FACULTY OF PURE AND APPLIED SCIENCES

MONA

Year ending July 31, 2009

Ishenkumba Kahwa, BSc, MSc *Dar,* **PhD** *Louisiana State*
– Dean

Dean's Overview

Preparation of the distinctive UWI graduate – initiatives, notable achievements

The Faculty continued to expand access to and the range of its programme offerings 2008-9. For example:

The Faculty increased enrollment in its various Level 1 courses by about 31%.

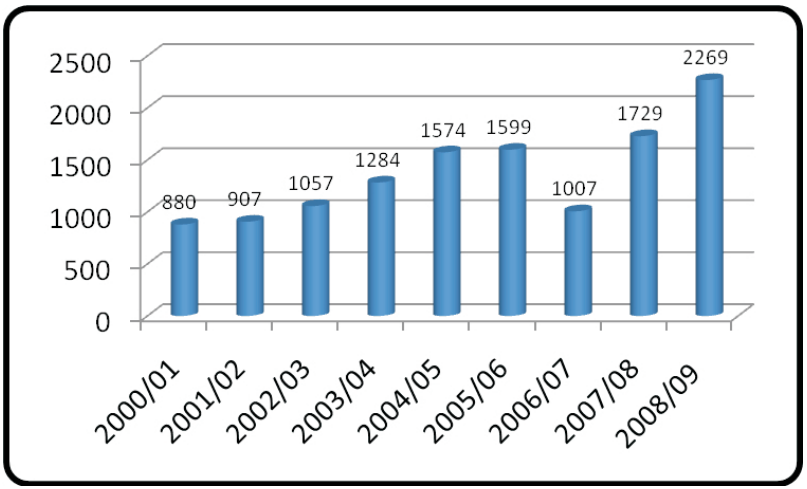

Figure 1: Growing demand for courses in the Faculty of Pure and Applied Sciences

Innovations in dealing with increased enrollment

This large increase was a result of an intense outreach campaign implemented in the previous years; it was a pleasant surprise given the large dip in enrollment in 2006/7. However, the increase caused

considerable pressure on the teaching space, laboratory equipment and staff. Through innovative approaches, flexibility of staff and more efficient use of resources, especially in scheduling laboratories and human resource deployment, and with additional temporary/part time staff, the challenges were successfully addressed. Most notably, additional laboratory streams in physics, life sciences, computing and mathematics as well as a Saturday chemistry laboratory stream (accommodating nearly 100 additional students) were introduced. All departments registered increases as shown in Figure 2.

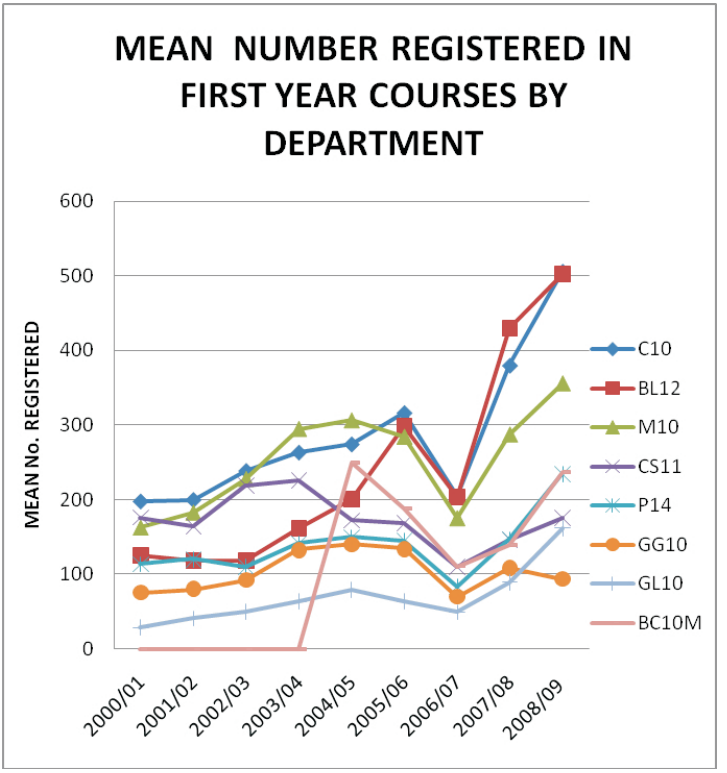

Figure 2: Distribution of enrolled students by Department.

Initiatives for enhancing the learning experience include:

New Programmes

Agriculture: Development of new agriculture programmes of study at both the graduate and undergraduate levels were developed. A

programme in Tropical Horticulture was finalized and approved for delivery beginning in the 2009/10 academic year. Advanced preparative work was made on other areas such as agro–processing.

