

DEPARTMENT OF PHYSICS

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– Head of Department

HIGHLIGHTS

The Department is in the midst of transformation occasioned by dwindling student enrollment a few years back and an increasing call for science relevance. At the heart of the transformation process has been curriculum reform, and the past year was notable for the time devoted to discussion and review of the Department's offerings. The result has been a three year plan, drafted for implementation beginning 2009/10, which will see modification to existing course structures, redefinition of existing majors and minors, a revamping of the Electronics programme, the reintroduction of a Materials Science major and the introduction of a new major in Medical Physics. To meet the implementation target, a new look first year programme was proposed and the necessary board and committee permissions acquired for it to be launched in September. Additionally, the Department proposed and acquired approval to launch a degree programme in Electronics Engineering – the first UWI Engineering programme to be offered outside of the St. Augustine Campus. The Engineering Faculty of St. Augustine will partner with the Department to roll out the first year of the programme in September 2009.



Staffing continues to be a challenge for the Department. No posts were filled even though there were 5 vacancies. The impact of this was most notable on the Electronics programme. This was relieved somewhat with the return of Dr. Leary Myers from his secondment to the government of Jamaica. Notwithstanding, teaching standards remained high (see ensuing section), and the vacancies provided the opportunities to (i) identify and evaluate potential staff for nurturing amongst PhD students who assisted in content delivery, and (ii) rationalize how the open posts will be filled in the coming years in

conjunction with the redrafted teaching focus and new programmes. Steps are underway to permanently fill two of the posts for the 2009/10 academic year.

The physical infrastructure and teaching and research capabilities were enhanced during the year with the opening of the Physics Virtual Laboratory. The Laboratory houses state of the art software, hardware and teaching technology which has already begun to transform how some areas of the subject are being taught. The Laboratory was funded through Departmental sources along with grants from the University and the Government of Jamaica.

The Department hosted a public lecture by Prof. Mercedes Richards - Professor of Astronomy and Astrophysics at the Pennsylvania State University and the recipient of the Institute of Jamaica's Gold Musgrave Medal for Science (2008). Professor Richards is a UWI Mona special physics graduate of 1977. The Department also hosted collaborators from the University of the Antilles and Guyane, Pointe-B-Pitre, Guadeloupe.

Finally, the profile of the Department benefited greatly from the continued achievements of its staff members. Professor A. Anthony Chen was given the nation's third highest honour – the Order of Merit for his contribution to climatology – and was honoured at the commemoration exercises of the Mona Campus. He was also conferred with the title of Professor Emeritus. Dr. Michael Ponnambalam was singled out for his excellence in teaching, winning both the UWI/Guardian Life Premium Teaching Award (2008) and the Vice Chancellor's Award for Excellence in teaching (2009). Mr. Samuel Daniel and Dr. Taylor were given Teaching Awards at the Faculty of Pure and Applied Sciences annual awards ceremony. Mr. Daniel topped the Faculty in terms of student assessment scores. Dr. Stephenson, Dr. Taylor and graduate students Jayaka Campbell and Felicia Whyte received the award for Best Publication in the Faculty of Pure and Applied Sciences at the annual Research Day awards. Dr. Taylor received the Third World Academy of Sciences (TWAS)/Caribbean Academy of Sciences (CAS) Young Scientist Award at the 16th General Assembly of CAS (2008). Prof. Chen and Dr. Michael Taylor were featured on the Mona Campus' calendar for 2009.

Undergraduate Teaching

A high standard of teaching and a student centered approach contributed to high student assessment scores received by staff members. No staff member received less than 3.6 and of 41 total assessments 37 exceeded 4.0. One staff member, Mr. Ricardo Paharsingh, received a score of 5.0. The Department average for lecturers was 4.4 and for courses was 3.9. With respect to student numbers, a 30% increase in enrolment at the Introductory level necessitated an increase in the number of Laboratory sessions offered and resulted in increased demand on equipment and facilities.

Graduate Programmes

No new MPhil postgraduate student entered the Department in 2008/09 due to the stringent application of admission rules. At the same time, two students were awarded MPhil degrees. There were consequently very few full time postgraduate students in the Department which negatively impacted research output. Efforts are being made to recruit new MPhil students for the upcoming academic year. The MSc in Digital Technology continued with a new batch of 8 students. 5 completed the requirements for graduation.

Research

The 12 members of staff produced 15 conference papers, 11 refereed publications and 1 book chapter. This gives an output of less than 1.0, which, though not ideal, is an improvement on previous years. A target of 1.5 is set for the new academic year. A new renewable energy research group was formed and has been helpful in identifying priority areas for research and teaching in this field. Two projects from the group have been shortlisted in the Global Energy Innovation Competition. New grants totaled in excess of 7 million dollars (see section below).

