DEPARTMENT OF PHYSICS

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OVERVIEW

The year 2013/14 represented the Final Year in the phasing in of the revamped Undergraduate Physics Curriculum. It also marked the ending of the Five Year Strategic Plan, which centered on building a foundation for the delivery of high quality Physics Teaching, Innovation and Research, Intellectual Leadership and Public Service, and the implementation of Student Friendly Systems and a harmonious work environment. Significant achievements in some of these areas were achieved and highlighted below.

CURRICULUM REFORM AND TEACHING

In keeping with the reworked Physics and Applied Physics Programme approved in 2010/11, new 3rd Year Courses were introduced. This completed the phased implementation of the Department's new Undergraduate Offerings. The reworked Programme is premised on (i)

Five Undergraduate Majors in Medical Physics, Energy and Environmental Physics, Materials Science, General Physics and Electronics; (ii) a common Physics Core and mandatory Mathematics Courses across all Majors; (iii) a simplification of student choices; (iv) 3-Credit Courses; (v) new Laboratory Courses; and (vi) an expanded credit requirement aimed at increasing the breadth of material covered in Majors and Minors. The steady increase in student numbers over the last Five Years, especially at the higher levels, suggests an interest in the New Offerings.

Student satisfaction with teaching remains high. Two (2) Lecturers (Dr. A. M. D. Amarakoon, and Professor Michael Taylor) were recognized for Excellence in Teaching, at the Annual Faculty Ceremony. The full-time staff complement remained constant at eight (8) throughout the Year. However, at the end of the year, Dr. Keith Duncan, Lecturer resigned to pursue new opportunities. One new Lecturer is expected in 2014/15, and the Department hopes to advertise two (2) posts.

Two (2) students will graduate with First Class Honours, both of whom were members of the Physics Honours Society. The Society continues to serve the purpose of identifying talented students early in their University Career and mentoring them through to an Honours Degree.

The Engineering Programmes, which were created in the Department, were transferred to the Mona School of Engineering at the end of the Academic Year. The Department will, however, maintain responsibility for the Teaching of Electronics Courses under the Shared Resources Model.

RESEARCH

By any of the standard metrics, Research in the Department continues to be on an upswing. There are four (4) established and active Research Groups in Climate Studies, Alternative Energy, Medical Physics, and Materials Science, and a fifth Group focused on Electronics is emerging. The groups continue to attract New Grants. Research topics emphasize the Applied Nature of Physics and are increasingly interdisciplinary. Active Research areas include Statistical and Dynamical Downscaling of

Climate Data, BioGlass, Compact Stars in General Relativity and Astrophysics, Vibrational Spectroscopy for Identification of Fire Debris, Applications of Optics in Non-Invasive Intracellular Imaging, Human Speech Recognition, and the Evaluation of Renewable Energy Technologies.

The Department produced seventeen (17) publications, which just exceeded the target set of two (2) Peer Reviewed Publications per full-time academic staff. Professor Michael Taylor received the Principal's Award for the Most Outstanding Research Activity, in the Faculty of Science and Technology and shared in the Award for the Research Project in the Faculty Attracting the Most Research Funds. Mrs. Tanya Kerr, Postgraduate Student was awarded the Faculty Prize for the Best Graduate Publication for her work on "Post fire material identification".

Graduate student numbers are at a record high with thirty (30) Research students and twenty (20) MSc students. Four (4) graduate students were awarded UWI Postgraduate Scholarships, (Tanya Kerr, Sameer Simms, Daren Watson, and Leaford Henderson). This brings to seven (7) the number of UWI Postgraduate Scholars in Physics, and to ten (10) the number of Physics Postgraduates on competitive Scholarships or Bursaries. Mr. Lindon Falconer, was awarded a Commonwealth Split-Site Scholarship and spent half the Year at the University of Sheffield (UK) pursuing Research. Graduate Student participation in International and Local Conferences is also at a high, and it is to be noted that half of the Peer Reviewed Publications from the Department were Co-Authored by Graduate Students.

