

SATURDAY MORNING

Blue Room

Pro-Vice Chancellor Baldwin Mootoo, *Chair*

- 10:30–1. Plenary Lecture
The Biological Information Revolution: Making Data Accessible And Integrated And Keeping It Open For All.
Tim J. P. Hubbard
- 11:30–2. Plenary Lecture
Leonard O’Garro
- 12:30 Lunch
Mona Visitors’ Lodge
- 1:30 Registration

SATURDAY AFTERNOON

Blue Room

Professor Winston Mellowes, *Chair*

- 2:00–3. Plenary Lecture
Sustainment of Capital Assets: From Skyways to Highways to Driveways.
Wesley Harris
- 3:00–4. Aviation Infrastructure Investment – A Quantitative Perspective.
John-Paul Clarke, Bruno Miller
- 3:25–53. Young Scientist Lecture
- 3:55 Business Meeting

SATURDAY EVENING

Mona Visitors’ Lodge
Reception

SUNDAY MORNING

Blue Room

Professor Gerald Lalor, *Chair*

- 9:00–5. Plenary Lecture
Bucking The Trend: Lead Poisoning Of Children In Sub-Saharan Africa.
Jerome Nriagu
- 10:00 Intermission

Section A. Blue Room
Professor Dyer Narinesingh, *Chair*

- 10:25–6. **John Caesar**
- 10:50–7. Caribbean Volcanoes: Friend or Foe?
Trevor Jackson
- 11:15–8. The Bathtub effect on climate in the Caribbean - El Niño and La Niña.
A. Anthony Chen
- 11:40–9. Structure And Properties Of Synoptic Systems That Affect The Caribbean Region. (Part 1 – The Rainfall Season of May-July).
Albert Owino

12:05–10. The Influence of the tropical Atlantic vs. the tropical Pacific on Caribbean Rainfall.

A. Anthony Chen, Michael A. Taylor, David B. Enfield

12:30 Lunch

Section B.
Professor Leonard O'Garro, *Chair*

Banquet Hall

10:25–11. Heresy today...? Tomorrow?

Errol Y. Morrison

10:50–12. The Mechanism of Worm-Induced Diarrhoea.

Ronald Young, Erica Robinson, Tom McDonald, Edward Cooper

11:15–13. Molecular Characterization and Phylogenetic Analysis of Human T-Cell Leukemia Virus (HTLV-I/II) from French Guiana, Surinam and Guyana.

Mirdad Kazanji

11:40–14. Effect Of *Momordica charantia* Fruit Juice Extracts On Amino Acid Transport In L6 Myotubes.

Emanuel Cummings, H. Hundal, H. Wackerhage, N. Woods, J. Singh

12:05–15. Sickle cell trait: an advantage for anaerobic performance?

O. Hue, Maryse Etienne-Julan, Fagn  t   Sara, Marie-Dominique Hardy-Dessources, Laurent Marlin, Claude Hertogh, Stephen Blanc

12:30 Lunch

Section C.
Professor Harold Ramkisoorn, *Chair*

Senior Common Room

10:25–16. Geochemisrty Of Jamaican Soils.

Gerald Lalor

10:50–17. Biodiversity as an Environmental Management Tool in Agricultural Landscapes: Implications for Agro-Chemical Usage.

Elizabeth Thomas-Hope, Balfour Spence

11:15–18. New Black Corals from Jamaican Reefs.

George Warner

11:40–19. Jamaica's Pilot Pollution Release And Transfer Register.

Claude Davis

12:05–20. Integrated Management And Conservation Of Guyana's Coast and Coastal Resources: Training and Screening of Issues and Problems for Integrated Coastal Zone Management.

Philip N. B. Da Silva

12:30 Lunch

SUNDAY AFTERNOON

Blue Room
Prof. Ramsey Saunders, *Chair*

1:30–21. Plenary Lecture

Ali Sayigh

Section A. Blue Room
 Prof. Ramsey Saunders, *Chair*

2:30–22. Natural Gas – The Alternative Fuel.
Raymond Wright

2:55–23. Solution To The Shortage Of Petroleum Geoscience Professionals In The Caribbean.
Richard Dawe, W. Bertrand

3:20 Intermission

Dr. John-Paul Clarke, *Chair*

3:35–24. Modeling RS CVn Light Curves.
John Lodenquai

4:00–25. Narrow-To-Broadband Fibre-Optic Laser For Fibre-Optic Sensing Based On Spontaneous Brillouin Scattering.
Keith De Souza

4:25–26. A Treatment of Hazardous Inorganic Metal Wastes and Wastewater Using Ordinary Portland Cement.
Marsha Mahabir, Ivan Chang-Yen

4:45–27. A Cost-effective Remediation Option for Heavy Metal-contaminated Soils in East Trinidad.
Azeena Ali, Ivan Chang-Yen, R. Osborne, I. Bekele

Section B. Banquet Hall
 Professor Junor Barnes, *Chair*

2:30–28. Malaria: Nutritional Implications for Young Children.
Shanomae Rose

2:55–29. The Biospectroscopic Studies Of HIV Patients' Hair.

Vishwa Verma, N.D. Whyte

3:20 Intermission

3:35–30. Detection of Leptospire in Clinical Material.

Paul. D. Brown, Dianne G. Carrington, Claudia Gravekamp, Herman van de Kemp, Charles N. Edwards, Stephen R. Jones, Patsy R. Prussia, Stewart Garriques, Wiepko J. Terpstra, Paul N. Levett

4:00–31. Developing New Molecular Diagnostic Tools For Human Onchocerciasis.

A. F. Ogunrinade

4:25–32. Optimization And Validation of High Performance Liquid Chromatography (HPLC) With Photodiode-Array Ultraviolet Detection To Analyse Domic Acid In The Green Mussel *Perna viridis* And Oysters (*Crassostrea sp*) From The Gulf Of Paria (Trinidad and Venezuela).

Luisa Rojas de Astudillo, Ivan Chang-Yen, Jose Franco Soler

4:45–33. An Economic Bioassay For Determining Serum Antibiotic Concentration In Rabbit.

Srinivas D. Sithu, Kaslyn Holder, Shevon Miller

Section C. Senior Common Room
 Dr Mirdad Kazanji, *Chair*

2:30–34. Novel Natural Products From The Antillean Flora.

Helen Jacobs

2:55–35. Biosmart Materials: Their Use In Biosensor Fabrication And Drug Delivery Systems.

Dyer Narinesingh, S. Brahim, A. Guiseppi-Elie

- 3:20 Intermission
- 3:35–36. An Investigation Into Arcing Of Sugar Mill Roller Shells In Jamaica.
Gossett Oliver, Vernon Buchanan, Nilza Justiz-Smith
- 4:00–37. The Potential of Red Mud in Casting.
Nilza Justiz-Smith, Gossett Oliver, Vernon Buchanan
- 4:25–38. The Possible use of Red Mud & Sodium Silicate to be used as a Substitute for Sand Casting.
Vernon Buchanan, Nilza Justiz-Smith, Gossett Oliver
- 4:45–39. Use Of Red Mud As Construction Material.
Willard R. Pinnock

MONDAY MORNING

Blue Room
Pro-Vice Chancellor Kenneth Hall, *Chair*

- 9:00–40. Plenary Lecture
Compton Bourne
- 10:00 Intermission

Section A. Blue Room
Dr Michael Craven, *Chair*

- 10:25–41. Effective Science Demands Effective Democracy.
Arnoldo Ventura
- 10:50–42. The Governance of Science.
Junor Barnes
- 11:15–43. Research in the Sciences at the University of the West Indies – Limitations and Possibilities
Baldwin Mootoo

- 11:40–44. Understanding Interactive Media in Science Education: Research, Development and Policy Lessons from Multiple Evaluations.
David D. Kumar
- 12:05–45. The Future Of Chemical Information: IT In Spectroscopic Data Handling.
Robert Lancashire, Debbie-Ann Facey
- 12:30 Lunch

Section B. Banquet Hall
Professor Vishwa Verma, *Chair*

- 10:25–46. Nano-Science: What's in it for the Caribbean?
Ishenkumba Kahwa
- 10:50–47. Production Of Legume Protein Isolates.
Winston A. Mellowes, R. K. Birla
- 11:15–48. Protein-Protein Molecular Interactions Of Wheat Flour During Extrusion Processing: Rheological And Expansion Studies With Sodium Bisulfite And L-cysteine.
Ian Lambert, Jozef L. Kokini
- 11:40–49. Studies on the Interaction of Some Bivalent Metal Ions with Bioactive Ligands.
Brij Tewari
- 12:05–50. Preparation Characterisation And Utilisation Of Activated Carbon In The Caribbean Region.
M. Castellanos, Winston A. Mellowes, F. Márquez
- 12:30 Lunch

MONDAY AFTERNOON

Section A.
Dr Robert Lancashire, *Chair*

Blue Room

- 1:30–51. Advances In Tourist Destination Web-site Technology.
Michael Craven, Leslie Facey, Mervyn Curtis
- 1:55–52. Internet Use Among Small and Mid-sized Businesses in Guyana: Unrealized Potential?
Mary S. Sithu, Pradeepa Bholanath, Troy Valladares

Section B.
Dr Brij Tewari, *Chair*

Banquet Hall

- 1:30–54. Chemical Evolution and Primeval Seas.
Naeem Hamid, Brij B. Tewari
- 1:55–55. Small Lanthanide Nanoclusters: Syntheses, Structures and Electronic Spectroscopy.
M. Singh-Wilmot, Ishenkumba A. Kahwa, Alan J. Lough, Andrew J. P. White, David J. Williams
- 2:20–56. Single-Crystal XRD, TEM, And Thermal Studies Of The Satellite Reflections In Nepheline.
Ishmael Hassan
- 2:45 Intermission

Blue Room
Ms Lorca Gatcliffe, *Chair*

- 3:00–57. Plenary Lecture
Analysis of Persistent Organic Pollutants by GC and GC/MS.
Joe Hedrick
- 4:00 Agilent Workshop
- 4:30 Closing Ceremony

The Biological Information Revolution: Making Data Accessible And Integrated And Keeping It Open For All

T.J.P. Hubbard

Wellcome Trust Sanger Institute, Hinxton, Cambs, UK

The availability of the genome sequences of human and mouse, human sequence variation data and other large genetic data sets will lead to a revolution in understanding of the human machine and the treatment of its diseases.