Outreach

Approximately 900 high school students from 24 high schools participated in the annual CAPE Workshop series held in January 2009. Two CAPE Modules (Oscillations and Waves and Operational Amplifiers) were taught by members of staff and related labs demonstrated by students. The demand for these workshops continues to be high and schools have to be turned away. During the year, the

Department hosted Iona High, Queens High, Wolmers Girls, (CSEC and CAPE demonstrations and labs), Glowell Prep and Hope Valley Experimental (Physics is Fun demonstrations). For the first time in recent years the Department also ventured out to Unity Primary School where 100 students participated in hands on demonstrations.

PAPERS PRESENTED

- **Batchelor, TWK, AMA Amarakoon, MA Taylor, TS Stephenson, PD Brown.** Effect of precipitation and temperature on Leptospirosis in the Caribbean. 4th Biennial Conference of the JIEP. Kingston, Jamaica. May 26-27, 2009.
- **Batchelor, T. W., D. Amarakoon, M. A. Taylor and T. S. Stephenson,** 2009: Investigating the Link Between Climate and Leptospirosis in the Caribbean Using Wavelet Analysis, *Eos Trans. AGU*, 90(22), Jt. Assem. Suppl., Abstract B73B-01.
- **Campbell, J and M. A. Taylor** 2009: ICT in Climate Change Research. 1st Caribbean Research Conference on Information and Communication Technology. Mona Visitors' Lodge and Conference Centre. March 16-17, 2009
- **McNamarah, C,** 2008. "An evaluation of the solar thermal electricity potential in Jamaica", 22nd Annual Science and Technology Conference, Kingston, Jamaica, Nov 18-20, 2008
- **Ponnambalam, MJ,** 2009: The Interface between Physics and Psychology 10th Inter American Conference on Physics Education, Medellin, Colombia, July 6-10, 2009.
- **Ponnambalam, MJ,** 2009: Calculation of the Mass of \square Particle. 10th Inter American Conference on Physics Education, Medellin, Colombia, July 6-10, 2009.
- **Ponnambalam, MJ,** 2009: Calculation Has Science Teaching Lost Its Soul? Meeting of the American Association of Physics Teachers, Ann Arbor, Michigan, USA, July 25-29, 2009.
- **Stephenson, T., M. A. Taylor, A. A. Chen, J. Campbell and R. Watson,** 2009: The Climate Studies Group Mona: Exploring Caribbean Climate Science. Christian Aid Regional Climate Change Forum, Courtleigh Hotel, March 19-21, 2009.

- **Taylor, M. A.** 2009: Climate Change Modeling in Jamaica. 2nd Caribbean Community Climate Change Conference, St. Lucia, March 23-24, 2009
- **Taylor, M. A.** 2009: The use of climate models for the projections of future climate scenarios in the Caribbean: Experience of the Climate Studies Group Mona. 2nd Caribbean Community Climate Change Conference, St. Lucia, March 23-24, 2009
- **Taylor, M. A.** 2008: We know enough to at least start. CAS 16th General Meeting. Grenada October 10-13 2008.
- **Taylor, M.A.** 2009: Climate Change – the Science. 4th Biennial Conference of the JIEP. Kingston, Jamaica. May 26-27, 2009.
- **Taylor, M. A., T. S. Stephenson, A. A. Chen and T. Batchelor,** 2009: Capacity and Need for Providing Climate Change Scenarios for Small Islands, Eos Trans. AGU, 90(22), Jt. Assem. Suppl., Abstract GC22A-05.
- **Campbell, G. and T. S. Stephenson,** 2009: National Adaptation Strategy for Water in Jamaica, St. Lucia, March 23-24, 2009.
- **Voutchkov, M,** 2008: “Medical Physics of Body Composition: Case studies in Jamaica” ICTP, Italy, Sept. 2008.

PUBLICATIONS

Book Chapters

- * **Anthony Chen, Michael Taylor,** David Farrell, Abel Centella and Leslie Walling, 2008: Caribbean climate scenarios for the Caribbean: Limitations and needs for biodiversity studies. In Climate Change and Biodiversity in the Americas. Edited by A. Fenech et al. Environment Canada. Toronto, Ontario, Canada. 366 p.

