

DEPARTMENT OF PHYSICS



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OVERVIEW

During the year consultations were held with all categories of stakeholders to craft a new Five Year Strategic Plan for the Department. The new plan is premised on growth and expansion and replaces the previous plan which expired in 2013/14. The previous plan emphasised establishing 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.

UNDERGRADUATE CURRICULUM REFORM AND TEACHING

2014/15 was the first year that the entire reworked Physics programme was offered. 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 at the advanced level continued, however the number of students registered for Introductory Physics fell again for the second year. This may in part have to do with the expanding Engineering School intake. The Department maintains its relationship with the Mona School of Engineering through the teaching of Electronics Courses under the Shared Resources Model.

Student satisfaction with teaching remains high. The Full-Time Staff complement increased by one to nine (9) when Dr. Louis-Ray Harris (Electronics) joined the Department. However, by the end of the year, Dr. Venketswarao Penugonda and Dr. Jean-Francois Dorville both resigned to pursue other opportunities. Two new Lecturers are expected to join the Department in 2015/16.

Two students will graduate with First Class Honours. Approximately 21 students will graduate with Physics majors or minors. In keeping with its drive to reward exceptional students, as well as mentor them to achieving honours, the Department continues to induct new and returning students to the Physics Honours Society. This year 25 students were inducted.

RESEARCH AND GRADUATE ACTIVITY

The four (4) established Research Groups remain active. A fifth Group focused on Electronics is finding its footing. The groups continue to attract new grants, the most significant being a US\$10.6 million grant for a five-year regional programme for building regional climate resilience to be jointly overseen by the Climate Studies Group, Mona (CSGM) and the Mona Office for Research and Innovation (MORI). Research topics emphasize the applied nature of Physics and continue to be interdisciplinary. Active Research areas include Statistical and Dynamical Downscaling of Climate Data, Evaluation of Renewable Energy

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Technologies and modelling Renewable Energy Resources, Examination of the effect of wireless device use on human health in realistic environments, Compact Stars in General Relativity and Astrophysics, BioGlass, Novel Applications of Optics, Human Speech Recognition, and the Detection of Trace elements in BioSamples.

The Department sought and got approval for two MSc programmes in Renewable Energy Management and Renewable Energy Technology to begin in September 2015. Approval was also granted for an MPhil and PhD in Applied Physics to meet the growing demand for interdisciplinary studies grounded in principles of physics, for example, those directly related to the Applied Physics majors offered by the Department.

The Department produced thirteen (13) Publications, which fell short of the target set of two (2) Peer Reviewed Publications per Full-Time Academic Staff. Dr. Kert Edward received the Principal's Award for the Most Outstanding Researcher and the Best Publication, in the Faculty of Science and Technology. Dr. Andre Coy won the Award for the Research Project Attracting the Most Research Funds. Postgraduate student Maurice Miller was the 2014 winner of the best Graduate Research Publication for the Faculty of Science and Technology for his article Evaluation of gamma activities of naturally occurring radioactive materials in uncontaminated surface soils of Jamaica. The article was co-authored with Professor Mitko Voitchkov. This is the second year that a Physics graduate student is winning this award.

Graduate enrolment was 23 Research Students and 27 MSc Students. Several graduate students participated in International and Local Conferences and International Exchanges. Noteworthy is Maurice Miller and Roxann Brown's selection and participation in the Commonwealth Science Conference organized by the Royal Society and the Queen Elizabeth Diamond Jubilee Trust, and Phyllicia Ricketts' selection to participate in the 22nd Annual Women in Nuclear Science. Both Mrs. Brown and Ms. Ricketts won awards for best poster presentations. More than half of the Peer Reviewed Publications from the Department were co-authored by Graduate Students.

Four PhD's were awarded: Dale Rankine with High Commendation, Maurice Miller, Victor Douse and Tanya Kerr.

Under the IADB-BRIDGE programme, a collaborative international effort to build capacity in renewable energy in the Caribbean, postgraduate students Sameer Simms, Leaford Henderson and Dudley Williams received internships to respectively the Edinburgh Centre for Carbon Innovation (Scotland), Jamaica Broilers (Jamaica) and General Electric (USA & Jamaica), and one undergraduate student Melissa LeBlanc received a scholarship to attend a Renewable Energy Summer School in Aruba. Postgraduate student Daren Watson and Laboratory Technologist Joni Hall went on training exchanges to China, while Senior Laboratory Technologist Andre Gordon went on exchanges to Germany and Spain funded by the IAEA.

OUTREACH AND PUBLIC SERVICE

The Department hosted its Annual CAPE Workshop for high school students. The workshop was held at Mona for 5 days and at Western Jamaica Campus for 2 days in January 2015. Over 1000 sixth form students attended from over 30 high schools. Over 150 students from 4 high schools also visited the Department, on multiple occasions, to do Physics labs to aid with the lab component of the CAPE and CSEC syllabus. The Department also hosted over 30 students from 2 colleges for experiments as well as a number of primary schools.