Complete genome sequences provide a framework to pull all biological data together such that each piece has the potential to say something about biology as a whole. Biology is too complex for any organisation to have a monopoly of ideas or data, so the collection, analysis and access to this data can be contributed to by research institutes around the world. However, although it is possible for all this data to be accessible to all through the internet, the more organisations provide data or analysis separately, the harder it becomes for anyone to collect and integrate the results. To address these problems of integration of data, open standards for biological data exchange, such as the "Distributed Annotation System" (DAS) are being developed and bioinformatics as a whole is now being strongly driven by the open source software (OSS) model for collaborative software development (1). The leading provider of human genome annotation, the Ensembl project (www.ensembl.org), is entirely an OSS project and has been widely adopted by academic and commercial organisations alike.

The success of the International human genome sequencing consortium in delivering a draft genome sequence shows what can be achieved by well coordinated large scale public domain projects. It is already clear that the availability of this sequence to all is having a huge impact on research worldwide. The financing by companies and funding agencies of further

public domain data generation projects via research consortium (SNPs consortium, mouse genome sequencing consortium) shows the public and private support for open access to primary data resources to all.

1. Hubbard & Birney, Open annotation offers a democratic solution to genome sequencing (1999) *Nature*, 403, 825.

Leonard O'Garro

University of the West Indies,

Biotechnology is driven by several fields of activities including fermentation technology, protein engineering, enzyme technology, cell and tissue culture technology and genetic engineering. The basis of these activities are the core disciplines of molecular biology, genetics, microbiology, protein chemistry, chemical and process engineering, computer science, etc. These disciplines, fermentation technology, cell and tissue culture technology and genetic engineering are established in science education and/or industrial processing in the Caribbean to varying extent. This paper traces the historical development of biotechnology and highlights gains and missed opportunities in the Caribbean. Areas of promise and approaches to bring them to reality are also addressed.

Sustainment of Capital Assets: From Skyways to Highways to Driveways

Wesley L. Harris

Massachusetts Institute of Technology, Cambridge, MA, USA

Current MIT Activities

MIT has worked with the US Air Force, US Defense Logistics Agency, and several manufacturing companies since 1997 to develop research-based recommendations that will enable fundamental change in the policy, practice, and process of maintaining, repairing, and over-hauling (MRO) of legacy aeronautical and space assets in the US Air Force inventory. The primary goals of this effort are (1) to implement depot and field level changes that reduce the US Air Force MRO costs by 20% based on FY 97 expenditures and (2) to perform applied research of the highest quality as practiced at MIT. This effort forms the core of the Lean Sustainment Initiative (LSI) within the MIT Center for Technology, Policy, and Industrial Development (CTPID). LSI is a government-industry-academe partnership. MIT LSI participating researchers constitute a multi-disciplinary skill set with home departments in the School of Engineering and the Sloan School of Management.

Scope of the Challenge

The framework and the basic principles utilized in LSI may be applied to increase productivity and efficiency in the sustainment of corporate assets in general. Our proven framework and basic principles of sustainment are fully integrated and are systems based. This framework is well suited to respond to full life-cycle aspects of systems and sub-systems. Extensions to

The Impact Of Aviation Infrastructure On Economies Of Developing Countries

John-Paul Clarke, Bruno Miller

International Center for Air Transportation, Massachusetts Institute of Technology, Cambridge, MA

other military assets such as land-based (US Army) and sea-based (US Navy) systems are direct and obvious. Equally rich and intellectually exciting challenges may be found in transportation, urban infrastructure, airports, seaports, hospitals, housing and buildings (family, commercial, and government), power generation facilities (fossil, wind, thermal, nuclear, and hydro) as well as the enormously complex world-wide commercial aviation enterprise. A modest improvement of 10% in productivity and efficiency in the sustainment of corporate assets is valued in excess of \$2 trillion annually in the US¹. In addition to such achievable cost savings, the positive benign impact on the earth's environment would be significant. A third and critical aspect of this proposal is the establishment of an industry – the sustainment or MRO industry – with revenues exceeding \$2 trillion dollars annually in the US and considerably greater worldwide.

Our research to date on sustainment has led to enhanced understanding of what are the fundamental barriers to improving sustainment of corporate capital assets. Central to any systematic change and improvement is the issue of incentives. We have also observed the need to differentiate the characteristics of manufacturing from those of maintenance; here there are basic differences in the type and use of tools, equipment, organizations, and management structures. Hence our universal framework for a science of sustainment is novel and is not a linear extension of present manufacturing models.

Air transportation is a significant factor in the socioeconomic development of nations around the world. In this presentation, a conceptual framework to analyze the role of aviation in this context is shown. In particular, this framework postulates that there is a series of attributes of the air transportation system (routes, fares, frequencies, travel time, safety, security) that determines its relationship to other sectors of the economy. By understanding the mechanisms that govern these attributes in relation to the needs of users and the macro-economy, decision-makers can create better policies to take advantage of aviation as a promoter of economic growth.

The presentation starts with an overview of current worldwide trends of air passenger travel, air freight and their relationship to macro-economic indicators. In order to analyze some of key the relationships between air travel and economic development in further detail, aviation activity in Costa Rica in the second half of the 20th century is considered. During the 1950s and 1960s, domestic aviation was fundamental to provide access to many communities given the limited reach of the road network; however, as the ground infrastructure expanded in subsequent decades, domestic aviation decreased considerably. Today, domestic aviation is primarily focused on

¹ US Department of Commerce, Bureau of Economic Analysis, Fixed Assets and Consumer Durables Data, Table 5KCU: Current-Cost Net Stock of Private Fixed Assets

by Industry, 1947 - 1999. Estimates are based on the 1987 Standard Industrial Classification(SIC).

Web site:<http://www.bea.doc.gov/bea/dn2/intro.htm>.

tourism. In this analysis, the conceptual framework mentioned above is applied to highlight some of the key attributes of the aviation system that enabled its positive impact on the economic development of Costa Rica in the past and even today.

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Bucking The Trend: Lead Poisoning Of Children In Sub-Saharan Africa

Jerome Nriagu

School of Public Health, University of Michigan, Ann Arbor, USA

The use of leaded gasoline, the greatest single source of human lead exposure worldwide, has been phased out in most developed and developing countries. By contrast, leaded gasoline remains the primary automotive fuel in all the Sub-Saharan African countries and, in fact, the lead content of gasoline in these countries has been increasing in recent years. The talk will explore the scientific, social, political and economic factors that have prevented the introduction of lead-free gasoline in Sub-Saharan Africa. The focus will be on the contribution of the following factors in preventing an effective phase-out program in these countries: (a) lack of data on blood lead levels and health impact studies in this region; (b) the oil industry lobby; (c) availability of right octane enhancer substitutes for tropical climate; (d) vehicle fleet condition and adaptability of to use of unleaded gasoline including the so-called valve seat recession problem; (e) upgradability of distribution networks; (f) cost of the switch to unleaded gasoline and policy measures to reach set targets; (g) pricing policy to encourage consumers to switch to unleaded fuel; (h) control and enforcement to discourage unwanted blending of fuels; and (i) public education.

Caribbean Volcanoes: Friend or Foe?

Trevor Jackson

*Department of Geography & Geology, University of the West Indies,
Mona Campus, Kingston, Jamaica*

The Lesser Antilles island arc chain is divided into an outer inactive arc known as the Limestone Caribbees and an inner volcanically active arc known as the Volcanic Caribbees. Within the Volcanic Caribbees, which extend from Saba in the north to Grenada in the south, there is a series of live volcanic centres, of which one is an active submarine centre. These islands are picturesque and attract tourists to the region each year. The islands possess a variety of geologic resources. Several contain deposits of pumice that is used in the construction industry as sand and in building blocks. All of the islands contain volcanic rocks that are suitable for road metal, for aggregate, and for building stone. Precious and base metals associated with epithermal mineralization have been identified, but none of the deposits are commercially viable. A pre-feasibility study of the volcanically active islands reveals that some have favourable geological conditions for the existence of high enthalpy geothermal systems.

The islands of the Volcanic Caribbees are vulnerable to explosive and violent eruptions due to the composition of their magma. In the last century just over 30,000 people lost their lives from the 1902 eruptions of Mt Pelee (Martinique) and Soufriere (St. Vincent), and two capitals have been destroyed, St Pierre in Martinique (1902) and Plymouth in Montserrat (1997). Pyroclastic flows and mudflows, associated with these types of eruption, are mainly responsible for the devastation and it is forecasted that they will continue to be a major source of damage in future explosive eruptions. Volcanic hazard maps have been produced for several islands and provide information on those areas that are most vulnerable to pyroclastic

and mud flows. Ground-based and satellite surveillance equipment are currently used to detect precursory volcanic activity. Monitoring and mapping programmes for several of these volcanic islands have made it easier to forecast the future behaviour of a volcano, although it remains difficult to predict when the eruption will occur.

