# DEPARTMENT OF PHYSICS



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

## OVERVIEW

The Department underwent the cyclical Quality Assurance Review process during the Academic Year ending. The Department received high commendation for its efforts to reinvent itself and for its attempt at finding renewed relevance within the University and the National and Regional contexts. The Department is attempting to do this through high quality Physics Teaching, Innovation and Research, Intellectual Leadership and Public Service. Recommendations made for improvements arising from the Review Process are being evaluated for implementation.

#### CURRICULUM REFORM AND TEACHING

Having introduced new Preliminary and Introductory Courses in 2011/2012, new Year 2 courses were introduced in keeping with the revamped Physics and Applied Physics Programme approved in 2010/11.

The new 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 to increase the breadth of material covered in Majors and Minors. Permission was also acquired for the new Year 3 courses which will be delivered in 2013/2014, in keeping with the phased introduction of the new programme.

Student satisfaction with teaching remains high with most Student Assessments of Lecturers being above four (4). Three Lecturers (Dr. A. M. D. Amarakoon, Mr. Victor Douse and Mr. Ervin Lyle) were awarded for Excellence in Teaching at the Annual Faculty Ceremony. The Full Time Staff complement increased from seven (7) to eight (8). Two (2) new Lecturers joined the Department – Dr. Kert Edward and Dr. Venkateswara Penugonda. One Senior Lecturer retired – Dr. Amarakoon. Two other Academic Posts were advertised during the Year and one New Staff Member is expected in 2013/2014.

At least six (6) students will graduate with First Class Honours, all of whom were three (3) or four (4) time 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.

## RESEARCH

There are four active Research Groups – the Climate Studies Group, Mona (CSGM) and the Alternative Energy, Medical Physics, and Materials Science Research Groups. New Grants or extensions of existing ones totalled in excess of \$J16M. Sources of funding include the UWI (two New Initiative Grants and Awards to Graduate Students from the Research and Publications Fund), competitive National and International Research Calls and Consultancies for the Government of Jamaica and the Private Sector (see listing below). There is significant interdisciplinary collaboration including with the Departments of Chemistry, Life Sciences, Geography and Geology and Economics. Emerging areas of Research include Post Fire Forensic Analysis, Photonics, Development of Models of the Terrestrial Environment based on Primordial Radionuclides, Emulating Human Speech Recognition; Energy Security and Sustainability, and the use of Electronics in Environmental Monitoring. Staff and Graduate Students made several presentations at both local and international Conferences and Research Groups coordinated three (3) Regional Workshops. Graduate Students Calvert Barclay, Kimberly Stephenson, Sanjay Simmonds, Stanley Smellie and Technical Staff Member Cherri-Ann Scarlett had short attachments in Japan, Columbia, Germany, South Korea and Germany respectively.

The Department produced sixteen (16) publications. This is close to the target of two (2) Peer Reviewed Publications/Full-Time Staff. Significantly, Graduate Student Publications in Peer Reviewed Journals have also increased (see listing below). At the University's Annual Research Awards, Dr. Andre Coy was recognized in the Best Publication (book) Category for the Faculty of Science and Technology. Staff Members Dr. Leary Myers and Mr. Leonardo Clarke as well as Graduate Students Stefan Watson and Vincent Taylor (Computer Science) won the Ministry of Science Technology, Energy and Mining Innovation Awards 2012, in the Resources / Knowledge Valorization Category for their invention of a Real Time Monitoring and Alert System, while Ewan Pitter (Electronics Engineering Final Year Student) won in the Open Category for a Renewable Energy driven fully controlled Microcontroller Based Automated Hydroponic Greenhouse System.

Six (6) students began Research Degrees bringing the Graduate complement to twenty-six (26). Two (2) MPhils successfully upgraded to PhDs. Graduate Students Jayaka Campbell, Kimberly Stephenson and Rochelle Walters were awarded PARCA Postgraduate Scholarships and Bursary, and Jhordanne Jones was awarded a University Postgraduate Scholarship. Cohorts of nine (9) and seven (7) students are pursuing MSc Degrees in Digital Electronics and Medical Physics respectively.

