INTERNATIONAL CENTRE FOR ENVIRONMENTAL AND NUCLEAR SCIENCES (ICENS)

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

WORK OF THE CENTRE

During this period ICENS continued to develop and strengthen partner- ships locally and overseas with the establishment of new working linkages with the Ministries of: Health, Agriculture, Commerce Science and Technology; the Rural and Physical Planning Agency; the Caribbean Food and Nutrition Institute (CFNI), the Caribbean Research and Development Institution (CARDI); the Federal University of Mato Grosso, Brazil; and Instituto Nacional de Investigaciones Nucleares (ININ), Mexico.

Members of the US Department of Energy visited ICENS for discussions on nuclear safety and security and agreed a mechanism for the return of the present high enrichment core to the US under the auspices of the International Atomic Energy Agency in exchange for a low enrichment core. Funding of the order of US$1,000,000 will be provided.

A distinguished scientific team, Professor Iain Thornton, Professor Jerome Nriagu, and Professor J. David Robertson, from Imperial College London, the University of Michigan, and the Research Reactor Center of the University of Missouri respectively, reviewed the Centre's performance to date. The team concluded in summary that:

> "Scientists at ICENS have achieved a considerable amount of original and innovative work, mastered crucial areas of high technology and information technology which have been used to highlight areas of research, hitherto neglected in Jamaica, especially in the development of a thorough understanding of the geochemistry of the local environment and its effects on human health. The Center remains an exemplary institution for the

> Caribbean countries that is, and should continue to be, regarded as a crown jewel for science in the CARICOM states. Investments in the human resource and infrastructure of ICENS will yield enormous returns in the sustainable development of Jamaica."

The Team produced a number of valuable recommendations which have been referred to its Board of Directors and will form a basis for certain discussions with the government of Jamaica.

Research

The main research programmes continue to concentrate on the presence of potentially toxic elements, especially cadmium and lead in Jamaican soils and the actual and potential effects on agriculture, the economy and human health. The understanding of food elemental composition is an important step in this.

Cadmium

The emphasis in now on examining the soil > food > human chain. Dietary intakes and concentrations of cadmium in foods are being measured to compare with health biomarkers, and mortality data. There are hints that cadmium may be affecting human health in Jamaica but it appears not to be a first order effect.

Additional food data obtained are serving as the core of a new project on the elemental composition of Jamaican foods.

Lead

An island-wide study completed this year identified 230 children, of a sample of 1081, with blood lead levels above 10 μg/dL, the current accepted limit. Of these, 80 were provided with medical attention. Four were desperately ill from acute lead poisoning necessitating courses of repeated sessions of chelation therapy. Remedial health, environmental and educational interventions were also carried out.

Lead poisoning in Jamaica is a problem of the poor. The most important source of lead exposure for children is the recovery of lead from old automobile batteries and the extent of contamination from even a single smelter can be surprisingly large. Work is continuing on inner city areas for which there is already information of a high intensity of lead smelting in the past leading in some locations to extreme contamination.

ICENS' Databases

As a result of its research and data gathering, ICENS databases are growing rapidly. There are now well over 250,000 analytical data entries on over 15,000 samples of soils, rocks, surface and ground water, stream sediments, air particulates, food, blood, animal and human kidney and liver tissues. The data are complimented by the satellite imagery, and geographically referenced information on topography, climate, vegetation, land use, geology, mineral deposits, and plant productivity.

Techniques are being developed to utilize Google Earth spatial viewing to allow overlays and visual links between the various data sets.

Centre Objectives for 2006 – 2007

The main objectives for 2006-2007 are to:

- Identify a suitable replacement for the present DG, who retires in 2008, to allow a suitable transition period.
- Complete the formalities of the transformation to the International Centre for Environmental and Nuclear Sciences.
- Expand and strengthen the ICENS databases and information systems.
- Increase the number and upgrade the skills and competence of staff.
- Establish new and strengthen existing collaborative linkages with local, regional and international institutions and with eminent individuals in related fields.
- Increase the availability of data to stakeholders and the public.
- Increase public awareness in science and technology.
- Advance research and development projects in, inter alia:

  The elemental composition of Jamaican foods;

  The health effects of cadmium, lead and other heavy metals in Jamaican soils;

  Soil-food elemental transfer processes and the socio-economic and health consequences thereof;

  The effect of lead smelting on the health of children;

Trace elements in the human body;

Essential element deficiencies in agricultural crops and animals.

ICENS undertook cooperative research activities with other Departments such as the Department of Sociology, Psychology and Social Work, the Health Centre and the Faculty of Medicine, to explore new research themes for health and poverty alleviation that increase its socio-economic impact and to better link its own research activities with those of other collaborators.