John Caesar

**The Bathtub Effect On Climate In The Caribbean - El Niño
And La Niña**

A. Anthony Chen

*Department of Physics, University of the West Indies, Mona Campus,
Kingston, Jamaica*

El Niño and La Niña conditions in the Pacific are due to traveling ocean waves similar to the sloshing of water from one end of a bathtub to the other. Their effects on Caribbean climate differ for the early rainfall season from mid-April to July and for the late rainfall season from September to November. In the former the effect is indirect through teleconnection with Atlantic sea surface temperature. In the latter the effect is more direct through the effect on the atmospheric circulation systems.

**Structure And Properties Of Synoptic Systems That Affect
The Caribbean Region
(Part 1 – The Rainfall Season of May-July)**

Albert Owino

*Department of Physics, University of the West Indies, Mona Campus,
Kingston, Jamaica*

This paper explores the relationships among the sea-surface temperatures (SST), mean sea-level pressure (MSLP) and rainfall in the Caribbean region during the rainfall season of May to July.

The rainfall climatology of the Caribbean shows a bimodal peak, with a primary peak in September-November and a secondary peak in May-July. Rainfall in the primary peak is also associated with fully-developed synoptic-scale cyclonic activities and hurricanes, which occur with timescales of the order of few days. Rainfall in the secondary peak is more associated with the planetary-scale circulations in addition to the developing synoptic-scale cyclonic activities and hurricanes.

The Climate Studies Group, Mona (CSGM), Department of Physics of the University of the West Indies, is analyzing the National Centers of Environment Predictions (NCEP) reanalysis data set of 1959-99, with a view towards the development of a common diagnostic set for the Caribbean region.

By using results of statistical analyses, and composite chart analyses, CSGM aims to identify and dynamically explain the structure and properties of the synoptic systems that are important for climate and climate variability over the Caribbean region. Of particular interest are the

atmospheric conditions that cause floods and droughts, and especially the impact of ENSO on the synoptic-scale circulations over the region. Preliminary results show that the structure of the sub-tropical ridge at 700-hPa gives both diagnostic and prognostic potential for variability of rainfall in the period of May to July.

The Influence of the tropical Atlantic vs. the tropical Pacific on Caribbean Rainfall

Michael A. Taylor¹, David B. Enfield², A. Anthony Chen³

*Physics Department, University of the West Indies, Mona Campus,
Kingston, Jamaica*

The Caribbean rainfall season runs from May through November and is distinctly bimodal in nature. The bimodality allows for a convenient division into an early season (May-June-July) and a late season (August-September-October). Evidence suggests that interannual variability in the early season is influenced strongly by anomalies in the sea surface temperatures of the tropical North Atlantic, with positive anomalies over a narrow latitudinal band (0°-20° N) being associated with enhanced Caribbean rainfall. The coincidence of this band with the main development region for tropical waves suggests a modification of the development of the waves by the warmer tropical Atlantic. The strong influence of the tropical North Atlantic wanes in the late season, with the equatorial Pacific and equatorial Atlantic becoming more significant modulators of interannual variability. The spatial pattern of significant correlation suggests strongly the influence of the El Niño/La Niña phenomenon, with a warm Pacific associated with a depressed late season and vice versa. There additionally seems to be a robust relationship between late season Caribbean rainfall and an east-west gradient of SST between the two equatorial oceanic basins. Oppositely signed SST anomalies in the NINO3 region and the central equatorial Atlantic (0°-15° W, 5° S-5° N) are well correlated with Caribbean rainfall for this period.

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² Physical Oceanography Division, NOAA/AOML 4301 Rickenbacker Causeway Miami, FL 33149 U.S.A., E-mail: David.Enfield@noaa.gov

Heresy today...? Tomorrow?

Errol Y. Morrison

University of the West Indies, Mona Campus, Kingston, Jamaica.

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The Mechanism of Worm-Induced Diarrhoea

Ronald E. Young, Erica Robinson, Tom McDonald, Edward Cooper

University of the West Indies, Mona Campus, Kingston, Jamaica

In 1992 PAHO estimated that in the Caribbean and Latin America, diarrhoeal diseases other than cholera killed 130,000 children under five years old. Trichuris Dysentery Syndrome (TDS) caused by heavy infection with the nematode *Trichuris trichiura*, is a significant contributor to this statistic. In 1994 Chan *et al.* estimated a regional Trichuris infection prevalence of 34% and morbidity prevalence of 2.61%. Beyond the statistics which mark this as an important problem, is the need to establish the functional relationship between helminthic infection and the consequent morbidity and mortality. Many physicians still ascribe the morbidity to “inanition” associated with blood loss and/or competition for nutrients.

This study aims to verify for the first time in human subjects, suggestions from animal studies, that the diarrhoea associated with TDS may be secretory in nature, and directly triggered by worm-associated products. Stool chloride ion concentrations were determined electrochemically during diarrhoea and after treatment. Rectal biopsies from previously infected patients and uninfected controls were voltage clamped in Ussing chambers, challenged mucosally with excretory-secretory *Trichuris trichiura* antigen, and the change in short-circuit current (ΔI_{sc}) monitored. Ion channel and receptor blockers were used to discern the ions, channels and transporters involved. Mast cell ultrastructure in the biopsies was examined after antigenic challenge.

Stool chloride ion concentrations were elevated in TDS patients with diarrhoea, returning towards normal after treatment. In response to antigenic challenge biopsies from patients showed a secretory ΔI_{sc} (Peak

$\Delta I_{sc} \approx 3.63 \pm 1.16 \mu A/cm^2$); no change was seen in controls. The ΔI_{sc} response was completely blocked by furosemide, anthracene-9-carboxylic acid, and diphenhydramine hydrochloride. Indomethacin reduced ΔI_{sc} . After challenge, mast cells were degranulated in patient biopsies, but intact in controls.

We concluded (1) that the diarrhoea in TDS is due to the secretion of chloride ions across the rectal mucosa, mediated primarily by histamine released from mast cells in an specific immune response to Trichuris antigen and (2) that prostaglandins are secondarily involved.

Molecular Characterization and Phylogenetic Analysis of Human T-Cell Leukemia Virus (HTLV-I/II) from French Guiana, Surinam and Guyana

Mirdad Kazanji

*Laboratoire de Rétrovirologie, Institut Pasteur de la Guyane, B.P 6010.
97306 Cayenne, French Guiana.*

We investigated the serological, epidemiological and molecular aspects of HTLV-I/II infection in French Guiana, Surinam and Guyana. Analysis of the nucleotide sequences of 522 bp of the *env* and the complete *LTR* genes from French Guiana and Surinam showed that all of the strains belonged to the cosmopolitan subtype A. High homology could be observed between strains from French Guiana and Surinam. The similarities were greater between Amerindian and Creole strains than between Amerindian and Noir-Marron strains or than between Creole and Noir-Marron strains. Phylogenetic analysis showed two clusters: one of strains from Amerindians and Creoles, which belong to the transcontinental subgroup, and the other of strains from Noirs-Marrons, belonging to the West African subgroup. During the serological control HTLV-II virus was also detected in a Brazilian woman of Amerindian origin. Comparative analyses of the nucleotide sequences of 589 bp of the *gp21env* gene and of 625 bp of the long terminal repeat (*LTR*) showed that this new HTLV-II strain was of subtype A. Sequences comparison and phylogenetic analyses demonstrated that this HTLV-II was very closely related to a group of distinct variants of HTLV-II subtype A strains originating mostly from Brazilian inhabitants and formerly called HTLV-II subtype C. As there is a high level of immigration from Brazil in French Guiana, we carried out a seroepidemiological study of 175 Brazilians, and 72 female Brazilian prostitutes living in French Guiana to determine whether HTLV-II is likely to become an emerging infection in this area. No HTLV-II infection was

detected, indicating that this virus is unlikely to become prevalent in the near future. In another hand we investigated the serological, epidemiological and molecular aspects of HTLV-I/II infection in blood donors from Guyana. The results and analysis are in progress.

Effect Of Momordica Charantia Fruit Juice Extracts On Amino Acid Transport In L6 Myotubes

E. Cummings, H. Hundal, H. Wackerhage, N. Woods and J. Singh

School of Medicine, University of Guyana, Georgetown, Guyana; Department of Anatomy and Physiology, MSI/WTB Complex, University of Dundee, Australia; Department of Biological Sciences, University of Central Lancashire, UK

Diabetes mellitus (DM) is a metabolic disorder characterized by hypoglycaemia which is associated with absolute or relative deficiencies in insulin secretion or action. Diet plays a major role in the management of DM. Prior to insulin therapy, the main form of treatment was dietary measures including the use of traditional medicines derived from plants. The fruit juice of one such plant is *Momordica charantia* (MC) (family: Cucurbitaceae) which is widely used in many developing countries as a hypoglycaemic agent to treat DM. In this study we have investigated the effect of insulin (100 nM) or MC fruit juice extracts A and B in concentrations of 1, 5 and 10 µg/ml on N-methyl-amino-a-isobutyric acid (14C Me-AIB) in L6 rat muscle cells. The extracts were prepared and the cells were cultured by established methods. The results of the study revealed that insulin marked and significant increases in 14C Me-AIB uptake during 1, 3 and 6 hr of incubation. The optimum effects in 14C Me-AIB uptake were achieved during 6 hr incubation and the concentration of 5 µg/ml of both extract A or B were more effective in stimulating the amino acid uptake. It is well established that insulin can stimulate amino acid uptake in muscles and since these findings of this study suggest that the extracts of the MC fruit juice can do the same these findings may have implications for the treatment of Diabetes mellitus.