Engineering: A new Electronics Engineering programme – the first UWI Engineering programme to be offered outside of the St. Augustine campus was completed for delivery in 2009/10. The Electronics Unit and the Faculty of Engineering at St. Augustine will partner with the Department of Physics to roll out the first year of the programme in September 2009.

Biotechnology: Teaching of tissue culture techniques was enhanced by in-house designed and fabrication of build a low cost mobile micro-propagation unit which facilitates high throughput of students in tissue culture laboratory techniques. The innovation supplements the laminar flow tissue culture equipment thereby enabling more hands-on experience for more students.

Chemistry: ***Peer-Led Learning Project:*** Driven by the dedication to provide an environment that creates and maintains enthusiasm for Chemistry and high quality instruction, the Peer-Led Team Learning project was introduced. This is designed to improve the learning experiences and performance of introductory level students through small group workshops with Peer Leaders. The pilot project produced satisfactory results and received positive feedback from the Peer Leaders as well as the students who participated. Further, postgraduate students through a recently re-launched Chemical Society (which is formed by undergraduate and postgraduate students, research fellows and academic staff) began organizing and running useful tutorial before the April/May examinations

International Student exchange: **Miss Janelle Morris**, a student from the industrial chemistry undergraduate course (CHEM3402), was selected for an internship, in summer of 2009, at Hambolt-Universitat zu Berlin (in the Chemical Analysis laboratory of the Department of Crop and Animal Sciences). This new initiative was effected through the International Association for the Exchange of Students for Technical Experience (IAESTE). Ms. Morris' travel expenses were covered by a grant from the Office of the Principal. In turn the department hosted Miss Anne Brieger, a final year student from the Faculty of Agriculture of the University of Bonn, Germany. Miss Brieger worked on a project for the Sugar Industry Research Institute (SIRI), which paid her salary.

Computing: The Department has implemented (2008/9) the curriculum reforms designed to introduce object-oriented programming, such as Java, into Level 1 courses and data structures were taught at level 1 within the context of object-oriented programming instead of functional programming. Functional programming and object-oriented programming are taught in both semesters thereby exposing students to a broader range of programming paradigms than hitherto and allowing for rapid recovery, in case of failure, and flexibility. This is expected to enable students to access a more diverse set of advanced course at levels 2 and 3. For example, students now have a stronger programming background to engage new and popular advanced courses such as Web Development.

Life Sciences: A programme designed to expose students to Jamaica's marine resources and the need to develop and protect them, i.e. the Marine Biology major was run for the first time and the course Caribbean Biodiversity, BL39D/BIOL3019, was reinstated at level III.

Mathematics: The Department implemented a 'Mathematics Bridging programme' in August 2008 to assist students coming to the University with deficiencies in mathematical skills and competences to successfully access mathematics-rich courses in disciplines such as mathematics, computing, physics and chemistry. The programme will be rolled out on larger scale in 2009/10 following informative trials in 2008/9.

Physics: (i) New Majors: The Department has concluded curriculum development and reforms that will see new courses and programmes ready for offering in 2009/10. The electronics programme has been revamped, the major in Materials Science was ready for reintroduction and a new major in Medical Physics and new look first year programme were also ready to be offered in 2009/10.

A Virtual Lab: To enhance teaching and learning (including research) at the undergraduate level, a 50-seater Physics Virtual Laboratory was designed and funding sought to successfully establish it in 2008/9. The Laboratory houses state of the art software, hardware and teaching technology, which has already begun to transform how some areas of physics are taught. The Laboratory was funded through Departmental sources along with grants from the University and the Government of Jamaica.

The electronics unit organized internship placement for students.

Improvements in Graduate Studies; notable accomplishments of graduates

Overall there was an increase in the number of students who completed their MSc, MPhil and PhD programmes respectively and graduated in November 2008. Additional notable achievements include:

Biotechnology: There is a high demand for graduate education in biotechnology as indicated by the number of applications, but there are no sufficient staffing, laboratory space and equipment infrastructural resources to accommodate them.

Chemistry: Professional growth among graduate students and structured engagement with the faculty was fostered by the formation of the Chemistry Association of Postgraduate Students (CAPS) in September 2007. The CAPS played a major role in the planning, organizing and implementation of several activities for the department and faculty. These include the CAPE workshop, Research Day, the National Science Expo held at UTECH, assistance with Faculty pre-orientation and orientation exercises and re-launched of the over 50 year old Chemical Society (CS) on the February 12, 2009. The CS allows structured interaction and professional growth among both graduate and undergraduate students and academic staff. The chemistry tutorials organized and conducted by graduate students for undergraduate colleagues before the April/May 2009 examinations were successful; they provided growth opportunities for both graduate and undergraduate students while enriching the teaching programme.

