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PGIS News

Quarterly Update of the work and progress of the Postgraduate Institute of Science (PGIS), University of Peradeniya, SRI LANKA (also available at www.pgis.lk)

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10TH ASIAN CONFERENCE ON SOLID STATE IONICS (ACSSI - 10) AND ASIAN CONFERENCE ON SOLAR ENERGY MATERIALS AND SOLAR CELLS (ACSEMSC): 12 – 16 JUNE 2006

Hon. Prof. Tissa Vitharana, Minister of Science and Technology addressing the Inaugural Session of the ACSSI-10 held at the PGIS during June 12 - 16, 2006. Seated (L to R): Prof. B V R Chowdari (National University of Singapore), Prof. O A Ileperuma (Dean, Faculty of Science), Prof. M A K L Dissanayake (Director, PGIS and Co-chairman, Organizing Committee), Prof. A Wickramasinghe (Acting Vice-Chancellor, University of Peradeniya), Prof. M A Careem (Co-chairman, Organizing Committee) and Prof. W Weppner (University of Keil, Germany).

10th Asian Conference on Solid State Ionics (ACSSI – 10) and Asian Conference on Solar Energy Materials and Solar Cells organized by the Postgraduate Institute of Science and the Faculty of Science, University of Peradeniya were held at the PGIS Auditorium from 12th to 16th June 2006. 97 foreign scientists and 69 local scientists participated in these two international research conferences.

Latest developments on technologically important materials, including nano-materials that could be used in solid state batteries, sensors and solar cells were discussed and research papers were presented by local and foreign scientists and research students working in these research areas. The conference provided a forum for local researchers to interact with their peers from other countries and exchange ideas and initiate collaborative research projects in these important areas of materials research.

Hon. Tissa Vitharana, Minister of Science and Technology was the Chief Guest at the inauguration held on 12th June at 9.00 a.m. at the PGIS auditorium.

The organizing committee consisted of Prof. Lakshman Dissanayake and Prof. M A Careem, as co-chairmen, Prof. Gamini Rajapakshe, Dr. Varuni Seneviratne, Prof. K Premaratne and Dr. V Sivakumar and several senior academics from Peradeniya and other Universities. The Asian Solid State Ionics Society was represented by Prof. B V R Chowdari of National University of Singapore. The keynote address on 12th June 2006 was delivered by Prof. Werner Weppner of University of Keil, Germany. According to the feed back received from the participants these two conferences were very successful and local arrangements were quite impressive. Presentations were of very high academic standard.

Proceedings of the ACSSI-10 conference was published by World Scientific Co., Singapore. Sponsorship for the two conferences were provided by Abdus Salam International Centre for Theoretical Physics (Trieste, Italy), Asian Society of Solid State Ionics (ASSSIS), Materials Research Society (Singapore), and National Science Foundation, University Grants Commission, PGIS and University of Peradeniya (Sri Lanka).

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We shall be pleased to receive your comments, suggestions and contributions with a view to improving the quality of this newsletter. Correspondence and requests for copies of **PGIS *News*** should be addressed to Dr. N C Bandara – Editor:

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10th Anniversary of the PGIS: A Message from "Vidya Nidhi"

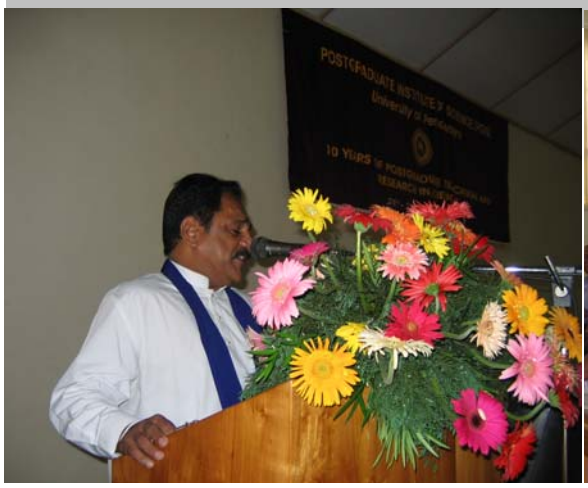
Prof. M A K Lakshman Dissanayake,
Director, PGIS

The Postgraduate Institute of Science (PGIS), University of Peradeniya completes 10 years of service to the nation this year. During this 10-year period, the PGIS has been able to move into its own three-storey building, design and offer more than 20 M.Sc. Programmes of national importance, train more than 500 M.Sc., M.Phil. and Ph.D. graduates, set up a modern computer laboratory and a dedicated laboratory for GIS and Remote Sensing, conduct a large number of workshops, short courses, training programmes in important areas of science and technology and organize several international research conferences. A number of collaborative programmes with leading foreign institutions have been established. The PGIS has been able to achieve all these during a short span of 10 years, largely due to the active corporation extended by the members of the Faculty of Science and other Faculties of the University of Peradeniya, other Universities and research institutions.

PGIS has been able to offer some unique and interdisciplinary M.Sc. programmes starting them for the first time in Sri Lanka. This has been possible largely due to the availability of experts from seven different Faculties at Peradeniya. M.Sc. programmes in Disaster Management, GIS and Remote Sensing and Science Education are some of the programmes initiated by the PGIS.

During the next phase of development of this national institute, infrastructure facilities need to be expanded and new postgraduate programmes in emerging areas of science and technology as well as those relevant to our socio-economic development need to be initiated. The institute has the potential to expand further and train the human resources in scientific disciplines needed for our national development.

I would like to take this opportunity to extend my sincere gratitude to those who have contributed their utmost support to make the PGIS a leader in postgraduate level science education and research and seek their continuous support to make it a Centre of Excellence in the region.



Hon. Tikiri Kobbakaduwa, the Governor of the Central Province, who was the Chief Guest at the 10th Anniversary Celebrations of the PGIS held on 28th April 2006 at the PGIS Auditorium, is seen here addressing the audience. The first activity of the day was a seminar-session, where eminent alumni and chairpersons of Boards of Study of the PGIS made presentations.

PGIS inaugurates the first MSc and MSc Eng Programmes in Disaster Management

The chief-guest, His Excellency Dr. Greg French, High Commissioner for Australia in Sri Lanka addressing the audience at the inauguration ceremony of MSc programmes on Dec. 16, 2006 held at the PGIS Auditorium. Seated (L to R): Dr. N C Bandara, Prof. V Kumar (Dean, Faculty of Science), Prof. M A K L Dissanayake (Director, PGIS), Prof. K Dahanayake (Acting Chairman, Board of Study in Earth Sciences), Dr. A P N Somaratne (Acting Dean, Faculty of Engineering) and Prof. N K B Adikaram (Chairman, Board of Study in Plant Sciences).

For the first time in Sri Lanka MSc and MSc Eng programmes in Disaster Management were commenced at the Postgraduate Institute of Science on December 16, 2006. These programmmes are conducted jointly by the PGIS and the Faculty of Engineering University of Peradeniya. Several foreign institutes also participate in the conduct of courses for these programmes. Among them are: ITC (The Netherlands) and ADPC (Thailand).

The MSc and MSc Eng programmes in Disaster Management were inaugurated together with MSc programmes in Medical Microbiology and Water Resources Management on December 16, 2005 at the PGIS. His Excellency Dr. Greg French, High Commissioner for Australia in Sri Lanka was the chief-guest at this occasion.

M.Sc. PROGRAMMES COMMENCED (July 2005 - June 2006)

M.Sc. Programme *(Date of Commencement)*	***Board of Study***	***Coordinators***	***No. of Students***
Plant Sciences (*July 1, 2005*)	*Plant Sciences*	*Dr. S. Madawala Weerasinghe (Dept. of Botany, UPDN)*	*4*
M.Sc. & M.Sc.Eng. in Disaster Management (*December 16, 2005*)	*Earth Sciences*	*Prof. K. Dahanayake (Dept. of Geology, UPDN)* *Prof. M. A. K. L. Dissanayake (Director, PGIS)* *Dr. A. P. N. Somaratne (Head, Dept. of Civil Engineering, UPDN)* *Dr. J. Wijetunga (Dept. of Civil Engineering, UPDN)*	*MSc - 33* *MSc Eng - 12*
Medical Microbiology (*January 27, 2006*)	*Plant Sciences*	*Dr. C. L. Abayasekara (Dept. of Botany, UPDN)* *Prof. V. Thevanesam (Head, Dept. of Microbiology, UPDN)*	*10*
Water Resources Management (*May 6, 2006*)	*Earth Sciences*	*Dr. H. A. Dharmagunawardhane (Dept. of Geology, UPDN)*	*15*

UPDN ≡ University of Peradeniya

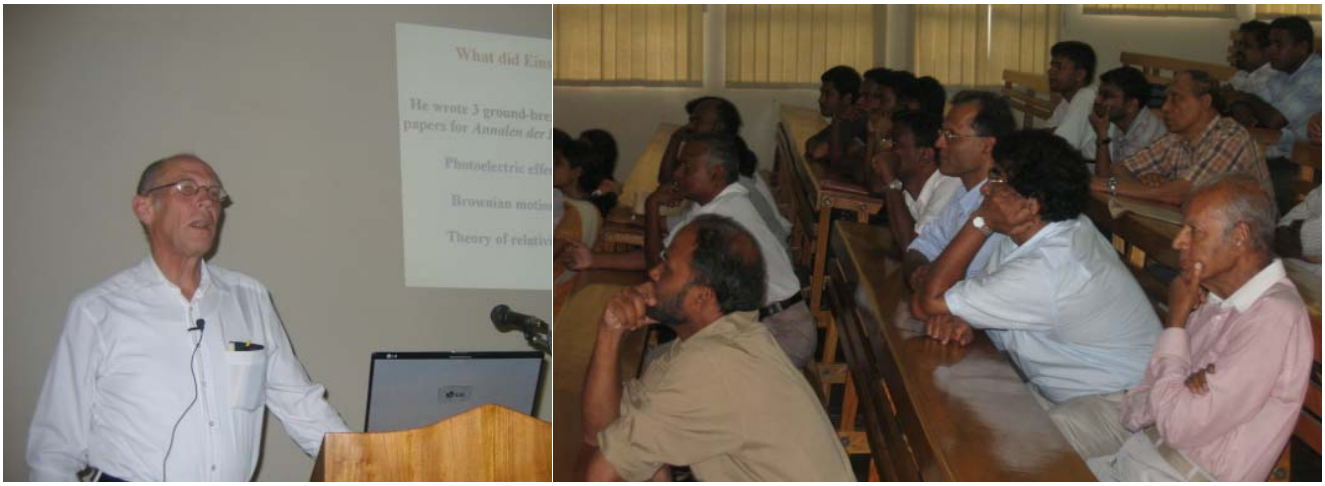
PUBLIC LECTURES AND SEMINARS
(July 2005 – June 2006)

Title of the Lecture/Seminar	*Presenter's Name & Affiliation*	*Date*
Methods and applications of image analysis in medicine	*Prof. Ewert Bengtsson* *Centre for Image Analysis* *Uppsala University, Sweden*	*July 04, 2005*
Some examples of land use pressures on water resources in relation to catchment management issues	*Dr. Simon Langan* *Senior Research Scientist, Environmental Science Group,* *Macaulay Institute, Aberdeen, Scotland, UK*	*July 05, 2005*
Cysteine protease in urchin eggs and embryos	*Prof. Aki Moriyama (B.Sc., M.Sc., Ph.D.)* *Dean, Graduate School of Natural Sciences* *Nagoya City University, Japan*	*August 08, 2005*
Ecology of metal hyperaccumulation and the emerging field of phytoremediation	*Dr. Nishanta Rajakaruna* *Professor of Botany, Atlantic College* *Maine, USA*	*August 10, 2005*
Agent - based modeling	*Prof. Jon Pearce* *Professor of Computer Science & Mathematics* *San Hose State University, California, USA*	*August 20, 2005*
Applying mass spectrometry in biological research	*Prof. Werner Ens* *Department of Physics & Astronomy* *University of Manitoba, Winnipeg, Canada*	*September 05, 2005*
The barcode of life initiative: progress and available tools	*Dr. Sujeevan Ratnasingham* *Informatics Lead, Barcodes of Life Initiative* *Biodiversity Institute of Ontario, University of Guelph,* *Ontario, Canada*	*September 20, 2005*
Early cancer detection using laser-induced fluorescence	*Prof. Katarina Svanberg MD, PhD* *Overlakare, Docent, Associate Professor of Oncology* *Lund University Medical Laser Centre* *Division of Oncology, Lund University Hospital* *Sweden*	*October 10, 2005*
Organized in collaboration with the Department of Radiology, Peradeniya Teaching Hospital, as an event under the 'World Year of Physics' celebrations and conducted at the Teaching Hospital, Peradeniya.		
Laser spectroscopy applied to energy, environmental and medical research	*Prof. Sune Svanberg* *Chairman, Physics Nobel Prize Committee &* *Professor, Department of Physics* *Lund Institute of Technology and Lund Laser Centre, Lund University, Sweden*	*October 10, 2005*
Organized in collaboration with the Department of Physics, University of Peradeniya, as an event under the 'World Year of Physics' celebrations		

The selection of Nobel Prize winners in physics	*Prof. Sune Svanberg* *Chairman, Physics Nobel Prize Committee &* *Professor, Department of Physics* *Lund Institute of Technology and Lund Laser Centre, Lund University, Sweden* *(Conducted at the IFS, Kandy)*	*October 11, 2005*

Organized in collaboration with the Institute of Fundamental Studies (IFS), Kandy, as an event under the 'World Year of Physics' celebrations

World Year of Physics	*Prof. Sune Svanberg* *Chairman, Physics Nobel Prize Committee &* *Professor, Department of Physics* *Lund Institute of Technology and Lund Laser Centre, Lund University, Sweden*	*October 11, 2005*



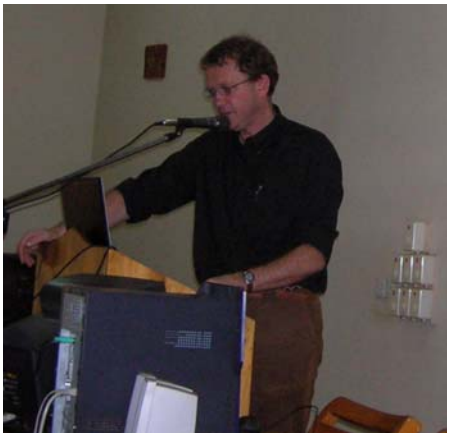
Prof. Sune Svanberg , Chairman, Physics Nobel Prize Committee & Professor of Physics at Lund University, Sweden giving a presentation on '*World Year of Physics*' at the PGIS auditorium on Oct 11, 2005.

Evolution of plants and ants in Macaranga (Euphorbiaceae)	*Dr. Stuart Davies* *Director, Centre for Tropical Forest Science* *Smithsonian Tropical Research Institute* *Republic of Panama*	*October 31, 2005*
Active resistance in plants	*Professor David Guest* *Professor of Horticulture, University of Sydney* *New South Wales, Australia*	*November 29, 2005*
Some problems associated with the inverse Gaussian distribution	*Prof. Vanamamalai Seshadri* *Department of Maths and Statistics* *McGill University, Montreal, P.Q., CANADA*	*December 17, 2005*
Dating of past climatic events through the study of tree ring growth	*Dr. Brendan Buckley* *Associate Research Scientist, Tree Ring Laboratory, Lamont Doherty Earth Observatory, The Earth Institute at Columbia University, New York, U.S.A. &* *Director, Laboratory of Tropical Dendrochronology, Kasetsart University, Thailand*	*December 20, 2005*

Resume and interview tips	*Dr. Ravi Ranatunga* *Procter & Gamble* *USA*	*December 20, 2005*

Organized by PGIS –Young Researchers' forum (YRF)

Earthquakes: hazards, prediction and vulnerability	*Dr. Rashmin Gunasekera* *Postdoctoral Research Fellow* *School of Science and the Environment* *University of Coventry, U.K.*	*December 29, 2005*
Dipterous pests and their control: Ecological mosquito regulation along low-land rivers of Eastern Austria	*Dr. Bernhard Seidel* *Department of Theoretical Biology* *University of Vienna* *Austria*	*January 19, 2006*
Applications of Geo Information Systems and Remote Sensing (GIS & RS) for hazard and risk assessment	*Prof. Cees van Westen* *International Institute for Geoinformation Science and Earth Observation (ITC), The Netherlands*	*February 9, 2006*



Prof. Cees Van Westen from ITC, The Netherlands giving a presentation on Feb. 9, 2006 at the PGIS Auditorium on '*Applications of GIS & RS for hazard and risk assessment*'.

