

## DEPARTMENT OF PHYSICS



**Professor Michael A. Taylor, BSc, MPhil, UWI,**  
*PhD University of Maryland, College Park*  
**Head of Department**

### **OVERVIEW**

**U**ndergraduate and postgraduate curricular reform and staff recruitment were among the primary objectives for the 2015/16 academic year. Undergraduate forums were instituted that targeted the development of soft skills useful to future graduates. Outreach activities to high schools and community colleges remain a priority.

### **Undergraduate Curriculum Reform and Teaching**

The Bachelor of Science in Electronics and Computer Science was developed in collaboration with the Department of Computing and will be on offer in 2016/2017. This three-year programme will target students who matriculate normally to the University and wish to develop proficiencies in both disciplines.

Student satisfaction with teaching is generally high. The number of students pursuing advanced level courses remain high while numbers at Level 1 continue to reflect a minor decline.

Two members of staff were added to the academic staff complement. Dr. Marhoun Ferhat joined with a specialization in Materials Science and Dr. Venketswarao Penugonda returned with a specialization in General Physics. A laboratory technologist position was regularized and filled by Mr. Chadwick Barclay.

One student will graduate with First Class Honours. Approximately 17 students completed the requirements for majors or minors in Physics. In keeping with its drive to reward exceptional students, as well as mentor them to achieving honours, the Department in collaboration with the Mona School of Engineering continues to induct new and returning students to the Physics and Engineering Honours Society. This year 19 Physics and 27 Engineering students were inducted.

### **Research and Graduate Activity**

The five (5) Research Groups are active and continue to attract new grants. Research areas include Statistical and Dynamical Downscaling of Climate Data, Evaluation of Renewable Energy 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 obtained approval for a revised M.Sc. programme in Advanced Electronic System (formerly Digital Technology) to commence in the 2016/17 academic year.

The Department produced sixteen (16) publications. Half of the publications were co-authored by Graduate Students. Dr. Tannecia Stephenson received the Principal's Award for the Most Outstanding Researcher in the Faculty of Science and Technology. The Climate Studies Group Mona won the award for Most Outstanding Research

## Department of Physics

Activity. Postgraduate student Dale Rankine received an award for the Most Outstanding Thesis in Faculty of Science and Technology for his thesis entitled Assessing yield response to water in root crops in present and future climates: An application of the FAO Aquacrop Model for Jamaican Sweet Potato, *Ipomoea Batatas*. Professor Michael Taylor received the Vice Chancellor's Award for Most Outstanding Research Accomplishments.

Graduate enrolment was 25 Research students and 22 MSc students. One PhD was awarded: Christopher Burgess; and two MPhil's: Mr. Daren Watson and Miss Jhordanne Jones. Eight MSc's were awarded.

Under the Caribbean Catastrophe Risk Insurance Facility (CCRIF) Internship programme, postgraduate students, Mrs. Roxann Stennett-Brown and Miss Christina Douglas, received internships to the Climate Studies Group, Mona and Mr. Alton Daley to the Caribbean Community Climate Change Centre in Belize.

### **Outreach and Public Service**

The Department hosted its Annual CAPE Workshop for high school students. The workshop was held at Mona Campus on January 11–15 and at Western Jamaica Campus on January 7, 2016. Over 1000 sixth form students attended from over 30 high schools. Approximately 52 students from 3 prominent high schools also visited the Department in February 2016 to conduct Physics experiments to aid with the International Assessment (IA) of the CAPE syllabus. The Department continues to actively participate in Outreach Activities of the Faculty and University. These include Research Days 2016 where the Climate Studies Group, Mona showcased climate tools for decision-making, Western Fair 2016, Titchfield High School Career Day, Relay for Life 2016, Science in the Park, Jonathan Grant High School Open Day and the Climate Walk hosted by the Environmental Solutions Limited.

### **Pre-Labour Day Project**

An inaugural Pre-Labour Day Project was undertaken on Friday, May

20, 2016 and supported by staff and postgraduate students. Activities included the painting of the interior section of the three-storey building and the planting of flowers in the Physics car park and the Quadrangle.

### **Infrastructure Upgrade**

Renovations to the Materials Science Lab and a Technical Staff Centre commenced in Summer 2016. The work should be completed ahead of the start of Semester 2 of 2016/17. An office space was renovated and made available for use by the Pilot Program for Climate Resilience (PPCR) Program Management Unit.

