarship), Raimona Gowie-Roberts (The Kenneth Magnus Prize), Shay-Ann Raymond (The Garfield Sadler Award), Krystal Graham (The Bert Fraser-Reid Award), Tamoya Wilson (The Wilfred Chan Award), Chad Buckle (The Willard Pinnock Prize), Jordan Collins (The Leonard J. Haynes Award), Jamilia Morgan (The Pavelich/Honkan Prize), and Mikayla Miles (The Chemistry Department Prize).

### ACS Student Chapter

The Department's American Chemical Society (ACS) student chapter was named a finalist in the ChemLuminary Award, and was invited to participate in the 23rd Annual ChemLuminary Awards ceremony held virtually during National Chemistry Week. The award recognizes the work of ACS volunteers in their continued efforts to improve people's lives.

### Postgraduate Presentations

Postgraduate student, Mr. Marcel Denny, was nominated as one of only 21 students from across Latin America and the Caribbean to participate in a dialogue with the 2016 Nobel Laureate, Dr. Bernard Feringa (Chemistry). Postgraduate student, Mr. Jermaine Smith gave a virtual presentation at the CAS Biennial Conference in August. His presentation was entitled "Rare Earth Metal Organic Frameworks from Perhalogenated Terephthalate Ligands: Fluorescence Sensors for Iron, Copper and Nitroaromatic Explosives".

## STUDENT ENROLMENT

Student enrolment for the 2021/2022 academic year was as follows: Preliminary (125), Introductory (413), Advanced (219), Postgraduate (Research – 23, MSc – 30).

## PUBLICATIONS

- D González-Arjona, MM Domínguez, G López-Pérez, WH Mulder. Noise-injection as an Approach to Generating Random Data Sets for Online Tests and Virtual Labs. *Journal of Laboratory Chemical Education* 2021, 9(2), 26-35.
- Kolahi, M., Faghani, E., Kazemian, M., Andrea Goldson-Barnaby & Sedighe Dodangi. Changes in secondary metabolites and fiber quality of cotton (*Gossypium hirsutum*) seed under consecutive water stress and in silico analysis of cellulose synthase and xyloglucan endotransglucosylase. *Physiology & Molecular Biology of Plants* 2021, 27, 1837–1857. <https://doi.org/10.1007/s12298-021-01033-y>.
- Peter N. Nelson. A DFT mechanistic study of two possible hydrolytic evolution pathways of thiamethoxam; implications in food and environmental safety. *Computational and Theoretical Chemistry*, 2021, 1202, 113333. <https://doi.org/10.1016/j.comptc.2021.113333>
- Falloon, O.C., Mujaffar, S., and Minott, D. (2022), "Physicochemical and Functional Properties of Protein Isolate from Ackee (*Blighia sapida*) Seed", *West Indian Journal of Engineering*, 2022, 44(2), 92-102; <https://doi.org/10.47412/AJTD3244>
- Robert M. Hanson, Damien Jeannerat, Mark Archibald, Ian J. Bruno, Stuart J. Chalk, Antony N. Davies, Robert J. Lancashire, Jeffrey Lang, Henry S. Rzepa. IUPAC specification for the FAIR management of spectroscopic data in chemistry (IUPAC FAIRSpec) – guiding principles, Apr 21, 2022 (online). *Pure and Applied Chemistry*, <https://doi.org/10.1515/pac-2021-2009>.
- Peter N. Nelson, Willem H. Mulder. Thermodynamic and kinetic models for acid chloride formation: A computational and theoretical mechanistic study. *Journal of Molecular Graphics and Modelling*, 2022, 112, 108139. <https://doi.org/10.1016/j.jmgm.2022.108139>.
- Elham Faghani, Maryam Kolahi, Mina Kazemian, Andrea Barnaby, M. H. Razzaghi. Effect of irrigation regimes on starch biosynthesis pathway, cotton (*Gossypium hirsutum*) yield and in silico analysis of ADP-glucose-pyrophosphorylase. *International Journal of Environmental Science and Technology*. 2022. DOI: 10.1007/s13762-022-04281-x
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- Tahjna I. Robertson, Peter N. Nelson. A DFT and experimental study of the spectroscopic and hydrolytic degradation behaviour of some benzylideneanilines. *Journal of Molecular Structure*, 2022, 1249, 131625. <https://doi.org/10.1016/j.molstruc.2021.131625>. Walter, Laura O., Mariana F. Maioral, Lisandra O. Silva, Douglas B. Speer, Sanjay C. Campbell, Winklet Gallimore, Miriam B. Falkenberg, and Maria Cláudia Santos-Silva. "Involvement of the NF- $\kappa$ B and PI3K/Akt/mTOR pathways in cell death triggered by stypoldione, an o-quinone isolated from the brown algae *Styopodium zonale*." *Environmental Toxicology*, 2022, 37(6), 1297-1309.