Biosensors for improved postharvest quality control	*Dr. Leon A. Terry* *Plant Science Laboratory, Cranfield University* *Bedfordshire, U.K.*	*February 15, 2006*
Preventing environmental pollution	*Prof. O A Ileperuma* *Dept. of Chemistry, Univ. of Peradeniya*	*February 23, 2006*
Living with landslides	*Prof. K G A Dahanayake* *Dept. of Geology, Univ. of Peradeniya*	

Organized in collaboration with the Science Education Unit, Faculty of Science, University of Peradeniya as an awareness programme for students, their parents and teachers at the Hindagala Maha Vidyalaya, Kandy

Web-based analytics for business decision-making	*Dr. Sam Weerahandi* *Director of Analysis* *Time/Warner RSM Research* *New York, U.S.A.*	*June 23, 2006*

VISITORS FROM FOREIGN UNIVERSITIES/INSTITUTES (July 2005 – June 2006)

- *Prof. Ewert Bengtsson, Centre for Image Analysis, Uppsala University, Sweden*
- *Dr. Simon Langan, Senior Research Scientist, Environmental Science Group, Macaulay Institute, Scotland, U.K.*
- *Prof. Aki Moriyama, Dean, Graduate School of Natural Sciences, Nagoya City University, Japan*
- *Dr. Nishanta Rajakaruna, Professor of Botany, Atlantic College, Maine, U.S.A.*
- *Prof. Jon Pearce, Professor of Computer Science & Mathematics, San Jose State University, California, U.S.A.*
- *Prof. Werner Ens, Department of Physics & Astronomy, University of Manitoba, Winnipeg, Canada*
- *Dr. Sujeevan Ratnasingham, Informatics Lead, Barcodes of Life Initiative, Biodiversity Institute of Ontario, University of Guelph, Ontario, Canada*
- *Prof. Katarina Svanberg, Overlakare, Docent, Associate Professor of Oncology, Lund University Medical Laser Centre, Division of Oncology, Lund University Hospital, Sweden*
- *Prof. Sune Svanberg, Chairman, Physics Nobel Prize Committee &Professor, Department of Physics, Lund Institute of Technology and Lund Laser Centre, Lund University, Sweden*
- *Dr. Stuart Davies, Director, Centre for Tropical Forest Science, Smithsonian Tropical Research Institute, Republic of Panama*
- *Professor David Guest, Professor of Horticulture, University of Sydney, New South Wales, Australia*
- *Prof. Vanamamalai Seshadri, Department of Maths and Statistics, McGill University, Montreal, P.Q., Canada*
- *Dr. Ravi. Ranatunga, Procter & Gamble Co., U.S.A.*
- *Dr. Brendan Buckley, Associate Research Scientist, Tree Ring Laboratory, Lamont Doherty Earth Observatory, The Earth Institute at Columbia University, New York, U.S.A. & Director, Laboratory of Tropical Dendrochronology, Kasetsart University, Bangkok, Thailand*
- *Dr. Rashmin Gunasekera, School of Science and the Environment, University of Coventry, U.K.*
- *Dr. Bernhard Seidel, Department of Theoretical Biology, University of Vienna, Austria*
- *Prof. Cees van Westen, International Institute for Geoinformation Science and Earth Observation, The Netherlands*
- *Dr. Leon A. Terry, Plant Science Laboratory, Cranfield University, Bedfordshire, U.K.*
- *Dr. Sam Weerahandi, Director of Analysis, Time/Warner RSM Research, New York, U.S.A.*

Some of the conference sessions of ACSSI-10 and ACSEMSC conferences held at the PGIS during June 12 – 16, 2006.

WORKSHOPS (WS), SEMINARS (S), CONFERENCES (C) AND SHORT COURSES (SC)

(July 2005 – June 2006)

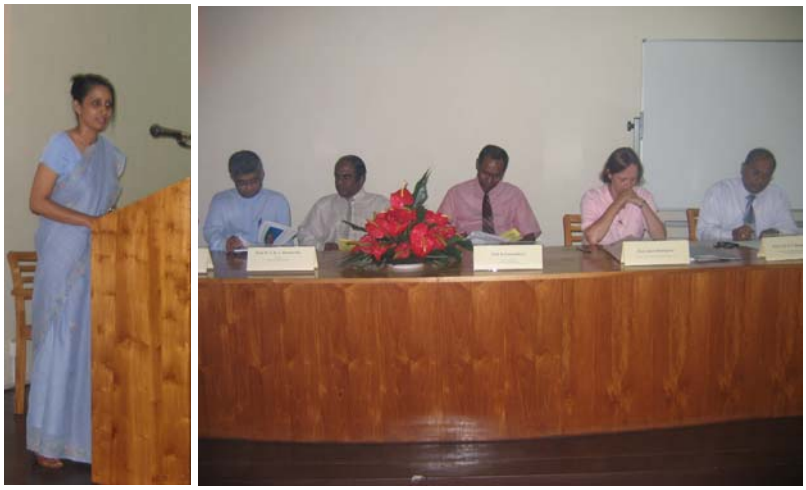
Event	***Coordinator/s (Board of Study)***	***Period***	***No. of Participants***
National Symposium on Mosquito Control	*Prof. SHPP Karunaratne* *Dr. R Rajakaruna* (*Zoological Sciences*)	*September 15 – 16, 2005*	*50*
Postharvest Handling of Fruits & Vegetables (*WS*)	*Dr. M Daundasekara* *Dr. C Abayasekara* (*Plant sciences*)	*October 20 – 21, 2005*	*19*
Postgraduate Certificate Course in 'Advanced Biochemistry'	*Prof. R Sivakanesan* *Dr. SBP Athauda* (*Biochem. & Mol. Biology*)	*October 2005 – January 2006*	*9*
Pre- & Postharvest Management of Vegetables & Cut Flowers (*WS*)	*Dr. C Abayasekara* *Dr. M Daundasekara* (*Plant Sciences*)	*October 24 – 25, 2005*	*35*
Peradeniya University Research Sessions (*PURSE*)	*The PGIS joined the Faculty of Science at the Peradeniya University Research Sessions (PURSE) - 2005 where research papers by PGIS students were presented.*	*November 10, 2005*	
2nd Short course on GIS and its Applications (*SC*)	*Dr. AAJK Gunatilaka* (*Earth Sciences*)	*November 30 – Dec. 5 &* *December 15 – 18, 2005*	*65*
Health and Anesthesia in Captive Elephants (*SC*)	*Dr. A Dangolla* (*Zoological Sciences*)	*December 3, 2005*	*24*
Identification of Common Bees of Sri Lanka (*SC*)	*Prof. JP Edirisinghe* *Dr. WAIP Karunaratne* (*Zoological Sciences*)	*December 19 – 20, 2005*	*15*
Dendrochronology (*WS*)	*Prof. IAUN Gunatillake* (*Plant Sciences*)	*December 22, 2005*	*24*
Introduction to Ecological Data Analysis using Univariate and Multivariate Techniques (*WS*)	*Prof. IAUN Gunatillake* *Dr. SM Weerasinghe* (*Plant Sciences*)	*January 4 – 5, 2006*	*30*

'Biological and Cultural Ecology of Sri Lanka': A Study Programme for a Staff/Student Group from U.S.A.	*Prof. SA Kulasooriya* *Prof. Jon Pearce, U.S.A* (*PGIS*)	*January 5 – 22, 2006*	*9*
3rd Short course on GIS and its Applications (*SC*)	*Dr. AAJK Gunatilaka* (*Earth Sciences*)	*January 12 – 13, 2006*	*40*
Environmental Management: Basic Concepts and Legal Framework (*SC*)	*Dr. GWAR Fernando* *Dr. AKN Zoysa* *Mr. WADD Wijesooriya* (*Environmental Sciences*)	*January 28 - 29, 2006*	*38*
GIS and its Applications (*SC*)	*Dr. AAJK Gunatilaka* (*Earth Sciences*)	*February 9-17, 2006*	*1*
Active Teaching and Learning Approaches in Science (*6th ATLAS WS*)	*Dr. S Karunaratne* (*Science Education*)	*February 21, 2006*	*71*
Programme on 'Albert Einstein and Physics'	*PGIS* *and Department of Physics, University of Peradeniya*	*March 14, 2006*	*125*
4th Short course on GIS and its Applications (*SC*)	*Dr. AAJK Gunatilaka* (*Earth Sciences*)	*April 3 - 8, 2006*	*21*
10th Anniversary Celebrations of PGIS: *- Seminar and Poster Session* *- Seminar for A/L Science Teachers*	*PGIS*	 *April 28, 2006* *April 29, 2006*	 *100* *79*
Actuarial Statistics (*SC*)	*Dr. P Wijekoon* (*Stat. & Computer Science*)	*April 29 - 30, 2006*	*49*
Dynamic Modeling for Landslides & Floods using GIS & RS (*WS*)	*Dr. AAJK Gunatilaka* (*Earth Sciences*)	*May 8 - 11, 2006*	*65*
Computer & Computational Mathematics (*SC*)	*Dr. AAI Perera* *Dr. HM Nasir* (*Mathematics*)	*May 26 - 28, 2006*	*31*
Loss and Damage (*WS*)	*PGIS*	*June 3 - 4, 2006*	*40*
Disaster Management (*SC*)	*Prof. K Dahanayake* *Dr. AAJK Gunatilaka* *Dr. J Wijetunga* (*Earth Sciences*)	*June 5 - 9, 2006*	*112*
10th Asian Conference on Solid State Ionics (*ACSSI-10*) *and* *Asian Conference on Solar Energy Materials and Solar Cells* (*ACSEMSC*)	*Organizing Committee with Prof. Lakshman Dissanayake and Prof. M A Careem as co-chairmen:* *PGIS & Faculty of Science, University of Peradeniya*	*June 12 - 16, 2006* *June 14 - 16, 2006*	*97 - foreign & 69 - local*

REPORTS FROM THE COORDINATORS OF WORKSHOPS, SEMINARS, CONFERENCES & SHORT COURSES

NATIONAL SYMPOSIUM ON MOSQUITO CONTROL

The National Symposium on Mosquito Control organised by the Board of Study in Zoological Sciences of the PGIS was held on the 15th and 16th September 2005 at the PGIS. More than fifty participants representing Universities, Research Institutes, Antimalaria Campaign, Antifilariasis Campaign, National Dengue Control Unit, World Health Organization attended the symposium. The Deputy Vice Chancellor, Prof. E.R.N. Gunawardena was the chief guest at the inauguration ceremony. The main objective of the symposium was to provide an opportunity for researchers to present their research findings, to get exposed to new developments in mosquito control research and to interact with their peers from various institutes.



Dr. Rupika Rajakaruna (Co-coordinator of the symposium) is addressing the audience during the inaugural ceremony of the National Symposium on Mosquito Control held at the PGIS Auditorium on 15th September 2005. Seated L to R: Prof. V Kumar (Dean, Faculty of Science), Prof. Lakshman Dissanayake (Director, PGIS), Prof. Nimal Gunawardena (Acting Vice-Chancellor, University of Peradeniya), Prof. Janet Hemingway (Director/ Liverpool School of Tropical medicine, UK) and Prof. Parakrama Karunaratne (Chairman, Board of Study in Zoological Sciences & Co-coordinator of the symposium).

Sixteen eminent scientists who are working on mosquito control research in Sri Lanka were invited as resource persons. The Guest Speech on '*Progress, opportunities and need for operational mosquito control globally'* was delivered by Professor Janet Hemingway, (Director/ Liverpool School of Tropical medicine, U.K.) one of the leading researchers of the world in the field of mosquito control. Dr Pushpa R.J. Herath, a WHO retiree Scientist/Entomologist, World Health Organization, Geneva, Switzerland discussed '*Strategies for control of vectors of mosquito-borne diseases in Sri Lanka'*. Several high quality scientific work carried out on mosquito control were presented at the symposium covering a wide area including, *use of insecticides and insecticide resistance, Sri Lankan larvivorous fish species in mosquito control, use of insect growth regulators in mosquito control, Anopheline species complexes, application of Farmer Field School Technology for integrated pest and vector management, bioinsecticides, use of impregnated bed nets, phototoxic effect of some porphyrin derivatives against the mosquito larvae and GIS in mosquito control*. The symposium provided a great opportunity and a single forum to bring all the scientists/students in biological and medical sciences together for dissemination and sharing their expertise for an effective mosquito control in Sri Lanka.

The proceedings of the symposium were published jointly by the PGIS and the National Science Foundation Sri Lanka (NSF) with Prof. S.H.P.P. Karunaratne as the editor. The coordinators gratefully acknowledge the partial funding provided by the NSF.

Coordinators: Prof. S H P P Karunaratne
Dr. R S Rajakaruna

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WORKSHOP ON 'POSTHARVEST HANDLING OF FRUITS AND VEGETABLES'

Workshop on 'Postharvest Handling of Fruits and Vegetables' was held during October 20 – 21, 2005 at the Postgraduate Institute of Science, University of Peradeniya. The technical sessions commenced with an overview of the current trends in fruit and vegetable industry and postharvest technology in Sri Lanka and the ASEAN countries. This enabled the participants to realize the level at which we in Sri Lanka, need to improve current practices in postharvest technology, in order to achieve significant improvements in the industry. Different stages of the postharvest chain were dealt with. Special reference was made to banana, mango, pineapple and papaya, which are fruits that are currently being exported and have potential for improvement, both for local and export markets. Handling of selected vegetable was discussed.

Prof. N K B Adikaram (Chairman, Board of Study in Plant Sciences), Mr. Tony Cooke (Principal Resource Person from QDPI, Australia), Dr. Malkanthi Daundasekara and Dr. Charmali Abayasekara (Workshop Co-coordinators) with workshop participants.

There were 16 participants at the workshop, representing private sector industries, the Department of Agriculture, Technical Institutes and the Universities (Peradeniya, Jaffna, Eastern, Wayamba and Sabaragamuwa). The wide range of speakers (from Queensland Department of Primary Industries & Fisheries (QDPI) - Australia, Industrial Technology institute (ITI), Dept. of Agriculture, National Packaging Institute, Export Development Board, and Universities of Peradeniya, Kelaniya, Rajarata and Ruhuna) and participants added to the success of the workshop.

The workshop provided opportunities for participants of similar interest to meet and share knowledge and establish links between each other. The response from the participants to the evaluation of the workshop was very positive, and most of them expressed that the content of the workshop was of great use to them.

Coordinators: Dr. (Mrs.) M Daundasekera
Dr. (Mrs.) C Abayasekara

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POSTGRADUATE CERTIFICATE COURSE IN ADVANCED BIOCHEMISTRY – Part I

Biochemistry and Molecular Biology has emerged as an important essential discipline serving the foundation for all modern sciences including Medical, Dental, Veterinary, Agricultural, and Biological science. Postgraduate Certificate Course in Advanced Biochemistry is designed to cover updated knowledge of each discipline in Biochemistry. The Board of Study in Biochemistry & Molecular Biology of the Postgraduate Institute of Science conducted a Postgraduate Certificate Course in Advanced Biochemistry (Part I) from 23rd October, 2005 to January 2006 at the Department of Biochemistry, Faculty of Medicine. There were 9 participants registered for the course.