The Department continues to actively participate in Outreach Activities of the Faculty and University. These include Research Days 2015 where the suite of tools developed by the Climate Studies Group, Mona were part of the main highlights; Denbigh 2014, Western Fair 2015, Titchfield High School Career Day, and Math Olympiad 2015.

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STAFF EXCHANGE

Dr. Tannecia Stephenson visited the Department of Infrastructure at the Anton de Kom University of Suriname for three weeks in May where she lectured a course entitled Physics Infrastructure.

MILESTONES

Dr. Tannecia Stephenson was awarded the Bronze Musgrave Medal for Science. She was also promoted to Senior Lecturer. Drs. Kert Edwards and Louis-Ray Harris were appointed Senior Members of the IEEE. Prof. Michael Taylor delivered the Grace Kennedy Foundation Annual Lecture. Mrs. Ilene Thomas, Laboratory Attendant, and Mr. Rudolph Blair, Senior Instrument Laboratory Technician both retired after 34 years of service. Ms. Ann-Marie Miller, Senior Secretary, resigned. Four staff members received Long Service Awards: Mrs. Beverley Hurlock-Cox (21 years), Dr Leary Myers (21 years), Mr. Steven Box (21 years) and Prof. Michael Taylor (15 years).

INFRASTRUCTURE UPGRADE

The Preliminary Physics Laboratory was refurbished.

DEPARTMENTAL STATISTICS

Total Student Registrations

(Columns to right indicate previous year totals and include Engineering courses. Years II and III include overlaps.) See page 412

	Semester 1		Semester 2		Year Totals	
	Current	Previous	Current	Previous	Current	Previous
Preliminary	64	83	51	77		160
Intro Physics	127	204	86	151	213	355
Intro Electronics	–	–	113	116	113	116
Year II	128	324	124	281	252	605
Year III	15658	156	81	120	139	276
Totals	382	609	369	594	751	1,558

Postgraduate Student enrolment:

MPhil seventeen (17) students (F/T and P/T); PhD ten (10) students; MSc twenty seven (27) students (all years)

PRIZES AWARDED

- The Professor John Lodenquai Prize for Introductory Physics: Theodore Ludlow Wynter;
- Level II – Departmental Prizes: Savanna Rae Lloyd & Alton Patrick Daley;
- Michael Tharmanahthan Physics Bursary: No award made;
- Francis Hadden-Bowen Bursary: Keith Astley Kurt Samuda

PUBLICATIONS

Book

- Taylor, M. A., 2015: *Why Climate Demands Change*, Grace Kennedy Foundation, Kingston Jamaica. 97 pp. ISBN 978-976-8041-32-6.

Book Chapter

- K. Edward, 2014: Two Photon Fluorescence Microscopy. In *Handbook of Optical Sensors*. José Luis Santose and Faramarz Farahi. CRC Press. 718 pp. ISBN-13: 978-1439866856;

Journal Articles

- 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, 2015: [Regional Climates] Caribbean [in State of the Climate in 2014]. *Bull. Amer. Meteor. Soc.* IF 11.57
- McLean, N., T. Stephenson, M. A. Taylor and J. Campbell, 2015: Characterization of future Caribbean rainfall and temperature extremes across rainfall zones. *Advances in Meteorology*. Article ID 425987, doi:10.1155/2015/425987. IF 1.348
- Burgess, C. P., M. A. Taylor, T. S. Stephenson, A. Mandal and L. Powell, 2015: A macro-scale flood risk model for Jamaica with impact of climate variability. *Natural Hazards*. DOI 10.1007/s11069-015-1712-z. IF 1.958
- Rankine, D. R., J. E. Cohen, M. A. Taylor, A. D. Coy, L. A. Simpson, T. Stephenson, and J. L. Lawrence, 2015: Parameterizing the FAO AquaCrop Model for Rain-fed and Irrigated Field Grown Sweet Potato. *Agronomy Journal* 107: 1-13. doi:10.2134/agronj14.0287 IF 1.542
- Burgess, C. P., M. A. Taylor, T. S. Stephenson, and A. Mandal, 2015: Frequency analysis, infilling and trends for extreme precipitation

for Jamaica (1895 to 2100). *J. Hydrol.: Reg. Stud.*
doi:10.1016/j.ejrh.2014.10.004

