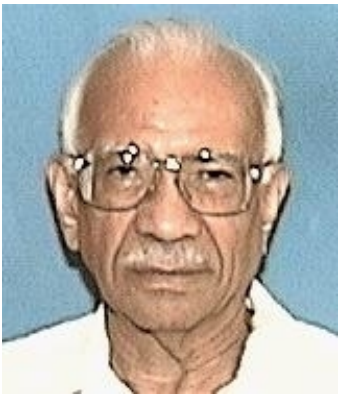
INTERNATIONAL CENTRE FOR ENVIRONMENT AND NUCLEAR SCIENCES (ICENS)

Professor the Hon. Gerald C. Lalor OJ, CD, MSc *Lond-UCWI,* **PhD** *Lond* **– Director General**



The Centre has recovered from a multitude of equipment problems. The major remaining one, the replacement of detectors for the total reflection x-ray fluorescence machine, is near solution. During the equipment down period there was extensive overseas training of staff; eight members of staff participated in visits sponsored by the IAEA to: Argonne National Laboratory (Illinois); Instituto de Pesquisas Energeticas e Nucleares (Brazil); Instituto Nacional de Investigaciones Nucleares (Mexico City); IAEA's Marine Environment Laboratory (Monaco); Jozef Stefan Institute (Ljubljana); Czech Technical University (Prague); Nuclear Research Institute (Czech Republic); Universidad del Valle de Guatemala.

Mr John Preston participated in a meeting on the state of the art of instrumentation and control systems for Research Reactors, Bariloche, Argentina, March 8-12, 2010.

Mr. Charles Grant also attended workshops and provided expertise for Ingeominas in Bogata. Dr. Paul Wright attended the 2nd Coordination Meeting for the ARCAL project in February 2010. The title of the project is: Improvement of Analytical Quality through Proficiency Testing and Certification of Matrix Reference Materials using Nuclear and Related techniques in Latin America.

Changes to the Board of Directors

The Prime Minister has appointed Dr. Carlton Davis to be Vice-Chairman of the Board.

Search for a new Director-General

A person with exceptional qualifications has been identified and negotiations are proceeding.

New Equipment

The Perkin Elmer 7000DV ICP Spectrometer which was provided by a grant from the CHASE fund is fully in service. This instrument will significantly advance the analytical power both in terms of quality and throughput. Its value has been enhanced by the installation of a computer controlled microwave oven which greatly increases the capability to dissolve intractable material such as soils and rocks. These should be reflected in improved productivity.

ICENS is now probably the most powerful laboratory in the Caribbean for multi-elemental analysis. At this time it lacks only one major item of equipment, an ICP mass spectrometer.

Collaborations

Collaborations are essential to ICENS' programmes. The main ones during this past year have been in agriculture: the Ministry of Agriculture (the Rural Agricultural Development Agency (RADA) and Rural Physical planning Department (RPPD) and CARDI on the productivity of soils; species variation of cadmium uptake by sweet potato, and spatial visualizations of essential and potentially toxic elements to assist in land use selections. This work has implications for agricultural production and to help ensure that exports meet heavy metal limits set by national and international regulatory bodies.

ICENS maintains a reputation with the IAEA as being one of the best utilized small reactor centres in the world and is pleased to be a partner in its varied activities in the region. These now include supporting a sustainable increase in the use of research reactors in the Latin American and Caribbean Region by the formation of the Caribbean Coalition of Research Reactors. The members are: ICENS, the Instituto Nacional de Investigaciones Nucleares (ININ, Mexico), the Instituto Colombiano de Geología y Minería (INGEOMINAS, Columbia), Vienna University of Technology (Atominstitut, Austria). This partnership is expected to enable

the group to jointly provide improved research reactor services to governmental and commercial customers, especially in the areas of analyses, production of radioisotopes, radiation protection, and neutron activation analysis for agricultural, environmental and industrial resources.

The first activity organized by the CRRC was a training Course on Marketing and Quality Control for Services of Research Reactor Based Facilities and Techniques, in Bogotá, Colombia between January 18-22, 2010.

RESEARCH AND DEVELOPMENT

Lead exposure studies have continued, though on a reduced scale since new resources are lacking. Despite earlier successes with the several appropriate government agencies on the development and implementation of strategies to reduce levels of lead exposure and reduce the blood lead levels of the Jamaican population, further progress in dealing with especially the once severely lead poisoned children, has been slow and some persons continue to require chelation treatment as lead stored in the bone is released to the blood. This emphasizes that prevention strategies are the way to go and assistance is being provided to a local firm that is developing a lead recycling project.

The lead isolation in the Kintyre area, a "hot spot" of the past, has weathered reasonably well but the area is beginning to require further attention.

The geochemistry of Jamaican soils and foods continues as the essential baseline activity but the work is shifting significantly towards the levels and consequences of trace element exposures of the population. Data are being gathered on as many elements as possible with a focus at present on levels in blood of potentially toxic elements such as arsenic, cadmium, lead and mercury and on essential elements like copper, iron, selenium and zinc, some of which is reminiscent of the excellent work performed two decades ago by the TMRU.