Postgraduate Certificate Course in Advanced Biochemistry is designed to cover updated knowledge in different disciplines in biochemistry. Course contents of the Advanced Biochemistry - Part I course (30-hr, 2 credits) are: *Chemistry of Amino Acids and Proteins* (*4 hrs*), *Chemistry of Lipids* (*3 hrs*), *Chemistry of Carbohydrates* (*3 hrs*), *Chemistry of Nucleic Acids* (*4 hrs*), *Advanced Enzymology* (*4 hrs*), *Integrated Metabolism* (*6 hrs*) & *Group discussion* (*6 hrs*). Postgraduate certificate course in Advanced Biochemistry - Part II is to be conducted later.

Coordinators: Prof. R Sivakanesan
Dr. S B P Athauda

WORKSHOP ON 'PRE- AND POSTHARVEST MANAGEMENT OF VEGETABLES AND CUT FLOWERS'

Workshop on 'Pre- and Postharvest Management of Vegetables and Cut Flowers' was held at Agriculture Cooperative Society (AgCo), Nuwara Eliya during October 24 – 25, 2006. The group comprised mainly of vegetable and flower growers, industry people, academics, technical people, researchers and students from universities. There was a good coverage of both vegetable and flower pre- and postharvest management. The discussions on "packaging" were a new experience to the farmers, which was appreciated. The root problems that the growers face was discussed and one of the crucial issues addressed was the indiscriminate use of chemicals for which the farmers requested alternatives. Some solutions were suggested. A field visit to vegetable cultivation under poly tunnels created much interest and generated questions.

The interest and enthusiasm shown by all participants (22) and resource persons is commendable. The feed back from the participants was very positive. We hope that the links established through conducting the workshop will strengthen, and together, we can lend a hand to develop the fresh produce industry in Sri Lanka.

Coordinators: Dr. (Mrs.) C Abayasekara
Dr. (Mrs.) M Daundasekera

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SHORT COURSES ON 'GIS AND ITS APPLICATIONS'

Three more short courses (2nd, 3rd and 4th) in the series of courses on "GIS and its Applications" were organized and conducted at the Postgraduate Institute of Science (PGIS) of the University of Peradeniya during the period from November 2005 to April 2006. The objective of these short courses was to expose working personnel from state and private sector organizations to the capabilities & strength of Geographical Information Systems (GIS) & Global Positioning Systems (GPS) for efficiency in management and planning and to provide basic theoretical and comprehensive hands-on training in the use of (GIS) for various applications.

Course Contents: *• Introduction to GIS and its application areas • Overview of Remote Sensing and its applications • Introduction to Coordinate Systems, Map Projection, Geo-referencing • GIS Database Creation (GIS Functions, Input of geospatial data – Digitizing etc.) • GIS Analysis (Single Layer/ Multi Layer Analysis, DEM generation, 3-D Analysis etc.) • Map output generation • Introduction to Global Positioning Systems (GPS) & its Applications • Application of GIS in various disciplines - Case Studies • Individual Mini Projects*

Expert GIS trainers were drawn from various Institutions and Universities as resource persons.

2nd Short Course on GIS and its Applications:

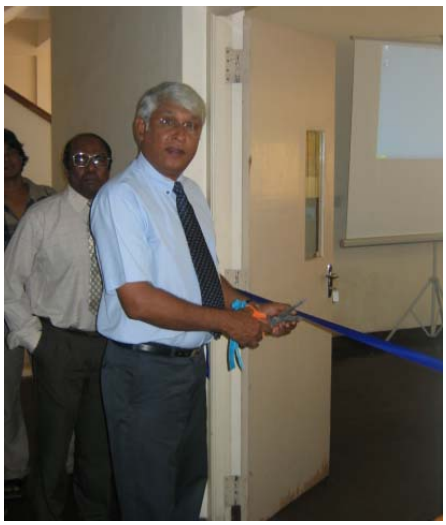
The Vice-Chancellor of the University of Peradeniya, Prof. Kapila Goonasekara was the Chief Guest at the inaugural session held at the PGIS Auditorium on 30th November 2005. There were 68 participants for the short course from various governmental and private sector organizations such as Universities, Central Engineering Consultancy Bureau (CECB), Veterinary Research Institute (VRI), Land Use Policy Planning Division (LUPPD), Road Development Authority (RDA), Sri Lanka Telecom (SLT), National Water Supply & Drainage Board (NWS&DB), Animal Production and Health

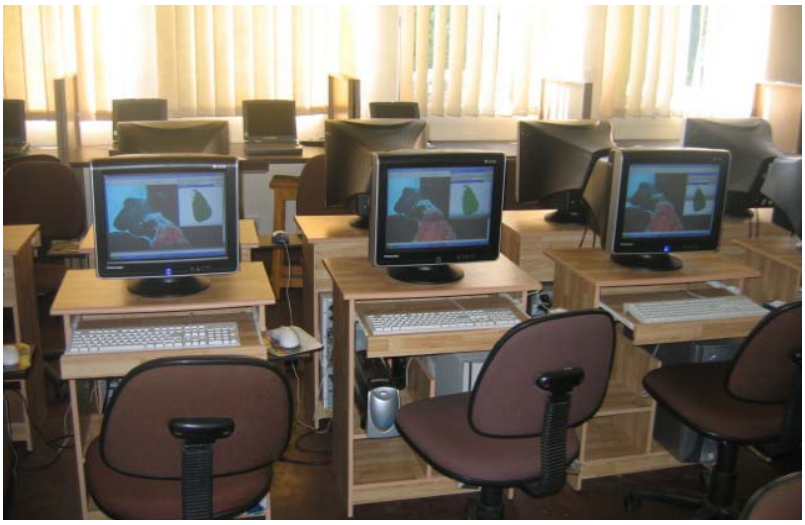
Participants of the 2nd short course on 'GIS and its Applications' during a session.

Department (AP&HD), Department of Agriculture, Survey Department, Centre for House planning and Building (CFHP&B) and several NGOs.

As the number of participants was too big to handle in one session, the participants were divided into 2 groups and the course was conducted in 2 sessions. Both groups of participants attended lectures and practical sessions that were conducted during the first two days, 30th November and 1st December. Rest of the GIS practical sessions were conducted for the first group from December 2 - 5 and the second group from December 15 – 18, 2005. Practical sessions were conducted both at the IT Centre of the University of Peradeniya and at the GIS and Remote Sensing Laboratory of the PGIS.

All the participants, resource persons and invitees enjoyed the dinner and the pleasant evening held at Gal Bangalawa Guest House. Prof. Kapila Goonasekera, Vice-Chancellor, University of Peradeniya and Prof. Lakshman Dissanyake, Director, PGIS awarded the certificates to the participants at the closing ceremonies held on 5th and 18th December 2005.





Prof. Kapila Goonasekara, Vice-chancellor of the University of Peradeniya and Prof. Lakshman Dissanayake, Director of the Postgraduate Institute of Science (PGIS) are seen here during the opening of the new GIS and Remote Sensing laboratory of the PGIS on November 30, 2005.

3rd Short Course on GIS and its Applications:

The 3rd short course on "GIS and its Applications" was organized by the PGIS, on request of the Land Use Policy Planning Division (LUPPD), Sri Lanka. There were 40 participants from the district offices of the Land Use Policy Planning Division (LUPPD). The Deputy Vice-Chancellor, Prof. Nimal Gunawardena was the Chief Guest at the inaugural session held at the PGIS Auditorium on 12th January 2006.

The short course was planned to be conducted in 3 sessions during 3 week-ends in January and February, 2006 at the GIS and Remote Sensing Laboratory of the PGIS. Lectures and practical sessions on fundamentals and applications of GPS were conducted as the session 1 of the course during 12th and 13th January 2006.

Dr. Jagath Gunatilake, Coordinator of the GIS short course is lighting the traditional oil lamp during the inauguration ceremony held on 12th January 2006 at the PGIS Auditorium.

4th Short Course on GIS and its Applications:

The 4th short course on "GIS and its Applications" was conducted by the PGIS from 3 – 8 April 2006, on request of the North East Community Restoration and Development Project (NECORD) of the North East Provincial Council. There were 20 participants for the short course from various ministries and departments: the Ministry of Health (NEP), Ministry of Agriculture and Land, Ministry of Rehabilitation and Reconstruction (NEP), Provincial Councils, Department of Agriculture, Provincial Health Services, Road Development Department, and NECORD and all these 20 participants were funded by NECORD. There was one participant from Central Engineering Consultancy Bureau (CECB).

Prof. Anura Wickramasinghe (Acting Vice-Chancellor, University of Peradeniya) is addressing the audience during the inauguration ceremony of the 4th short course on 'GIS and its applications' held at the PGIS on April 3, 2006. Seated L to R: Dr. Jagath Gunatilake (Coordinator), Prof. Lakshman Dissanayake (Director, PGIS) and Mr. L R K Perera (Chariman, Board of Study in Earth Sciences).

Prof. Kapila Goonasekara, the Vice-Chancellor, University of Peradeniya was the Chief Guest at the inaugural session held at the PGIS Auditorium on April 3, 2006. During the 6-day short course the practical sessions were continued until about 9.30 p.m. on most days. The short course dinner was organized at the Gal Bangalawa Guest House on the fifth day. Participants in their final evaluation forms, commended well for the facilities provided and particularly the participants from the North and East expressed their gratitude to the organizers for their kind hospitality. Many of the participants have indicated their willingness to attend further advanced courses to be conducted for a longer duration.

Deputy Vice-Chancellor of the University of Peradeniya, Prof. Anura Wickramasinghe and the Director of the PGIS, Prof. Lakshman Dissanayake awarded the certificates to the participants at the closing ceremony held on 8th April 2006.

Coordinator: Dr. A A J K Gunatilake

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SHORT COURSE ON HEALTH AND ANESTHESIA IN CAPTIVE ELEPHANTS

Captive elephant is important from several aspects to all Sri Lankans. Elephant is involved and is important therefore, in cultural, religious and state functions and lately for tourism. Captive elephants bring lots of foreign currency and assist livelihood of many families through tourism.

Most often when captive elephants are sick, native treatments are administered. However, in the recent years western veterinary practices have become popular among elephant owners for several reasons. Captive Elephant Owners Association formed 6 years ago has also contributed for this popularity. The new research findings and other information on diseases are constantly being disseminated through this association. In addition, practical problems of keepers and owners are investigated. Wherever possible discussions, training programmes and clinics are held with the participation of foreign trainers and experts.

Most important historical reason for elephant owners and keepers to consult veterinarians is to get the elephants anesthetized/sedated in an emergency situation. The veterinarians have extended their services to the Kandy

Esala Perehera, the most important annual cultural pageant in the country. However, there had been no formal training for this purpose despite several requests made by the veterinarians. The new Diyawadana Nilame of Sri Dalada Maligawa who he is also the president of the Captive Elephant Owners Association took the initiative to formally train veterinarians on aspects of health and anesthesia. Funds for this short course of national importance was provided by the Diyawadana Nilame.

The Diyawadana Nilame, the chief guest of the occasion, was accompanied in a glamorous procession with 5 elephants including tuskers to the PGIS. Prof. Indira Silva was the principal resource person. Practice session on the use of different types of "tranquilizing guns" held at the University Rugger grounds was an attractive event. In addition to 24 veterinarians, 36 veterinary undergraduates participated in lectures.

A group photograph of the participants of the short course. Front raw (L to R): Prof. Indira Silva (Principal Resource Person), Prof. Nimal Gunawardena (Acting Vice-Chancellor, University of Peradeniya), Hon. Pradeep Nilanga Dela Bandara (Diyawadana Nilame of Sri Dalada Maligawa, Kandy), Prof. Lakshman Dissanayake (Director, PGIS), Prof. Parakrama Karunaratne (Chairman, Board of Study in Zoological Sciences) and Prof. Padma de Silva (Member of the Board of Study). Dr. Ashoka Dangolla (Coordinator of the course) is seen in the middle of the 2nd row.

At the end of the course, certificates were distributed by the Hon. Pradeep Nilanga Dela Bandara, Diyawadana Nilame. The importance of providing formal training to veterinarians serving in other parts of the country was also emphasized by the Diyawadana Nilame.

Coordinator: Dr. A Dangolla

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SHORT COURSE ON 'IDENTIFICATION OF COMMON BEES OF SRI LANKA'

A 2-day short course conducted by the Board of Study in Zoological Sciences of the PGIS was held in the Department of Zoology from 19th to 20th December 2005. The course was funded by the National Science Foundation (NSF).

Bees constitute an important group of insects due to their indispensable role as pollinators of crops and natural vegetation. Apart from the well-known four species of the honeybees of Sri Lanka there are about 144 species of pollen bees which are the major pollinators. Not all of them are common or easily seen. The course was aimed at training biologists involved in crop production, quarantine officers, museum taxonomists and academics on the identification of 40 selected species of common bees of Sri Lanka.

Group photograph of the participants of the short course. Prof. Jayanthi Edirisinghe and Dr. Inoka Karunaratne, coordinators of the short course are seen in the middle of the front row.

Taxonomic keys, reference specimens and descriptions were used as aids in the identification of common bees under varying magnifications. The laboratory study was supplemented with a field demonstration at the Meewatura Agriculture Farm where participants learnt the methods of collection of bees, curation of specimens for microscopic examination and made field observations on the behavior of bees at flowers.

Each of the 15 participants was provided with a set of bee specimens, a stereomicroscope and an illustrated key to the common bees of Sri Lanka. Taxonomic features and biology of common bees were highlighted through overhead projections and multimedia presentations.

The evaluation of the course by participants was very encouraging where they stressed that aspects of taxonomy which are often difficult have been put across in a simple and an interesting manner. The workshop also gave an opportunity for participants from different fields to come together for a common objective.

It is intended to follow the progress of the participants in the application of the knowledge acquired at the workshop.

Coordinators: Prof. J P Edirisinghe
Dr. W A I P Karunaratne

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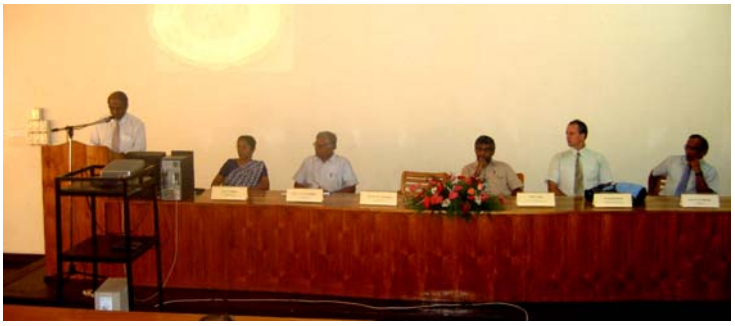
WORKSHOP ON DENDROCHRONOLOGY

A one-day workshop on Dendrochronology organised by the Board of Study in Plant Sciences of the PGIS was held on 22nd December 2005. Dendrochronology is the dating of past events such as climatic changes through the study of tree-ring growth. The National Science Foundation (NSF) of the USA has funded a five-year study to apply the science of tree-ring analysis in addressing key questions regarding the processes that drive development of Asian monsoons: One of the largest natural climatic variability systems affecting the globe. Tree-ring records provide quantitative estimates of past climate on a year-by-year time scale; this allows us to reconstruct more complete records of variations and interrelationships among the components of the Asian monsoon system.



Prof. Lakshman Dissanayake, Director of the PGIS is addressing the audience during the inauguration ceremony of the workshop on Dendrochronology held on December 22, 2005 at the PGIS auditorium. Seated L to R: Dr. N C Bandara, Prof. Nimal Gunatilleka (Coordinator of the workshop), Prof. V Kumar (Dean, Faculty of Science), Dr. Brendan Buckley (Earth Institute, Columbia University, New York, USA) and Prof. N K B Adikaram (Chairman, Board of Study in Plant Sciences).

Analysis of tree ring data throughout "Monsoon Asia" will enable scientists to reconstruct and analyse regional climate histories over time frames of centuries to millennia. The data will also reveal information on three major process regions that collectively drive much of the variability of the Asian monsoon: Asian land-surface air temperatures, sea-surface temperatures in the Indian Ocean, and tropical Pacific sea-surface temperatures associated with *El Niño*. Identifying interrelationships among these regions, and how the Asian monsoon manifests itself in different regions across the globe, will lead to the development of improved models for better long-term forecasting. With approximately one half the world's population impacted by the Asian monsoon, long-term forecasting will have profound social and economic impacts, such as improved agricultural planning and risk assessment.