Sickle Cell Trait: An Advantage For Anaerobic Performance?

Olivier Hue, Maryse Etienne-Julan, Fagn  t   Sara, Marie-Dominique Hardy-Dessources, Laurent Marlin, Claude Hertogh, Stephen Blonc

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Athletes of West-Central African origin, including African-Americans and Antillais, have long dominated international sprint and jump events, although the explanation for their disproportionate success remains unclear. Older studies showed that in both male and female children, blacks performed better than their white counterparts in 30- to 50-m dashes, but there are few data to explain why most of the best sprinters and jumpers have been African-Americans and Antillais. The sickle cell trait (SCT), presents a diminished affinity for oxygen (O₂) and is widely distributed among blacks, representing 7-9 % of African-Americans and reaching 30-40 % of some Central African populations. Because the uncommon but severe injuries reported in SCT carriers (SCTs) during athletic activities have been related to aging, training and the deconditioned state of the subjects, initial investigations were oriented toward the aerobic exercise performance and metabolism of these subjects. In epidemiological studies on the sickle cell trait in Ivory Coast champions (1956-1995), however, some investigations demonstrated that SCT runners won significantly fewer titles than non-SCTs in long-distance races and that they won fewer titles over the course of their careers. Interestingly, these studies also revealed that the percentages of SCTs as title holders (27.3 %) and record holders (41.9 %) in throw and jump events were significantly higher than the prevalence of SCTs in the general Ivory Coast population (12.0 %). These authors concluded that SCT may be a determinant factor for success in brief and explosive track and field events involving mainly anaerobic metabolism but failed to demonstrate this hypothesis. The aim of the present studies

was to assess the performance of subjects with sickle cell trait (SCT) during brief and explosive exercise involving mainly anaerobic metabolism. Black subjects (196 students, 98 children and 20 international-level sprinters) underwent SCT screening, which revealed the presence of 16 students (8.2 %), 9 children (9.2 %) and 3 athletes (15 %) with SCT. Whereas aerobic performance was similar in SCTs and non SCTs, students and children with SCT demonstrated significantly greater performance during anaerobic test (i.e., a jump-and-reach test) than non-SCTs (63.7 ± 3.6 vs 58.6 ± 3.1 cm for students and 54.7 ± 2.9 vs 47.8 ± 2.9 cm for children). When taken together with the greater prevalence of SCT in international-level sprinters (15 %) than that usually noted in the French West Indies population (8-9 %), the results of the present studies suggests that the performance of brief and explosive exercise, which involves mainly anaerobic capacity, may be enhanced in subjects with SCT.

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Geochemistry of Jamaican Soils

Gerald Lalor

Biodiversity as an Environmental Management Tool in Agricultural Landscapes: Implications for Agro-Chemical Usage

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The benefits of biodiversity apply as much to farmed landscapes as to protected areas. Yet, the nature and value of biodiversity in the environmental management of farmed landscapes has received relatively little attention. While the promotion of biodiversity has implications for reduction in the demand for agro-chemicals, high level of agrochemical use by small farmers in Jamaica is fundamentally contradictory to the objectives of both biodiversity and good environmental management. In that regard, while there is general recognition that use of agrochemicals among Jamaican small farmers is high, little information exists on the dynamics of this agronomic practice, including the relationship between volumes and types of chemicals used and the specific characteristics of small farming systems. Nor are the factors that influence the agrochemicals used and the specific characteristics of agrodiversity, fully understood. However, there is a general observation that high levels of agrochemical use on farms are associated with low levels of biodiversity. This paper examines the dynamics of the relationship between agro-chemical use and biodiversity.

This paper is based on biodiversity-related research conducted in the lower Rio Grande Valley in Portland, Jamaica and involved assessment of 45 farm farming units comprising nearly 90 farm fragments. Based on a methodology developed by the People, Land and Environmental Change project, the small farming systems of the lower Rio Grande valley were categorized into four land- use stages. The paper examines the relationship

between land-use stage and agro-chemicals used. In addition, this paper examines the relationship between agrochemical use and different cropping systems. In a farming landscape, which is characterized by scarce and expensive agro-chemical inputs, information on the use of biodiversity to enhance soil fertility and reduce pest infestation can contribute to the more efficient use of agricultural resources, significant reduction in expenditure on agro-chemical input and thus to more sustainable methods of environmental management.

New Black Corals from Jamaican Reefs

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An unusual new Jamaican black coral species is described. Its most unusual feature is the possession of multiple holdfasts, by which it clings to the undersides of overhangs on steep reef walls. In contrast, two other apparently undescribed black corals are very similar to a known species in overall morphology, but differ in colour and in microscopic details of their skeletal structure. Problems of taxonomical and ecological separation in black corals are discussed.

Jamaica's Pilot Pollution Release And Transfer Register

Claude S. Davis

Pollutant Release and Transfer Registers (PRTRs) as envisaged at the 1992 United Nations Conference on Environment and Development (UNCED) embody the "Community Right to Know" principle and provide publicly available information on environmental releases from industrial facilities. The registers typically entail multistakeholder involvement in their development and implementation.

PRTRs are becoming more common in developed countries but not so in developing countries. This paper presents the methodology and results of the Jamaican Pollutant Release and Transfer Register (PRTR) pilot project and the next steps for implementing Jamaica's PRTR. The paper also includes the outcomes of discussions at a regional PRTR conference attended by representatives from English speaking Caribbean Basin countries and Jamaican stakeholders. These initiatives are designed to promote establishment of PRTRs that are suitable for the needs and requirements of Caribbean countries.

The proposed PRTR for Jamaica goes beyond the traditional PRTRs which provide information on the quantities of pollutant releases and transfers and limited information on pollution prevention activities. The Jamaican PRTR will include reporting by the tourism sector and will include information on sources and selected natural and man-made resources at risk near to each reporting facility. Since the register will be based on and phased in with reporting that will be required under environmental regulations, it will include a report that indicates the number of pollutants or parameters that are in compliance with applicable air, water and solid waste regulations and will also allow reporting facilities to present their pollution prevention, energy conservation and community activities.

Integrated Management And Conservation Of Guyana's Coast and Coastal Resources: Training and Screening of Issues and Problems for Integrated Coastal Zone Management

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The coastal plain of Guyana is considered by many to be economically and socially one of the most important regions of the country. Over 90% of the population live here and this area accounts for about 7% of the total area of the country (216,000 km²), and for over 70% of the country's economic productions (GDP). Early Dutch settlers initiated agricultural development in coastal areas and to protect these a complex system of sea walls, drainage and irrigation canals, sluice gates and inland dams were constructed. Over the years net erosion and a general regression of the coastline has adversely affected the economic and socioeconomic development of the coastal area. Numerous environmental consequences have emerged and have served as the impetus for promoting the need to embark on an Integrated Coastal Zone Management programme.

The University of Guyana as a member of the national ICZM Committee was in a very good position to be an integral part of an ICZM training and research programme. In collaborating with the EPA, the University brought its varied experience to the project with a focus that sought to maintain social and ecological development and resilience.

In the inception phase the main driving forces for ICZM in Guyana were identified. The absence of an accepted definition and/delimitation of the coastal zone of Guyana was recognized as a major constraint to the development and promotion of effective ICZM measures. Community

screening was beneficial in identifying the regional ICZM issues and problems. A SWOT Analysis indicated that most of the threats to ICZM in Guyana were related to external factors and that the strengths and weaknesses were very similar across sectors and were not very related to external factors.

The community-based participatory approach was successful and the acceptance of the recommendations from the training programme and regional screening exercise in developing the national ICZM Action Plan demonstrated that policy and planning documents produced with adequate public support face a greater potential for success in their social acceptance for their practical implementation. A good assessment of the most appropriate strategies for the major ICZM sectors under an 'Integrated Coastal Zone Management' approach was acquired. The training methodology and tools used were highly effective. Major conclusions and recommendations of this study were considered to be critical to the development and implementation of a National ICZM-Program. Based on the recommendations of this ICZM-Training Project the National Integrated Coastal Zone Action Plan was drafted and eventually approved for implementation by Cabinet in May 2001.

Ali Sayigh

Natural Gas – The Alternative Fuel

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Gas turbine technology has shown a rapid evolutionary pace of development over the past 15 years. Development has been driven primarily by advances in aeroderivate turbine technology from the aerospace industry. Independent of these technological advances has been the rapid and widespread expansion of the natural gas industry. Development of new, low-cost fields has brought on a period of low prices and wide availability since the 1980s. As a result, what used to be considered a high-cost, peaking-power technology, has become a baseload technology. Installed costs of **large** combined-cycle gas turbine (CCGT) power plants have decreased from about US\$900/kW in 1990 to as low as US\$400/kW in 2002. The cost of energy from **large-scale plants** (300 MW or more) reaches as low as US\$0.028/kWh. Natural gas, as LNG, has now become a relevant product to be considered for energy deficient countries such as Jamaica.

When cooled to minus 162°C, natural gas becomes a clear, colourless and intensely cold liquid reduced to some 1/600 of original volume. This liquefied natural gas (LNG) can be transported by seagoing vessels and regasified in consumer countries. Thus the producer requires an LNG export terminal and the consumer, an import terminal and regasification plant at the end-user market. Major LNG producers today are Algeria, Brunei, Malaysia, Indonesia, Australia, Nigeria, Qatar, Oman, Trinidad & Tobago and USA (Alaska). Producer countries that are developing LNG facilities include Angola (2006) and Venezuela (2005).

