DEPARTMENT OF CHEMISTRY

Professor Ishenkumba A. Kahwa, BSc (Hons), MSc *Dar es Salaam*, **DPhil** *Louisiana State* **– Head of Department**

Overview

The new Mission Statement for the Department was formulated in the academic year 2007-2008 and reads:

"The Department of Chemistry, UWI, Mona, having achieved regional and global distinction in the provision of first class teaching, research and service, remains committed to educate and train students to the highest standards to become chemists who are competent at all levels of professional development.

The Department will provide an environment that creates and maintains enthusiasm for Chemistry and high quality instruction, and will endeavour to harness the talent, abilities and potential of all entrants into our programmes and will seek to empower them to think critically, intelligently and independently.

Through exceptional service to our primary and secondary clients, the Department aims to contribute to the development of the wider community, the nation and the world at large".

The long awaited Curriculum Reform Plan for the Department was also finalized and submitted to the Vice Chancellor, Professor E. Nigel Harris.

Towards the end of the year there were short-term changes to the Headship of the Department as Professor Helen Jacobs was appointed Acting Head of Department to allow Professor Kahwa to assume the position of Acting Dean of the Faculty of Pure and Applied Sciences. Subsequent to that appointment, Professor Paul Reese also acted as Head of Department and was appointed Head at the start of the academic year 2008-2009.

Consistent with one of the main aims of the Department, that is, the upgrading of the laboratory services, four new Laboratory Technicians were appointed, all of whom are holders of B.Sc or higher degrees.

A new approach with the delivery of the C34J course was initiated by Dr. Ian Thompson, which included the mounting of a series of team building workshops, presentations from leading financial institutions and an inaugural project presentation luncheon.

HIGHLIGHTS OF MAJOR ACTIVITIES

The Mona Symposium

The twenty second Mona Symposium, held on January 7 -10, 2008, was the first conference to be held at the UWI in 2008, the sixtieth anniversary year of the institution.

The main objective of this biennial conference, the longest running conference at UWI, is to highlight research work being done by local, regional and internationally acclaimed researchers in the field of Natural Products and Medicinal Chemistry. The Symposium is one of the activities which helps to maintain the international profile of the UWI and the recognition of UWI as a centre for natural products chemistry.

Organized by an eight-member team chaired by Professor Paul Reese, Professor of Bio-organic Chemistry, over sixty persons attended the Symposium. The international attendees were from various Universities and Institutes in Japan, Canada, the United Kingdom and the United States of America. Regional attendees (graduate students and lecturers) were from the Cave Hill and St. Augustine campuses of UWI. A contingent of sixteen undergraduate students from St. Olaf College, Minnesota, USA accompanied by two professors, participated in the Symposium.

The scientific sessions consisted of ten plenary presentations and ten short papers. An official poster session was held as part of the proceedings at which the graduate students (local, regional and international) were given an opportunity to showcase their research. This activity fostered an environment in which ideas and thoughts on best practices and current technologies took place. Cash prizes were awarded to the students with the most outstanding posters.

THE OCCUPATIONAL AND ENVIRNONMENTAL, SAFETY AND HEALTH (OESH) PROGRAMME

The OESH programme continues to fulfill its mandate by raising public awareness about OESH issues impacting the country and, by extension, the region. To this end, the programme hosted two symposia: "Managing Risk in the Work Environment" and "Cutting Edge Developments in OESH". The former was held in commemoration of World Day for Safety and Health at Work on April 28, 2008. Dr. Benjamin Alli, Technical Advisor to the International Labour Organization, delivered the keynote address and the Hon. Pearnel Charles, Minister of Labour and Social Security, addressed the group regarding the government's position and plans for Occupational Safety and Health.

The latter symposium, Cutting Edge Developments in OESH, brought the international perspective of current OESH practice to Jamaica. Among the international presenters were Dr. Martin Harper, Adjunct Professor at West Virginia University, USA, and Professor Harri Vianio, Executive Director, Finnish Institute of Occupational Health, Finland, and Professor Michael Morgan of the University of Washington, Seattle.