Due to its considerable importance to global climate and implications for the world's population, there is an urgent need for greater understanding of this Asian monsoon system. The ultimate goal of this is improved prediction of its intensity on annual to decadal and longer time scales. The NSF (U.S.A.) grant has facilitated the establishment of the Laboratory of Tropical Dendrochronology at Kaesetsart University in Thailand. Its Director, Dr. Brendan Buckley of Lamont Doherty Earth Observatory of the Earth Institute, Columbia

University, New York, USA is developing a regional network to carry out tree-ring analysis research in several Asian countries including Sri Lanka.

Dr. Buckley along with Dr. Lareef Zubair of Columbia University, conducted this initial workshop during which the theoretical foundations of using tree-ring data for climate variability analysis were elaborated through a lecture presentation in the morning. This was followed in the afternoon by a field practical demonstration of taking wood cores from trees using an increment corer and on storing them for microscopic examination. A brief laboratory demonstration session was held at the Botany Department where the participants were introduced to the microscopic variations associated with tree rings using wood sections that were available at the Department of Botany.

A group photograph of the workshop participants taken in the field.

Twenty four participants representing a number of academic, research, governmental and private-sector institutions in Sri Lanka actively participated in this introductory training workshop. At the final session they indicated their interest in establishing a network of participants through the PGIS for any follow up activities on dendrochronology.

Coordinator: Prof. I A U N Gunatilleke

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WORKSHOP ON 'INTRODUCTION TO ECOLOGICAL DATA ANALYSIS USING UNIVARIATE AND MULTIVARIATE TECHNIQUES'

A two-day workshop on 'Introduction to Ecological Data Analysis using Univariate and Multivariate Techniques' organized by the Department of Botany, University of Peradeniya in collaboration with the School of Biological Sciences, University of Aberdeen, Scotland, UK under the patronage of the Board of Study in Plant Sciences of the Postgraduate Institute of Science, Peradeniya was held at the PGIS during 4th and 5th January 2006. Prof. I.A.U.N Gunatilleke and Dr. H.M.S.P. Madawala Weerasinghe (Department of Botany, University of Peradeniya) coordinated the workshop. The workshop was conducted by Dr. David Burslem of the School of Biological Sciences, University of Aberdeen, Scotland, UK. While his visit was sponsored by the British Council, this training programme was conducted as an activity sponsored by the EU-ASIA Link programme of the PGIS.

Prof. V Kumar (Dean, Faculty of Science) is addressing the audience during the inauguration session of the workshop on dendrochronology held on January 4, 2006 at the PGIS Auditorium. Seated L to R: Dr. Sumedha M Weerasinghe (Co-coordinator of the workshop), Prof. Lakshman Dissanayake (Director, PGIS), Dr. David Burslem (University of Aberdeen, UK) and Prof. N K B Adikaram (Chairman, Board of Study in Plant Sciences).

The main objective of the workshop was to introduce univariate and multivariate analysis of ecological data using the latest version of PC-ORD (Version 4.0) software package. Complex multivariate methods such as Mantel tests, non-metric multi-dimensional scaling and simple spatial approaches also have been discussed at the workshop. The first day of the workshop was spent to give the participants a good overall

knowledge on the different univariate and multivariate techniques and also hands on experience on the latest version of the statistical package. On the second day of the workshop, a statistical 'clinic' was conducted to provide an opportunity for the participants to seek expert advice on statistics to solve problems with their own ecological data sets which was well received by the participants, most of whom were post-graduate students.

Thirty participants attended the workshop representing various higher education and research institutes.

Coordinators: Prof. I A U N Gunatilleke
Dr. S M Weerasinghe

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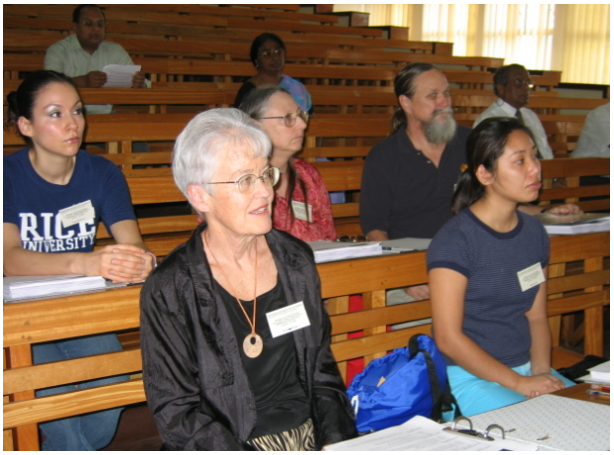
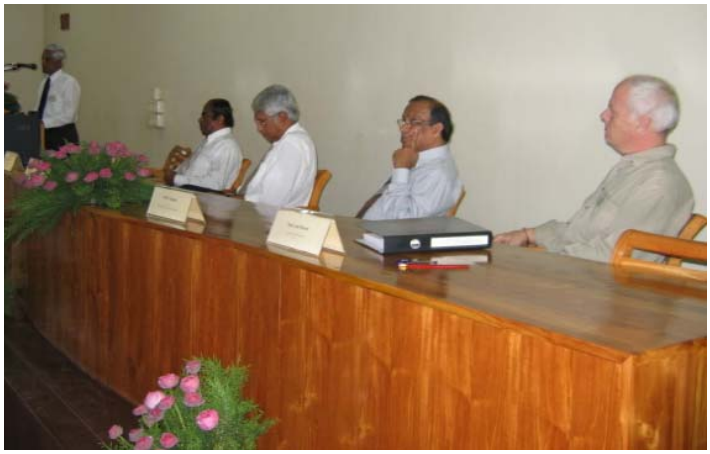
'BIOLOGICAL AND CULTURAL ECOLOGY OF SRI LANKA':
A Study Programme for a Staff/Student Group from U.S.A.

A 3-week study abroad programme was held in January 2006, for a group of students and staff from the United States of America as a result of a 'Memorandum of Understanding' signed between the PGIS and the San Jose State University (SJSU), California. Among the ten participants, seven came from California while one was from Texas together with one staff member each from Tuscon, Arizona and Norfolk, Virginia.

Prof. S A Kulasooriya (Coordinator of the 3-week study programme) addressing the audience including the staff/student group from U.S.A. at the inauguration ceremony held at the PGIS Auditorium on January 5, 2006. Seated L to R at the high table: Prof. Lakshman Dissanayake (Director, PGIS), Prof. Kapila Goonasekara (Vice-Chancellor, University of Peradeniya), Prof. N K B Adikaram (Acting Dean, Faculty of Science, University of Peradenya) and Professor Jon Pearce (Coordinator from San Jose State University - SJSU, California, U.S.A.).

This group was exposed to an excellent academic programme that included lectures, laboratory classes, ritual dance performances and field visits. The coverage was diverse and included Sri Lankan history, language, culture, archeology, Buddhist philosophy, geology, mineralogy and gemology, land formation and land stability, floral, faunal and ecosystem diversity and conservation, herpetology, ornithology, elephant conservation and eco-tourism. The field studies included visits to Dambulla, Sigiriya, Anuradhapura, Polonnaruwa, National Wildlife parks at Kawdulla and Minneriya, National Botanical Gardens at Peradeniya and Hakgala, Nuwara Eliya and Horton Plains, the Elephant orphanage at Pinnawela, Sinharaja rain forest, Anawilundawa bird sanctuary and Ranweli Eco-tourism Holiday Village at Waikala.

Resource persons were the best available in Sri Lanka and included Professors Kapila Dahanayake, Mangala de Silva, K. N. O. Dharmadasa, C. B. Dissanayake, I. A. U. N. Gunatilleke, C. V. S. Gunatillelka, Sarath Kotagama, C. M. Madduma Bandara, Udaya Meddegama, P. D. Premasiri and Sudharshan Seneviratne, Drs. Siril Wijesundera, and Devaka Weerakoon and Mr. S. Basnayake, Mr. Anslem de Silva together with Mr. Indika Karunarante and Ms. Priyanka de Silva as field instructors.

This study tour went off very well as planned. The participants thoroughly enjoyed their stay at the University Circuit Bungalow at Mahakande (Colonel Wright's Bungalow or the Gal Bangalawa) located in the serene misty vegetation. None of them had any previous experience in staying in a house with such British colonial architecture. Most of them being 1st visitors to Sri Lanka were overjoyed by what they learnt and saw and all the comments received were of a superlative degree. The general consensus was that the programme was beyond their expectations. The only drawback was that the duration was too short for them to appreciate all what was on offer. This was really their problem as they could not prolong their stay in Sri Lanka. Most of their colleges were reopening after the Fall break within one or two days after their return. Dr. Victoria Johnson from the Department of Biology, SJSU has written an excellent report on the programme after her return. Professor Jon Pearce the SJSU Coordinator has won the Faculty prize for the **Best overseas picture 2006** for a photo he has taken of a group of Muslim Students in their traditional white dresses climbing the spiral stairway at Sigiriya. He has submitted this photo with the title 'Nuns winding up their way to Heaven'. It is most likely that there will be earnest requests to offer such programmes in the future.

Coordinator: Prof. S A Kulasooriya

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SHORT COURSE ON 'ENVIRONMENTAL MANAGEMENT: BASIC CONCEPTS AND LEGAL FRAMEWORK'

A Short Course on 'Environmental Management: Basic Concepts and Legal Framework' was held at the PGIS on 28th and 29th January 2006. The main objective of this course was to introduce the basic concepts and legal framework of the environmental management to those who deal with environmental management issues. The objective was to bring relevant scientists / professionals together for dissemination and sharing their expertise in environmental management issues in Sri Lanka.

Prof. Mangala de Silva (Chairman, Board of Study in Environmental Sciences) is addressing the audience during the inauguration ceremony of the short course held at the PGIS Auditorium on January 29, 2006. Seated L to R: Dr. Rohan Fernando (Coordinator), Prof. Lakshman Dissanyake (Director, PGIS), Dr. A K N Zoysa (Coordinator) and Mr. W A D D Wijesooriya (Coordinator).

This course covered; *the overview of the basic concepts of bio-diversity conservation, land and watershed management, air and water quality management, solid-waste management, social impact assessment, environment economics, noise and vibration controls and also the Sri Lankan environmental legislation, environmental impact assessment (EIA) regulations and environmental protection licensing procedure (EPL) under the National Environmental Act and Environmental management system (e.g. ISO 9001 and ISO 14000)*. Emphasis was also made to educate the participants on environment safeguard requirements of International and local funding agencies and banks. Thirty eight participants attended the short course, which was co-sponsored partially by the National Ozone Unit, Ministry of Environment.

Coordinators: Dr. G W A R Fernando
Dr. A K N Zoysa
Mr. W A D D Wijesooriya

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6TH WORKSHOP ON 'ACTIVE TEACHING AND LEARNING APPROACHES IN SCIENCE (ATLAS)'

Under the British Council DfID Higher Education Link (HEL) programme between Sheffield Hallam University (SHU) and PGIS, first five ATLAS workshops were conducted to train teachers on the use of active reading, writing, listening, simulations, investigations, curriculum development and ICT in science teaching. The 6th workshop was the last workshop of the ATLAS workshop series and was sponsored by the Secondary Education Modernization Project (SEMP) of the Ministry of Education and held at the PGIS on February 21, 2006. These workshops were conducted with Dr. Mark Windale of SHU, U.K. as the principal resource person.

The emphasis of the sixth workshop was on role-play, drama and problem-solving. Seventy one teachers participated in the workshop and the above activities were performed as group work. The first session was on role-play using Fisherman technique. The second session was on drama where the participants performed the true story of the Plague (Black death) in the village of Eyam in Derbyshire in 1965 and the discovery of vaccines. For the problem solving activity each group was assigned an activity.

The feedback received from participants revealed that by participating in ATLAS workshops they have gained knowledge and understanding of using several novel techniques to teach science in their classrooms and also shared their experiences with other teachers.

Dr. Mark Windale, the Principal Resource Person of the 6th ATLAS Workshop and Dr. Sunethra Karunaratne (Coordinator of the workshop) are conducting a group activity with workshop participants.

Coordinator: Dr. S Karunaratne

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PROGRAMME ON 'ALBERT EINSTEIN AND PHYSICS'

The programme on 'Albert Einstein and Physics' was organized by the PGIS and the Department of Physics of the University of Peradeniya and was held on March 14, 2006. The programme commenced with the unveiling of a photograph of Einstein at the Department of Physics by the Chief Guest, Prof. Kirthi Tennakone, Director of the Institute of Fundamental Studies (IFS), Kandy.

The programme was conducted at the PGIS Auditorium and attended by 125 participants including University academic staff, PGIS students, undergraduate students and GCE (A/L) students. After the opening remarks made by the Director of the PGIS, Prof. Lakshman Dissanayake, the Chief Guest, Prof. Kirthi Tennkone delivered his presentation on '*Albert Einstein: The Great Scientist*'. Prof. K. Premaratne from the Department of Physics, University of Peradeniya gave a presentation on '*Physics in Everyday Life*'.

During the tea break the undergraduates and GCE (A/L) students participated in a 30-minute written quiz competition on Albert Einstein administered by Prof. B. S. B. Karunaratne, Chairman of the Board of Study in Physics. After the tea break and quiz competition an impressive, visual presentation was given on '*Brownian Motion*' by Dr. R. P. U. Karunasiri of the Department of Physics. Prof. Lakshman Dissanayake gave a presentation on '*Fascinating physics of Superconductivity*'.

Prof. K Premaratne giving a presentation on '*Physics in everyday life*' during the Programme on 'Albert Einstein and Physics' held at the PGIS Auditorium on March 14, 2006. There were 125 participants including university academic staff, PGIS students, undergraduate students and GCE A/L students.

The certificates and cash prizes were awarded to the first three winners of the quiz competition. The programme concluded with a movie on Albert Einstein.

Prof. Lakshman Dissanayake

'WORLD YEAR OF PHYSICS - 2005'

PGIS organized and conducted the following activities to celebrate 'World Year of Physics - 2005'.

- *A seminar on 'Early cancer detection using laser-induced fluorescence' by Prof. Katarina Svanberg, Lund University Medical Laser Centre, Sweden*

  (Organized in collaboration with Department of Radiology, Peradeniya Teaching Hospital and held at the Teaching Hospital, Peradeniya on Oct. 10, 2005)

- *A seminar on 'Laser spectroscopy applied to energy, environmental and medical research' by Prof. Sune Svanberg, Chairman, Physics Nobel Prize Committee, Lund University, Sweden*

  (Organized in collaboration with Department of Physics, University of Peradeniya and held at the Department of Physics on Oct. 10, 2005)

- *A seminar on 'The selection of Nobel Prize winners in physics' by Prof. Sune Svanberg, Chairman, Physics Nobel Prize Committee, Lund University, Sweden*

  (Organized in collaboration with Institute of Fundamental Studies (IFS), Kandy and held at the IFS on Oct. 11, 2005 at 11.00 a.m.)

- *A seminar on 'World Year of Physics' by Prof. Sune Svanberg, Chairman, Physics Nobel Prize Committee, Lund University, Sweden*

  (Held at the PGIS on Oct. 11, 2005 at 4.00 p.m.)