Jamaica is an island economy, highly dependent on imported petroleum to meet its energy needs. Further, its per capita consumption of energy is one of the highest in the non-oil producing developing countries. The high cost of energy makes Jamaica less competitive on the global market. Jamaica's economic growth and sustainability depends on its ability to obtain diverse but secure sources of energy supply at the least economic cost. For this reason, Jamaica is taking a coordinated national approach to the energy diversification programme in considering natural gas as a fuel of choice. Korea, and the oil deficient island country of Japan, are relevant models. Between them they import approximately 70 per cent of the LNG used worldwide today. They have extended concerns for energy security, efficiency, and the environment beyond their borders, and in effect globally. Accordingly they are providing technical support abroad for LNG import projects. Jamaica is conducting studies on the economic potential of LNG use against the background of the Japanese and Korean experience.

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Solution to the shortage of Petroleum Geoscience Professionals in the Caribbean

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A new programme – a B.Sc. in Petroleum Geoscience with majors in Petroleum Geology and Petroleum Geophysics – has been introduced into the Faculty of Engineering, University of the West Indies, St Augustine Campus. It is a quantitative geoscience programme in synergy with Petroleum and Chemical Engineering and will be expanded to an M.Sc. within three years.

Geologists have been trained for many decades in many universities, both locally and elsewhere, but not with a specific orientation toward petroleum. Graduates of UWI's Petroleum Geoscience programme will fast track the petroleum and gas industry to help find and develop hydrocarbon resources both in Trinidad and Tobago and in the South East Caribbean. Barbados and Suriname already have active oil industries and oil will be found in Guyana in due course. There may even be gas offshore Grenada. Faculty will hopefully include a Venezuelan professor lecturing to the students including some Venezuelans, as after all, the geology of the two countries is similar.

The programme initially requested by the petroleum industry and the GSTT (Geological Society of Trinidad and Tobago) has the active support from all the major upstream hydrocarbon companies and government. It should be their main source of young graduate professional petroleum geoscientists in Trinidad.

The 15 first-year students who started in September 2001 are all Trinidad and Tobago citizens, including some of the best performers in the recent A-Level examinations, but a wider group will be recruited in 2002's intake.

This paper will describe the purpose, aspirations, curriculum and progress of the programme.

Modeling RS CVn Light Curves

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The RS CVn is a class of close binary-star systems in synchronous rotation with orbital periods between 1 day and a few weeks. The light curves of these binaries are periodic over a rotation period and show changes in shape, amplitude and phase over several years. The light curve variation is assumed due to the presence of large, dark spots (similar to sunspots) on the surface of one of the component stars (the active star). As the stars orbit each other, the spots move across the line of sight resulting in the observed variation of the light curve. The change in shape and phase of the light curve for a given system is explained as due to the slow migration of the spots over the surface of the active star as well as changes in the spot size. A general multi-parameter model for the RS CVn light curves has been developed (J. Lodenquai and J. McTavish). A simplified 3-parameter version of this numerical model has been applied to fit the light curves of several systems obtained over several years in an attempt to find out if there exists a correlation between the sizes of the spots and the orbital periods (M. Leighton). Such a correlation is likely to exist if the spots are generated on the active star due to the closeness of its companion. The results of this modeling are presented and discussed.

Narrow-To-Broadband Fibre-Optic Laser For Fibre-Optic Sensing Based On Spontaneous Brillouin Scattering

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A Q-switched erbium-doped fiber-optic laser capable of switching from a narrowband spectrum of 700MHz to a broadband spectrum of 375GHz with a switching speed of 50ns and pulse widths less than 200ns has been developed for use in a distributed fiber-optic temperature sensor based on spontaneous Brillouin scattering and Rayleigh scattering. Temperature information is extracted by ratioing the Rayleigh signal to the Brillouin signal. Narrowband operation allows optical filtering of the Brillouin and Rayleigh signals while broadband operation minimizes coherent Rayleigh noise resulting in improved temperature resolution.

A Treatment of Hazardous Inorganic Metal Wastes and Wastewater Using Ordinary Portland Cement

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Ordinary Portland cement (OPC) was used to treat inorganic metal waste chemicals which had accumulated in storerooms in the Department of Chemistry at the University of the West Indies, St Augustine campus, for more than 10 years. The treatment involved solidification/stabilisation technology (SST) of available waste metal compounds with OPC to determine its usefulness for transforming wastes from an environmentally hazardous form, to one that is environmentally safe for disposal in a secured landfill or in long-term storage. Waste metal halides required pretreatment and this was effected by alkaline precipitation with sodium hydroxide. This treatment resulted in metal hydroxide precipitates that were solidified in OPC, but the supernatants contained with trace metal ions exceeding the local limits for safe disposal down laboratory sinks. OPC was then used as a coagulating-flocculating agent to treat the waste supernatant. Crushed cement-waste blocks were analysed in accordance with the United States Environmental Protection Agency (USEPA) Toxicity Characteristic Leaching Procedure and Flame Atomic Absorption Spectrophotometry to measure the leachability of the metal ions. Results showed that the crushed samples no longer have the hazardous characteristics for which they were originally listed. Cement-waste blocks are environmentally safe for disposal of toxic inorganic metal wastes in storage around the country. The waste supernatant treated by OPC coagulation-flocculation met the local regulatory levels for wastewater disposal and the method offers a cheap and effective means for removing residual ions from wastewater.

A Cost-effective Remediation Option for Heavy Metal-contaminated Soils in East Trinidad

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Studies have shown that the most frequent element found on polluted sites in Trinidad is lead, and the main source of pollution is spent lead-acid batteries and lead-smelter waste. Four sites in East Trinidad were investigated for possible remediation, since they included heavily populated, agricultural, and wetland areas. Chemical characterisation of the contaminated soils revealed high levels of lead (1.1 – 34.9%), copper (0.03 – 1.60%), zinc (0.03 – 0.75%), and antimony (0.02 – 0.43%); and relatively lower levels of arsenic (22 – 502 µg/g), chromium (12 – 53 µg/g), cadmium (0.95 – 24 µg/g), nickel (19 – 95 µg/g) and cobalt (5 – 23 µg/g). Solidification/stabilisation (S/S)² technology was employed using ordinary Portland cement (OPC) to immobilize the heavy metals. Mix designs involving various waste-to-cement and water-to-cement ratios were investigated for specimens cured for 7, 28, and 90 days respectively. The leachable levels of lead from each of the treated waste were all less than the US Environmental Protection Agency Toxicity Characteristic Leaching Procedure (US EPA TCLP) criteria.³ Our optimised treatments of lead-contaminated soils and waste cost approximately \$40 US per ton of waste. This represents the cost of OPC only, with equipment and labour cost being dependent on the quantity of waste to be treated. Nevertheless, our treatments compares favourably with the treatment options used for heavy metal-contaminated wastes.

Keywords: Heavy-metal contaminated soils, OPC, S/S, US EPA TCLP

Malaria: Nutritional Implications for Young Children

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2. Hessling, J; Smith, M.L.; Giti-Pour, S.; Miller, J. and Isenburg, J. "US EPA Project Summary: Onsite Engineering Report for Solidification/Stabilization Treatment Testing of Contaminated Soil," 1993.
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Malaria, endemic to most developing countries, has a complex relationship with nutrition in young children. Two converse theories for this relationship have been debated in literature. The first states that malaria induces malnutrition. This occurs because malaria induces a loss of appetite, haemolysis, iron sequestration and malabsorption due to vomiting and diarrhoea. It is also often associated with mild to severe anaemia.¹ The second argument states that malnutrition protects a child against malaria. The malaria parasite requires iron for its multiplication in the blood. A malnourished child is however iron deficient.

This paper examines these theories using results from studies conducted in Africa and South America. The relationship between malaria and low birth weight in infants, the induction of protein energy malnutrition and the pathogenesis of anaemia will be addressed.

¹ Abdalla S, Weatherall DJ, Wickramasinghe SN, Hughes M. The Anaemia of P. falciparum Malaria. *Br J Haematol* 1980; 46: 171-183.

The Biospectroscopic Studies Of HIV Patients' Hair

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Hair sample analysis is an accurate method for heavy metal screening and further hair from the scalp of human is a non-invasive way to measure the toxicity. The hair samples were collected from the patients at the male and the female wards and the out-patients-clinic. The hair samples were analysed for toxic and nutritional elements taken from various race, gender, ethnic groups, ages etc. A total of 4 elements were analysed: cadmium and lead being the toxic elements and copper and sulfur as the nutritional elements. Toxic elements in the system can inhibit the function of the enzymes in the body, weaken cell membranes and impair nutrient absorption. It has been observed in our study that the nutritional and toxic elements varied with the individual's age, race and sex. The high concentration of sulfur observed was due to the drug Indianavir Sulphate. Further work is in progress to establish some solid pattern.

Detection of Leptospire in Clinical Material

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Leptospiral culture, direct immunofluorescence, and the polymerase chain reaction (PCR) were used to detect leptospire in material collected from eight patients who died of leptospirosis. Diagnosis of leptospiral infection was based on clinical summary and confirmed by serological analysis and/or culture of leptospire. Leptospiral culture was the least sensitive technique, yielding two isolates (3%) from 65 samples. Both isolates were from the aqueous humour and cerebrospinal fluid of the same patient. Direct immunofluorescence was of intermediate sensitivity for detection of leptospire, confirming the presence of leptospire in 11% (2 of 18) of tissue samples from three patients. PCR analysis was the most sensitive technique for detection of leptospire in tissue samples, being positive in 20% (11 of 56) of samples from eight patients. Both samples (cerebellum and liver) positive by immunofluorescence were also positive by PCR. The sensitivity of the PCR assay was 1-10 leptospire ml⁻¹ sample, and the assay was specific for *Leptospira* species. Multi-system involvement was indicated based on successful amplification of leptospiral DNA from more than one tissue sample, which corroborated with the clinical and pathologic findings. The

results suggest that in acute and/or fatal leptospirosis, the pathogenesis of the pathologic features is related to the presence of the organisms in the tissues. In conclusion, PCR combined with serology appears to be a useful tool for diagnosis of leptospirosis and may be invaluable in epidemiological studies.