The year closed with the External Examiners meeting and Programme Review. Several key stakeholders, including a Student representative and the External Examiners, gathered for the Programme Review during which the execution and delivery of the Programme was carefully analyzed. All in all, the year was considered a success. One external examiner in his report stated that the OESH programme at UWI *"has again impressed me with the enthusiasm and commitment that are clearly demonstrated by the students, staff and faculty."*

For the academic year 2007- 2008 there was a student enrolment of twenty-one, with nineteen pursuing the Master of Science and two in the Doctor of Philosophy. The programme had, since its inception, enrolled over fifty students. One student graduated in November 2007 and at least thirty more are expected to graduate in November 2008.

OUTREACH ACTIVITIES

Cape Workshop

During the period February 25 to March 2, 2008 the Department held workshops on spectroscopy and chromatography for students doing the

Caribbean Advanced Proficiency Examinations (CAPE) in Chemistry. A total of 500 students and 30 teachers participated.

Brief lectures on various aspects of chromatography and spectroscopy were given by Dr. Marvadeen Singh-Wilmot (UV/visible, Infrared), Mr. Kamau Francis (chromatography), Mr. Jason McKenzie and Ms Nykeita James (mass spectrometry) and Prof. Robert Lancashire (the use of computers in teaching spectroscopy). In addition, graduate students participated by demonstrating the use of equipment, solving spectroscopy, problems as well as assisting students with a chromatography experiment.

The Department also hosted laboratory sessions for high schools as well as summer laboratories in organic, inorganic, physical and analytical chemistry for the B.Ed. (online) Chemistry students.

CHEMSAF DINNER AND SCHOLARSHIP AWARDS

As part of the UWI 60th Anniversary celebrations, the Chemistry Alumni and Friends (CHEMSAF) hosted a dinner on Friday, July 18, 2008 at the Mona Visitors' Lodge and Conference Centre. The guest speaker was **Professor Cedric Hassall,** who was the first Head of the Chemistry Department from 1947 to 1957.

Highlights of the dinner included: the presentation of a 60th anniversary congratulatory plaque to the Department by Dr. Stanley Langer on behalf of the Royal Society of Chemistry. The presentation of four scholarships in honour of four former Heads of Department namely, **Professors Gerald Lalor, Kenneth Magnus, Tara Dasgupta** and **Dr. Earle Roberts** were made to Ms. Tamara Matthews, Ms. Veronica John-Luke, Ms. Candice Edwards and Mr. Fitzroy McPherson respectively.

Ms. Alexa Redway received the **Wilfred Chan** award for overall excellence in Organic Chemistry Level 1 while Ms. Tomeika Myers got the **Cedric Hassall** award for overall excellence in Chemistry.

THE JAMAICA BAUXITE INSTITUTE (JBI) DELEGATION

In July 2008 the Department was asked by the **Jamaica Bauxite Institute** (JBI) to host a delegation of twenty persons from China, who were in the island to investigate the possibility of establishing a new bauxite processing plant. Dr. Anthony Greenaway spearheaded the visit and made a presentation to the group. He then carried them on a tour of the facilities which included the X-ray lab, NMR lab, Central

Analytical lab and the Ken Magnus Applied Chemistry Teaching and Research lab.

Similarly, the **Laboratories Association of Jamaica** (LAJ) visited the Department in July 2008 and held discussions with Dr. Anthony Greenaway concerning our Analytical Chemistry Programme.

At the request of the Latin American-Caribbean Centre (LACC), **40 Venezuelan Students** were accommodated on a tour of the Department that was spearheaded by Professor Helen Jacobs, Acting Head of Department, with seven postgraduate students assisting.

ACHIEVERS AND AWARDEES

Professor Helen Jacobs received the 2007 Gleaner Honor Award (Science & Technology category) for Outstanding Contribution in the Field of Chemistry.

Professor Yvette Jackson was selected as one of UWI's leading academics – featured in the 60th Anniversary Publication "60 Academics under 60".

Dr. Anthony Greenaway and **Dr. Michael Coley** were congratulated for securing US$259,212.00 from ALCOA World Alumnia for the 'Study of caustic soluble chromium and zinc in JAMALCO Bauxite'.

Professor Robert Lancashire's JSpecView article published in December 2007 attracted high interest and was rated as' highly accessed' by the Editor. It was listed as one of the Top 10 articles published in *Chemistry Central Journal* during 2007.