- *A half-day seminar session*

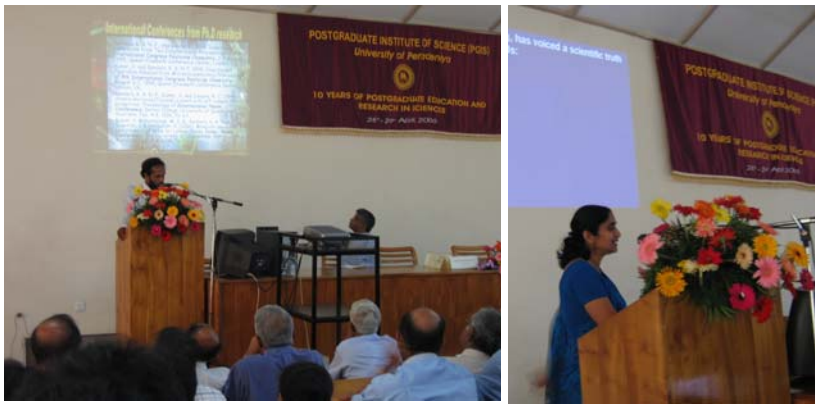
  (Organized by Young Researchers' Forum-YRF of the PGIS and held at the IFS on 25th January 2006) - see page 30 for details

- *A programme on 'Albert Einstein and Physics'*

  (Held at the PGIS on March 14, 2006) - see page 21 & 22 for details

10TH ANNIVERSARY CELEBRATIONS OF THE PGIS

The Postgraduate Institute of Science completed 10 years of its service to the nation in 2006. Several events were organized on 28th April 2006 to mark the 10th Anniversary. Among them were (i) Full-page newspaper supplements published in the Ceylon Daily News and The Island on 28th April 2006, (ii) A half-day seminar with presentations by eminent alumni and Chairpersons of Boards of Study, (iii) A poster session by M.Phil./Ph.D. students and the release of a book consisting of abstracts of poster presentations by the PGIS Young Researchers' Forum (YRF), (iv) A TV Panel Discussion on ITN by the Director and the members of the 10th Anniversary Committee.



Eminent alumni of the PGIS giving presentations at the half-day seminar session held on April 28, 2006 at the PGIS Auditorium.

On 29th April 2006, a half-day seminar was held for Advanced Level science teachers on 'Activity Based/Interactive Science Teaching'. In addition to the above activities, the publication of the abstracts of M.Phil./Ph.D. research projects and the titles of the M.Sc. research projects during the last 10 years is to be released soon by the Senior Assistant Librarian/Science, University of Peradeniya.

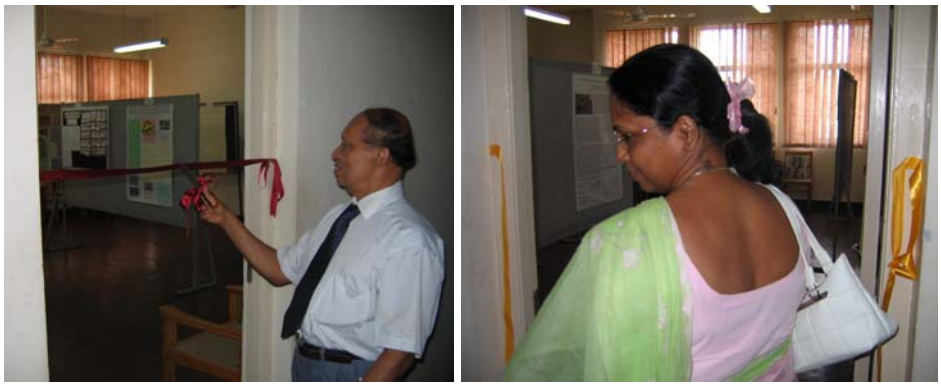
The two-international conferences, 10th Asian Conference on Solid State Ionics and the Asian Conference on Solar Energy Materials and Solar Cells held during 12 – 16 June 2006 with about 100 foreign scientists were also a part of the 10th Anniversary activities.

Half-day seminar on 28th April 2006

Three alumni of the PGIS made presentations on their experiences and how their training at the PGIS helped them in their respective careers. Chairman of each Board of Study made presentations highlighting the past and present activities of each Board of Study.

Poster Presentation by M.Phil. /Ph.D. Students – 28th April 2006

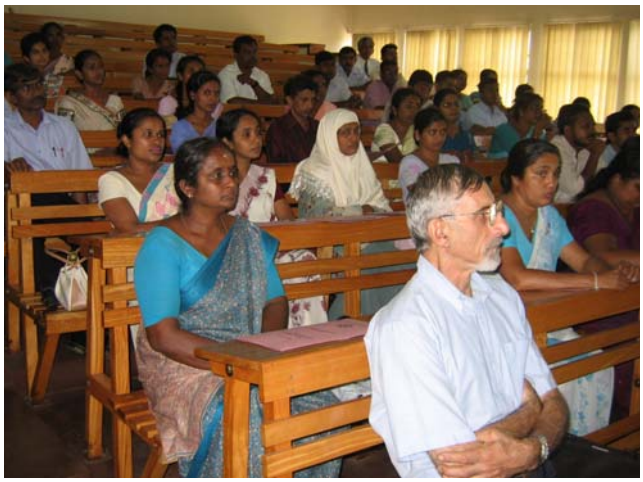
A Poster Presentation with nearly 80 Poster was successfully held by current M.Phil. /Ph.D. students highlighting ongoing research. Abstracts of ongoing research projects were compiled by the Young Researcher's Forum and published as a booklet.



During the opening of the poster session by two invitees Prof. Kirthi Tennakone (Director, IFS) and Prof. Sirimali Fernando (Chairperson, NSF) on April 28, 2006 at the PGIS.

Prof. Kirthi Tennakoon, Director/IFS and Prof. Sirimali Fernando, Chairperson/NSF were Chief Guests at the opening of the Poster Session. The posters were of high quality and of International standard. The three best posters were each awarded a cash prize of Rs. 5000/-.

The main objective of the Poster Session was to train young researchers in the dissemination of scientific information visually through colourful posters and explaining the contents to other scientists and research students.



A/L science teachers attending the half-day seminar on 'Activity based/interactive methods of science teaching' held on April 29, 2006 at the PGIS auditorium.

Half-day Seminar for A/L Science Teachers – 29th April 2006

As a special event to mark the 10th Anniversary of the PGIS, the Board of Study in Science Education organized a half-a-day seminar for A/L Science Teachers on "*Activity-based/Interactive methods of science teaching*".

Presentations were made by Prof. Lakshman Dissanayake, Dr. K M Liyanage, Dr. Sunethra Karunaratne, Dr. M B Ekanayake, Prof. H M N Bandara, Prof. S H P P Karunaratne, Ms. Ashoka Abeykoon Menike and Ms. Pushpa Vitharana. Dr. Sunethra Karunaratne coordinated the programme.

Prof. Lakshman Dissanayake

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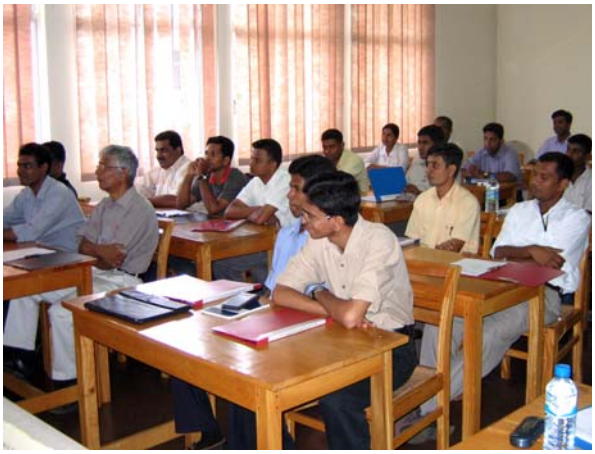
SHORT COURSE ON ACTUARIAL STATISTICS: MATHEMATICAL AND COMPUTATIONAL APPLICATIONS



Dr. Kithsiri Liyanage, Chairman of the Board of Study in Statistics & Computer Science addressing the audience during the inauguration ceremony of the short course on Actuarial Statistics held at the PGIS on 29th April 2006. Seated L to R: Principal Resource Person, Prof. Rohana Ambagaspitiya (University of Calgary, Canada), Prof. Lakshman Dissanayake (Director, PGIS), Prof. V Kumar (Dean, Faculty of Science) and Dr. Pushpa Wijekoon (Course Coordinator).

The first PGIS short course on Actuarial Statistics was held at the PGIS during 29th - 30th April 2006. 51 participants including academics, students and personnel from industry attended the programme. The principal resource person was Prof. R. Ambagaspitiya from University of Calgary, Canada.

The purpose of the short course was to train academic staff and students in this key area of banking and insurance. The first half of the workshop was on pricing and valuation of traditional life insurance products,

including computation of benefit premiums and benefit reserves for life insurances and annuities. This was followed by an introduction to pricing the products using the asset share technique. The second half of the workshop was devoted to modern life insurance products, including a survey of non-traditional products and techniques available to price them.

Coordinator: Dr. P Wijekoon

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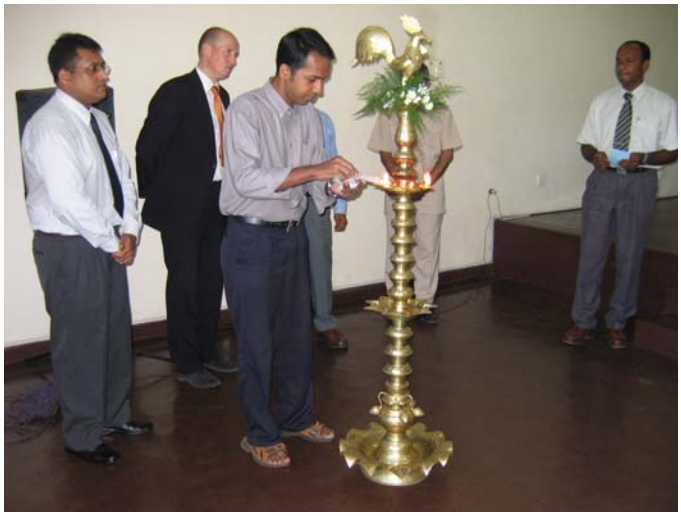
WORKSHOP ON 'DYNAMIC MODELING FOR LANDSLIDES & FLOODS USING GIS & RS'

A workshop on 'Dynamic Modeling for Landslides and Floods using GIS & Remote Sensing' was held from 8 – 11 May 2006 at the Postgraduate Institute of Science, in collaboration with The International Institute for Geo-Information Science and Earth Observation (ITC), The Netherlands, and the United Nations University.

The workshop was coordinated by Dr. Jagath Gunatilake and Dr. Janaka Wijetunge. Objectives of the workshop were to train participants Postgraduate Students, Scientists, Engineers, Academics and Researchers working on Landslide and Flood Hazard Assessment etc. in the Government and Private Sector Organizations on the use of GIS in Dynamic Modeling for Landslides and Floods.



A workshop participant lighting the traditional oil lamp during the inauguration ceremony of the workshop held at the PGIS on May 8, 2006. Standing L to R: Dr. Janaka Wijetunga (Workshop Co-coordinator), Dr. Dinand Alkema (ITC, The Netherlands), Prof. Lakshman Dissanayake – covered (Director, PGIS), Prof. V Kumar – covered (Dean, Faculty of Science) and Dr. Jagath Gunatilake (Workshop Co-coordinator).

The main topics covered at the workshop included: *Slope Hydrology and Stability; Soil Erosion and Flooding; Principles of Dynamic Modeling and Basics of PCRASTER Modeling Software; Derivation of Variables for Dynamic Modeling Using GIS and RS; Application of PCRASTER Software for Landslide Initiation, Debris Flow and Flood Modeling with examples from Sri Lanka*. Fifty five (55) participants attended the workshop. The students of the MSc in GIS and Remote Sensing and MSc in Disaster Management programmes along with the outside participants from Central Engineering Consultancy Bureau (CECB), Disaster Management Centre (DMC), Ceylon Electricity Board (CEB), and Land Use Policy Planning Division (LUPPD) attended the workshop.

Dr. Theo van Asch, Department of Physical Geography, University of Utrecht, The Netherlands, and Dr. Dinand Alkema, International Institute for Geo-Information Science and Earth Observation (ITC), The Netherlands were the principal resource persons.

Prof. Lakshman Dissanayake, Prof. Kapila Dahanayake, Dr. Jagath Gunatilake and Dr. Janaka Wijetunge awarded the certificates to the participants at the closing session held on 11th May 2006.

Coordinators: Dr. A A J K Gunatilaka
Dr. J Wijetunge

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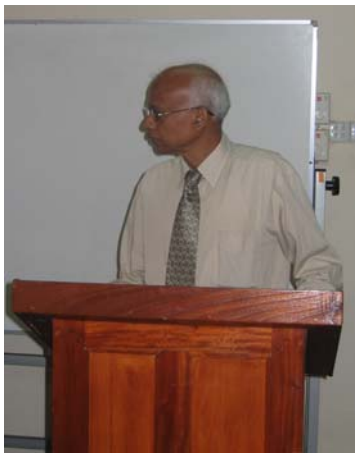
SHORT COURSE ON COMPUTER & COMPUTATIONAL MATHEMATICS



Prof. O A Ileperuma (Acting Director, PGIS and Dean, Faculty of Science, University of Peradeniya) addressing the audience at the inauguration ceremony of the short course on computer and computational mathematics held at the PGIS on May 26, 2006.

A short course on Computer and Computational Mathematics jointly organized by the PGIS and the Department of Mathematics of the University of Peradeniya was conducted at the PGIS during May 26 - 28, 2006. The short course was designed to provide an integrated assessment of the use of mathematics in various computer related fields as well as the use of computers in solving mathematical modeling problems.

Thirty one (31) participants attended the short course. There were lectures and laboratory sessions on *Parallel Network and Programming, Graphics and 3D Animations, Financial Mathematics and Computer Applications Mathematical Simulations, Scheduling Problem Solving Document Preparation Systems Internet Resources Information Sharing and Web Designing, Logic Based Software Prototyping and Mathematical Packages and Applications*.

The participants were of the opinion that the short course provided them an opportunity to further understand the connection between mathematics and computers, and also the power of computer in performing highly advanced mathematical manipulations both numerical and symbolic.

Coordinators: Dr. A A I Perera
Dr. H M Nasir

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WORKSHOP ON LOSS AND DAMAGE

A workshop on Loss and Damage was held at the Postgraduate Institute of Science on 3 - 4 June, 2006. Forty postgraduate students following the M.Sc./M.Sc.Eng. programmes in Disaster Management at the PGIS participated in the workshop. The principal resource person was Mr. N M S I Arambepola, Director of the Asian Disaster Preparedness Centre (ADPC), Bangkok, Thailand. Areas covered at the workshop were Earthquakes, Volcanology, Landslides and Vulnerability Assessment.

Administrative and logistic support for conducting this workshop was facilitated under an MOU between the PGIS and ADPC.

Coordinator: Director, PGIS

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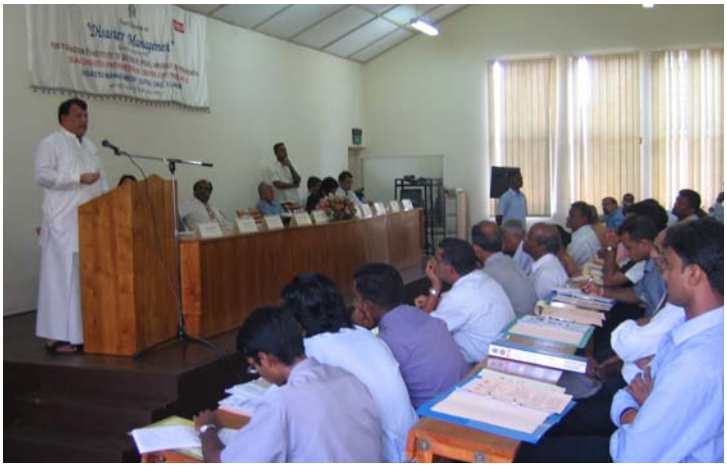
SHORT COURSE ON DISASTER MANAGEMENT

A Short Course on Disaster Management was organized by the Postgraduate Institute of Science in collaboration with the Asian Disaster Preparedness Centre (ADPC), Thailand and the Disaster Management Centre (DMC), Sri Lanka. The Minister for Disaster Management and Human Rights, Hon. Mahinda Samarasingha was the Chief Guest and Prof. Kapila Goonasekara was the Guest of Honour at the inaugural Session held at the PGIS Auditorium on 5th June 2006. The Short course was conducted from 5 – 9 June 2006 with 117 participants representing various governmental and non-governmental organizations, private enterprises, security forces, Police Department, etc.