## ALIGNMENT

### PAPERS PRESENTED

- Goldson-Barnaby, Andrea, H. Virgo. "Investigation of the Antioxidant Properties and Phytochemical Composition of *Rivina Humilis* and *Cissus Sicyoides* Berries", 2021 ACS Fall Conference (online). August 22-26, 2021. <https://doi.org/10.1021/scimeetings.1c00892>
- Poster presentation: "X-Ray Powder Diffraction Peak Predictor for Characterization of Isorecticular Metal-Organic Frameworks: An Online Resource," (from paper co-authored by Dr. Zeyar Min, and Dr. Marvadeen Singh-Wilmot), Royal Society of Chemistry (online) 2nd Commonwealth Chemistry Poster competition, September 2021, was one of 25 winners.
- E. Jauregui, R.C. Martindale, K.K. Ellins, D. Henry, D-A. Gordon-Smith. "Facilitating spaces of collaborative learning for geoconservation using a new board game, reef survivor Jamaica", Geological Society of America Connects 2021. Portland, Oregon, USA. October 10 – 13, 2021. <https://gsa.confex.com/gsa/2021AM/meetingapp.cgi/Paper/368746>
- Norbert Campbell, Henroy Scarlett, Sylvannus Thompson. "The Growth of the Jamaica Association of Public Health Inspectors: The Last Forty Years", 75th Annual Conference of the Jamaica Association of Public Health Inspectors October 25, 2021.
- Marvadeen Singh-Wilmot. "Lanthanides and Assembly of Metal Organic Frameworks as a Cost Effective Way to Develop Tailor Made Devices". The Young Affiliate Network of the World Academy of Sciences Meeting (online), December 2, 2021.
- Mark Lawrence. "Copper(II) and cobalt(II) pincer complexes based on pyridylcarbo(thio) amides backbones in the hydrogen evolution reac-

tion”, American Chemical Society, Middle Atlantic Regional Meeting, New Jersey, June 1-4, 2022.

- E. Myers, G. Skrzypek, D-A Gordon-Smith, L. Kheng Heng. “Irrigation water quality assessed using hydrochemical and stable isotope analyses, Rio Cobre, Jamaica”, International Symposium on Managing Land and Water for Climate-Smart Agriculture, International Atomic Energy Agency, Vienna, Austria, July 25 – 29, 2022. <https://conferences.iaea.org/event/270/>

## **PUBLIC SERVICE**

### **Dr. Marvadeen Singh-Wilmot**

- Caribbean Academy of Science (CAS)
- Appointed as Interim Head CASJ Chemistry Division
- Moderator CAS Youth in Science Forum “Career Trajectories: On the Shoulders of Giants” at CAS 22nd Biennial Conference (online), August 10, 2021–IUPAC: Appointed to first Standing Committee for Ethics, Diversity, Equality and Inclusion (CEDEI); part of 6-member team actively engaged in compiling IUPAC’s Guidelines for Professional Behaviours and Practise by Chemists
- **Appointed as NAO representative on IUPAC Council**
- Royal Society of Chemistry (RSC)
- Participated as a judge in the Royal Society of Chemistry (RSC) 2nd Commonwealth Chemistry Poster event – Building Networks to Address the Goals 2021.
- Hosted the Commonwealth Chemistry Poster Competition and judged the poster presentations in the session on Water and the Environment.
- The World Academy of Science (TWAS)
- Appointed to review committee (2021-2023) for the TWAS-Atta-Ur-Rahman Award
- Invited to attend the 2022 AAAS-TWAS Course on Science Diplomacy
- Attended the TWAS 29th General Meeting and 15th General Conference the capacity of a member of TWAS’ Young Affiliate Network (TYAN), hosted by the King Abdullah University of Science and Technology (KAUST) with the support of/and in collaboration with the Islamic Development Bank (IsDB).
- Contributed to TWAS-LACREP Individual Regional Partners Meeting.
- Participated in The Young Affiliate Network (part of TWAS) engagement meeting Appointed to the External Engagement Committee of the Fac-

ulty of Science and Technology

- Coordinated the planning of Science for Today program on “Front of Package Food Labelling”.
- Appointed to serve on Musgrave Awards Sub-Committee by the Natural History Museum of Jamaica, IOJ
- Presenter at the MOEYI Science Skills and Practices Workshop for Primary School Teachers.
- Initiated a partnership with MITS, FST and KMA Consulting Ltd, the company contracted by CPSO to execute the project: “CARICOM Impact Assessment Study: Determination of an Appropriate Front of Packaging Nutrition Labelling (FoPNL) Scheme and the Identification of a Harmonized Approach for Implementation”.
- Guest speaker at the Morant Bay High School fourth form orientation session

**Dr. Debbie-Ann Gordon-Smith**

- Invited speaker for the DeFord Lecture Series at Jackson School of Geosciences, The University of Texas at Austin.

**Dr. Patrice Peart**

- Panelist on the Science for Today program on “Front of Package Food Labelling”.

**Dr. Ian Thompson**

- Chairman for the Science for Today program on “Front of Package Food Labelling”.

## AGILITY

### INCOME GENERATION

Consultation fees, summer school and other departmental income: J\$6,405,239.46.

Dr. Debbie-Ann Gordon-Smith was instrumental in securing a collaborative partnership between the UWI, The Alligator Head Foundation, and the University of Texas at Austin, to conduct research through the East Portland

Conservation and Education in Earth Sciences (CEES) Research Project. Additionally Dr. Gordon-Smith is the principal researcher on a project entitled "Determining Potential Contamination Pathways for Groundwater and Surface Water Recharge and Flow Dynamics in the Rio Bueno sub-Watershed Management Unit of the Dry Harbour Mountains Basin. The project was made possible through a Memorandum agreement between The UWI and the Water Resources Authority of Jamaica.

Grants: USD2,800 received from The University of Texas at Austin; J\$1,075,000 received from the Tourism Enhancement Fund (TEF).

Grants received from the Mona Campus Research and Publications & Graduate Awards Committee: Dr. Debbie-Ann Gordon-Smith J\$447,259.30, Ms. Pearl Bergan USD3000, Mr. Ricaldo Pryce USD2800, and Ms. Ronnique Blair USD2800.

An ACS Student Engagement Grant was received by the ACS Jamaica Student Chapter in the amount of USD1000. The funds were utilized to facilitate a visit to the Port Royal Marine Lab and a Dairy Chemistry Workshop for ACS student members.

Departmental allocations was received from the Research & Publication and Graduate Award Committee for 2021/2022 in the amount of J\$160,616.11 for discretionary use to support research students' work related activities.