## OUTREACH AND PUBLIC SERVICE:

Approximately one thousand (1000) CAPE Students from twenty-five (25) High Schools participated in the Annual CAPE Physics Workshops (one day of which was held at the Western campus). Several other High and Tertiary Students visited the Department throughout the year to conduct Laboratory Experiments. The Department also hosted a Workshop for High School Teachers on "Incorporating Computer Simulations into High School Physics". The Department hosted a three (3) weeks Summer Workshop on Alternative Energy in collaboration with the Scientific Research Council, the Wigton Wind Farm and Alternate Power Sources Ltd. During the Year the Department also hosted several other Workshops and Public Lectures with External Partners and Visiting Academics. Themes covered were the Climate-Energy Nexus (monthly Public Lecture Series held over the course of a year), Climate Modelling, Biodiesel production, and Medical Physics.

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

Dr. Leary Myers was promoted to Senior Lecturer. Dr. Michael Taylor was promoted to Professor. Mrs. Rosalene Simmonds was promoted to Senior Administrative Assistant.

#### FACULTY OF SCIENCE & TECHNOLOGY

#### DEPARTMENTAL STATISTICS

#### **Total Student Registrations**

(Brackets indicate previous year totals. Years	II and III include overlaps)
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Semester 1	Semester 2	Year	Totals
Preliminary	113 (101)	96 (89)	209 (190)
Intro Physics	227 (203)	151 (128)	378 (331)
Intro Engineering	51 (25)	_	51 (25)
Intro Electronics	_	108 (81)	108 (81)
Year II	293 (259)	284 (213)	577 (472)
Year III	135 (76)	143 (154)	278 (230)
Totals	819 (664)	782 (665)	1601 (1329)

#### Postgraduate Student enrolment:

MPhil fifteen (15) students (F/T and P/T) PhD eleven (11) students; MSc sixteen (16) students (all years)

#### PUBLICATIONS

#### **Book Chapters**

• M. A. Taylor, and R. Williams, 2012: "ICTs and the Environment". In Ringtones of Opportunity: Policy, Technology and Access in Caribbean Communications. Edited by H. Dunn.

## Journals

- J. Nichols, J. Niles, M. Riddle, G. Vargas, T. Schilagard, L. Ma, K. Edward, S. LaFrancesca, J. Sakamoto, S. Vega, M. Ogedegbe, R. Mlcak, D. Deyo, L. Woodson, C. McQuitty, S. Lick, D. Beckles, E. Melo and J.Cortiella, 2013: "Production and Assessment of Decellularized Porcine and Human Lung Scaffolds; feasibility of producing AC lung scaffolds with potential clinical applicability". Tissue Eng. Part A; 19 (17-18):2045–62. doi: 10.1089/ten.TEA.2012.0250 013.
- V. Penugonda, 2013: "The influence of modifier ions on the emission features of Ho3+ ion in lithium fluoro borate glasses". *International Journal of Luminescence and its Applications* Vol. 32 (Special Issue: III) March-2013 ISSN No. 2277–6362.
- T. Kerr, K. Duncan, L. Myers 2013: "Post fire material identification by micro-Raman spectroscopy and principal component analysis". *The Journal of Analytical and Applied Pyrolysis.* http://dx.doi.org/10. 1016/j.jaap.2013.03.008
- Karmalkar, A. V., M. A. Taylor, J. Campbell, T. Stephenson, M. New, A. Centella, A. Benzanilla, J. Charlery, 2013: "A Review of Observed and Projected Changes in Climate for the Islands in the Caribbean". Invited Paper. *Atmósfera* 26(2), 283–309.
- M. Miller, M. Voutchkov 2013: "Modelling the impact of uncertainty in detector specification on efficiency values of a hpge detector using angle software. *Nuclear Technology & Radiation Protection*". Vol. XXVIII, No. 2, pp. 169–181.
- Taylor, M. A., A. Centella, J. Charlery, A. Benzanilla, J. Campbell, I. Borrajero, T. Stephenson, and R. Nurmohamed, 2013: "The PRECIS-Caribbean Story: Lessons and Legacies". *Bulletin of the American Meteorological Society* doi: 10.1175/BAMS-D-11-00235. IF 6.124
- E. N. Armstrong, K. L. Duncan and E. D. Wachsman, "Effect of A and B-site cations on surface exchange coefficient for ABO3 perovskite materials" Phys. Chem. Chem. Phys., 2013,15, 2298–2308