Peer Reviewed Papers

- * **Andrade C., Clarke L., Skobla J.,** A novel approach to integrated GPS/INS tracking, Proceedings IEEE Aerospace Conference, Big Sky, MT , March 7-14, 2009.
- * **Clarke L.A., Skobla J.,** 2009: Benefits Derived from Restructuring the Practical Component of an Introductory Course in Electronic Communication Systems, Proceedings IEEE International Conference on Microelectronic Systems Education , San Francisco, CA , July 25-27, 2009.
- * Ngalamou, L., **Leary Myers,** Christopher Donaldson, Petri Nets and Fuzzy Sets in Hybrid Control Synthesis: The Discrete-event Aspect, WSEAS Trans on System and Control, Issue 2, Volume 4, February 2009, pp. 98-117, ISSN: 1991-8763.
- * Ngalamou, L., and **L. Myers,** A Software Approach for Automatic Selection of Programmable Logic Controllers, *South African Computing Journal*, Volume 41, December 2008, ISSN: 10157999.
- * Ngalamou, L., and L. Myers, Digital SPWM Synthesis for the Design of Single-Phase Inverters, *International Journal of Electronics*, Vol. 95, No. 5, May 2008, pp 489-503.
- * Ngalamou, L., and **L. Myers,** Modelling PLC Characteristics for Resource Allocation, *International Journal of Computer Applications in Technology*, Inderscience, Vol. 31, Nos. 3/4, 2008 pp. 263-274.
- * Nriagu, J., Mazen Boughanen, Aaron Linder, Andrea Howe, Charles Grant, Robin Rattray, **Mitko Vutchkov** and Gerald Lalor, 2009. Levels of As, Cd, Pb, Cu, Se and Zn in bovine kidneys and livers in Jamaica, *Ecotoxicology and Environmental Safety*, Volume 72, Issue 2, February 2009, Pages 564-571
- * **Paharsingh R., Skobla J.,**(2009), A Novel Approach to Teaching Microprocessor Design Using FPGA and Hierarchical Structure, Proceedings IEEE International Conference on Microelectronic Systems Education , San Francisco, CA , July 25-27, 2009.
- * **Stephenson, T., A. A. Chen** and **M. A. Taylor** (2008), The Climate Studies Group Mona, *Caribbean Quarterly*, 54, 85-88.

- * **Stephenson, T.,** C. Goodess, M. Haylock, **A. Chen** and **M. A. Taylor** (2008), Detecting inhomogeneities in Caribbean and adjacent Caribbean temperature data using sea surface temperatures, *Journal of Geophysical Research – Atmospheres*, DOI: 10.1029/2007JD009127.
- * Spence, J. M and **M. A. Taylor**, 2008: Jamaica, in State of the Climate in 2007. Levinson, D.H., and J.H. Lawrimore eds., *Bulletin of the American Meteorological Society*, 89, S107-S109.

CATEGORIES OF STUDENTS

Total undergraduate student enrolment in departmental courses.

	Semester 1	Semester 2	Year Totals
Preliminary	87	81	168
Introductory	223	141	364
Year II	158	150	308
Year III	87	108	195
Totals	555	480	1035

MPhil	10 students (F/T & P/T)
PhD	3 students
MSc	30 students (all years)

INCOME GENERATION

The MSc in Digital Technology programme generated 3.5 million in fees and summer school netted 1.1 million.

Dr. Skobla and Dr. Voutchkov received a grant award for J\$5.3M from the Government of Jamaica Cabinet Office, Public Sector Modernisation Division for “Strengthening Medical Physics through Virtual Education and Training”. Laboratory and research equipment were purchased and installed for the new academic year.

Dr. Skobla and Dr. Voutchkov continued work on the IAEA Project JAM0004 “Developing National Capacities for the Application of Nuclear Science in Jamaica” with the scheduled activities for 2009 (sub-total of US\$54,700).

Dr. Skobla and Dr. Voutchkov participated in the Inter-regional Research Project “Measurement of the Atmospheric Pollutants – volatile organic compound, particles, Sahara dust and their effects on health” between the University of the Antilles and Guyane, University of the West Indies, Mona and St. Augustine and National Institute of Meteorology, Cuba. Currently the air sampling equipment supplied by the project is used to measure Saharan dust levels in Jamaica.

Dr. Voutchkov, Mr. Chad Andrade and Dr. Skobla received a Research Fellowship grant for development of an “In-vivo X-Ray Fluorescence Technique for Measurement and Diagnosis of Heavy Metal Poisoning with GPS capability”. The amount of the grant is not yet available.

Dr. Voutchkov and Mr. Victor Douse received a UWI New Initiative Grant for J\$1.5Mto perform research on “Novel Utilization of Red Mud for Anticorrosive Protection and Heavy Metal Removal from Waste Water 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 and the amount for each participant is not yet confirmed.

Dr. McNamarah and collaborators received UWI New Initiative Grant for J\$1 million for the project *The Effectiveness of Using Fixed Wide Angle Collectors in Solar Thermal Electricity Power Plants* (Dr. Claude McNamarah, PI).

Dr. Taylor, Dr. Stephenson and Prof. Chen received US\$ 10,000 for the project *Vulnerability and Adaptation to Climate Change: Workshop for the Government of St. Lucia*.

PRIZES

Undergraduate prizes were awarded to:

UWI Academic Bursary:	–	Tricia Evans
Professor John Lodenquai Prize for Introductory Physics:	–	Ralphston Johnson
Level II Departmental Prize:	–	Tricia Evans
Francis Haddon Bowen Bursary:	–	Natalie McLean
Michael Tharmanahthan Ponnambalam Bursary:	–	Javian Malcolm

PUBLIC SERVICE

Academic staff continue to give sterling service to the University and society at large. Most notable are contributions as external examiners, reviewers for international journals and on several public sector boards and committees.