Chief Guest Hon. Mahinda Samarasinghe (Minister of Disaster Management and Human Rights) addressing the audience at the inauguration ceremony of the workshop on disaster management held at the PGIS Auditorium on 5th June 2006.

The objective of this short course was to expose personnel engaged in disaster management activities to fundamentals of disaster management from an 'all-hazards' viewpoint.

The short course covered *Basic Principles of Disaster Management, Causes, Occurrence & Mitigation of Natural Hazards: floods, landslides, earthquakes, tsunamis, etc., Man-Made Hazards, Fire Fighting, First Aid, etc., Approaches & Tools for Disaster Risk Management, Vulnerability Assessment, Loss & Damage Estimation, Emergency Planning & Management, Use of GIS & RS in Disaster Management, Social, Cultural, and Administrative Aspects of Disaster Management, etc.*

Resource Persons were drawn from Universities, Department of Meteorology, Geological Survey Department, Centre for Disaster Management, NBRO, Police Department, STF, Fire Services Dept., St. John Ambulance

Group photograph of the participants of the short course in Disaster Management. Seated L to R: Mr Muhibuddin Bin Usamah (Resource person from ADPC, Thailand), Ms. Clarence Carlos (Coordinator, ADPC, Thailand), Mr. R Alwis (Registrar, University of Peradeniya), Dr. J Wijetunga and Dr. J Gunatilaka (Course Co-coordinators/Resource Persons), Mr. L R K Perera (Chairman, Board of Study in Earth Sciences), Prof. K Dahanayake (Course Co-coordinator/Resource Person), Prof. A Wickramasinghe (Deputy Vice-Chancellor, University of Peradeniya), Chief Guest Hon. Mahinda Samarasinghe (Minister of Disaster Management and Human Rights), Prof. M A K L Dissanayake (Director, PGIS), Major General Gamini Hettiarachchi (Director-General, DMC), Ms. Gabrielle Iglesias (Resource person from ADPC, Thailand), a participant, Mr. Dias Amerasinghe (Secretary, Ministry of Disaster Management and Human Rights) and a participant.

Service and Asian Disaster Preparedness Centre, Bangkok, Thailand.

A Field Excursion was arranged to Nawalapitiya – Gampola Area to show the landslide hazards and the various mitigation techniques adopted to reduce the risk. The short course dinner was held at the Gal Bangalawa, University Guest House.

During the follow-up discussions it was decided to form a voluntary task force from among the participants. Certificates of participation were awarded to the participants at the closing session held on 9th June 2006.

Coordinators: *Prof. K Dahanayake*
Dr. A A J K Gunatilaka
Dr. J Wijetunga

FIRST ANNOUNCEMENT AND CALL FOR PAPERS

NATIONAL CONFERENCE ON ADVANCED MATERIALS FOR EMERGING TECHNOLOGIES (NCAMET-2007)

PERADENIYA, SRI LANKA

21 – 22 JULY 2007

Organized by

POSTGRADUATE INSTITUTE OF SCIENCE & FACULTY OF SCIENCE
UNIVERSITY OF PERADENIYA

and

NATIONAL SCIENCE FOUNDATION, SRI LANKA

Recognizing the importance of advanced materials in areas like electronics, communication, transportation, healthcare, energy sector and environment the Postgraduate Institute of Science and the Faculty of Science of the University of Peradeniya along with the National Science Foundation have made arrangements to organize a two-day National Conference on Advanced Materials for Emerging Technologies (NCAMET-2007) to create an awareness of the new developments and to encourage research activities in advanced materials among the Sri Lankan researchers.

The conference will mainly focus on synthesis, characterization, fabrication, and applications of advanced materials including the newly emerging class of materials such as nanomaterials and nanocomposites. Improvements and advanced applications of the conventional materials will also be addressed.

The conference will provide a valuable forum for research scientists, engineers and research students to present their research findings and to gain a first-hand knowledge of some of the frontier areas and new directions in materials research and technology as well as to share and exchange ideas.

For details please visit the website - http://www.ncamet2007.pgis.lk

PGIS – YOUNG RESEARCHERS' FORUM (YRF)

PGIS-YRF was established on 12th May 2005 at a seminar on 'Challenges and Opportunities in Scientific Research for Young Researchers' conducted by the PGIS. The Forum was found with a view to:

1. Realize the potential of young researchers as the next generation of scientists.
2. Interact and exchange information pertaining to scientific research in order to disseminate knowledge and extend collaboration among other groups (local and foreign) with similar interests.
3. Generate a research climate that allows for creativity, open communication and free flow of ideas and talents.
4. Create a platform to bring to the attention of the authorities and government, the problems faced by young researchers in carrying out scientific research in Sri Lanka.
5. Promote public awareness and importance of scientific research.

Memberships of the Young Researchers' Forum are open to all postgraduate students currently registered for an M.Phil. or a Ph.D., and M.Sc. (during their project phase) at the Postgraduate Institute of Science, young research scientists and university staff who are active in scientific research in universities and other institutions.

First Executive Committee of the YRF 2005/2006

Patron : Prof. Lakshman Dissanayake (Director, PGIS)
President : Ms. V.M. Thadhani
Secretary : Mr. Dionysius Gnanakkan
Members : Dr. Inoka Karunarate, Dr. Varuni Seneviratne, Mr. L.V. Ranaweera, Mr. D.M.M. Krishantha, Mr. A.M.C. Herath, Mrs. Jilushi Damunupola and Dr. H. M. Nazir

Activities carried out under the First Committee of PGIS-YRF

- Half-day seminar session on 14th September 2005
  (40 participants)
- A seminar on 'Resume and interview tips' by Dr. Ravi Ranatunga (Procter and Gamble Co., U.S.A.) on Dec. 20, 2005
- Half-day seminar session on 25th January 2006 at the IFS, as an event under the 'World Year of Physics' celebrations
  (40 participants)
- A poster session on 28th April 2006 (as a part of the 10th Anniversary programmes of the PGIS) and compilation and publishing of an abstract volume of the posters
  (54 participants)
- Half-day session followed by Annual General Meeting of the YRF on 26th June 2006
  (41 participants)

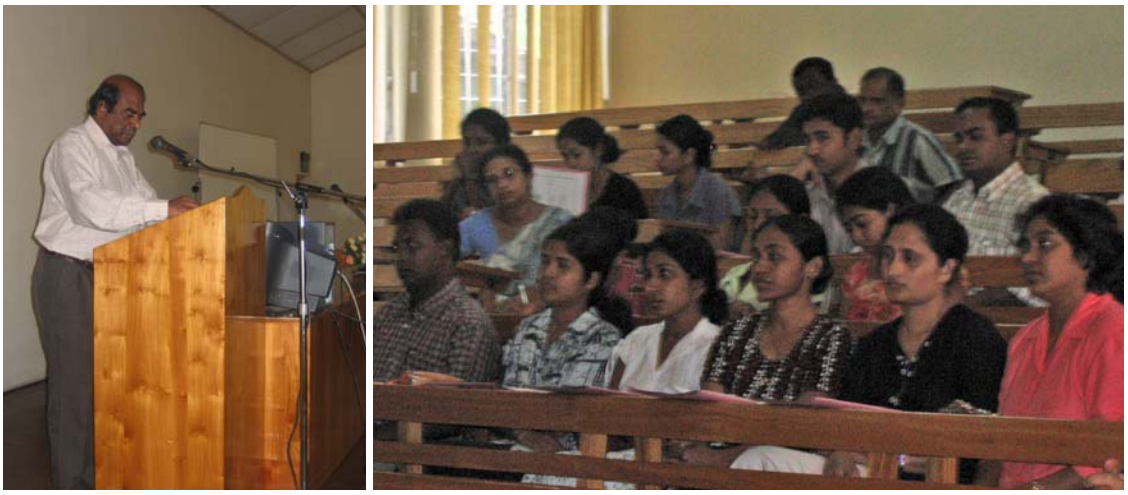
Executive Committee of the YRF 2006/2007

Patron : Prof. Lakshman Dissanayake (Director, PGIS)
President : Dr. Inoka Karunarate
Secretary : Dr. Nilwala Kottegoda
Members : Dr. Sanath Rajapakse, Dr. Irushika Fernando, Mr. H.M.J.C. Pitawala, Miss. S. M. Young, Miss Uthpala Jayawardhana, Dr. H.M.Nasir, Mr. E.V.A. Premalal, and Mr. Rohan Fernando

Dr. Inoka Karunarate
President, PGIS-YRF (2006/2007)

ACTIVITIES CARRIED OUT UNDER THE FIRST COMMITTEE OF PGIS-YRF (July 2005 – June 2006)

HALF-DAY SEMINAR SESSION



Prof. Lakshman Dissanayake, Director of the PGIS and Patron of the PGIS-YRF addressing the audience at the half-day seminar organized by the PGIS-YRF on 14th September 2005.

The first half-day seminar organized by the Young Researcher's Forum (YRF) of the PGIS was held on 14th September 2005 at the PGIS Auditorium. The seminar was intended to make presentations by young researchers including young Ph.D. holders active in research and M.Phil./Ph.D. research students of the PGIS. After the welcome address by Prof. Lakshman Dissanayake (Director, PGIS and Patron, YRF), a presentation on '*FTIR Study on Biosystems*' was made by Dr. V. Sivakumar of the Department of Physics, University of Peradeniya. This was followed by a presentation on '*Lichen Chemistry*' by Ms. V.M. Thadhani, a Ph.D. research student attached to the Department of Chemistry, University of Peradeniya. Prof. Veranja Karunaratne of the Department of Chemistry, University of Peradeniya gave a presentation on '*Making Sense of the Opportunities and Challenges of Postgraduate Studies*'. This was followed by a panel discussion (over snack lunch) by Prof. Lakshman Dissanayake, Prof. Gamini Rajapakse, Prof. Veranja Karunaratne, Prof. Jayanthi Edirisinghe and Dr. V. Sivakumar on Problems and Challenges by young researchers in Sri Lanka and also opportunities available for them.

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HALF-DAY SEMINAR SESSION (*as an event under the 'World Year of Physics' celebrations*)

A second half-day seminar session was organized by the PGIS-YRF as an event under the 'World Year of Physics' celebrations on 25th January 2006 at the Institute of Fundamental Studies (IFS), Kandy. Welcome address was given by Ms. V. M. Thadhani, President, PGIS-YRF (Ph.D. Research Student, Department of Chemistry, University of Peradeniya). Prof. Lakshman Dissanayake, Director, PGIS and also Patron of YRF gave the inaugural address and Prof. Keerthi Tennakone, Director, Institute of Fundamental Studies gave the guest speech. There were four seminar presentations by both young and senior scientists of IFS during the rest of the programme: presentation on '*What kind of science is Biology*?' by Dr. M. C. M. Iqbal, Senior Research Fellow, IFS; presentation on '*Solar energy conversion with dye-sensitized nano structures*' by Mr. P. K. D. D. P. Pitigala, Research Assistant, IFS; presentation on '*Inland water resources in Sri Lanka: its safety for drinking and other beneficial uses*' by Prof. E. I. L. Silva, Senior Research Fellow, IFS; presentation on '*Geology of Sri Lanka and assembly of Gondwana: a review and recent updates*' by Mr. L. V. Ranaweera, Research Assistant, IFS. At the end of the programme vote of thanks was given by Mr. Dionysius Gnanakkan, Secretary, PGIS-YRF (Research Assistant, IFS).

POSTER SESSION (AS A PART OF 10TH ANNIVERSARY PROGRAMMES OF THE PGIS)

M.Phil. and Ph.D. students of the PGIS presenting their posters during the poster session organized by the PGIS-YRF on 28th April 2006 as a part of the 10th Anniversary Celebrations of the PGIS.

Fifty four M.Phil. and Ph.D. students of the PGIS presented their posters under nine Boards of Study. An abstract volume of these posters was compiled and published by the YRF. All the presenters were awarded certificates and the presenters of the following three best poster presentations were awarded cash prizes.

1. Poster titled '*Preformed and Induced Chemical Resistance of Tea Leaf against Exobasidium vexans Infection*', authored by P A N Punyasiri, V Kumar and I S B Abeysinghe, and presented by P A N Punyasiri.

2. Poster titled *'Antibacterial Activity of Tea Extracts / Compounds against Strains of Methicillin-Resistant Staphylococcus aureus (MRSA)'*, authored by W W Kumbukgolla, B M R Bandara, N S Kumar, M A L C Manikarachchi, V Thevanesan and E W M A Ekanayake, and presented by W W Kumbukgolla.

3. Poster titled '*Spatial Variation of Surface Materials and Wave Energy and their Effect on the Coastal Erosion along Southwest Coastal Zone of Sri Lanka*', authored by A K Wickramasooriya, P Wickramagamage, S W Nawaratne and S N Wickramarathne, and presented by A K Wickramasooriya.

See page 23 for details

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HALF-DAY SEMINAR SESSION & ANNUAL GENERAL MEETING (AGM)

Annual General Meeting of the YRF was held on 26th June 2006 at the PGIS Auditorium following another half-day seminar session. Prof. Lakshman Dissanayake, Ditector, PGIS/Patron, YRF delivered the welcome speech and this was followed by the distribution of certificates for those who made poster presentations at the 10th Anniversary Celebrations – Poster Session on 28th April 2006 at the PGIS. The Keynote Address was delivered by Prof. Keerthi Tennakone, Director of the Institute of Fundamental Studies, Kandy. Dr. Chris Ennes from U.K. who was a visiting Senior Lecturer of the Department of Chemistry, University of Peradeniya gave the guest lecture on '*Professional Skills*'.

Apart from these two senior scientists, two research students registered at the PGIS for M.Phill./Ph.D. degrees made presentations on their fields of study: Ms. Vinitha M. Thadhani, the former president of the YRF presented '*the Challenges and opportunities in the field of natural product chemistry in Sri Lanka*'; Mr. Wajira Kangara from IFS presented '*A case study on Environmental aspects of eutrophication and the trophic evolution in Kandy Lake*'.

At the AGM the new committee for 2006/2007 was elected. The committee consists of 12 members from the Faculty of Science and Faculty of Medicine, University of Peradeniya and Institute of Fundamental Studies, Kandy.

INCENTIVE SCHEME FOR RESEARCH PUBLICATIONS

In order to encourage and promote research publications by M.Phil./Ph.D. (and also M.Sc.) students attached to the PGIS and their research supervisors, an incentive cash award scheme has been initiated by the PGIS.

This cash award scheme will be effective for research papers published during 2006 and after.

The guidelines for the award:

1. *At least one of the authors should be a student currently registered at the PGIS, (or should have received the degree form PGIS within two years prior to the year of publication)*
2. *The publication should be based on the research work carried out for the M.Phil./Ph.D. or M.Sc. degree at the PGIS.*
3. *The Postgraduate Institute of Science, University of Peradeniya should be mentioned as students' affiliation (in addition to the place of work), at the top of the publication.*
4. *The award is to be divided equally among all authors if the paper is co-authored by several authors.*
5. *If foreign authors and foreign institutions are included, only 50% of the award will be offered to local authors.*

Type of publication	***Cash award per publication***
Full papers in Citation Index Journals	*…… Rs. 3000/-*
Full papers in other International Journals and Local Journals (NSFJ, CJS etc.)	*…… Rs. 2000/-*
Full papers published as conference proceedings	*……. Rs. 1000/-*
Abstracts, extended communications published as proceedings, local or foreign (SLAAS, PURSE, etc)	*……. Rs. 500/-*

Authors, who are eligible for this award, should write to the Director, PGIS along with a re-print or a copy of the research publication and other necessary evidence.

