



INTERNATIONAL CENTRE FOR ENVIRONMENTAL AND NUCLEAR SCIENCES (ICENS)

Charles Grant, MSc, *University of Surrey* – Director General

The period 2018/2019 saw the International Centre for Environmental and Nuclear Sciences (ICENS) make great strides in bringing a multi-purpose irradiator to Jamaica, with greater engagement from stakeholders, particularly those invested in the sterile insect technique and the reduction of mosquito-borne diseases. There was also the completion of several projects and the consolidation of the ICENS' involvement in several regional, interregional, national and international projects. A successful project proposal also saw an addition to the number of projects under the Centre's portfolio. Underpinning these activities, was the gradual upgrading of infrastructure and continuous training activities to increase the capacity of the ICENS to meet its mandate through the sustainable development goals that are imbedded in its corporate plan and to use these tools, not only to aid in the socio-economic development of the country but to strengthen regional capacity.

IAEA INTERREGIONAL PROJECT

The interregional project “Applying Nuclear Science and Technology in Small Island Developing States in Support of the Sustainable Development Goals and the SAMOA Pathway” (INT0093) aims at supporting the human and institutional capacity of SIDS in key areas, such as human health, nutrition, food, agriculture, water management, marine environment, as well as safety and security through knowledge and experience-sharing among SIDS. This entails enhancing capabilities in selected interregional resource centres and promoting the cooperation among SIDS. Establishing cooperation among SIDS fulfils the Sustainable Development Goal (SDG) 17, as global partnerships for sustainable development are being created. The interregional project operationalizes the document “Rationale for an inter-regional project 2019–2023 for Small Island Developing States” as a complement to existing technical cooperation (TC), national, regional and interregional programmes. The Director General serves as the project lead. Several activities have occurred under the project during the review period including:

- The Interregional Open-Ended Meeting on the Code of Conduct on the Safety and Security of Radioactive Sources in Small Island Developing States: New Guidance of Management of Disused Sources and Regulatory Infrastructure held from August 13th to 17th, 2018.
- The Coordination Meeting and Workshop on the Use of Nuclear Techniques in the Marine Environment held from November 5th to 9th, 2018 in Cienfuegos, Cuba.
- First Coordination Meeting on Nutrition Projects Using Nuclear Techniques in SIDS held from December 10th to 14th, 2018 in Vienna, Austria.

IAEA REGIONAL PROJECTS

As participant in the IAEA Regional Project – ARCAL CLIV: “Assessing Atmospheric Aerosol Components in Urban Areas to Improve Air Pollution and Climate Change Management” (RLA7023), Mr. Johann Antoine participated in the Regional Training Course on Method Validation and Quality Assurance of Airborne Particulate Matter Analysis using Nuclear Analytical Techniques to be held from October 18th to 26th, 2018 in San Jose, Costa Rica. Under the project ICENS also received a Tisch® Environmental TE-6070BL high volume ambient PM₁₀ air sampler with PM_{2.5} inlet and a Sven Leckel GMBH low volume PM_{2.5} air sampler. These samplers were deployed temporarily on the UWI Mona Campus and various stages during the review period and will be permanently deployed for the duration of the project going forward. Mr. Johann Antoine is now counterpart for this project.

Under the Regional Project RLA9081: “Strengthening Cradle-to-Grave Control of Radioactive Sources” an Atomtex AT6101C Spectrometric Backpack Radiation detection system was acquired under the period of review. The national training course, “National Workshop on Orphan Source Search Training under the TC regional Project RLA9081” held at ICENS from December 3rd to 6th, 2018. Participants from ICENS, the Hazardous Substances Regulatory Authority (HSRA), the Jamaica Customs Agency, the National Solid Waste Management Authority and the Office of Disaster Management and Emergency Management were present. Experts representing the IAEA lectured to the meeting on various strategies on how to search for sources particularly with incomplete inventories. There was also a practical exercise to familiarise participants with equipment and how to use them to find, identify, recover and transport sources. Desktop exercises and calculations were also carried out by the participants to categorise sources.