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Developing New Molecular Diagnostic Tools For Human Onchocerciasis

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Human onchocerciasis (river blindness) caused by the filarial worm, *Onchocerca volvulus*, affects an estimated 17 million people in 28 countries of sub-Saharan Africa as well as countries of South America. About 270,000 go blind as a result of the disease and about half a million others suffering varying forms of visual impairment and extensive dermal lesions characterised by severe pruritis, dermal excoriations and a degenerative skin depigmentation known as leopard skin.

Although definitive diagnosis of onchocerciasis is based on the demonstration of microfilaria in skin snips, new molecular and immunological methods have been developed for improving the sensitivity and specificity of diagnostic assays. I describe the application of these techniques for mapping the clinical distribution of blinding and non-blinding forms of the disease and for monitoring the impact of control measures on the epidemiology of onchocerciasis.

Optimization And Validation of High Performance Liquid Chromatography (HPLC) With Photodiode-Array Ultraviolet Detection To Analyse Domoic Acid In The Green Mussel *Perna viridis* And Oysters (*Crassostrea sp*) From The Gulf Of Paria (Trinidad and Venezuela)

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Domoic acid (DA) is a neurotoxin that produces Amnesic Shellfish Poisoning (ASP) and also causes gastrointestinal and neurological illness (sometimes fatal) in humans, and mortalities among a variety of marine vertebrates. Recently, abundant *Pseudo-nitzschia sp.* that produces domoic acid was found in the Gulf of Paria, and shellfish during water filtration ingest this. Although, ASP incidences in Trinidad and Venezuela have not been recorded, it was important to develop a rapid and sensitive detection method as requisite for monitoring public health hazards in regions threatened by toxic algal blooms. High performance liquid chromatography (HPLC) with photodiode-array ultraviolet detection was used to analyse the domoic acid that contains a chromophoric group that is detected at 242 nm, and is detectable in shellfish tissue at levels of 0.5 µg/g tissue. The extracts were prepared in aqueous methanol, which avoids the need for sample cleanup prior to HPLC analysis. A certified reference mussel material containing DA (MUS – 1B) was used to validate the method. The results for recovery of domoic acid were 94 – 113%, which demonstrate that detection of domoic acid was not affected by any interference from other constituents. No domoic acid was found in any of the samples analysed. It is plausible that *Perna viridis* and oyster (*Crassostrea sp*) have the ability to

lose toxins quickly, particularly a small molecular weight hydrophilic compound like DA, or effect metabolic transformation of the toxin. In addition, the non-detectable DA in these shellfish may also suggest that the diatom *Pseudo-nitzschia sp* which produces DA is not prevalent in the areas selected. At present, HPLC provides good accuracy and reproducibility and may be used for monitoring domoic acid in the Caribbean.

An Economic Bioassay For Determining Serum Antibiotic Concentration In Rabbit

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High-performance liquid chromatography (HPLC) is the method of choice for measuring the serum drug concentrations, but requires expensive equipment and laborious sample preparation. Bioassay affords several practical advantages, such as simplicity, rapidity, and minor costs. The aim of the present work was to develop a simple and economic bioassay to measure the serum antibiotic concentration in rabbits, to be used for the ongoing research work in the department. A linear relationship was obtained between the diameter of the zone of inhibition and \log_{10} antibiotic concentration in rabbit serum using wells or paper filter disks on nutrient agar plates. *Bacillus thuringiensis* (4Q2 strain) and *E. coli* were used as assay organisms. Healthy rabbits were administered with different doses of gentamicin or Penicillin-G. The animals were bled at different times starting from 3 h after drug administration and the presence of antibiotic activity was assayed in each serum sample. The diameter of the zone of inhibition caused by each sample was used to determine the antibiotic equivalent concentration ($\mu\text{g/ml}$), based on the zone of inhibition verses antibiotic concentration relationship curve. The results and advantages of the method will be discussed.

Novel Natural Products From The Antillean Flora

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There are approximately 900 species of higher plants endemic to Jamaica. These require systematic botanical and chemical study because of their importance in biodiversity and taxonomy, and for the potential bioactivity and intrinsic scientific interest of their chemical constituents. For the past ten years, a semi-systematic phytochemical survey of endemic Jamaican plants has been underway. A taxonomic approach is taken, and species from groups known to produce structurally and biologically interesting compounds are targeted.

Results of studies on plants from a number of families, including the Clusiaceae (from Jamaica and Barbados), and Rutaceae, will be presented.

Biosmart Materials: Their Use In Biosensor Fabrication And Drug Delivery Systems

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This study reports on the integration of two widely used classes of polymeric materials (hydrogels and conducting electroactive polymers) to produce electroactive hydrogel composites for biosensor construction and chemically stimulated controlled release. Amperometric biosensors constructed by entrapping glucose oxidase, cholesterol oxidase and galactose oxidase within these composite membranes displayed enhanced biosensing capabilities. They exhibited extended linear response ranges (10^{-5} – 10^{-2} M), rapid response times (<60s), good storage stabilities (up to a year) and enhanced screening of the physiological interferents ascorbic acid, uric acid and acetaminophen. Membranes prepared using a crosslinking hydrogel component containing an amine moiety (dimethylaminoethyl methacrylate) resulted in polymeric materials that were pH responsive. Coloaded of glucose oxidase and insulin within these biosmart materials resulted in a two-fold increase in insulin release rate when the devices were immersed in glucose solutions. This demonstrates the potential use of such systems to function as a chemically synthesized artificial pancreas.

An Investigation Into Arcing Of Sugar Mill Roller Shells In Jamaica

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The process used to extract the sugar bearing juice from sugar cane involves squeezing shredded cane between large rotating rolls. The crushing rolls are a composite assembly of an annular grey cast iron shell shrink fitted on to a forged steel shaft. The surface of the grey cast iron is roughened by an arc hardfacing process known as roller arcing, which produces discrete globules of hardmetal on the surface. This is necessary in order to have a surface sufficiently rough to prevent slippage of the shredded cane as it is pulled into the nip region between the counter rotating rolls.

Following, is an investigation of some surface failures of roll shells made from the high manganese, high phosphorous grey cast iron traditionally employed in the Jamaican sugar milling industry; the arcing of sugar mill roller shells in the Jamaican sugar industry is discussed. In particular, the use of arcing equipment, welding rods, metallurgical factors, and manpower are investigated. Finally the effect of arcing on final bagasse moistures is considered.

The Potential of Red Mud in Casting

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The alumina industry in Jamaica is the third largest producer of alumina in the world. Because of the technological way by which bauxite is being processed there is a large proportion of the world's red mud residue being disposed in Jamaica. The magnitudes of the industrial alumina production and the red mud production are of the same order.

This research was conducted to investigate the feasibility of using red mud to produce high quality castings of components, using Guaiacum Resin and Silica sand. In this research the possibility of using red mud for casting was investigated based on the nature of red mud binding and its chemical characteristics.

The research was divided into two main areas:-

1. Test the use of red mud, silica sand and Guaiacum Resin (Lignum Vitae) as a mixture for casting.
2. Test the use of red mud combined with silica sand based on different particle sizes.

The specimen obtained from the casting process were compared with those obtained from the traditional way of casting by using silica sand of different values of porosity. Samples were tested using a microscope for pores in moulded material, and found to be satisfactory over silica sand/red mud ratio of 25/75 percent in both cases. The specimen obtained from the conventional mixture with silica sand, was also tested for porosity and found to be unsatisfactory.

Although there are some other variables which can affect the quality of the red mud casting this result is very significant given the possibility of red mud application in other fields as casting.

The Possible Use Of Red Mud & Sodium Silicate To Be Used As A Substitute For Sand Casting

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This investigation was conducted to determine the possible use of red mud and sodium silicate for moulding processes similar to sand castings, with respect to the physical properties. Both the red mud and sand were extensively investigated. The properties in consideration were refractoriness, cohesion, permeability, grain size and collapsibility. Tests were carried out to determine these properties of the red mud and they were compared to the standards used for sand castings.

Investigation showed that after heating, the collapsibility of the red mud sodium silicate mixture would be poor as the mould strength would increase tremendously with temperature, (due to the properties of the sodium silicate) and therefore would be difficult to break away the mould from the casting. In the case of casting with groves the operator might have to resort to digging the mould away from the casting, which will result in a very poor surface finish.

Laboratory work carried out by Kaiser Alumium & Chemical Corporation determined several interesting properties of the red mud.

- Dried red mud particle size ranges from small aggregate down to a very fine particle.
- The shape of the soil particles is normally consistent.

- The mud increases in strength when dried to its geo-technical optimum moisture.
- The particle size distribution allows for good compaction.

The red mud itself displays good permeability. For an air pressure of 7.8 PSI the time found for the air to pass through the clay was 23 seconds, which gives it a permeability of 167.62. However, when mixed with the sodium silicate and heat is applied, the mud being very fine, will be practically impermeable. Thus, it maybe difficult to avoid blows of the mould or cores if the sand mixture contains volatile liquids such as water. The sodium silicate strengthens the bond, which in turn decreases the permeability.