Most noteworthy, is the fact that after a lull, three (3) MPhils (Stanley Smellie with High Commendation, Kevin Mills and Stacey-Ann Nelson) and one (1) PhD (Maurice Miller) were Awarded, the latter being the first in Physics since 2005.

OUTREACH AND PUBLIC SERVICE:

The Department hosted its Annual CAPE Workshops for High School Students. Workshops were held at Mona, (5 days) and Western Jamaica Campus (2 days). Nine Hundred and Five (905) sixth form students

from twenty-four (24) high schools participated. For the third year, the Department also hosted the Fifth Form CSEC Workshops. Three Hundred and Seventy-Nine (379) students from fourteen (14) high schools island wide participated. Other outreach activities included an International Master Classes on Particle Physics for High School Teachers and Students, hosted in collaboration with the International Particle Physics Outreach Group. Twenty four (24) secondary School teachers and sixteen (16) high school students attended.

The Department launched the UWI Radioecological Laboratory for Research and Services, which was established through collaboration with the International Atomic Energy Agency (IAEA) and the Planning Institute of Jamaica (PIOJ). During the year, the Department also hosted several workshops and public lectures with external partners and visiting academics.

The Department continues to actively participate in Outreach Activities of the Faculty and University (e.g. Research Days). Members of Staff continue to serve in various capacities on University, National and International Boards and Committees, and provide services to and on behalf of the University.

MILESTONES

Mrs. Ilene Thomas, Laboratory Attendant, was named the Most Outstanding Worker (UAWU) in the Faculty. Professor Michael Taylor was awarded the Silver Musgrave Medal for contributions to Research in Climate Change. Dr. Tannecia Stephenson was appointed to the Joint Scientific Committee of the World Climate Research Programme (WCRP) as a Member of the CORDEX Science Advisory Team.

DEPARTMENTAL STATISTICS

Total Student Registrations

(Columns to right indicate previous year totals. Years II and III include overlaps)

	Semester 1		Semester 2		Year Totals	
	Current	Previous	Current	Previous	Current	Previous
Preliminary	83	113	77	96	160	209
Intro Physics	204	227	151	151	355	378
Intro Engineering	46	51			46	51
Intro Electronics			116	108	116	108
Year II	324	293	281	284	605	577
Year III	156	135	120	143	276	278
Totals	**609**	**592**	**594**	**631**	**1,558**	**1,601**

Postgraduate Student enrolment:

MPhil twenty (20) students (F/T and P/T); PhD ten (10) students; MSc twenty (20) students (all years)

Prizes Awarded

- The Professor John Lodenquai Prize for Introductory Physics: Anna Thomas;
- Level II – Departmental Prizes: Rochelle Lee & Camesha Browne;
- Michael Tharmanahthan Physics Bursary: Kaleish Smith;
- Francis Haddon-Bowen Bursary: Chadwick Barclay.

PUBLICATIONS

Book Chapters

- Taylor, M. A., A, Mandal, C. Burgess and T. Stephenson, 2014: Flooding in Jamaica: Causes and Controls. In Flooding and Climate Change: *Sectorial Impacts and Adaptation Strategies for the Caribbean Region.* Dave Chadee et al. (ed). Nova Publishers. p. 221.