Geography and Geology: The Department has a vibrant and productive group of graduate students under its supervision. Opportunities for teaching, learning and research have been enhanced by the appointment of a new museum curator at a PhD level who has already begun an innovative programme of educational activities. A collection of new 135 agate items was donated to the museum by Anthony Porter and more than 500 new specimens have been accessed and labeled in a major overhaul of the museum's collection data base and cataloguing system.

Life Sciences: A new programme, MSc MATE (Marine and Terrestrial Ecosystems: Assessment, Conservation and

Management), formed out of two old programmes, was prepared and will be ready for delivery in 2009/10.

Mathematics: Preparation for revision, enrichment and resumption of the MSc in Mathematics Programme was finalized. A preliminary programme was developed to attract to and prepare more students (in particular from University of Technology) for the MSc programme. The two aspects of the programme are expected to start in 2009/10 with about 30 students.

Mona Institute of Applied Sciences (MIAS): MIAS continued to offer industry needed graduate education: e.g. programmes and enrollment were: MSc (Computer Science) -50; Post Graduate Diploma in Information Technology-15.

Physics: No new programmes were introduced but the MSc in Digital Technology continued with a new batch of 8 students; 5 completed the requirements for graduation.

Multidisciplinary Programmes: Collaborations with the office of the Principal, Faculty of Social Sciences and Mona School of Business produced an advanced draft of an MSc curriculum for a programme in Agricultural Entrepreneurship. This programme will be finalized for approval in early 2009/10 academic year.

Improving research/ innovation output, notable achievements, distinctive research output

The faculty continued its advancement in research.

Research/Innovation Output

Department/Centre/ Institute/Unit	Number of Items				Edited Works
	Referred Articles/ Chapters	Patents	Non Referred Articles	Conference Presenta-tions	
Biotechnology	11	–	1	15	5*
Chemistry	31	1(filed)	2	3	–
Computing	13	–	–	2	1
Electron Microscopy	3	–	–	–	–

Electronics Unit	–	–	–	–	–
Geography/Geology	17	–	–	21	4
Life Sciences	17	–	2	20	7*
Mathematics	13	–	–	–	4
MIAS	–	–	–	–	–
Physics	11	–	–	15	–

Notable Achievements

Biotechnology and Life Sciences: There is growing recognition of the good quality research capacity on the ground as evidenced by guest editorship of a total of 8 international literature volumes. The maturing capacity in the vital postharvest technology is also evident in the rather large number of papers in the area. Thus, UWI has the capacity it needs to move aggressively in horticulture and agro-processing.

The application of macro-propagation and micro-propagation techniques of trees being used for medicinal, fruit, forestation, timber, spice and yam stick purposes has shown potential for forest restoration and alternative livelihood for inhabitants.

Very encouraging results were obtained for the work on transgenic papaya developed to fight the most deadly virus (papaya ring spot virus) that is limiting papaya production. The transgenic papaya did not exhibit any major unintended alterations in either the nutritional or the antinutritional composition. Additional test are required to claim complete equivalence between transgenic papaya and the rest on the market.

Chemistry: The Department's investment in crystallographic capacity is bearing fruit as structure elucidation by this technique is now more common.

Interesting results from new research areas have began to emerge; for example research in raspberry which grown wildly in Jamaican highlands has revealed compounds with some anti-cancer ability.

Computing: The cardiovascular simulator went into more extensive trials involving several major US universities prominent in cardiac surgery educational programmes (i.e. Mass. General Hospital (Harvard Medical School), Johns Hopkins University, Mayo Clinic, Vanderbilt

University, Rochester University, University of North Carolina (Chapel Hill), University of Washington, and Stanford University). Further development of a second version of the simulator to expand its functionality and to improve its usability is under way.

A new research programme exploring the potential for using Wireless Sensor Networks (WSN) to create intelligence based services for shopping, tourism enhancement, trade and other services is beginning to show interesting results.

Mathematics: Studies of mathematical solutions of noisy systems or systems that have potential to be affected by noise induced from neighbours have thrown new light on how systems can be stabilized by introduction or removal of noise. This is important for biomedical, financial, mechanical and other important processes/applications for which predictability requires complex mathematical modeling in which noise could be a critical factor. Strengthening of mathematical modeling is a key development.

Physics: Development of a novel approach for systematic evaluation of the homogeneity of daily surface temperature observations for the Caribbean and neighbouring regions on a monthly timescale. This novel approach is more effective compared to the conventional use of highly correlated nearby stations, given the sparse station network for the Caribbean and adjacent areas.