From the results obtained from the testing of the red mud, sodium silicate mixture it was concluded that the mixture was not suitable for casting where a good surface is of prime importance.

Use Of Red Mud As Construction Material

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The idea that Jamaican red mud could be used as construction material became a serious proposition only after the characterization of various Jamaican muds was carried out by Yong and Wagh (1984)¹. The several possibilities investigated in the initial stages considered mainly those cases in which red mud would be the main component, any additives used would be readily available and inexpensive, and the process of formation would be simple enough to be carried out as part of community-based projects.

Several composite materials were formulated on this basis (Wagh et al. 1991, Gordon et al. 1996)^{2,3} but none of these materials have been used to any extent in construction in Jamaica. Their non-acceptance is thought to be related to the fact that none are comparable in strength to concrete, and there is the further drawback that Jamaican red mud was found to contain measurable natural radioactivity (Pinnock, 1991)⁴.

Our work has looked at the hazard that the radioactivity presents, for instance, to a dweller who lives in a house constructed with red mud walls, and the conclusion is that the absorbed doses are likely to be well within internationally acceptable limits. A model has been proposed (Pinnock, 1999)⁵ in which the absorbed dose incurred by a dweller can be estimated simply and accurately from parameters which may be determined from a sample of the construction materials, taken together with features of the design of the house.

We have begun to look more recently, at the possibility of using red mud as an additive to conventional concrete and have found that its presence can

modify the properties of the concrete significantly. Strength, sulphate resistance, and enthalpy of hydration of the concrete can all be influenced to advantage by adding red mud in the right proportion. The possibility of manufacturing a cement based mainly on red mud, is also currently being investigated.

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Effective Science Demands Effective Democracy

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The pervasive power of science is progressively being summoned to elucidate and solve intractable social problems. However, to realise this expectation in a systematic and purposeful manner, science must become more responsive to the demands of society and less dependent on the inherent proclivities of scientists. Increasingly it is being realised that the management of science cannot be left exclusively to scientists. Accordingly, more participatory democracy must be practiced both within science itself, and within the social strata, which accepts and uses its results.

Although science cannot be expected to be a pure meritocracy, nevertheless, questions are being raised about the autocracy pervading most scientific establishments, which curtails the creativity and dynamism of young scientists. The old administrative power structures, which are relics of a rigid theological past, inhibit the installation of flattened management arrangements, normative to progressive knowledge societies.

Science has, over the last four decades, lost much of the respect and reverence it once engendered, and this must be recaptured by the next generation of scientists, if science is not to lose much needed support, especially in developing countries. Young scientists therefore, have a responsibility to revive the social effectiveness of science and thereby, reconfirm it as the chief generator of truth and knowledge. Science must be seen as a source of integration and meaning, instead of an element of disintegration and doubt. In this way it will regain the endorsement of the majority.

The Governance Of Science

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Although science does not need public democracy to work effectively, and is indeed itself autocratic in its ideals of excellence, its fullest expression in human development will come when all are free to think, act and innovate. Informed democratic participation is impossible without confident scientific thinking and balanced technological assessment throughout societies. Civic society must therefore become willing partners with science for the attainment of its success.

It is consequently being advanced that science is vital for democracy and democracy for science. Moreover, it is proffered that the best science will emerge when innovative talent is allowed to grow and flourish unencumbered in just and democratic facilitating environments.

The roots of discoveries that have contributed to the evolution of modern civilized societies have their foundation in the purest forms of scientific activities. In order to improve the quality of human life by bringing new goods to the market place, to offset the impending exhaustion of fossil fuels, and finite mineral resources, governments of both developed and developing countries are relying on science to provide the new engines to drive the economies of tomorrow's world. Science is therefore perceived as big business by governments and scientists. Since governments are major providers of funds to drive scientific endeavors they assume a governing role for such activities. The current conventional practice is for governments to support innovation to improve the standard of living for the average citizen. Industry stresses the proprietary nature of knowledge - something that can be bought and sold. In contrast, the emphasis in universities is the pursuit and propagation of truth. Despite the differences between the goals of government, industry and universities, the modern approach is to forge a nexus between these disparate interest groups. Elaborate schemes have been established to govern various research enterprises. This presentation will make comparisons of structures and functions of the following major research sponsoring bodies: The US National Institutes of Health (NIH), the largest biomedical research facility in the world that is part of the US Department of Health and Human Services; the National Science Foundation (NSF); the National Research Council (NRC) of Canada; the UK Medical Research Council (MRC), a national non-departmental public body established by Royal Charter and funded mainly by the UK Government, the evolution of the Wellcome trust

from the International (tropical) units to the current six major research centers in the UK, and the European Economic Community (EEC). The access and participation of developing countries in international scientific activity will also be addressed.

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Research in the Sciences at The university of the West Indies – Limitations and Possibilities

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An overview of the status of research in the Science-based Faculties at the University of the West Indies will be presented, limitations discussed and possible new directions suggested.

Understanding Interactive Media In Science Education: Research, Development And Policy Lessons From Multiple Evaluations

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USA*

This paper will analyze three distinct evaluations of an interactive media National Science Foundation project in science education. It should be emphasized that having three separate evaluations of the same project from totally different perspectives, traditional as well as non-traditional, and by totally different evaluators, provide a rare opportunity to gain a more clear picture of interactive media in science education. Comparisons of these three evaluations reveal the complementary nature of the outcomes, as well as the complexity of evaluating technology projects. Multiple evaluations of interactive media innovations in science education could provide insight into the role of technology in science education and even more importantly, information necessary to make decisions concerning research, development and policy. Implications for cross-national settings will also be discussed.

The Future Of Chemical Information: IT In Spectroscopic Data Handling

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The first standard by the Joint Committee on Atomic and Molecular Physical Data Exchange (JCAMP-DX) was published for IR in the early 1990's. Even at that stage it was envisaged that it would expand to include other spectroscopic techniques and since then protocols for MS, NMR and IMS have been published and task groups are being set up for ESR, NIR and XML.

The benefits of such a standard include:

- It was the first non-binary approach to data formats and uses ASCII characters only (important for e-mail etc.)
- The JCAMP-DX protocol is non-proprietary, i.e. is vendor independent
- It has reasonable compression rates (important before cheap storage devices)
- It is extendable and open definitions allow further enhancements
- It is accepted and used by all major instrument manufacturers.

A major objective of JCAMP-DX has been to enable routine capture of data at the source and to make it available for exchange, archiving, and entry into databases.

Software developed at Mona enables data files that have been taken directly from different instruments to be displayed in a web browser. Some examples will be highlighted in the talk.

Nano-Science: What's in it for the Caribbean?

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There is considerable interest in particles (clusters, molecules, supramolecules, crystals, etc.) of dimensions between 1-100nm (nano-particles). Their mechanical, electronic, magnetic and chemical characteristics tend to be very different from those of larger particles or individual molecules. Many applications of nano-particles are being pursued. This presentation will examine this area of nano-science and seek out potential benefits for the Caribbean.

Production Of Legume Protein Isolates

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A methodology has been developed for the production of legume protein isolates. The process consists of a homogenization step in a phosphate buffer, filtration, an alkali precipitation step followed by a salting out step for the recovery of protein. The protein is purified by dialysis and the moisture removed by freeze drying to give a protein isolate. 75-90% of the total protein is recovered by alkali precipitation with 2-8% being recovered by salting out. By using dialysis, the thermal conductivity of the protein precipitate was reduced to 2.0- 4.0 $\mu\text{s}/\text{cm}$. Freeze-drying of the protein precipitate produced a protein isolate in the form of a fine powder. The freeze drying constant for the proteins recovered by precipitation methods was found to be in the range 0.08-0.24 min^{-1} . The protein isolate was stable for three months after recovery. Six legumes were selected for analysis: black eye pea, channa, lentil, pigeon pea, red kidney beans and split pea. Pigeon pea gave the best protein recoveries.

**Protein-Protein Molecular Interactions Of Wheat Flour
During Extrusion Processing: Rheological And Expansion
Studies
With Sodium Bisulfite And L-cysteine**

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Researchers have proposed a range of reaction pathways for protein-protein crosslinking during extrusion processing and thus in the development of textural characteristics of extruded products. What is clear is that the mechanism of protein-protein interactions which play an important role in rheological properties, texture and structure development during extrusion processing are rather complex and remain uncertain. It is therefore important to understand the mechanism of protein-protein interactions during extrusion and the stability of such extruded products.

This study investigates the effect of both sodium bisulfite and L-cysteine on the rheological properties of wheat flour extrudates, possible mechanisms of protein-protein interactions, and the relationship between such interactions, extrudate expansion and product stability.

On-line rheological measurements and expansion studies were generated by a WP ZSD-30 corotating twin screw extruder during extrusion processing of wheat flour at moisture contents of 25% and 18% respectively. Glass transition temperatures of expanded and unexpanded extrudates were determined by differential scanning calorimetry and mechanical spectrometry. All experiments were carried out in the presence of L-cysteine and sodium bisulfite at concentrations of 0, 0.25, 0.5 and 0.75%.

Results show reducing shear viscosity of the melt and increased extrudate expansion as additive concentration increased. Rheological properties did not affect glass transition behaviour of the extrudates and thus product stability.

Combination of on-line rheological results, expansion studies data and dynamic oscillatory results provide both a qualitative and quantitative basis for arriving at a better understanding of possible reaction mechanisms which may occur during extrusion processing of cereal products. Possible reaction pathways and a preliminary reaction kinetic model to characterize the rheological behavior are suggested.