Journals

- **Venkateswara Rao,** P., P. Syamprasad, G. Naga Raju, V. Ravi Kumar, C.Laxmikanth, N. Veeraiah, 2014: Dielectric and spectroscopic investigations of copper ions in PbO-Bi2O3-B2O3 glass matrix. *International Journal of Engineering Research*-Online Vol.2, Issue.1, 18-31.
- **Edward, K.**, and F. Farahi, 2014: Quantitative non-invasive intracellular imaging of Plasmodium falciparum infected human erythrocytes. *Laser Phys. Lett.* 11 055603 doi:10.1088/1612-2011/11/5/055603
- **Edward, K.**, and F. Farahi, 2014: Biomedical Applications in Molecular, Structural, and Functional Imaging. Proc. SPIE 9038, *Medical Imaging.* doi:10.1117/12.2044407
- **Stephenson, T. S.**, L. A. Vincent, T. Allen, C. J. Van Meerbeeck, N. McLean, T. C. Peterson, M. A. Taylor et al. 2014: Changes in extreme temperature and precipitation in the Caribbean region, 1961–2010. *Int. J. Climatol*. DOI: 10.1002/joc.3889.
- **Stephenson, T. S., M. A. Taylor**, A. R. Trotman, A. O. Porter, I. T. Gonzales, J. Spence, N. McLean, J. D. Campbell, G. Brown, M. Butler, R. C. Blenman, A. P. Aaron-Morrison and V. Marcellin-Honore, 2014: [Regional Climates] Caribbean [in State of the Climate in 2013]. B*ull. Amer. Meteor. Soc*. 95 (7), S166-S168.
- Raphaël, C., D. Bernard, C. d'Alexis, **J-F. Dorville**, 2014: Numerical Simulations of Island-Induced Circulations and Windward Katabatic Flow over the Guadeloupe Archipelago. *Mon. Wea. Rev.,* 142, 850–867. doi: http://dx.doi.org/10.1175/MWR-D-13-00119.1

- Centella-Artola, C., **M. A. Taylor**, A. Bezanilla-Morlot, D. Martinez-Castro, J. D. Campbell, T. S. Stephenson and A. Vichot, 2014: Assessing the Effect of Domain Size over the Caribbean Region using the PRECIS Regional Climate Model. *Climate Dynamics*. 10.1007/s00382-014-2272-8.
- **Coy, A.**, 2013: On the Use of Automatic Speech Recognition to Facilitate Increased Literacy Rates in Jamaica, *International Journal for Cross-Disciplinary Subjects in Education* (IJCDSE), Special Issue Volume 3, Issue 1, 1379-1386.
- **Hyman, T-A.**, 2013: Assessing the vulnerability of beach tourism and non-beach tourism to Climate Change: A case study from Jamaica. *Journal of Sustainable Tourism,* doi: 10.1080/09669582.2013.855220
- Mohini G. J., N. Krishnamacharyulu, G. Sahaya Baskaran, **P. Venkateswara Rao**, N. Veeraiah, 2013: Studies on influence of aluminium ions on the bioactivity of B2O3–SiO2–P2O5–Na2O–CaO glass system by means of spectroscopic studies. *Applied Surface Science,* 287, 46–53.
- **Miller, M., and M. Voutchkov**, 2013: The impact of uncertainty in the elemental composition of the certified reference material on gamma spectrometry. *Journal of Radioanalytical and Nuclear Chemistry.* DOI : 10.1007/s10967-013-2781-7.
- **Taylor, M. A., J. Campbell, T. Stephenson**, A. Trotman, 2013: [Regional Climates] Caribbean [in State of the Climate in 2012]. *Bull. Amer. Meteor. Soc.*, 94 (8), S156–S157;
- **Kerr, T., K. Duncan, L. Myers**, 2013: Application of vibrational spectroscopy techniques for material identification from fire debris. *Journal of Vibrational Spectroscopy*, 68 (2013) 225-235.

PEER-REVIEWED CONFERENCE PROCEEDINGS

- **Edward, K.**, and F. Farahi, 2014: Biomedical Applications in Molecular, Structural, and Functional Imaging. Proc. SPIE 9038, *Medical Imaging*. doi:10.1117/12.2044407.