### **Recognitions and Awards**

A business plan submitted by Energy and Environmental Physics and Electronics final year student, Yekini Wallen-Bryan, won the GreenTech Innovation Boot Camp hosted by the World Bank in partnership with the CaribbeanCIC. This automatically granted Mr. Wallen-Bryan entry into the accelerator programme hosted in May 2016 to help fund and launch his business and product: Plug An' Pree. The product enables users to remotely monitor and control any electrical load on their property from their computer, tablet or smartphone.

A team from the UWI Mona Alternative Energy Club was awarded first place in the BRIDGE Program Competition for its concept on Girls Enrolled in Alternative Energy Retention (GEAR) Initiative. The team included postgraduate students, Mr. Alton Daley and Mr. Dudley Williams, and undergraduate students, Miss Jamila Walters and Miss River Providence, with advisors Dr. Tanya Kerr and Mrs. Cherri-Ann Scarlett. The concept paper focused on the inclusion of women in the renewable energy sector and included an innovative mix of demonstrations, advertisements, internships, scholarships, mobile application and other technologies.

A team of Level 2 electronics engineers, electronics and computer science students placed 3rd in the IEEE International Robotics competition held Saturday, April 2, 2016 in Virginia, USA. They competed against 46

## Department of Physics

universities within southeast USA. Team members were: Yekini Wallen-Bryan – team captain; Paulo Williams, Richard Harris, Aisha Robinson, Khalid Sharpe, Sean McBean, Jason Brown, Locksley Murray, Kriston Kong and Dane Miller. Mr. Lindon Falconer was the team advisor.

### Milestones

Ms. Sandra Fairweather and Mr. Trevor Hall were recognized for 21 years of service to the University of the West Indies. Dr. Kert Edward was promoted to senior member in the international organization SPIE. The promotion was for "Achievements in optical imaging and optics education".

### Departmental Statistics

**Table1:** Total Undergraduate Student Registrations

	Semester 1		Semester 2		Year Totals	
	Current	Previous	Current	Previous	Current	Previous
Preliminary	86	64	65	51	151	115
Intro Physics	120	127	93	86	213	213
Intro Electronics	48		65	113	113	113
Year II	352	128	254	124	606	252
Year III	133	58	170	81	303	139
<b>Totals</b>	<b>739</b>	<b>377</b>	<b>647</b>	<b>455</b>	<b>1,386</b>	<b>832</b>

**Postgraduate Student Enrolment:**

MPhil – twenty (20) students (F/T and P/T); PhD – five (5) students;  
MSc – twenty (22) students (all years)

**Prizes Awarded**

- The Professor John Lodenquai Prize for Introductory Physics: Isaac Alfred;
- Level II – Departmental Prizes: Jason Tomlinson and Karlus Redway;
- Michael Tharmanathan Physics Bursary: Theodore Wynter;

**UWI Postgraduate Scholarships**

- Alton Daley (MPhil Physics)
- Darrion Walker (MPhil Physics)

**Significant Funding**

- **Dr. Kert Edward** – Received USD\$50,000 with Dr. Delgoda to develop a flow cytometer and to test specific local products for their efficacy in treating cancer.
- **Dr. Kert Edward** – Awarded JA\$500,000 from UWI MONA to complete Optical Characterization of Ackee Project.
- **Dr. Tanya Kerr** – Awarded JA\$1,500,000.00 from the UWI New Initiative Grant Programme for the project Post fire temperature profiling of concrete compartments using Raman Spectroscopy.
- **Dr. Marhoun Ferhat** – Awarded JA\$1,500,000.00 from the UWI New Initiative Grant Programme for the project Band gap engineering in silicon Clathrates based materials for photovoltaic energy conversion.

**PUBLICATIONS**

**Journal Articles**

- Coy, A., D. Rankine. M. A. Taylor, D. Nielsen, J. Cohen, 2016: Increasing the Accuracy and Automation of Fractional Vegetation

Cover Estimation from Digital Photographs. *Remote Sensing*, doi:10.3390/rs8070474, www.mdpi.com/journal/remotesensing. IF 3.036