Dr. Willem Mulder was promoted to the rank of Professor of Physical Chemistry.

PREMIUM TEACHING AWARDS 2008

The following members of staff were congratulated for achieving excellence in teaching in the 2007-2008: Dr Winklet Gallimore, Dr. Sandra Jarrett, Mr. Alwyn Lynch (Part-Time Food Chemistry), Dr. Willard Pinnock, Professor Paul Reese and Dr. Marvadeen Singh-Wilmot.

UWI LONG SERVICE AWARDEES

Three members of staff **Dr. Novelette Sadler-McKnight, Mrs. Delene Roberts** and **Miss Dawnette Stephenson** were honoured at the UWI Annual Long Service Award for twenty-one, twenty-one and fifteen years of service, respectively.

Departmental Awards and Prizes

Seven undergraduate students, **Saddi Gilbert, Zach Powell, Cordel Morris, Tamara Matthews, Fitzroy McPherson, Jheanell Johnson, Nijole Young** and **Astor Tate** received awards ranging from $10,000 to $60,000 for their academic performance in Chemistry.

Research Fellowships

Two members of staff had their UWI Research Fellowship extended for a second year, that is, **Professor Yvette Jackson** – "*Benzothiazoles and analogues of shermilamine B: mechanistic studies and synthesis*" and **Dr. Paul Maragh** – "*Synthese,s characterization and reactivity studies on novel oxo-centered trinuclear transition metal complexes to be used as biological models*".

Professorial Inaugural Lectures

Three Professors from the Organic Section of the Department gave their Inaugural Lectures during the year.

Prof. Helen Jacobs, Professor of Organic Chemistry lectured on – "*Natural Products from Caribbean Biodiversity –The Promise and the Challenges*"

Prof. Paul Reese, Professor of Organic Chemistry his title was "*Transforming Nature's Bounty: A trek through the Chemistry of some Plants and Fungi*".

Prof. Yvette Jackson, Professor of Organic Chemistry titled: "*Chemical Synthesis: A Viable Research Option at Mona*".

Special Public Lectures

A Public Lecture was given by **Professor Vratislav Langer** of the University of Gothenburg, Department of Chemistry on the topic: "*Structural Chemistry in Practice*".

Chemistry Work Study Programme

Dr. Anthony Greenaway, who supervised the Chemistry Work Study Programme, has thirty-tw (32) students placed in industrial companies and research centres over an 8-week period. The students were exposed to hands-on training and were given subsistence allowance totaling over J$2M Dollars.

STUDENT ENROLMENT IN CHEMISTRY COURSES

Levels	2005/2006	2006/2007	2007/2008
Preliminary	412	406	378
Introductory	613	413	732
Advanced	976	1124	1108
Postgraduates	70	60 – (32 F/T) (28 P/T)	64 – (32 F/T) (32 P/T)

PhD Postgraduates

Six postgraduate students have submitted their theses.

Two postgraduate students **Kathryn Murray** and **Fiona Ho Shing** graduated with a Master of Philosophy degree; their supervisors were Dr. Willard Pinnock and Professor Helen Jacobs respectively.

PAPERS PRESENTED

Winklet Gallimore

- Poster presentations at Mona Symposium on Natural Products, January 2008, UWI Graduate Student: Monique Thompson Title: The Investigation of the Marine Sponge, *Amphimedon compressa.* Graduate Student: Shamar Richards Title: Brominated Phenols from *Avrainvillea sp.*

Yvette Jackson

- N. K. Downer-Riley, O. V. Barrett and Y. A. Jackson, Oxidative Cyclization of Thiobenzamides to Benzothiazoles, The Mona Symposium, Kingston, Jamaica, Jan. 2008.
- Y. A. Jackson, J. A. Grant, M. Gossell-Williams, T. Clayton, T. Bonnick and J.M. Cook, Pharmacological Studies and Molecular Modelling of Synthetic Tetracyclic 1,3-Diazepinium

Chlorides, The Mona Symposium, Kingston, Jamaica, Jan. 2008.

- L. C. Morris and Y. A. Jackson, Synthetic Approaches to Azarotenoids and Diazarotenoids, Eighth Faculty (of Pure & Applied Sciences) Conference, Kingston, Jamaica, Feb. 2008

Helen Jacobs

- H. Jacobs, Fiona Ho Shing presented at the Mona Symposium, Kingston, Jamaica "Chemistry of a New Species of Cinnamodendron (Canellaceae)".