An IAEA expert mission was also conducted for training on Orphan Source Recovery in Georgetown, Guyana from March 25–28, 2019. Mr. Ronmccrea Cushnie participated in this expert mission. The project is effectively closed with the final project meeting to be held at the end of the calendar year 2019 where it is expected that a spin-off project will be initiated.

The ICENS participation in the regional project RLA1012, “Developing a Capacity Building Programme to Ensure Sustainable Operation of Nuclear Research Reactors through Personnel Training (ARCAL CLI)” continued with the participation of Mr. Oshane Hamilton and Mr. Haile Dennis in the Regional Training Course on Operation and Maintenance of Research Reactors based upon the “Research Reactors” Module from the RLA1012 Project Training Material on Reactor Theory, Research Reactors and Operation and Safety of Research Reactors held in Santiago, Chile from October 22nd to 26th, 2018. The nominal date for the end of the project was December 2018 although the final research coordination meeting was held at the Instituto Nacional de Investigaciones Nucleares (ININ) in Toluca Mexico from February 11–15, 2019, attended by Mr. Dennis who was the local project coordinator.

The Director General of the ICENS, Mr. Charles Grant is the counterpart for the regional project, RLA0059, “Strengthening Regional Cooperation ARCAL CLXII.” The objective of this regional programme is to enhance regional cooperation by establishing mechanisms aimed at strengthening technical cooperation among developing countries and the regional programming for Latin America and the Caribbean. It is aimed mainly at following the planning and monitoring of the ARCAL regional programme and promoting communication and partnership between the State parties to the Agreement for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean (ARCAL). A meeting, the Development of the Regional Strategic Profile for IAEA Technical Cooperation with the Caribbean, was held from November 26th to 30th, 2018 in Vienna, Austria.

IAEA NATIONAL PROJECTS

The International Centre for Environmental and Nuclear Sciences (ICENS) made significant progress during the review period in its effort to install a multi-purpose gamma irradiator facility on its premises in 2020. The project concept, JAM2018004 -Establishing a Self-Contained Gamma Irradiation Facility for the Introduction of Sterile Insect Technique and Experimental Mutagenesis and Diagnostic Technologies – went through various requisite development stages, including the submission of the project design to the section head of the IAEA Technical Cooperation Section, the forwarding of the project design to the National Liaison Officer and the review and development of the project design by the IAEA Programme Management Officer (PMO) at the latter part of 2018. At the start of 2019, the Field of Activity Focal Point (FoA-FP) conducted the first technical review and feedback was sent to the PMO who reopened the project design to the team. After a second round of reviews by the PMO and FoA-FP a safety review was conducted by the Nuclear Safety Section in June. The project design quality was ensured and closed by the PMO. The project design, having passed all approvals by the IAEA only awaits the final approval by the IAEA Board of Governors. The progress of the project remains on pace for the

irradiation facility to be commissioned in the latter part of the calendar year 2020. Concurrently, ICENS is also an involved stakeholder in the development of The Nuclear Safety and Radiation Protection Regulations. These regulations will impact the progress of the project and the eventual installation, commissioning and operation of the multi-purpose gamma irradiator.

Under the national project JAM1001 “Upgrading the Research Reactor Infrastructure at the University of the West Indies Slowpoke Facility” ICENS received several pieces of equipment that would enhance the ability of the Centre to safely operate the reactor while contributing to the mandate of supporting the socio-economic development of Jamaica through research utilizing nuclear sciences in environmental geochemistry, health, the safety of Jamaican foodstuffs, environmental protection and the development of natural and human resources. These included a Berthold Technologies Hand and Foot Contamination Monitor LB, an Ortec HPGe Detector System with Peltier cooling to increase the capacity to analyse environmental samples and a new Thermoluminescent Dosimetry (TLD) reader for the reintroduction of extremity and whole body measurements.

IAEA COORDINATED RESEARCH PROJECTS

The International Centre for Environmental and Nuclear Sciences (ICENS) was involved in three coordinated research projects (CRP) during the reporting period.