DEGREES AWARDED (July 2005 – June 2006)

Ph.D. & M.Phil. Research Degrees

		Title of the Thesis (Year)

Ph.D. – Biochemistry and Molecular Biology

1.	E M I Edirisinghe	Effect of coconut fat on serum and aortic tissue lipids, and endothelial dependent relaxation of blood vessels - a study in guinea pig (2005)

Ph.D. – Chemical Sciences

1.	H M A M C Herath	A novel approach to the control of *Aedes aegxpti*, a vector of dengue fever and pollution abatement by the use of porphyrin derivatives (2005)

Ph.D. – Science Education

1.	A R G A M A Menike	Development of General Chemistry concepts at school level (2006)
2.	P R K A Vitharana	Teaching 'Environment related activities' at key stage one to help children in developing science process skills to attain scientific literacy in future (2006)

Ph.D. – Zoological Sciences

1.	S R Krishnarajah	Aspects of biology and ecology of *Acavus* species in Sri Lanka (2005)

M.Phil. – Biochemistry and Molecular Biology

1.	M W S Perera	Development of an animal model to study oral sub-mucous fibrosis using aqueous Areca nut (*Areca catechu*) (2006)

M.Phil. – Chemical Sciences

1.	K S Kalhari	Synthesis of essential oil derivatives for development of insecticidal products against mosquitoes and houseflies (2005)
2.	N M J Nissanka	Investigation of the extent of acid precipitation in Sri Lanka (2005)
3.	K G N P Piyasena	Chemistry and bioactivity studies of *Garcinia mangostana* L. (2005)
4.	R N Susantha	Chemical and biochemical modifications of electrode surfaces for sensor applications (2005)
5.	M T Napagoda	Bioactivity studies of some Sri Lankan flora & bioactive xanthones from C*alophllum thwaitesii* (2006)

M.Phil. – Environmental Sciences

1.	R N R Jayaratne	Air quality trends in the city of Colombo (2006)

M.Phil. – Physics

1.	Y Velmurugu	Electrochemical and electromechanical behaviour of polypyrrole films (2005)
2.	S Kuhanesan	Fracture toughness and crazing behaviour of virgin and filler added polystyrene films (2005)

M.Phil. – Plant Sciences

1.	M A A B Dilhan	Vegetation structure and floristic composition in the irrigation extension area of the lower Walawe basin, Sri Lanka (2005)
2.	K K S K De Alwis	Development of propagation techniques & agronomic practices of two medicinal plants *Asparagus racemosus willd* & C*yperus rotundus* L. (2006)

M.Phil. – Zoological Sciences

1.	W A P P De Silva	Insecticidal activity of *Euphorbia antiquorum* L. latex against agricultural insect pests (2006)

M.Sc. Degrees (*by course work with a research project of 3 – 6 months duration*)

M.Sc. – Analytical Chemistry

1.	J M D Abeysinghe	Quantitative and qualitative assessment of pesticide residues in large-scale vegetable plots surrounding the tea plantation (2005)
2.	M V Gamlathge	Chemical and biological activity of selected varieties of spring canola (*Brassica napus*) and mustard (*Brassica juncea*) and introduction of a high content of favourable fatty acids to mustard (2005)
3.	W D S Gunathilaka	Antimicrobial natural products against oral pathogens (2005)
4.	C D Jayasinghe	Evaluation of chemical properties of tea in different regions of Sri Lanka (2005)
5.	W E U Malewana	Mosquitocidal studies of mugetanol derivatives and herbal-based mosquito coils (2005)
6.	R A C N Perera	Development of novel methods to prepare montmorillonite-polyaniline nanocomposites (2005)
7.	T Markandu	Development of an opto-chemical sensor for the investigation of metal cations (2005)
8.	I G P M Wickramasinghe	Copper kaolinite interactions: an application of diffuse layer surface complexation model (2005)
9.	S Balagowry	Current pollution status of Valaichenai lagoon (2005)
10.	V Jeevaretnam	Investigation on the extent of pollution of the Kallar lake (2005)
11.	Subramaniam Suthakaran	Investigation of lead pollution in Pinga-oya & comparison of analytical results of lead content using atomic absorption & UV/Visible spectrophotometer (2006)

M.Sc. – Applied Statistics

1.	S Kuhananthan	Investigating the statistical properties of exponential family of distributions and estimation of parameters (2005)
2.	A M C C Premathilake	A regression model for the stream flow prediction in the upper Kothmale catchment in Sri Lanka (2005)
3.	T Theepthakumar	Developing Java applets to illustrate the basic concepts in simple linear regression analysis (2005)
4.	E M R P K Ekanayake	Statistical verification and further improvement of the models for carbondioxide emissions (2005)
5.	M C Alibuhtto	Structural changes in Sri Lankan population (2005)
6.	S Selvakkadunko	Estimation of parameters from Gausian-beta hierarchical model (2005)

M.Sc. – Computer Science

1.	R M N B Rathnayake	Performance analysis of Coda file systems (2005)
2.	S N Gunasekera	Extraction of topological properties from a 2D contour map and reconstruction of the 3D terrain (2005)
3.	K Ganeshamoorthy	'Grktexedt' - Tamil tex editor for scientific typesetting and for latex output (2005)
4.	J A G N Jayasinghe	Optimum and shortest way finder (2005)
5.	R W M D B Kapukotuwa	Integrated solution to monitor and audit network for IT and non-IT personnel (2005)
6.	P U Liyanage	A university timetabling system based on graph colouring and constraint manipulation (2005)
7.	T Naresh	Distributed sales application (2005)
8.	P S R Peiris	Tracking moving objects and reconstruction in 3D space (2005)
9.	M Seneviratne	Compression of medical X-ray images by extraction of details of interest for the images of hand and wrist of children (2005)
10.	W M J P Wanigasekera	Designing a role based access control system using design patterns (2005)
11.	W M S K V Wijayakoon	University time table system (2005)
12.	C P K Wijekoon	Tools support for design pattern (2005)
13.	S J B Samarasinghe	A tool for testing Java programs (2005)
14.	H M A K B Herath	Performance analysis of a small low cost Beowulf cluster with mathematical modeling in a parallel computing environment (2005)
15.	G H Alagiyawanna	Automated exam marking system (2005)
16.	Kalaimagal Sivayoganathan	Facial expression recognition system (2006)

M.Sc. – Engineering Geology & Hydrogeology

1.	W M G B Weerasekera	A study of soil weathering profiles in determining geotechnical problems in the urban area of Kandy (2005)

M.Sc. – Environmental Science

1.	L A W D Ariyadasa	Photocatalytic degradation of Remazol Blue using imenite and titaniumdioxide (2006)
2.	K D T N Abeywardana	Fluctuations in physicochemical parameters and dipteran larval density in household composting units (2006)

M.Sc. – Experimental Biotechnology

1.	C R V P Samarasekara	Estimation of the effective population size for coconut genome mapping using computer simulation (2005)
2.	N S Tennakoon	Enhanced biodegradation of photodegradable polyethylene from developed microbial biofilms (2005)
3.	B D S L De Tissera	Characterization of germline mutations in the breast cancer gene 1-exon 15 (2005)
4.	D C Hettiarachchi	Antigenic analysis of bovine *Sarcocystis* spp in Sri Lanka (2005)
5.	M M T P Bandara	Development of a specific molecular marker to identify the coconut form bodiri. (2005)
6.	R S Mallawa Arachchi	A study on partial characterization of excretory-secretory (ES) and somatic antigens of *Explanatum explanatum* and establishment of its phylogenetic relationship by genetic characterization (2005)

M.Sc. – Gemmology

1.	S M S Abeyweera	Preparation of a diffusion material for colouration of colourless Topaz (2005)

M.Sc. – Industrial Chemistry

1.	Arunasalam Karunaharan	Effect of sunlight and rain on the color of coloured asbestos sheet (2006)

M.Sc. – Industrial Mathematics

1.	A S Athapattu	A mathematical model for blending of aggregate by weight (2005)

M.Sc. – Medical Physics

1.	Jeyasingam Jeyasugiththan	The performance characteristics of Gamma camera (2006)

M.Sc. – Oceanography

1.	J K G P Sanjeewa	Environmental parameters and fish abundance in Negombo lagoon (2006)

M.Sc. – Physics of Materials

1.	H B A U Jayasinghe	Development of clays or minerals as backfill materials in lightning conductors (2005)
2.	P A M T Jayathilaka	Transport properties of polymer electrolytes based on poly(ethyleneoxide) complexed with copper salts (2005)
3.	A R K Peiris	Effect of high energy radiation on poly(ethyleneoxide) complexed with copper thiocyanate (2005)
4.	G M Hapanweera	A study on low cost phosphate bonded clay bricks (2005)
5.	S Z R Fervin	Electrical conductivity of synthesized Zircon ceramics doped with different dopants (2006)

M.Sc. – Plant Sciences

1.	A M A S Attanayake	A detailed taxonomic study on the genus *Ilex* L., (family Aquifoliaceae) in Sri Lanka (2006)

M.Sc. – Science Education

1.	S Parthasarathy	Evaluation of computer-based conceptual simulations: A case with reproduction in flowering plants (2005)
2.	R Sandeswaran	Interactive study package on G.C.E. (A/L) Electronics (2005)
3.	A Methew	Evaluating and enhancing grade eleven Science teachers' teaching of Physics concepts in Nuwara-Eliya zone (2005)
4.	V Vithanage	An investigation of students' achievement levels in Mathematics at the G.C.E. (O/L) examination (2005)
5.	W J Iranganie	Need for an organized remedial teaching programme in Mathematics for pre-advanced level science classes (2005)
6.	S L Domingo	Guide to identify marine food fishes available at some selected markets/landing sites in southwestern and southern coasts of Sri Lanka (2005)
7.	M C Gamage	Development of guidebook to assist successful implementation of \advanced level projects (2005)
8.	G P S Swarnalatha	Liana vegetation in Kurulu Kele forest in Kegalle (2005)
9.	I Thiagarajah	Contribution to mathematics teaching at senior secondary level via error analysis of problem solving in Mathematics (2005)
10.	I Abeykoon	An attempt to introduce simple experiment-based projects for A/L Agriculture atudents (2006)
11.	S W K Alahakoon	Analysis of problems of G.C.E. (A/L) science students and teachers in conducting projects and suggestions for overcoming (2006)
12.	H A Dharmadasa	Study guide on air and water pollution for advanced level students (2006)

Postgraduate Diplomas (*by course work only*)

Diploma – Applied Statistics

1. G P Karunasheely (2005)

Diploma – Gemmology

1. S A T Bandara (2006)

Diploma – Computer Science

1. U S B Panamaldeniya (2006)

Diploma – Science Education

1. S M D Crisenta (2006)

Diploma – Oceanography

1. M S P K Malaviarachchi (2006)

Diploma – Physics of Materials

1. H M L K Werake (2005)

Diploma – IT for Education (2006)

1. A G S K Adhikari
2. A G A K Akmeemana
3. H P G M De Alwis
4. P G N Balangoda
5. B M P L P Bandara
6. M Charmeendran
7. K W D U Chandrakumara
8. K W S Chandraman
9. S Chandramohan
10. R A Chandrarathna
11. D M M Dissanayake
12. D M N J Dissanayake
13. S K Dissanayake
14. D M A Dissanayake
15. S Gnanarajan
16. S Gunatilake
17. M Y A A Hameed
18. K G D Heenbanda
19. S Ilankeswaran
20. R D Jeyarajah
21. W B Jinadasa
22. R S Karunarathna
23. M B T Khan
24. A K P S Kodituwakku
25. R M K D B Koswaththa
26. M Krishananth
27. K Manivannan
28. S M Medagedara
29. A M Mural
30. S Nagarathnam
31. G H D R Padmasiri
32. L C R Pathirana

33. M S P Perera
34. S L Piyadigama
35. P G S Piyasiri
36. M N Premadasa
37. S S Premakumar
38. W D Premathilake
39. S Rajan
40. N S K Rajapakshe
41. R M P K Rathnayake
42. R M D S Rathnayake
43. S A M Riyas
44. N Sahabandu
45. G Sasikala
46. N U Sellahewa
47. W M K R Seneviratne
48. E G S Shantha
49. G A Silva
50. B P Sirinanda
51. M Sivanathan
52. G G A C K Sumanasekara
53. T Surendran
54. Y Suthagaran
55. T G R Tharukaratne
56. R M Thilakarathna
57. N Umashangar
58. W G R K Weerakoon
59. P V U S Weerawardhana
60. H W S K Welikala
61. A R D J Wijerathne
62. S K Wijethilaka
63. S D D Wijewickrama
64. D M Wimalaratne
65. T M S S K Yatigammana

ABSTRACTS OF Ph.D./M.Phil. THESES

Ph.D. (*Biochemistry and Molecular Biology*)

Effect of coconut fat on serum and aortic tissue lipids, and endothelial dependent relaxation of blood vessels - a study in guinea pig

E M I Edirisinghe, *PGIS & Department of Biochemistry, University of Peradeniya, Peradeniya*

Atherogenicity of saturated fat is well documented. Coconut fat is a rich source of cholesterogenic-saturated fatty acids (CSF). Sri Lankans use coconut extensively to prepare their daily food and have a high dietary intake of coconut fat. Although coronary heart disease is one of the leading causes of death in Sri Lanka, the role of coconut consumption remains controversial.

The present study was undertaken in an animal model to test the hypothesis that a diet rich in coconut fat induces atherosclerosis. The experiments were done on guinea pigs, whose lipid metabolism is similar to that of humans. The antiatherogenic effect of grape seed extract (GSE) was also studied. This extract is abundant in polyphenolic antioxidants.

Study was done in two phases. The animals in each phase were age and weight matched. Groups of guinea pigs (n = 6) were assigned to different isocaloric diets containing 5% (w/w) fat. Fat content was varied as follows: coconut oil (Co), coconut + corn oil (1: 1) (Co+Cor) and corn oil (Cor). After 12 weeks of feeding, animals were sacrificed and blood and aortic tissue were collected to estimate total cholesterol, serum and aortic fatty acids in one study and lipid profiles and endothelium dependent relaxation (EDR) in the other. Same measurements were made in an animal group fed the Co diet with 1 mg GSE/g food.

The animals that consumed Co diet had the significantly high concentrations of plasma total cholesterol (77%), LDL cholesterol (97%), HDL cholesterol (53%), serum CSF (16%) and aortic cholesterol (51%) compared to the lowest values

reported in animals fed Co +Cor diet. Bradykinin induced EDR was significantly lower in animals fed Co (24%) compared to animals fed Co+Cor diet.

Feeding the Co diet with GSE significantly reduced the aortic cholesterol (29%), but did not improve plasma lipid profiles and EDR. GSE caused EDR even when the vessels were not responsive to acetylcholine.

It is concluded that coconut fat is atherogenic in the guinea pig. This conclusion is based on the high cholesterol content of the aorta and impaired bradykinin induced EDR in animals fed the Co diet. Partial replacement of dietary saturated coconut fat with unsaturated corn fat improved serum lipids.

Supervisors: **Prof. C T Kappagoda** (*University of California-Davis, U.S.A.*)
Prof. P A J Perera (*University of Peradeniya & PGIS*)
Dr. P H P Fernando (*University of Peradeniya & PGIS*)

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Ph.D. (*Chemical Sciences)*

A novel approach to the control of *Aedes aegypi*, a vector of dengue fever and pollution abatement by the use of porphyrin derivatives

H M A M C Herath, *PGIS & Department of Chemistry, University of Peradeniya, Peradeniya*

The discharge of hazardous chemicals by the activities of mankind has been a serious threat to the environment. Among the pollutants, pesticides, coloured dyes and heavy metals are significant in terms of their detrimental consequences to living organisms. Therefore, the development of efficient and reliable techniques for the removal of these pollutants from the environment is essential. In the pollution abatement studies, it was demonstrated that porphyrin derivatives such as haematoporphyrin dihydrochloride (HPDHC) and protoporphyrin dimethylester (PPDME), in the presence of visible light and oxygen, could be utilized for the destruction of coloured organic dyes in aqueous media.