Teaching

Although some members of the Academic staff participate in teaching programmes, ICENS does not offer formal teaching programmes except for a few topics mainly for Applied Chemistry in the undergraduate and graduate programmes using Neutron Activation Analysis and X-ray Fluorescence techniques.

Training

Various staff members attended workshops/training sessions/ seminars. These included visits to Siebersdorf Laboratories in Vienna; and a two-week training program in the Analytical Lab at Brandon Agricultural Research Center, Manitoba Canada.

PAPERS PRESENTED

- **G.C. Lalor**, "Potential Toxicity of Elements in Soils and Foods in Jamaica". The Mike D'Silva Memorial Lecture, Medical Association of Jamaica, Kingston, June 2006.
- **M. Vutchkov, G. Lalor** and **S. Bryan,** "Mitigation of Lead Hazards in Lead Mining and Smelting Communities" Annual Science Symposium, Northern Caribbean University, Mandeville, April 2006.
- **Vaughn Rattray,** "Current Research at ICENS", 9th Meeting of the Coordinating Council of the Commission on Science and Technology for Sustainable Development in the South (COMSATS), Amman, Jordan, March 2006.
- **Mitko Vutchkov** and **Gillian Guthrie,** "Mercury in Jamaica" CEC-Americas Workshop to Reduce Mercury Use in Products,

American Commission for Environmental Cooperation, Merida, Mexico, February 2006.

- **Mitko Vutchkov** and **Gerald Lalor.** "Applications of the Nuclear Methods in Medical Geology" 50th Anniversary Geological Conference, Geological Society of Jamaica, December 2005.
- **Mitko Vutchkov** and **Gerald Lalor,** "Nuclear Energy and the Environment", 19th Annual Conference on Science & Technology, Kingston, November 2005.
- **Charles Grant, Gerald Lalor** and **Mitko Vutchkov,** "Neutron Activation Analysis and its application to agricultural, environmental and health programs in Jamaica" National Nuclear Research Institute, Mexico, October 2005.

PUBLICATIONS

* **P. Allsworth-Jones, G, Lalor, G. Lechles, S.F. Mitchell, E.Z. Rodriques, M. Vutchkov** The Taino Settlement of the Kingston Area The Earliest Inhabitants: The Dynamics of the Jamaican Taino. Edited by Lesley-Gail Atkinson, 2006, University Press

* **C.N. Grant, G.C. Lalor, M.K. Vutchkov,** 2005. A Comparison of Bauxites from Jamaica, the Dominican Republic and Suriname, *Journal of Radioanalytical and Nuclear Chemistry.* Vol 266 No. 3, 385-388.

INCOME GENERATION

The major research grants were:

IDRC: 2004 – 2007. Ecohealth Consequences of Heavy metals in Jamaica. (CAD)$480,000.

IAEA: 2007 - 2008 "The Application of Nuclear Techniques to Food Safety and Health in Jamaica". (US)$150,000.

CHASE Fund: 2006 - 2007 "The Health implications and interventions in communities associated with lead acid battery smelting and recycling". J$4 Million.

BNS Foundation: Funding to support a replacement for the retiring Director – General. J$25,000,000.

PUBLIC SERVICE

Professor Gerald Lalor

- Honorary Chairman, Gleaner Company;
- Director, Insurance Company of the West Indies Group;
- Member of: the Board of Governors of the ICWI Group Foundation;
- Member, National Commission for Science and Technology (NCST);
- Member, Technical Committee of the Scientific Research Council.
- Member, Editorial Boards, Environmental Geochemistry & Health;
- Member, Jamaica Journal of Science & Technology;
- Member, The Science of the Total Environment;
- Member, Regional Editor Revista Latino-Americano Quimica.
- Member, Jamaica Government representative to UNEP Lead Cadmium Working Group.

Dr. Robin Rattray

- Member, Air and Water Quality Subcommittees, National Environment and Planning Agency.
- Recording Secretary, Laboratories Association of Jamaica.
- Member, Lions Club of Mona.

Dr. Mitko Vutchkov

- Member, Product Research & Development Committee, Scientific Research Council.
- Council Member, Jamaican Society of Scientists and Technologists (JSST)

Dr. Gladstone Taylor

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

Mr. John Preston

– Member, Land Information Council of Jamaica

– Member, Telecommunications Appeals Tribunal.

Mrs. Joan Thomas

– Member, Radiation Protection Advisory Committee of Jamaica.

– Member, Inner Wheel Club of Kingston.

STUDENT MATTERS

Summer employment was reduced this year due to lack of funding. Only two students were employed, one as is usual in the Chemistry Department's Work Study Programme and a computer science graduate student.