ICENS commenced participation in new coordinated research activities with the acceptance of the project proposal, “Use of Nuclear Analytical and related techniques for authentication of High-Value Jamaican Commodities” to join the CRP D52042, “Use of Nuclear Analytical and related techniques for authentication of High-Value Jamaican Commodities.” Other countries participating in the CRP include China, Costa Rica, Denmark, India, Indonesia, Italy, Japan, Malaysia, Morocco, Myanmar, New Zealand, Slovenia, Spain, Thailand and Uruguay. The first research coordination meeting was held in Vienna from May 1–17, 2019. Ms. Leslie Hoo Fung is the chief scientific investigator. Ms. Hoo Fung was interviewed for the IAEA’s press and communication services for ICENS’ and Jamaica’s participation and also featured in the Jamaica Observer.

<https://www.iaea.org/newscenter/pressreleases/iaea-launches-project-to-help-countries-fight-food-fraud>

http://www.jamaicaobserver.com/latestnews/Jamaica_only_Cbean_country_in_IAEA_project_fighting_food_fraud

As part of the project she will also attend the IAEA Training course on the use of Stable Isotope Techniques to determine food origin and verify food authenticity. Seibersdorf, Austria. A first tranche of €7,000 was received prior to the first research coordination meeting.

The second research coordination meeting for the coordinated research project F11021, “Enhancing Nuclear Analytical Techniques to Meet the Needs of Forensic Science” was held in Vienna from April 8–12, 2019. Mr. Johann Antoine is the chief scientific investigator for the project. The status report for the project was submitted prior to the meeting and a consequent presentation on the progress and accomplishments to date made. Based on the presentations of other investigators opportunities were discussed for collaborative work with other counterparts and there has been a subsequent exchange and receipt of food and pharmaceutical samples. The meeting participants were also given the opportunity to review e-learning modules related to forensic science including, “The Application of Neutron Analysis to Forensic Sciences” authored by Mr. Antoine. The module has been reviewed and is now fully available. The second tranche of funding of €5,000 was received from the IAEA following the meeting. A collaborative effort between CARITOX, the Masters of Science programme in Forensic Science and ICENS through CRP F11021, has meant sampling of Cannabis samples for the fulfillment of the thesis portion for M.Sc. student Mr. Corey Roberts.

The coordinated research project J02006, “Enhancing the Effectiveness of Nuclear Security at Research Reactor and Associated Facilities” was initially scheduled for completion in 2018. The scope of the project was however expanded based on the request of the participating countries; Jamaica, the USA, Pakistan, Syria, Malaysia, Greece and Ghana. A contract extension was granted and the project is now slated for completion in 2020. ICENS is participating in 2 of 5 project tasks, one of which the Centre is the lead organization (task 5). The final report for this task is in the advanced stages of review and will be published as an IAEA TECDOC®. The ICENS is also a participant for the “Assessment methodologies for open source tools used to assess physical security installations.” Mr. Ronmccrea Cushnie is the principal investigator for CRP J02006.

NATIONAL TRANSPORTATION AND ENERGY POLICY

The ICENS, in collaboration with the UWI’s Faculty of Science and Technology, the Ministry of Transport and Mining and the Ministry of Energy hosted the one day seminar “Energy Challenges, Nuclear Technology, Safety and Regulation in the Caribbean” on March 27th, 2019. The seminar addressed global energy challenges, specifically in the Caribbean, as well as safety in the region’s maritime transport sector. The meeting was attended by nuclear industry representatives from the UK, France and Japan, as well as speakers from the UWI’s Faculty of Science and Technology, Faculty of Law, the Ministry of Transport and Mining, the Ministry of Energy, CARICOM, the Caribbean Disaster Emergency Management Agency (CDEMA) and the Panama Canal Authority. The seminar provided a forum for discussion and informing the public on regional and global energy issues whilst showcasing UWI’s research on climate change and promoting the peaceful uses of nuclear energy.