Robert Lancashire

- (with Kenneth Magnus). "The first UCWI PhD and early studies from the Chemistry Department" – in celebration of the 60th anniversary of UWI" Faculty of Pure and Applied Conference Jan 2008

Roy Porter

- Phytochemical investigations of some Jamaican folklore medicinal plants, Geneseo, New York, April, 2008
- U.W.I – Geneseo capacity building opportunity, Geneseo, New York, April, 2008

Paul Reese

- A General Technique for the Use of Immobilised Filamentous Fungi in the Transformation of Steroid Substrates, 5th International Symposium on Natural Products, Kasane, Botswana (February 25-29, 2008).
- Steroid biotransformations by *Exophiala jeanselmei var. lecanii corni* and the examination of its potential for hydroxylation. K.P. McCook and P.B. Reese, American Chemical Society Annual Meeting, New Orleans, Louisiana, U.S.A., April 6-10, 2008.
- The biotransformation of steroids by *Thielaviopsis paradoxa.* F.A. Russell and P.B. Reese, American Chemical Society Annual Meeting, New Orleans, Louisiana, U.S.A., April 6-10, 2008.

- Steroid transformation using free and immobilized cells of *Curvularia lunata.* D.K. Fearon, P.B. Reese and W.F. Reynolds, IUPAC International Conference on Biodiversity and Natural Products (ICOB-6 and ISCNP), Charlottetown, Prince Edward Island, Canada, July 13-18, 2008.

PUBLICATIONS

Referred Journals

* **Bakir M,** Lawrence M, Singh-Wilmot M, 'Synthesis and characterization of a cadmium-dichloro compound of N,N,O di-2-pyridyl ketone thiophene-2-carboxylic acid hydrazone (η^3-dpktch). The structure of [$CdCl_2$ (η^3-N,N,O-dpktch], *J. Coordination Chemistry,* 2007, 60, 2385.

* **Bakir M,** Green O, Mulder WH, "Synthesis, characterization and optical behavior of a zinc compound of μ^3-N,N,O-bidentate di-2-pyridyl ketone benzoyl hydrazone (dpkbh) $ZnCl_2$(η^3-N,N,O-dpkbh)", *J. Mol. Struct.* 2008, **873,** 17.

* Padmanabhan M, Joseph JC, Olsson S., **Bakir M** "catena-Poly[aqua(propane-1,3-diamine μ^2N,N')copper(II)]-μ-fumarato-μ^2O,O']monohydrate]" *Acta Cryst.* 2008 E64, m303.

* **Bakir M,** Conry RR, Green O, Synthesis, spectroscopy, thermodynamics and structure of [ZnCl2 (eta(3)-dpktch)] (eta(3)-dpktch = N,N,O-di-2-pyridyl ketone thiophene-2-carboxylic acid hydrazone) *Journal of Coordination Chemistry,* 2008, **61**, 3066-3079

* Taylor RA and **Ellis HA** Anhydrous polymeric zinc(II) pentonate, *Acta.Cryst.*, 2008, E64, m895.

* Webster SA, Mitchell SA, **Gallimore WA,** Williams LAD, Ahmad MH, Biosynthesis of Dibenzyl trisulfide (DTS) from somatic and rhizogenous/embryogenic callus derived from Guinea hen weed (*Petiveria alliacea L.*) leaf explants, *In Vitro Cell Dev. Biol. Plant,* 2008, **44,** 112-118.

* Taylor KG, Perry CT, **Greenaway AM**, Machent PG. Bacterial iron oxide reduction in a terrigenous-sediment impacted tropical shallow marine carbonate system, north Jamaica Marine Chemistry, 2007, **197,** 433-448.