- **Barclay, C. S.**, L. Zhao, S. R. Bishop and K. L. Duncan, 2013: Defect Equilibria Of (Pr0.6Sr0.4)(Co0.2Fe0.8)O3-δ. *ECS Trans.* 2013 volume 57, Issue 1, 2105-2113. doi: 10.1149/05701.2105ecst (full paper).
- **Burgess, C. P., M. A. Taylor, T. S. Stephenson** and A. Mandal, 2013: Extreme precipitation for Jamaica: 1895 to 2100. In Urban flood Resilience: Proceedings of the International Conference on Flood Resilience: Experiences in Asia and Europe. Exeter, UK. Edited by: David Butler, Albert S. Chen, Slobodan Djordjevic and Michael J. Hammond.

SIGNIFICANT FUNDING

- Dr. Coy received a Leverhulme Grant in Partnership with the Sheffield University, the University of Toronto and with AIAS Bologna to develop a Cloud-Based Computational Resource for Clinical and Educational Applications for Speech Technology (CloudCAST).
- Spoken Language Technology to integrate the deaf in hearing only classrooms. (J$2.5 million). UWI Multidisciplinary Research Fund. PI: A. Coy
- Production of near term climate scenarios for Jamaica. (J$2.1 million). PIOJ (2014). PI: M. A. Taylor
- A Grant was received from SPIE to host a Summer Science Camp at the UWI Mona, in the next Academic Year in Collaboration with UTECH and the Scientific Research Council of Jamaica. (US$5000). PI: K. Edward
- Fiber Optic Solar In-door Lighting (FOSIL) system. A Grant was awarded by the Caribbean Climate Innovation Center and the World Bank for the development of a system to facilitate in-door lighting using sunlight. (US$ 50,000) PI: K. Edward.

PUBLIC SERVICE

Anthony Chen

- Member, Climate Change Advisory Board, Ministry of Land, Water, Environment and Climate Change
- Member, GEF- Small Grants Programme

Andre Coy

- Reviewer Journals, IEEE Transactions on Audio, Speech and Language Processing, Computer Speech and Language, Instrumentation Science & Technology
- Member, IEEE Signal Processing Society
- Member, IEEE Communications Society
- Member, STEM Integration Committee – Ministry of Education
- Advisor to the Ministry of Education – Core Curriculum Unit.

Keith Duncan

- Managing Editor, *International Journal of IONICS*.

Victor Douse

- Chairman, Cement Technical Committee, Bureau of Standards;
- Technical Assessor, Jamaica National Agency for Accreditation (JANAAC).

Kert Edward

- Member, American Association for Cancer Research, Optical Association of America, IEEE, SPIE;
- Member (elected), Institute of Physics, The Scientific Research Society (elected);
- Reviewer, Optics Letters, Optics Express, Biomedical Optics Express, Applied Optics, Optical Engineering and Tissue Engineering, Mathematical Biosciences;
- Reviewer, SPISE program for the Caribbean Science Foundation.

Leary Myers

– Member, International Who's Who Historical Society.

Tannecia Stephenson

– Member, National Committee for Climate Change Adaptation and Disaster Risk Reduction;

– Member, CORDEX Science Advisory Team, Joint Scientific Committee of the World Climate Research Programme (WCRP);

– Reviewer Journals, *Climate Research, Climate Dynamics.*

Michael Taylor

– Member, Board, Water Resources Authority;

– Member, Climate Change Advisory Board, Ministry of Land, Water, Environment and Climate Change;

– Member, International Science Panel of VAMOS/CLIVAR;

– Member, Steering Committee, Pilot Project on Climate Resilience (Caribbean);

– Reviewer Journals: *Journal of Geophysical Research, International Journal of Climatology, Journal of Climate, Climate Dynamics, Theoretical and Applied Climatology, Tellus A*.

Mitko Voutchkov

– Member, Jamaica's Energy Council, Ministry of Science Technology, Energy and Mining;

– Member, Heavy Metal Task Force, Ministry of Health;

– Life Member, International Society of Environmental Geochemistry and Health;

– Chairman, Technical Advisory Committee "In-situ Methods for Characterization of Contaminated Sites", International Atomic Energy Agency (IAEA);

– IAEA Technical Co-operation Expert in Nuclear Physics.