HAZARDOUS LABORATORY WASTE AD-HOC COMMITTEE

The work of the Hazardous Laboratory Waste Clean-Up Ad-Hoc Committee (HALWAC) continued with student interns concluding the qualitative characterization of unknowns in August 2018, following which the findings and recommendations were compiled in a technical report delivered to the National Commission on Science and Technology (NCST) under the auspices of the Ministry of Science, Energy and Technology (MSET). Following the pilot incineration exercise, a disposal schedule was arranged with the Caribbean Cement Company for the incineration of the bulk of non-halogenated liquid organic wastes residing in public sector facilities. To date approximately 8000 L has been disposed of. Mr. Charles Grant is the Chair of the HALWAC, Ms Leslie Hoo Fung of ICENS and Dr. Roy Porter of the Department of Chemistry, UWI Mona, are technical advisors.

TOXIC SITES IDENTIFICATION PROGRAM (TSIP)/PURE EARTH

The Toxic Sites Identification Program (TSIP) effectively concluded after the database was populated with results on metal analysis of potentially contaminated sites obtained using instrumental neutron activation analysis (INAA) and portable energy-dispersive X-ray fluorescence (EDXRF). Continued collaboration between the ICENS, the Department of Physics, UWI Mona and the Ministry of Economic Growth and Job Creation resulted in an extension of the project including further site visits. During the review period paints were purchased for analysis of lead (Pb) content as well as sampling of local and imported Dutch pots and ladles to determine the potential for leaching of toxic metals into the food that is prepared and cooked in these utensils. The results for the paint was reported to the Ministry in the latter part of 2018 and work continued on the Dutch pots. In 2019, the project was shifted from the auspices of the Ministry of Economic Growth and Job Creation to the National Environment and Planning Agency (NEPA). The project has subsequently been closed, although the collaboration between the Department of Physics and the ICENS will continue the assessment of work on the Dutch pots.

INTER-GOVERNMENTAL PANEL ON CLIMATE CHANGE, CARBON BIOGEOCHEMISTRY PROJECTS

As part of his continued work on the Intergovernmental Panel on Climate Change (IPCC) Dr. Adrian Spence attended the Fourth Lead Author Meeting – IPCC Special Report on Climate Change and Land. International Center for Tropical Agriculture (CIAT), Cali, Columbia, February 11–15, 2019 and the First Lead Author Meeting – IPCC Sixth Assessment Report. University of Edinburgh, Edinburgh, Scotland, April 1–5, 2019.

He has also continued his work as technical Advisor to the Resilient Islands by Design Project: Integrating Ecosystem- and community-based Approaches to Enhance Climate Change in the Caribbean project in Jamaica. Implementing partners: The Nature Conservancy (TNC) and the International Federation of the Red Cross and Red Crescent Societies (IFRC); and also as a consultant scientist to the Agrobiodiversity, Indigenous Knowledge and Protected Area Management in the Rio Grande Valley, Jamaica and KwaZulu-Natal, South Africa and the World Bank's Program on Forests (PROFOR): Assessing ecosystem services provided by mangroves, Jamaica.

PUBLICATIONS

Special reports

- Nabuurs, G-J., Mrabet, R., Hateb, A.A., Bustamonte, M., Clark, H., Fobissi, K., Havlik, P., House, J., Mbow, C., Ninan, K., Popp, A., Sohngen, B., **Spence, A.**, Towprayoon, S. (2019) Agriculture, Forestry and Other Land Uses. In: IPCC 6th Assessment Report – *First Order Draft*.
- Arneth, A., Denton, F., Agus, F., Elbehri, A., Erb, K., Osmani Elasha, B., Rahimi, M., **Spence, A.**, Valentini, R. (2019) Framing and Context. In: *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. Cambridge University Press, New York.

E-Modules and Electronic Publications

- **Antoine, J.M.R.** The Application of Neutron Activation Analysis (NAA) to Forensic Sciences. IAEA Learning management System. Nuclear Analytical Techniques for Forensic Science. <https://elearning.iaea.org/m2/mod/scorm/player.php>
- **Antoine, J.M.R.** Fingerprinting Food: Using Neutron Activation Analysis for Provenance studies. Case Studies: Neutron Case Studies. IAEA Accelerator Knowledge Portal. <https://nucleus.iaea.org/sites/accelerators/CaseStudies/SitePages/Home.aspx>

Conference Publications

- **Grant, C.N., Antoine, J.M.R.** “Neutron activation analysis in forensic science in Jamaica: The Coral Springs beach theft, Nuclear Analytical Techniques in Forensic Science, 62nd IAEA General Conference Side Event, Vienna, Austria, September 18, 2018
- **Antoine, J.M.R.** Neutron Activation Analysis and associated techniques in Jamaican Forensic Investigations – Autopsy Tissue and Cannabis Profiling, Joint ICTP-IAEA Advanced Workshop on Enhancing Accelerator-Based Analytical Techniques for Forensic Science (smr 3291).