* Antao SM, **Hassan I,** BaCO3: high-temperature crystal structures and the Pmcn -> R3m phase transition at 811 degrees C, Physics and Chemistry of Minerals 2007, **34,** 573-580

* Antao SM, **Hassan I,** Gaudefroyite, Ca8Mn63+[(Bo(3))(6)(Co-3)(2)O-6]: High-temperature crystal structure, *Canadian Mineralogist,* 2008, **46,** 183-193

* **Jackson YA,** Townsend NO. Bicyclic 5-5 Systems: Four Heteroatoms 1:3. In *Comprehensive Heterocyclic Chemistry III,* A. R. Katritzky, C. A. Ramsden, E. F. V. Scriven and R. J. K. Taylor, Eds.; Elsevier: Oxford, 2008, **10,** 129-160.

* Downer NK, **Jackson YA.** Iodine-Mediated Cyclisation of Thiobenzamides to Produce Benzothiazoles and Benzoxazoles, *Tetrahedron,* 2007, **63**(41), 10276-10281.

* Downer NK, **Jackson YA.** Conversion of Thiobenzamides to Benzothiazoles via Intramolecular Cyclization of the Aryl Radical Cation,*Tetrahedron,* 2008, **33,** 7741-7744 (doi:10.1016/j.tet.2008.06.023).

* **Jackson YA,** Downer NK. Highlight Syntheses, *Annu. Rep. Prog. Chem., Sect. B: Org. Chem.,* 2008, **104,** 142 - 163, doi: 10.1039/b717024f).

* Downer-Riley NK, **Jackson YA.** Iodine-mediated cyclisation of thiobenzamides to produce benzothiazoles and benzoxazoles Tetrahedron, 2007, **63:** 10276-10281

* **Kahwa IA,** Science, Technology and Innovation at the NANO Scale, Knowledge for Development, CTA, 2008

* Kuhn S, Helmus T, **Lancashire RJ,** Murray-Rust P, Rzepa HS, Steinbeck C, Willighagen EL. "Chemical Markup, XML, and the World Wide Web. 7. CMLSpect, an XML Vocabulary for Spectral Data" *Journal of Chemical Information and Modelling,* **47** (6), 2015-2034, 2007. 10.1021/ci600531a S1549-9596(60)00531-7

* **Lancashire RJ.** "The JSpecView Project: an Open Source Java viewer and converter for JCAMP-DX, and XML spectral data files", *Chemistry Central Journal* 2007, 1:31 (07Dec2007) Potential of zero charge as a sensitive probe for the titration of ionizable self-assembled monolayers. P. Ramírez, A. Granero, R. Andreu, A. Cuesta

* Roberts M, **Minott DA,** Tennant PF, Jackson JC. Assessment Of Compositional Changes During Ripening of Transgenic Papaya Modified for Protection Against Papaya Ringspot Virus, *Journal of the Science of Food and Agriculture,* 2008, **88**(11), 1911-1920.

* **Mulder WH**, Calvente JJ. Electrochemistry Communications, 2008 **10,** 1548-1550.

* **Pinnock WR**, Rashidah Khan and Mark Richards. A Study of Nitrogen Dioxide Levels in the Kingston Atmosphere Using Passive Monitors, *Jamaican Journal of Science and Technology*, 2007, **18,** 19-30.

* Mark Richards and **Pinnock WR**. Development and Use of a Sulfur Dioxide Passive Monitor for Air Pollution Monitoring, *Jamaican Journal of Science and Technology,* 2007, **18**, 31-43

* Williams LAD, **Porter RB,** Junor G-AO. Biological activities of selected essential oils, *Nat. Prod. Commun.,* 2007, **2**, 1295-1296

* Junor GAO, **Porter RBR,** Yee TH. The chemical composition of the essential oils from the leaves, barks and fruits of Bursera simaruba (L.) Sarg. from *Jamaica Journal of Essential Oil Research,* 2008, **20**, 426-429

* Biotransformation of terpenes and steroids by fungi. **Reese PB,** in *Natural Products: Essential for human survival,* ed. Y.-Z. Zhu, B.K.-H. Tan, B.-H. Bay and C.-H. Liu, World Scientific Publishing Co., Singapore, 2007, pp 71-76.

* Steroid hydroxylation by *Whetzelinia sclerotiorum, Phanerochaete chrysosporium and Mucor plumbeus*. Lamm AS, Chen ARM, Reynolds WF, **Reese PB,** Steroids, 2007, **72**, 713-722.

* Martin GDA, Durrant MC, and **Reese PB.** A predictive cytochrome P450 monooxygenase functional model for

generic hydroxylation by *Rhizopus oryzae* ATCC 11145, *Journal of Theoretical & Computational Chemistry,* 2008, **7**, 421-433.