Cadmium still represents a potential threat to trade in some exports and a UNEP report on lead and cadmium to be released next year is likely to

raise that threat. There is still no significant evidence of effects of cadmium on mortality or morbidity in the Jamaican situation and as this runs counter to the accepted global opinion, it would seem necessary to arrive at a firm conclusion as soon as possible. To do this would mean funding a major epidemiological study, so in the meantime, following the precautionary principle, ICENS has been better defining areas and foods that meet international requirements or are likely substitutes for some that do not do so.

New Applications

Crime Fighting

In collaboration with the Forensic Laboratory ICENS is: (1) examining the matching of samples from crime scenes with those taken from known areas. The first effort, the "stolen beach case" provided evidence to eliminate certain possible "receiver" beaches; (2) characterising trace elements in gunshot residues sampled from hands, clothing or other areas; (3) measuring of the blood lead levels of officers involved in ballistics testing.

Effects of lead exposure

Funding proposals to assess: (a) the possible relationship between childhood lead exposure and violent adult crime and (b) the level of risk in persons who have un-removed lead bullets in their bodies are being developed.

EShare - An Environmental Data Sharing Platform for Jamaica

ICENS leads this effort to provide for digital data and information sharing amongst Jamaican institutions through an open access digital repository. The other members at present are:

- Environmental Management Division, Office of the Prime Minister;
- Rural Physical Planning Division, (RPPD); Ministry of Agriculture;

- Faculty of Pure and Applied Sciences, University of the West Indies;
- Department of Geology and Geography, University of the West Indies.

NUCLEAR ENERGY

At the request of the Minister of Energy, ICENS performed and reported on a prefeasibility study on nuclear power for Jamaica. The report noted that nuclear energy is enjoying a global renaissance driven by improved economics and environmental benefits, and that the present cost of electricity from nuclear reactors appears to be cheaper even than that of coal. Importantly, the new small modular factory produced reactor designs have completely altered the prospects for nuclear energy for small countries to the extent that Jamaica should now begin to consider adding nuclear power to its generation mix within the next decade.

PUBLICATIONS

Book Chapter

* **Wright P.R.D.,** Rattray R. and **Lalor G.C.** "A Regional Perspective of Medical Geology - Cadmium in Jamaica", Medical Geology: A Regional Synthesis (International Year of Planet Earth), Olle Selinus, Robert B. Finkelman and Jose A Centeno (eds.), Springer, 2010, pp 29 -58.

Refereed Journals

* Jerome Nriagu, Mazen Boughanen, Aaron Linder, Andrea Howe, **Charles Grant,** Robin Rattray, Mitko Vutchkov, and **Gerald Lalor**. "Levels of As, Cd, Pb, Cu, Se and Zn in bovine kidneys and livers in Jamaica". *Ecotoxicology and Environmental Safety* 2009; 72(2):564-71.

* Robert G. Garrett, Anthony R.D. Porter, Patricia A. Hunt and **Gerald C. Lalor.** "The presence of anomalous trace element levels in present day Jamaican soils and the geochemistry of

Late-Miocene or Pliocene phosphorites". *Applied Geochemistry* 23(4) (2008) 822-834.

* **Paul R.D. Wright,** Robin Rattray, **Gerald Lalor** and **Richard Hanson.** "Minimal health impact from exposure to diet-sourced cadmium on a population in central Jamaica". *Environmental geochemistry and Health* (2010). DOI: 10.1007/s10653-010-9318-6Online First™

PUBLIC SERVICE

Ms. Leslie Hoo Fung

– Chair, National Food Standards Committee, Bureau of Standards Jamaica.

Professor Gerald Lalor

– Honorary Chairman, Gleaner Company;

– Chairman Gleaner Honour Awards Committee

– Director, Insurance Company of the West Indies Group

– Member, Third World Academy of Sciences (TWAS); The Royal Society of Chemistry; the American Chemical Society; the New York Academy of Sciences; The American Association for the Advancement of Science;

– Member, Council of the Institute of Jamaica;

– Member, Editorial Boards of: *Jamaica Journal of Science & Technology; The Science of the Total Environment; Revista Latino-Americano Quimica.*

– Member, UNEP Workgroup on Lead and Cadmium.

Mr. John Preston

– Member, Land Information Council of Jamaica

– Member, Telecommunications Appeals Tribunal.

Dr. Gladstone Taylor

- Member, Executive Council, Inter-American Institute for Global Change Research.

Mrs. Joan Thomas

- Member, Inner Wheel Club of Kingston.

Dr Paul Wright

- Member, International Medical Geology Association;
- Country representative (Jamaica) to ARCAL, the Regional Cooperation for the Promotion of Nuclear Science and Technology in Latin America and the Caribbean.