- **Jones, J.J., T.S. Stephenson, M.A. Taylor, and J.D. Campbell,** 2016: Statistical downscaling of North Atlantic tropical cyclone frequency and the amplified role of the Caribbean low level jet in a warmer climate. *J. Geophys. Res. Atmos.*, 121, doi:10.1002/2015JD024342. IF 3.94
- **Miller, M. O., and D. A. Miller,** 2016: The Technological Enhancement of Normally Occurring Radioactive Materials in Red Mud due to the Production of Alumina. *International Journal of Spectroscopy*, Volume 2016 (2016). IF 0.79
- **Rao, P.V., G.N. Raju, P.S. Prasad, C. Laxmikanth, N. Veeraiah,** 2016: Transport and spectroscopic properties of nickel ions in ZnO B2O3 P2O5 glass system. *Optik-International Journal for Light and Electron Optics* 127 (5), 2920-2923. IF 0.742
- **Edward, K. and F. Farah,** 2015: Non-destructive evaluation of nanoscopic subsurface features in fabricated samples. *CIRP Annals-Manufacturing Technology* 64(1), 503-506.
- **Ricketts, P., H. Fletcher, M. Voutchkov,** 2015: Impact of maternal diet and natural environment on placenta mercury levels in Jamaica. *West Indian Medical Journal*. DOI: 10.7727/wimj.2015.239 IF 0.26
- **Simms, S. and J. F. Dorville,** 2015: Thermal performance of a hybrid photovoltaic-thermal collector with a modified absorber. *International Conference on Renewable Energy Research and Applications (ICRERA), Palermo, 2015*, pp. 600-605. doi: 10.1109/ICRERA.2015.7418484
- **Stephenson, T. S., M. A. Taylor, A. R. Trotman, S. Etienne – LeBlanc, A. O. Porter, M. Hernández, D. Boudet, C. Fonseca, J. M. Spence, A. Shaw, A. P. Aaron-Morrison, K. Kerr, G. Tamar, D. Destin, C. Van Meerbeek, V. Marcellin, A. C. Joseph, S. Willie, R. Stennett-Brown and J. D. Campbell.,** 2016: [Regional Climates]

Caribbean [in State of the Climate in 2015]. *Bull. Amer. Meteor. Soc.* 97(8), S181-S182. IF 7.929

- **Williams, D.** and J. F. Dorville, 2015: Predicting thermal impact of Light pipe on air temperature in room using OLS-Multiple Regression. International Conference on Renewable Energy Research and Applications (ICRERA), *Palermo*, 2015, pp. 913–916. doi: 10.1109/ICRERA.2015.7418542
- Pal R., **K. Edward**, J. Yang, and G. Vargas, 2016: Multiphoton Autofluorescence microspectroscopy in hamster model of oral epithelial pre-cancer and cancer. *Lasers in Surgery and Medicine*, 48, pp. 6–6.
- Himarnaheswarea Rao, V., P. Syam Prasad, **V. Penugonda**, L. F. Santos, N. Veeraiah, 2016: Influence of Sb<sub>2</sub>O<sub>3</sub> on tellurite based glasses for photonic applications, *Journal of Alloys and Compounds* 687 (2016) 898-905, <http://dx.doi.org/10.1016/j.jallcom.2016.06.256> IF 3.014
- Mandal, A., **T. S. Stephenson**, **A. Brown**, **J. Campbell**, **M. A. Taylor**, and **T. Lumsden** 2016: Rainfall-runoff simulations using the CARIWIG Simple Model for Advection of Storms and Hurricanes and HEC HMS Tools: Implications for Hurricane Ivan over the Jamaica Hope River watershed, a case study. *Nat. Hazards* (2016) 83: 1635. doi:10.1007/s11069-016-2380-3. IF 1.746
- Oglesby, R., C. Rowe, A. Grunwaldt, I. Ferreira, F. Ruiz, **J. Campbell**, L. Alvarado, F. Argenal, B. Olmedo, A. del Castillo, P. Lopez, E. Matos, Y. Nava, C. Perez, and J. Perez, 2016: A High-Resolution Modeling Strategy to Assess Impacts of Climate Change for Mesoamerica and the Caribbean. *American Journal of Climate Change*, 5, 202-228. doi: 10.4236/ajcc.2016.52019 IF 1.39
- Moron, V., Gouirand and **M. A. Taylor**, 2015: Weather types across the Caribbean basin and their relationships with rainfall and sea surface temperature. *Climate Dynamics*. Doi: 10.1007/s00382-015-2858-9 IF 4.708
- Jones, P. D., C. Harpham, I. Harris, C. M. Goodess, A. Burton, A.



