

INTERNATIONAL CENTRE FOR ENVIRONMENTAL AND NUCLEAR SCIENCES (ICENS)



Charles Grant MSc, *University of Surrey*
Director General

The period 2016/2017 represents the first full academic year after the core conversion of the JM-1 SLOWPOKE research reactor. This delineation in time has seen the resumption of analytical activities for some of the International Centre for Environmental and Nuclear Sciences' (ICENS) core programmes, the continued participation in several active projects and the embarking on new endeavours. One of the most significant activities was to revise the corporate and strategic plans of the Centre to fully align its ambitions with those of Jamaica's Vision 2030 and the United Nations Development Programme's Sustainable Development Goals. ICENS was selected as a lead organization in the International Atomic Energy Agency's proposed interregional technical cooperation project for Small Island Developing States (SIDS) further bolstering the reputation of the institution and the confidence that external entities

have placed in the capacity of ICENS to meet the unique challenges of these stakeholders. Furthermore the reactor management's commitment to safety was validated by an independent peer-review mission by the IAEA, the Integrated Safety Assessment for Research Reactors (INSARR) which praised the efforts of ICENS in continuous improvement of the safety of the reactor.

WORK OF THE DEPARTMENT

IAEA Coordinated Research Projects

The reporting period saw continued involvement and meaningful progress in the participation of ICENS in various IAEA coordinated research projects (CRP). The CRP T33001 – Options and Technologies for Managing the Back End of Research Reactor Fuel Cycle – received funding during the period of €4,000. Under the CRP J02006 – Enhancing the Physical Security Effectiveness of Research Reactors and Associated Facilities, work progressed with ICENS designated as the lead on one of two thematic research areas. The Centre also received €9,000 in funding for this project. In July 2017 the IAEA accepted ICENS' proposal for the new CRP F11021-Enhancing Nuclear Analytical Techniques to Meet the Needs of Forensic Science.” The research contract has been signed and the first tranche of funding of €5,000 has been received.

Jamaican Marine Environment Research

A new project has been incorporated into the environmental monitoring programme at ICENS where the vulnerability of primarily coastal regions of the island to anthropogenic influence including global climate change are assessed by the sampling of various compartments of the marine and coastal environment. The project has commenced with the sampling of marine sediments in the mainly industrialized area of the South Eastern section of the island and a section of the northern coast. Coastal sampling of Mangrove communities has also begun and will be expanded to an island-wide work with renewed collaboration with the Centre of Marine Sciences, UWI.

ICENS Air Quality Programme

Initial sampling during the visit of a Third World Academy of Sciences (TWAS) fellow in 2015 was postponed during the latter part of the year due to core conversion activities. As mentioned in the 2014/2015 Departmental report this work was to be resumed in early 2017. Sampling activities actually resumed before this and continued with method development for analysis of the air quality filters.

TLD Services and Radiation Protection

ICENS provides Thermoluminescence dosimetry (TLD) services for radiation workers internally, nationally and for clients within the Caribbean region. This section of ICENS was restructured and a new Radiation Safety Officer appointed. Commercial radiation protection services has continued to expand with the addition of seven (7) new clients to the monitoring program. This equates to an additional fifty (50) personnel (approximately). Eight (8) radiation surveys were conducted commercially along with five (5) radiation sensitisation sessions.

Carbon biogeochemistry (carbon emissions and sequestration)

Dr. Adrian Spence has been appointed Lead Author for Climate Change and Land: an IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security and greenhouse gas fluxes in terrestrial ecosystems. He is also working with the Ministry of Industry, Commerce, Agriculture and Fisheries in an initiative supported by the Food and Agricultural Organization (FAO) in developing digital soil organic carbon maps for the island. Work also continues on carbon sequestration and its biogeochemical implications particularly as it relates to climate change.

Strengthening Cradle-to-Grave Control of Radioactive Sources in the Caribbean Region

There was involvement in the regional Cradle-to-Grave, IAEA project which is geared at managing the use of sources both in use and disuse. There was further involvement at the national level in initiating a local

inventory of radioactive sources and a member of the department will be part of an expert mission to Guyana to assist them with initiating their national inventory this year.