Distinctive Research/Scholarly Output

The Department of Life Sciences and the Centre for Biotechnology staff has been invited to edit a total of 7 monographs on a variety of agri-science subjects. The recognition of this capability by the international scientific community brings high reputation to the University. Chemistry's discovery of insecticidal activity of oily extracts from Jamaica plants is a major step in the potential use of Jamaican plants products.

Service to the wider community, including the Open Campus community; notable achievements

Biotechnology: Tissue culture technology transfer through Farmers in Manchester and Trelawny.

Chemistry: Leading provider of public and targeted education on occupational and environmental safety and health in Jamaica and the region (activity in Trinidad and Tobago).

Computing: Engaged local and hemispheric companies in search of opportunities for student training and consultancy services provision. E.g. **Jamaica National Building Society** to provide consultative services and software to automate certain labour intensive processes.

Provision of input on a newly proposed **Cyber Crimes Act** in Jamaica.

In September, 2008, two recent graduates were selected to participate in a 6 week internship with a leading Costa Rican IT company, named **Avantica.**

Geography & Geology: Facilitating the search for petroleum on Jamaica's terrestrial and marine locations.

Provision of research data for disaster mitigation and management.

Life Sciences: The Marine laboratory maintains the only decompression chamber (useful for rehabilitation of deep sea divers).

Leading effort to replant mangroves along Jamaica's coastline.

Mathematics: Facilitation of development of data collection processes at the Ministry of Agriculture.

Provision of actuarial financial services advice.

Staging of mathematics Olympiad; events attracted teachers and students from high schools. The goal is to enhance problem solving skill and improve learning outcomes in mathematics education across the board. The programme will also prepare students for the international mathematics Olympiad competitions.

All Departments have outreach activities such as bringing to the Faculty school children for a structured exposure to science, helping candidates preparing for CAPE examinations, visits to schools in inner city areas to promote science and mathematics and provision of external

examiner services to other tertiary education institutions (CASE, UTECH, Community Colleges).

Several Departments offer services to the Open Campus through the B Ed programme.

All Departments and Centres provide referee services to international journals while some serve as editors.

Transformation of the administrative culture and processes to better respond to all our stakeholders

The Department of Mathematics and Computer Science was split into two independent Departments: Department of Computing (named to better reflect its broad areas of the computing discipline) and the Department of Mathematics. This was to allow focus, expansion and growth of both disciplines.

Addressing the funding constraints.

Resources continues to be a major issue for the Faculty but departments, centres, units and institutes have been moderately successful at attracting funding. The notable ones (over **J$3M**) are:

Notable External Grants

Dr. Judith Mendes **-** European Union EDULINK grant **- £488,000.00** for the project: The Caribbean Reef Education and Training Initiative (CREATIve). CREATIve will transform the way Coral Reef Biology and Management is taught throughout the region and produce a landmark textbook on the subject.

Sylvia Mitchell**:** The sum of **$14,772,000.00** has been granted for the period November 2008 – November 2011 by the Forest Conservation Fund for the identification, propagation and dissemination of native forest species of Jamaica.

Drs. M. Coley & A. Greenaway - **US$121,400.00** from Alcoa World Alumina (October 2008) for research project on "*Caustic-Soluble Chromium and Zinc in Jamalco Bauxite.*"

Webber, M.K. - on-going funded projects. Forestry Conservation Authority/Jamaica Protected areas trust grant for **J$5,229,006.00** with

Mr. Camilo Trench (Scientific Officer PRML) for the establishment of a mangrove and coastal plants seedling nursery.

The impact of Marine Invasive species on Jamaica's Biological Diversity, through Ballast Water. EFJ Research grant for **J$3,449,000.00** with two other researchers and the Institute of Jamaica's Natural History Division.

Dr. Skobla and Dr. Voutchkov- **J$5.3M** from the Government of Jamaica, Cabinet Office, Public Sector Modernization Division for "Strengthening Medical Physics through Virtual Education and Training".

US$284,000 IAEA Project JAM0004 "Developing National Capacities for the Application of Nuclear Science in Jamaica".

Dr. Mitko Voutchkov participated as a team member in the IAEA RLA6061 Regional Latin American project entitled "Training and Updating Knowledge in Medical Physics (ARCAL CVII) including 22 countries. The overall budget for the project is **US$708,330;** the amount for each participant is not yet confirmed.

Byron Wilson: Various external sources **US$68,000** to support work on iguana and other conservation work.

Income Generation Activities

Departments were engaged in various income generation activities, the most notable incomes are:

- Chemistry total: J$62.6M
- Electronics Unit: J$3.6M
- Life Sciences: J$11.1
- Mona Institute of Applied Sciences: J$19.9M.