- Centella-Artola, M. A. Taylor, A. Bezanilla-Morlot, D. Martinez-Castro, J. D. Campbell, T. S. Stephenson, O. Joslyn, K. Nicholls and T. Baur, 2015: Long-term trends in precipitation and temperature across the Caribbean. *Int. J. Climatol.*, 10.1002/joc.4557. IF 3.609
- Suresh, B., M.S. Reddy, J. Ashok, A.S.S. Reddy, **Penugonda V. Rao**, V.R. Kumar, 2016: Enhancement of orange emission of Co 2+ ions with Bi 3+ ions in lead silicate glasses, *Journal of Luminescence* 172, 47–52. IF 2.693

### Reports

- Eitzinger A; Rhiney K; Farrell A; Carmona S; van Loosen I; **Taylor M.** 2015. Jamaica: Assessing the impact of climate on cocoa and tomato. CIAT Policy Brief No. 28. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia. 6 p. <https://cgspace.cgiar.org/handle/10568/70143>
- Eitzinger A; Farrell A; Rhiney K; Carmona S; Van Loosen I; **Taylor M.** 2015. Trinidad & Tobago: Assessing the impact of climate change on cocoa and tomato. CIAT Policy Brief No. 27. Centro Internacional de Agricultura Tropical (CIAT), Cali, Colombia. 6 p. <https://cgspace.cgiar.org/handle/10568/70144>

### Conference Proceedings

- P. Green, R. Marxer, S. Cunningham, H. Christensen, F. Rudzicz, M. Yancheva, **A. Coy**, M. Malavasi, L. Desideri, F. Tamburini, CloudCAST – Remote Speech Technology for Speech Professionals. In Proceedings of Interspeech 2016, San Francisco, United States.
- **A. Coy** and K. Cumberbatch, The Use of Technology for Enabling Communication with the Deaf. Regional Disabilities Conference, March 2016, Kingston Jamaica.
- P. Green, R. Marxer, S. Cunningham, H. Christensen, F. Rudzicz, M. Yancheva, **A. Coy**, M. Malavasi, L. Desideri, Remote Speech Technology for Speech Professionals – the CloudCAST initiative.

In Proceedings of the 6th Workshop on Speech and Language Processing for Assistive Technologies at Interspeech 2015, Dresden, Germany.

- **S. Simms** and J. F. Dorville, Thermal performance of a hybrid photovoltaic-thermal collector with a modified absorber. International Conference on Renewable Energy Research and Applications (ICRERA), November 22–25 2015, Palermo, Italy.
- **D. Williams** and J. F. Dorville, Predicting thermal impact of Light pipe on air temperature in room using OLS – Multiple Regression. International Conference on Renewable Energy Research and Applications (ICRERA), November 22–25 2015, Palermo, Italy.
- **K. Edward** and Chadwick Barclay, Design and Characterization of a Fiber Optic Solar Indoor Lighting (FOSIL) System with Active Tracking. International Hydrogen Conference, The Hydrogen Economy – A Sustainable Energy Diversification Option for the Caribbean, November 3–4, 2015, Kingston, Jamaica

## **PUBLIC SERVICE**

### **Andre Coy**

- Member, International Speech Communication Association
- Convenor, Physics Panel for Caribbean Examination Council
- 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.

### **Victor Douse**

- Chairman, Cement Technical Committee, Bureau of Standards

## Department of Physics

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

### **Kert Edward**

- Senior Member, SPIE;
- Member, American Association for Cancer Research, Optical Association of America, IEEE
- 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**

- Chairman, Town and Country Planning Advisory
- Member, Board, Transport Authority

### **Tanya Kerr**

- Member, Board, Editorial Advisory Journal, '*Sample Preparation*' de *Gruyter open*

### **Tannecia Stephenson**

- Member, WMO Task Team on Guide to Climatological Practices;
- Member, CORDEX Science Advisory Team, Joint Scientific Committee of the World Climate Research Programme (WCRP)

- Reviewer Journals, *Climate Research*, *Climate Dynamics*, *International Journal of Climatology*

**Michael Taylor**

- Member, Board, Water Resources Authority
- Member, Climate Change Advisory Board, Ministry of Land, Water, Environment and Climate Change
- 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, Board, International Centre for Environmental Nuclear Science (ICENS)
- Member, Jamaica's Energy Council, Ministry of Science Technology, Energy and Mining
- 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.

**Venkateswara Penugonda**

- External Examiner in Physics Division, UTECH
- Member, Materials Research Society (MRS)
- Reviewer, *Journal of Radiation Research and Applied Sciences*, *Materials Science-Poland* and *Spectroscopy Letters*.