- Hall, T. C., A. M. Sealy, T. S. Stephenson, S. Kusunoki, M. A. Taylor, A. A. Chen and A. Kitoh, 2012: "Future Climate of the Caribbean from a super-high resolution atmospheric general circulation model". Theoretical and Applied Climatology. doi: 10.1007/s00704-012-0779-7.
- Bachelor, T., T. S. Stephenson, P. Brown, D. Amarakoon, M. A. Taylor, 2012: "Influence of Climate Variability on Human Leptospirosis Cases in Jamaica". Climate Research. doi: 10.3354/cr01120
- U. Shrivastava, K. L. Duncan, J.N. Chung, "Experimentally validated numerical modelling of Eu doped SrCeO3membrane for hydrogen separation". *International Journal of Hydrogen Energy*, Vol. 37, Issue 20, pp. 15350–15358
- Taylor, M. A., T. S. Stephenson, A. A. Chen and K. Stephenson, 2012: "Climate Change and the Caribbean: Review and Response". *Caribbean Studies* 40(2), 169–200. Invited Paper.

## Peer-reviewed Conference Proceedings

- Pal, R., Edward, K., Brown, T., Ma, L., Yang, J., McCammon, Set al. (2013, March). "Combination of wide field fluorescence imaging and nonlinear optical microscopy of oral epithelial neoplasia". In SPIE BiOS (pp. 85720M–85720M). International Society for Optics and Photonics.
- Vargas, G., & Edward, K. (2013, February). "Nonlinear optical microscopy and microspectroscopy of oral precancers and early cancer". In *SPIE BiOS* (pp. 85881U–85881U). *International Society for Optics and Photonics*. (invited paper)

## Other

 Climate Studies Group, Mona (CSGM), 2012: State of the Jamaican Climate 2012: Information for Resilience Building (Summary for Policy Makers). Produced for the Planning Institute of Jamaica (PIOJ), Kingston, Jamaica. 47 pp. • Climate Studies Group, Mona (CSGM), 2012: State of the Jamaica Climate: Past and Future. Information for Resilience Building. For Pilot Project for Climate Resilience. GOJ. 180 pp.

## SIGNIFICANT FUNDING

- Postgraduate Research Fund to purchase equipment / supplies and Research Assistance for a Project entitled: "Radon Risk Assessment and Prediction: A Comprehensive approach for a Tropical Country with Limestone Geology". PIS : Stephen Silvera and Mitko Voutchkov
- The Office of the Pro Vice Chancellor Research (€7000 Euros) for purchasing Research/Laboratory equipment in Materials Science. PI: Keith Duncan.
- CARIWIG Caribbean Weather Impacts Generator. Collaborators: University of Newcastle (UK), The Caribbean Community Climate Change Centre (Belize), and the Instituto de Meteorlogia (Cuba). Climate Development Knowledge Network (CDKN). The project is valued at £ 641K. PIS: Tannecia Stephenson and Michael Taylor.
- SPIE Educational Outreach Grant (08/2012): \$US5000. For the promotion of optics and the development of an optics curriculum at the institution. PI: Kert Edward.
- Ministry of Industry, Investment and Commerce): \$J2.1 million. For the advancement and promotion of scientific research in optics. PI: Kert Edward.
- New Initiative Grant (UWI): \$J1.74 million. An investigation of a non-invasive optical approach for blood glucose monitoring. PI: Kert Edward.
- New Initiative Grant (UWI): \$J1.90 million. Development of Phosphate based bioactive nano glass ceramics for biomedical applications in Materials Science. PI: V.Penugonda.
- Sustainable Water Management under Climate Change in small Island states of the Caribbean. IDRC (2012).PI: Michael Taylor.

• Wind Power for Domestic/Community Feasibility Study and Regulatory Review. Ministry of Science Technology Energy and Mining: PI: Anthony Chen.

# 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

# 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, 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
- Reviewer, SPISE program for the Caribbean Science Foundation

# Leary Myers

- Board Chairman, National Water Commission.
- Member, International Who's Who Historical Society

# Tannecia Stephenson

- Member, National Committee for Climate Change Adaptation and Disaster Risk Reduction
- Reviewer Journals, Climate Research, Climate Dynamics

# Michael Taylor

- 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.

# 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.