PAPERS PRESENTED

- **J.M.R. Antoine**, C.N. Grant, L.A. Hoo Fung, H.T. Dennis “Fingerprinting Food: Trace Element Research at ICENS”. IAEA Technical Meeting on Enhancing Nuclear Technologies to Meet the Needs of Forensic Science, Guildford, UK. September 5–9, 2016 (oral presentation).
- **J.M.R. Antoine**, L.A. Hoo Fung, C.N. Grant. “Assessment of the potential health risks associated with the aluminum, arsenic, cadmium and lead content in selected fruits and vegetables consumed in Jamaica”. First Food Chemistry Conference. Amsterdam, the Netherlands. October 30–November 1, 2016 (poster presentation).
- **J.M.R. Antoine**, C.N. Grant, H.T. Dennis. “Cradle to Grave Control of Radioactive Sources: The ARCAL Regional Effort.” International Conference on the Safety of Radioactive Waste Management. Vienna, Austria, November 21–25, 2016 (poster presentation).
- **S.A. Webster**, A. Spence. Soil organic inputs and soil organic matter: Impact of soil-water availability in crop production. Climate-Smart Agriculture Symposium, Jamaica Pegasus, September 13–14, 2016 (oral presentation).
- **A. Spence**. (Bio)geochemistry and global change. 5th Meeting of COMSATS ITRG on Climate Change and Environmental Protection, Beijing, China, September 28, 2016 (oral presentation).
- **L.A. Hoo Fung**, J.M.R. Antoine. “The Role of Trace Elements and Heavy Metals in Food Safety and Security”. 4th Biennial Conference and Expo, Scientific Research Council Jamaica. November 14–15, 2016 (oral presentation)
- **L.A. Hoo Fung**, J.M.R. Antoine. “Food security vs. food safety: the case of sorghum vs rice in Jamaica”. 30th EFFoST International

Conference: Targeted Technologies for Sustainable Food Systems. Vienna Austria, November 28–30, 2016 (poster presentation).

- **L.A. Hoo Fung, J.M.R. Antoine.** “Preliminary Investigations of the Cadmium Content of Jamaican-Grown Cocoa: Perspectives on Health, Standards and Trade”. 2nd International Fine Cocoa Conference, Symposium & Chocolate Exposition, Kingston, Jamaica. February 6–7, 2017 (oral presentation).

PUBLICATIONS

Books and Mongraphs

- N. Kgabi, **C.N. Grant, J.M.R. Antoine.** Effects of Energy Production and consumption on air pollution and global warming. In: *Pollution and the Atmosphere: Designs for Reduced Emissions* Chapter 8. Ed. Marco Ragazzi. *Apple Academic Press, CRC Press (Taylor & Francis Group)*; 2017, 137–150.
- **C.N. Grant,** Contributing Author. *Strategic Planning for Research Reactors*, IAEA Nuclear Energy Series No. NG-T-3.16, April 2017.
- **A. Spence.** Application of nuclear magnetic resonance spectroscopy in molecular structure identification: a microbial biogeochemistry perspective. In: *Applications of NMR Spectroscopy* Chapter 3, Vol. 6. Ed. by Atta-ur-Rhman and M. Iqbal Chaudhary. *Bentham Science Publishers* 2017, 1–42.

Refereed Journal Articles

- **J.M.R. Antoine, L.A. Hoo Fung, C.N. Grant.** “Dietary intake of trace and heavy metals from consumption of instant coffees on the Jamaican market”. *Jamaican Journal of Science and Technology* 26:34–45
- **J.M.R. Antoine, L.A. Hoo Fung, C.N. Grant.** “Assessment of the potential health risks associated with the aluminium, arsenic, cadmium and lead content in selected fruits and vegetables grown in Jamaica.” *Toxicology Reports* 4 (2017) 181–187.