Studies on the Interaction of Some Bivalent Metal Ions with Bioactive Ligands

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A new and simple method involving the use of paper ionophoresis is described for the study of the equilibria in mixed ligand complex system in solution. Present technique is based on the movement of a spot of metal ions under an electric field with the complexant added in the background electrolyte at pH = 8.5. Concentration of the primary ligand nitrilotriacetate was kept constant while that of secondary ligand methylcysteine varied. The plots of $-\log [\text{methylcysteine}]$ versus mobility were used to obtain information on the formation of mixed complexes and to calculate its stability constants. The binary equilibria metal(II) – methylcysteine and metal(II) – nitrilotriacetate have also been studied since this is a prerequisite for the investigation of mixed complexes. The stability constants of mixed metal(II) – nitrilotriacetate – methylcysteine have been found to be 3.42 ± 0.05 and 4.42 ± 0.09 (logarithm stability constant values) for lead(II) and uranyl(II) complexes respectively, at ionic strength 0.1 M and a temperature of 35° C.

Preparation Characterisation And Utilisation Of Activated Carbon In The Caribbean Region

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As it well known, activated carbons exhibit a large adsorption potential, which results from the activation of its internal natural porosity. The investigation, production, control and characterisation of this material rely on the collaboration of research teams having specific specialisations and tasks. It is generally difficult to meet this requirement in each individual country of the Caribbean.

Experience has shown that this could be possible at the scale of the whole region, given the many works published in Cuba, Trinidad and Tobago, and Guadeloupe. Some of this work has been carried out in collaboration with Belgium, Canada and Spain. Recommendations of the 7th General Annual Conference of the Caribbean Academy of Sciences (CAS) which took place in Tobago in 1996 centred on the developmental investigations into the production of activated carbon from resources (raw materials and waste) of our region.

This paper is concerned with the following:

- Potential for Caribbean integrated research in the field of preparation, characterization and utilization of activated carbon.
- Guidelines for international cooperation in the field of preparation and application of activated carbon produced from biomass in the Caribbean.

Advances In Tourist Destination Web-site Technology

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Many Caribbean economies rely heavily on tourism, and promotion of tourist destinations over the internet is becoming increasingly important to the tourism and hospitality industry, especially by means of the world wide web (WWW). Continued growth of the internet and e-commerce means that this communication channel will increase its relative importance in destination marketing, as it has for sales of airline tickets and leisure in general. Furthermore, as advanced multimedia capability is becoming commonplace in home computers, and high speed networking to the home is rapidly being introduced, customers will expect a growing sophistication in destination marketing deployed over the web. In this paper, the anatomy of a tourist destination web-site is reviewed, concentrating on typical characteristics. This is followed by discussion of how new computing, internet, and information technologies will change the way tourists choose vacation destinations and book their holidays. In particular, we present recent work at the University of Technology, Jamaica (UTech) into the incorporation of virtual reality into a WWW portal, intended to allow potential tourists to experience a taste of Jamaica in a 3D graphical environment from their homes, over the internet. The choices available for implementation of virtual reality are described, in terms of 3D formats and modes of interaction. Finally we attempt to draw out the essential characteristics required to make 3D work in a tourism application.

Internet Use Among Small and Mid-sized Businesses in Guyana: Unrealized Potential?

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Internet has created a new marketplace on the World Wide Web. This development is still in its early stage but has recently been growing at a rapid rate. It is likely to grow immensely in importance for global marketing in the future. Many studies were undertaken on Internet use but most have been based on developed countries such as the U.S.A., Australia and New Zealand. Guyana, third world by contrast, is way behind in Information Technology. This study seeks to determine the extent of unrealized potential of Internet use by small versus mid-sized businesses in Guyana. Questionnaires were designed to target small and mid-sized businesses in Guyana- primarily in the area of Georgetown (Region 4). The questionnaire was designed to collect the more reliable and consistent data for administration and interpretation, and authoritative sources were consulted to obtain standardized concepts and definitions. Size distinction in this study was based on number of employees.

The findings indicate that small and mid-sized businesses use Internet mainly for external applications like Communication, Marketing and Information Technology. The study further reveals that the lack of knowledge by mid-sized businesses is one of the prime reasons for not using Internet whereas small sized businesses feel that there is a lack of security in the use of Internet. Small and mid-sized businesses view the Internet as equally beneficial to their operations and have the expectancy of deriving a wider variety of benefits from Internet use in the future. Guyana needs to

develop its information technology potential to enter this competitive environment. Small and mid-sized businesses need to tap this unrealized potential i.e. the use of Internet to make a significant impact in the overall economic condition of the country and thereby open their businesses to a global arena.

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Young Scientist Lecture

Chemical Evolution and Primeval Seas

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Due to ease of formation of cyanide under prebiotic conditions, it is thought that cyanide might have formed stable complexes with the abundant transition metal ions present in the primeval seas. It is further assumed that during the course of chemical evolution, cyanide could also have formed insoluble double metal ferrocyanides of general formula $M_2 [Fe (CN)_6]$, where M could be Cu^{2+} , Zn^{2+} , Mn^{2+} and Sn^{2+} etc. As these metal ferrocyanides are insoluble in water, and they are therefore considered to have settled at the bottom of the primitive ocean or at the sea shore. It is proposed that the metal ferrocyanides which settled at the bottom of the primeval seas could have adsorbed biomonomers, thus condensation of biomonomers to biopolymers might have occurred in the presence of these metal ferrocyanides.

Adsorption of glycine and β -alanine on nickel, cobalt and cadmium ferrocyanides has been studied at neutral pH (7.0) and room temperature (30°C). The progress of adsorption was followed spectrophotometrically by measuring the absorbance of amino acids solution at their corresponding λ_{max} . At neutral pH (7.0), β -alanine was found to more adsorbed than glycine on nickel, cobalt and cadmium ferrocyanides. The Langmuir type of adsorption is followed in the concentration range of 10^{-4} M – 10^{-3} M of glycine and β -alanine solution.

Results on the present studies suggest the importance of double metal ferrocyanides as condensing agents for biomolecules during the course of chemical evolution and the origin of life on the prebiotic Earth. The

insoluble metal ferrocyanides on coming in contact with biomolecules must have either formed transition metal complexes have enhanced the formation of biopolymers in fluctuating environment.

Small Lanthanide Nanoclusters: Syntheses, Structures and Electronic Spectroscopy

Marvadeen A. Sigh-Wilmot,¹ Ishenkumba A. Kahwa,¹ Alan J. Lough,²
Andrew J. P. White³ and David J. Williams³

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Nanoparticles and their electronic behavior are currently of great interest because of the unusual electronic, mechanical and catalytic properties, which usually are size dependent. The preparation, crystal structures and luminescence behavior of small nanoclusters of the $[\text{Ln}_4(\text{OH})_4]^{8+}$ and $[\text{Ln}_4\text{O}(\text{OH})_2]^{8+}$ cores will be presented. The strength of electronic metal-metal interactions within these clusters depends on the type of cluster.

Single-Crystal XRD, TEM, And Thermal Studies Of The Satellite Reflections In Nepheline

Ishmael Hassan

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A nepheline, $(\text{K}_{1.32}\square_{0.68})(\text{Na}_{5.64}\text{Ca}_{0.36})[\text{Al}_{7.93}\text{Si}_{8.07}\text{O}_{32}]$, from Bancroft, Ontario, Canada have been studied using single-crystal X-ray diffraction, transmission electron microscopy, thermal analyses, and powder X-ray diffraction. The structure of nepheline was refined in the space group $P6_3$ to an R_1 index of 0.0410 for 737 unique reflections. The pseudo-hexagonal subcell parameters for nepheline are $a = 9.9853(7)$ and $c = 8.3689(17)$ Å. The Al and Si atoms are fully ordered. The O1 framework oxygen atom is disordered over three nearby positions that are slightly displaced off the threefold axis in the average structure. Vacancies are present in the K site. Selected-area electron diffraction (SAED) patterns show that the satellite reflections in nepheline are very weak and diffuse, and give rise to an incommensurate supercell. Although nepheline damages easily in the electron beam, high-resolution transmission electron microscopy (HRTEM) images indicate that nepheline probably consists of domains that are separated by antiphase boundaries (APBs). Results from thermal analyses indicate that a displacive transformation occurs in nepheline at 292 °C and represents a positional order-disorder of O1 oxygen atoms. A K – \square order-disorder transformation occurs at 399 °C and is attributed to disordering of K ions and vacancies, \square , in the large sixfold channels of the nepheline structure. The Al-Si order is not involved in the above transitions because of the small amount of energy involved in those transitions and because the Al and Si sites remain distinct to high temperatures. However, an Al-Si order-disorder transformation occurs at 963 °C and involves the highest energy among the various transitions. Except for Al-Si ordering,

the different structures are stable only over a restricted temperature interval because the most favourable configuration for each of the separate O1 and K - □ distribution is not compatible with the most favourable configuration of the others. The ordering that gives rise to the satellite reflections is destroyed in the electron beam and resulted in a twin unit cell in some cases.

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Analysis of Persistent Organic Pollutants by GC and GC/MS

C. Kai Meng, Mike Szelewski, Harry Prest, Joe Hedrick

Agilent Technologies

Persistent organic pollutants (POP's) are a specific group of slow degrading pesticides and industrial chemicals that tend to bioaccumulate. Most POP's are normally analyzed by GC or GC/MS.

When analyzed by GC/MS the typical quantitation limit in scan mode is in the sub-ppm range. Without any hardware modification, a lab can decrease the target compound quantitation limit to the low-ppb range using a Retention Time Locked (RTL) SIM (single ion monitoring) or ECD method. Adding Large Volume Injection (LVI) capability to the method, target compounds at parts-per-trillion can be quantified.

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