- **K. Edward** and F. Farahi, 2015: Non-destructive evaluation of nanoscopic subsurface features in fabricated samples. *CIRP Annals – Manufacturing Technology*, 64, 503-506 (2015)
- Nsom, B., **J. F. Dorville** and K. Bouchlaghem, 2015: Cocoyam Used as Substitute of Cassava in the Preparation of Starch Based Biofilms and Biocomposites by Casting Method, *International Journal of Emerging technology and Advanced Engineering*. ISSNn2250-2459, ISO 9001:2008 Certified Journal, Volume 5, Issue 5, www.ijetae.com.
- **Williams, D. A., J. F. Dorville**, 2014: Investigating the thermal and the lighting performance of light pipes for sunny and cloudy conditions in insular tropical climate *Journal of Electrical Engineering* 2 221-227 doi: 10.17265/2328-2223/2014.05.004
- Batic, D., **S. Nelson**, and M. Nowakowski, 2015. Light on curved backgrounds: *Phys. Rev. D* 91, 104015. <http://dx.doi.org/10.1103/PhysRevD.91.104015>
- Gupta, P., B. Anyama, **K. Edward**, K. Wells, M. Motamedi, B. F. Godley, and G. Vargas, 2014: Depth Resolved Differences After Corneal Crosslinking With and Without Epithelial Debridement Using Multimodal Imaging. *Trans. Vis. Sci. Tech.*: July/August 2014, Vol. 3, No. 4.
- Eakin, H., P. M. Wightman, D. Hsu, V. R. Gil Ramón, E. Fuentes-Contreras, M. P. Cox, **T. N. Hyman**, C. Pacas, F. Borraz, C. González-Brambila, D. Ponce de León Barido & D. M. Kammen, 2014: Information and Communication Technologies and Climate Change Adaptation in Latin America and the Caribbean: a framework for action, *Climate and Development*, DOI: 10.1080/17565529.2014.951021.
- Laxmikanth, C., J. Anjaiah, **P. Venkateswara Rao**, B. Appa Rao, and N. Veeraiah. “Luminescence and spectroscopic properties of ZnF 2–MO–TeO 2 glasses doped with Ho 3+ ions.” *Journal of Molecular Structure* 1093 (2015): 166-171.

- Prasad, P. Syam, V. Himamaheswara Rao, M. Mohan Babu, P. Venkateswara Rao, G. Naga Raju, and C. Laxmikanth. "Spectroscopic investigations of the PbO–MoO₃–P₂O₅: V₂O₅ glass system." Physics and Chemistry of Glasses-European Journal of Glass Science and Technology Part B 56, no. 4 (2015): 169-174.

PEER-REVIEWED CONFERENCE PROCEEDINGS

- 10th FST Conference 2015, "Non-invasive indirect characterization of hypoglycin levels in Jamaican ackees" David Moodie, Tanya Kerr and Kert Edward.
- 10th FST Conference 2015, "Predicting the intelligibility of noisy speech to hearing impaired listener" Lindon Falconer and Andre Coy.
- 10th FST Conference 2015, "An analysis of the formant frequencies of vowels in Jamaican Standard English for children" Stefan Watson and Andre Coy.
- 10th FST Conference 2015, "Wind resources map of Jamaica" Andrew Johnson.
- 10th FST Conference 2015, "Spatial-temporal relations of projected wind speeds based on the Wind Measurement Campaign of the IDB-Wigton Windfarm Ltd 2011-2014" Sanja Simmonds.
- 10th FST Conference 2015, "Investigating the effect of rare-earth photoanode doping on dye-sensitised solar cell performance" Leaford Henderson and Tania Henry.
- 10th FST Conference 2015, "Thermal modelling and experimental validation of a hybrid PVT" Sameer Simms and Jean-Francois .
- 10th FST Conference 2015, "Parametric Optimization for SAR Computation in Vehicular Environment" Louis-Ray Harris.
- 10th FST Conference 2015, "First experimentation of Photurgen: An optimization and management software for hybrid renewable energy systems" Daren Watson.
- 10th FST Conference 2015, "Projecting end-of-century North

Atlantic Hurricane activity using forecast statistical models” Jhordanne Jones.

- 2015 CIRP GENERAL ASSEMBLY in CAPE TOWN, SOUTH AFRICA, 23–29 August 2015, “Non-destructive evaluation of nanoscopic subsurface features in fabricated samples” K. Edward and F. Farahi; (to be presented by Prof. F. Farahi).

SIGNIFICANT FUNDING

- UWI New Initiative Grant (2015) to investigate the effects of wireless device use on human health in realistic environments (J\$1.5 million). PI: L. Harris
- NIH CARPHA Grant (2015): Cancer Treatment and Prevention Leads from the Jamaican Biodiversity and their Mechanism of Action: A project based initiative to enhance in –vivo cytotoxicity screening facilities at Mona (US\$50,000). Collaborator: K. Edward
- Mr. Da-Vaughn Sanderson – Postgraduate Student was awarded a Grant of US\$2,651.77, from the Postgraduate Research Fund, for Project entitled: “The Uptake, Distribution and Impact of Cadmium on Irish Potato”.

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

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- Member IEEE Communications Society
- Member STEM Integration Committee – Ministry of Education
- Advisor to the Ministry of Education – Core Curriculum Unit.

Victor Douse

- Chairman, Cement Technical Committee, Bureau of Standards
- Technical Assessor, Jamaica National Agency for Accreditation (JANAAC)
- Chairman, Aggregates Technical Committee
- Vice Chairman, Building and Associated Materials Committee.

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.

Louis-Ray Harris

- Member IEEE Electromagnetic Compatibility Society
- Member IEEE Antennas and Propagation Society

Leary Myers

- Member, International Who's Who Historical Society.

Penugonda Venkateswara Rao

- Member Materials Research Society (MRS)
- Reviewer *Journal of Radiation Research and Applied Sciences, Materials Science-Poland and Spectroscopy Letters.*

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.