- **J.M.R. Antoine, C.N. Grant.** “The determination of the inhalable fraction of 40K activity in marijuana (*Cannabis sativa* L.) buds by instrumental neutron activation analysis and the effective dose to the body.” *Journal of Radiation Research and Applied Sciences* 10 (3) (2017) 289–294.
- **L.A. Hoo Fung, V.R. Rattray, G.C. Lalor.** “Assessment of cadmium, mercury and lead concentrations in Jamaican conch, lobster and tilapia”. *Jamaican Journal of Science and Technology* 26:46–49.
- F. Puig, **H.T. Dennis.** “Neutron fluence effects on SLOWPOKE-2 beryllium reflector composition and reactivity”. *Nuclear Engineering and Design* 305 (2016): 451–460.
- **A Spence.** “Degradation of microbial proteins in soil – molecular-scale understanding to the forms and dynamics of organic nitrogen in soils.” *Chemical Data Collections* 11–12, (2017) 108–118.
- S.A. Onjefu, S.H. Taole, N.A. Kgabi, **C.N. Grant, J.M.R. Antoine.** “Assessment of natural radionuclide distribution in shore sediment samples collected from the North Dune beach, Henties Bay, Namibia.” *Journal of Radiation Research and Applied Sciences* (2017) <https://doi.org/10.1016/j.jrras.2017.07.003>

Technical Reports

- **L.A. Hoo Fung, J.M.R. Antoine.** “Sorghum Cultivation at Amity Hall: Trace Element Profile and Soil and Water Quality”. International Centre for Environmental and Nuclear Sciences, October 2016 (prepared for the Ministry of Industry, Commerce, Agriculture and Fisheries)

Non-refereed Publications and Lectures

- **A Spence.** International lecture courses on atmospheric aerosol, Beijing, China. September 25–27, 2016.
- **A. Spence.** Don’t treat soil like dirt. *The Agriculturalist*, March 7, 2017, p.3.
- **L.A. Hoo Fung.** “Heavy Metal Exposure: Sources, Toxicology and

Methods of Analysis” Institute of Forensic Science and Legal Medicine,
Ministry of National Security, Kingston, Jamaica. May 31, 2017.

PUBLIC SERVICE

Mr. Johann Antoine

- Chair, National Mirror Committee/ISO TC/93 Starch-including derivatives and by-products (Bureau of Standards Jamaica)
- Member, Soil Health Technical Working Group (Ministry of Industry, Commerce, Agriculture and Fisheries, Jamaica)

Mr. Charles Grant

- Member of National Bioethics Committee
- ARCAL National Coordinator (Jamaica), and member of the ARCAL
- Technical Coordination Board (OCTA which oversees all ARCALProjects).
- Member, Ministry of Energy Committee on Nuclear Energy as an option for Jamaica
- Member, NEPA/UNDP Committee for renewable wave energy technologies for the generation of electric power in small coastal communities in Jamaica
- National Coordinator for Incident Reporting system for Research Reactors
- National Coordinator, IAEA Radiation Safety Information Management System; (RASIMS).
- Chair, Hazardous Laboratory Waste Ad-Hoc Committee (Ministry of Science, Energy and Technology/ National Commission on Science and Technology)

Ms. Leslie Hoo Fung

- Chair, National Food Standards Committee/ ISO TC/34 Mirror Committee (Bureau of Standards Jamaica)
- Codex Committee on Methods of Analysis and Sampling (Bureau of Standards Jamaica)

- Member, Hazardous Laboratory Waste Ad-Hoc Committee (Ministry of Science, Energy and Technology/ National Commission on Science and Technology)
- ISO/IEC 17025 Assessor (Jamaica National Agency for Accreditation)
- Member, Soil Health Technical Working Group (Ministry of Industry, Commerce, Agriculture and Fisheries, Jamaica)
- Member, Royal Society of Chemistry
- Member, AOAC International

Mrs. Sandra Hunter

- Fellow of the Institute of Chartered Accountants, Jamaica

Mr. John Preston

- Member, Land Information Council of Jamaica;
- Independent Member, GOJ Telecommunications Appeals Tribunal

Dr. Adrian Spence

- Member, Geochemical Society.
- Member, American Chemical Society
- Member, Royal Society of Chemistry
- Chemistry Ambassador and Co- Advisor, American Chemical Society (ACS) Student Chapter, UWI.

Ms. Tracey-Ann Warner

- ISO/IEC 17025 Assessor (Jamaica National Agency for Accreditation)