Technical reports

- **Hoo Fung, L.A.** *Hazardous Laboratory Waste Clean-Up Ad-Hoc Committee (HALWAC) Pilot Exercise: Qualitative Analysis of Unknown Chemicals in Public Sector Laboratories*. International Centre for Environmental and Nuclear Sciences, September 2018.
- **Antoine, J.M.R.** “Provenance Studies of Food and Environmental Samples by Neutron Activation Analysis and related techniques,” CRP F11021, Enhancing Nuclear Analytical Techniques to Meet the Needs of Forensic Science, First Annual Progress Report, November 23, 2018.
- Mandal, A., Smith, R.-A., Edwards, T., Kinlocke, R., Mitchell, S., Trench, C., Webber, M., Francis, P., **Spence, A.**, Sharma, A. (2019). Assessment and economic valuation of coastal protection services provided by mangroves in Jamaica (P14696), Final Report.
- Mandal, A., Smith, R.-A., Edwards, T., Kinlocke, R., Mitchell, S., Trench, C., Webber, M., Francis, P., **Spence, A.** (2019). Mangroves monitoring and evaluation manual Jamaica.

INVITED LECTURES/PRESENTATIONS

- **Spence, A.** Land-climate-human interactions. Department of Geography and Geology, The University of the West Indies, Mona, September 20, 2018.
- **Spence, A.** Capacity building workshop for World Bank’s PROFOR project: Assessment and economic valuation of coastal protection services provided by mangroves in Jamaica, Kingston, Jamaica, October 1–3, 2018.
- **Spence, A.** Effects of, and response options to regional soil pollution. World Soil Day Symposium – Be the solution to soil pollution, College of Agriculture Science and Education, Portland Jamaica, December 5, 2018.
- **Antoine, J.M.R. & Grant, C.N.** The Sterile Insect Technique as a tool for controlling *Aedes Aegypti*. Faculty of Science and Technology Public Lecture Series: Minimizing Mosquito Mayhem-Science and Solutions, UWI Mona, February 28th, 2019.

PUBLIC SERVICE**Mr. Johann Antoine**

- Chair, National Mirror Committee/ISO TC/93 Starch-including derivatives and by-products (Bureau of Standards Jamaica) 2011–2018; Vice-chair, Chair, National Mirror Committee/ISO TC/93 Starch-including derivatives and by-products (Bureau of Standards Jamaica) 2019 to present.

Mr. Charles Grant

- Member of National Bioethics Committee
- ARCAL National Coordinator (Jamaica), and member of the ARCAL
- Technical Coordination Board (OCTA which oversees all ARCAL Projects)
- 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)
- Member, National Bioethics Committee
- Fellow, Institute of Physics.

Ms. Leslie Hoo Fung

- Chair, National Food Standards Committee (ISO TC34 Mirror committee, convened by the Bureau of Standards, Jamaica)
- ISO/IEC 17025 Assessor, Jamaica National Agency For Accreditation
- Member, Codex Committee on Methods of Analysis and Sampling (subcommittee, Jamaica)
- Member/ Technical Advisor, Hazardous and Laboratory Waste Ad-Hoc Committee (HALWAC) – Treatment, Disposal and Laboratory Guidelines Subcommittee, National Commission on Science and Technology/Ministry of Science, Energy and Technology, Jamaica
- Member, Board of Studies, School of Science, Technology, Engineering & Mathematics (STEM), Excelsior Community College, Kingston, Jamaica
- Royal Society of Chemistry, May 2012–present
- AOAC International, April 2016–present.

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