Non-refereed

* **Gallimore WA.** "The Investigation of Marine Organisms in Jamaican Waters for Bioactive Metabolites", 2008, 41 pages
* Greenaway A M. Water Quality Monitoring Protocol for the Water Monitoring Programme in the Nassau Valley in the Vicinity of the Appleton Distillery Wastewater Fertigation Project. Presented to the Spirits Pool Association of Jamaica and later approved by NEPA for implementation. June 2008.

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* UNESCO Report on Sustainable Development Issues for the CARICOM countries
* UNESCO Report on Primary School, Science, Technology and Innovative Education
* Report of CARICOM High Level Meeting on Science Technology and Innovation 2008

INCOME GENERATION / GRANTS

Anthony Greenaway accumulated **J$675,000.00** from commercial analyses.

Kahwa, IA received **US$16,000.00** from UNESCO and **US$21,800.00** for research on Caribbean Sustainable Development Issues and Primary School Science, Technology and Innovation Education Projects.

Donna Minott-Kates received **J$343,000.00** from the Mona Campus Committee for Research & Publications & Graduate Awards and **J$15,000.00** for Hypoglycin production.

Paul Reese obtained **US$2,027.85** from the Mona Campus Committee for Research & Publications and Graduate Awards (January 2008) to purchase glassware and media ingredients for project "Fungal transformation of cembrane terpenes to bioactive analogues".

Novelette Sadler-McKnight generated a total of **$2,053,100.00** from outreach activities.

Summer School programme earned **$8,000,000.00**

From the **Sale of Liquid Nitrogen - $85,140.00**

The Occupational and Environmental, Safety and Health (**OESH**) Programme generated income of **$12,189,260.00**

From other Income Generation Activities, e.g. rental of facilities, consultation fees, analytical services and departmental subventions, an amount of **J$4,614,144.85** was realised.

PUBLIC SERVICE

Dr. A. Greenaway

- Member, National Ozone Commission.
- Chairperson, Laboratory Association of Jamaica's Sub-committee on Proficiency testing.
- Member, Bureau of Standards Jamaica/National Environment and Planning Agency Phosphate Technical Committee.
- External Examiner, Environmental Chemistry, College of Science and Education (CASE) Jamaica.

Prof. Y. Jackson

- Scientific Consultant, Tanaud International.
- Regional Editor, MOLECULES.
- Member, Board of Governors, Hampton School for Girls.

Prof. H. Jacobs

- Member, Ministry of Health and Environment's Technical Review Committee for Persistent Organic Pollutants (POPS).

Prof. R. Lancashire

- Secretary, Caribbean Academy of Sciences.
- Titular member, IUPAC Committee on Printed and Electronic Publications (CPEP).

– Member, IUPAC Sub-committee on Electronic Data Standards (SEDS).

– IUPAC representative on CODATA.

– Member, Advisory Group on ChemSpider.com.

– Editorial Advisory Board Member, Chemistry Central (chemistrycentral.com).

Dr. D. Minott-Kates

– Member, Interim Governing Body/Food Advisory Council.

– Vice Chaiman, CARICOM Regional Organization for Standards and Quality (CROSS-Q.

– Coconut Water Technical Committee.

– Member, Scientific Research Council Board Sub-Committee for Food Technology.

– Board Member, Grove Primary School.

– Member, WIGUT Management Committee.

Dr. W. Pinnock

– Faculty of Pure and Applied Sciences Rep. – University Hospital of the West Indies Research Ethics Committee.

– Board Member, National Water Resources Authority.

– Chairman, Technical Advisory Sub-Committee, National Water Resource Authority.

Dr. R. Porter

– Member, Technical Committee for Propane-Butane Liquefied Petroleum Gas standards, Bureau of Standards Jamaica.

– Member, Technical Committee (TC 93) for all standards relating to starch and its by-products, Bureau of Standards, Jamaica.

Prof. P. Reese

- Member, Equine Drug Testing Committee.
- Member, Product Research & Development Committee, Scientific Research Council.
- Board Member, Jamaica National Agency for Accreditation, Ministry of Industry, Technology, Energy & Commerce.