The visible light irradiation of oxygenated aqueous solutions of coloured dyes magenta (MaG), crystal violet (CrV) and hematoxylin in the presence of HPDHC or PPDME showed complete colour bleaching after 12 hours. The rate of photobleaching was found to be sensitive to the medium pH. At low pH (pH = 3.2), a higher oxidative degradation rate for MaG was observed in comparison to the low rate at pH 6.0. Analysis of photoproducts of MaG and CrV in acidic as well as basic media showed the formation of micromolar levels of NO_3^- ions resulting from the destruction of amine moieties of the dyes.

Photobleaching experiments were carried out in the presence of different quenchers such as 1,4-diazabicyclo[2.2.2]octane (DABCO) for singlet oxygen and 1,4-benzoquinone (BQ) for the superoxide anion ($O_2^{\cdot-}$). Only BQ was able to stop photobleaching suggesting that the photooxidation of these dyes are mainly caused by $O_2^{\cdot-}$, which is generated by an electron transfer form the excited sensitizer to ground state oxygen in the photosensitization process. The participation of singlet oxygen in dye destruction process is comparatively low.

Solubility of porphyrins in water is an essential requirement when they are used in aqueous medium. Water soluble cationic porphyrin derivatives 5,10,15,20-tetrakis(4-*N*-pentyl-pyridyl)porphyrin, $[(TPePyP)H_2]^{4+}$, and its zinc analogue $[(TPePyP)Zn^{II}]^{4+}$ were synthesized by introducing cationic pyridyl groups into the *meso* positions of the porphyrin core. Photobleaching studies carried out in aqueous solutions of varying pH show that, in the presence of oxygen, $[(TPePyP)H_2]^{4+}$ undergoes fast photodegradation when the solution is irradiated with 560 nm light. The steady-state singlet oxygen quantum yields (Φ_Δ) measured in DMF for $[(TPePyP)H_2]^{4+}$ and it's Zn analogue were 0.80 and 0.85, respectively. These values are in the same order of magnitude as those of well-known porphyrins such as HPDHC and PPDME.

The aggressive and destructive nature of $O_2^{\cdot-}$ towards most of the organic materials is an important advantage in pollution abatement. A method generally employed to indirectly test for $O_2^{\cdot-}$ is the study of a $O_2^{\cdot-}$ driven reaction in the presence of a scavenger like superoxide dismutase or benzoquione. It was found that $O_2^{\cdot-}$ was effectively quenched when 1,2,3-triketohydrindence hydrate (NHy) was added to an oxygen-saturated solution, where $O_2^{\cdot-}$ is electrochemically generated at a glassy carbon electrode by applying a potential of -0.75 V vs Ag/AgCl wire. The suppression of the oxidation peak of $O_2^{\cdot-}$ with the addition of NHy in cyclic voltammetry was in close agreement with the results obtained in rotating ring disk voltammetric experiments. It was revealed that the decolouration of MaG by the $O_2^{\cdot-}$ produced by HPDHC in the presence of light in DMF was retarded in the presence of NHy.

The syntheses of porphyrin dyads in the combination of free-base and Zn porphyrin units with different redox potentials was attempted. In this respect, several porphyrin derivatives, *meso*-5-(4-hydroxyphenyl)-10,15,20-trisphenyl porphyrin (HPTrPP), meso-5-(4-hydroxyphenyl)-10,15,20-tris(4-methoxy phenyl)porphyrin (HPTrMPP), *meso*-5-(4-hydroxyphenyl)-10,15,20-tris(4-sulfonatophenyl)ammonium porphyrin $[NH_4]_4$[HPTrSPP] and their Zn derivatives were synthesized and characterized by UV-Visible, ^{1}H NMR spectroscopy and cyclic voltammetry.
The porphyrin-sensitized photoinactivation of the 2nd and late 3rd instar larvae of the urban dengue mosquito *Ae. aegypti* was investigated as a novel approach in controlling the mosquitoes. In this study it was revealed that haematoporphyrin dimethylester (HPDME), HPDHC, PPDME and haematoporphyrin (HP) caused a high level of phototoxicity to the 2nd and late 3rd instar larvae of *Ae. aegypti* in Pyrex and clear plastic containers. In contrast, the mortality under natural conditions was less in coconut shells, tin caps and PVC gutters. Least larvicidal activity was observed in tires. These results suggest that the efficacy of mortality depends on the amount of light reaching the photosensitizer (this is maximum only in case of Pyrex glass and clear plastic containers), the nature of the surface of the container, the concentration of the sensitizer and unit volume per larvae.

Out of four sensitizers tested, a high level of larvicidal activity was observed with aqueous solutions of HP which showed the highest phototoxic effect at 2.5 ppm in laboratory experiments. Field experiments set up inside and outside houses also showed that a high larvicidal activity with HP (100% mortality in four days) in the presence of light (outside). Conversely, the mortality was less inside the houses (36.79%).

The Phototoxic studies extended using HP and HPDHC towards other fresh water fauna, mayfly larvae, *Poecilia reticulata* (guppy) and *Bufo melanostictus* (tadpole) did not show any apparent toxic effect even after seven days at 100 ppm. This concentration is 40 times higher that than used in bringing about the effective killing of *Ae. aegypti* larvae. Based on field experiments as well as toxicity studies, both HP and HPDHC could be used effectively and safely to hasten the larval killing process, thus controlling the adult mosquito population.

Supervisors: **Prof. R M G Rajapakse** (*University of Peradeniya & PGIS*)
Prof. A Wickramasinghe (*University of Peradeniya & PGIS*)
Prof. N L V V Karunaratne (*University of Peradeniya & PGIS*)

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Ph.D. (Science Education)

Development of General Chemistry concepts at school level

A R G A M Abeykoon Menike, *PGIS, University of Peradeniya, Peradeniya*

A good understanding of the general chemistry section in the chemistry syllabus for the General Certificate of Examination – Advanced Level, GCE (A/L) is essential for students as it provides the knowledge in basic concepts in chemistry that are helpful to understand the other sections in the chemistry syllabus. However, most advanced level chemistry teachers consider teaching general chemistry section of the GCE (A/L) chemistry syllabus poses many problems. The analysis of the content in the evaluation reports of the chemistry papers in the GCE (A/L) examination shows that students too experience difficulties in answering the questions that are focused to evaluate their knowledge in general chemistry concepts. This study aimed at identifying problems of the learners and assisting them in learning the concepts in general chemistry. In the Sri Lankan context the knowledge of some basic concepts in general chemistry is introduced at the junior secondary level of the school system. Therefore this study focused on identifying the problems in the teaching learning process in this section from junior secondary stage of education to senior secondary stage (General Certificate of Examination - Ordinary Level) of education too. The purpose of this was to find out ways of developing concepts in general chemistry effectively in students.

To understand how general chemistry concepts are taught at junior and senior secondary levels, three questionnaires were administered among O/L and A/L science teachers. 25% of them were interviewed. The answer scripts in term test papers of the GCE (O/L) students were also analyzed. Two diagnostic tests were conducted to A/L students to identify problematic topics in a selected unit (The unit on 'Chemical bond') in the general chemistry section of the A/L syllabus. Six classrooms were observed to identify problems in teaching and learning chemical bonds at GCE (A/L). By doing a content analysis of the general chemistry sections in the O/L and A/L syllabuses, it was found out that the content in the teacher guides and textbooks had created some problems in learning. According to O/L teachers it is too much for the tenth graders to learn concepts involved in writing formulae using symbols, valence numbers, etc. in the same year. It was also found that the content related to general chemistry in the O/L syllabus has to be reorganized to ensure smooth flow of facts from lower grades to upper grades.

The students had difficulties in writing formulae, balancing chemical equations and drawing dot-cross diagrams and, understanding molecular geometry, intermolecular forces, polar and non-polar molecules. In writing chemical formulae most of O/L students made mistakes. Fifty percent of the teachers stated that it is difficult to teach balancing equations for O/L students as well as A/L students. In teaching chemical bonds, several defects of the teachers such as presenting incomplete or irrelevant facts, making incorrect and incomplete explanations, problems in introducing lessons and managing time were identified. To overcome the identified difficulties and to facilitate teaching learning process, a handbook was prepared on the unit on 'chemical bond' in the GCE (A/L) chemistry syllabus and it was tried out in four classes. The analysis of students' answer sheets showed that students in the classes of the trying out sessions had comprehended the content better than the students who learned the unit in the traditional manner. It is suggested to recognise the content in general chemistry from junior to senior secondary level and to introduce new methodologies of teaching to assist students in their learning. In addition preparation of handbook for each unit in general chemistry section of the GCE (A/L) chemistry syllabus is recommended.

In Sri Lanka students have the opportunities to develop science process skills in primary classes through the subject 'Environment Related Activities (ERA.)' The content in this subject was analysed in order to find out whether some activities that are related to general chemistry sections can be introduced in these grades. Two grade two classrooms were observed to understand the ways of introducing ERA subject in the primary classes. Subject experts were interviewed. It was found out that there are several themes in the ERA syllabuses in primary stage in which some activities related to general chemistry can be introduced. It was also found out that even though there are opportunities; teachers do not introduce activities that are directed to improve scientific process skills in students. A booklet of activities was prepared in which some activities related to general chemistry concepts are introduced that are related to the content in the ERA syllabuses. This book also provides opportunities to develop process skills in students. Some of the activities in this booklet were tried out in primary teacher training programmes and the primary teachers were very satisfied with the outcome of these activities.

Supervisor: **Dr. S Karunaratne** (*University of Peradeniya & PGIS*)

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Ph.D. (*Science Education)*

Teaching 'Environment Related Activities (ERA)' at key stage one to help children in developing science process skills to attain scientific literacy in future

P R K A Vitharana, *PGIS, University of Peradeniya, Peradeniya*

Today we live in a world filled with scientific innovations due to the advancement of science and technology. Therefore society is complex and rapidly changing than ever before. In order to face the dynamic nature of the 21st century, an individual should possess multiple skills. The developed countries like USA are aiming to produce scientifically literate citizens to succeed challenging situations in the world. Although we are a developing nation we have to face the global society. However, this cannot be achieved within one or two years and it should start from primary level. According to the primary education reforms introduced in 1997, the primary cycle of education has been divided in to three key stages as key stage one - grades1 and 2, key stage two – grades 3 and 4 and key stage three-grade five. Primary curriculum consists of four main subjects and science is integrated in Environment Related Activities (ERA). The aim of this study was to help children in key stage one to develop science process skills through the subject ERA, that are required to be a scientifically literate adult in future.

In order to achieve the aim of the study it was conducted in three phases. In the first phase data were collected relating to ERA using classroom observation, interviews and diagnostic questionnaire. In the classroom observation twelve teachers from three schools were observed while teaching ERA and detailed fieldnotes were prepared for each lesson. With the help of the fieldnotes, detailed transcripts were made with the objective of understanding the real situation in the classrooms. During the second phase, activities were planned in different themes of ERA to develop process skills of children. In the third phase those activities were piloted in three selected classrooms. Classroom observation was conducted and fieldnotes were prepared. The necessary improvements were made with the data obtained from observation and the feedback obtained from teachers. Data obtained from different sources were analysed and identified the weaknesses in teaching ERA, the types of activities suitable for developing process skills and how children developed process skills through suggested activities.

It was evident from the study that many teachers had difficulties in teaching science related components of ERA due to the lack of subject matter knowledge and it led children to develop misconceptions. The students' active participation, which is expected in the student-centered teaching, was not observed in most of the classrooms. Almost all the teachers had

weaknesses in the area of professional skills. Among the most prominent of those were the introducing lessons, questioning, planning lessons, organizing group work and use of teaching aids. 85% of teachers were not competent in developing process skills of children especially due to the weakness in professional skills.

Children enjoyed and actively participated in doing activities that were introduced. Children developed process skills when they engaged in simple activities with the proper guidance of the teacher. Teachers' responses towards suggested activities indicated that children were very interested in learning through such activities and teachers motivated children to be inquisitive and investigative.

Children in key stage one developed misconceptions due to the limited science background of teachers. Although there were number of opportunities in the ERA syllabus to develop science process skills of students, they were rarely given proper guidance for that which is required to be a scientifically literate adult in future. The subject matter knowledge as well as the professional skills of primary teachers should be strengthened through workshops, allowing them to actively involve in activities where they could understand their own misconceptions and weaknesses.

Supervisor: **Dr. S Karunaratne** (*University of Peradeniya & PGIS*)

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Ph.D. (Zoological Sciences)

Aspects of biology and ecology of *Acavus* species in Sri Lanka

S R Krishnarajah, *PGIS & Department of Zoology, The Open University of Sri Lanka, Nugegoda*

Super family Acavoidea has a Gondwanaland type geographic distribution, and is represented in Sri Lanka by a single genus *Acavus* with four or more arboreal species and three uncertain taxa. This study includes species differentiation based on shell morphology, morphometric analysis, ecological distribution and internal anatomy of the penial complex.

The detailed study regarding the biology of *Acavus haemastoma* has shown that it is active mainly at night. This species is however active by day during moist and cool periods. During inactive periods, it is found in aggregates mainly on the trunk, and the under surface of the leaves of *Areca catechu* L., and on trunks of other tree species.

There is a relative correlation between the shell length and peristome diameter until the commencement of lip formation. Three phases are recognized in the development of the shell: a juvenile phase (approximately 6 months), sub-adult phase (6-7 months) and lip formation phase (four months).

Food generally comprises lichens, mosses, fungi and dead soft plant materials. In the laboratory soft succulent plant materials are preferred. Young snails on hatching are sometimes seen feeding on broken eggshells.

Reproductive period of hermaphroditic *A. haemastoma* begins with the onset of rainfall and lasts throughout the season with repeated mating activity. During the reproductive period a snail produces 2 - 4 eggs 10.5 ± 0.5 mm in length, weighing 1.02 ± 0.25g. Eggs are laid on the soil at the base of trees. Incubating takes about 30 days. Newly hatched snails, measuring shell length 5.54 ± 0.75mm, move onto the trees.

Acavids are found in a limited range of altitudes both in the intermediate and wet zones of Sri Lanka. *A. phoenix* has the broadest distribution in both climatic zones. *A. haemastoma*, is restricted to southern maritime areas and interior regions and is sympatric with other three Acavid taxa. Geographic ranges of the four Acavid taxa, are sympatric in lower Udagama in the Galle district.

The main anthropogenic threats to Acavids are the clearing of habitats, collection for limited use in unauthenticated traditional medicine, and as collector's items. *A.prosperus*, *A.haemastoma concolor* and *A. haemastoma conus* are potententially endangered and require immediate conservation measures. The genus *Acavus* in Sri Lanka is an example of a paleo-endemic and biogeographically significant mollusc, which is worthy of further study and conservation.

Supervisors: **Prof. W R Breckenridge** (*University of Peradeniya & PGIS*)
Prof. N B Ratnasiri (*University of Colombo & PGIS*)

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M.Phil. (*Biochemistry and Molecular Biology*)

Development of an animal model to study oral submucous fibrosis using aqueous Areca nut (*Areca catechu*) extract

M W S Perera, *PGIS & Department of Biochemistry, University of Peradeniya, Peradeniya*

Oral Submucous Fibrosis (OSF), a potentially malignant condition of the mouth, has an insidious onset inducing progressive fibrotic changes of the oral sub-mucosa resulting restricted mouth opening. Its aetiology and pathogenesis remain obscure to date. However, areca nut *(Areca catechu*) has been implicated for the development and progression of the disease as evidenced by numerous epidemiological and experimental studies.

Non-availability of a reproducible animal model of OSF may have hindered uncovering the pathogenic mechanisms involved in this disease process. In addition, it may also account for the paucity of research related to the development of specific therapeutic agents to treat this disease. Therefore, the present study was undertaken to develop an animal model of OSF which would be confirmed by qualitative and as well as quantitative histopathological analysis.

BALB/c mouse was selected as the experimental animal. The corresponding test *(n=20)* and control *(n=20)* animals were allotted to four different treatment intervals i.e. 300, 350, 450 and 600 days, maintaining 5 animals in each group. A drop (~ 35 µl) of areca extract in normal saline (265g dry weight/L) was administered to the oral mucosa of each of the test group mice using a transfer pipette and a similar amount of normal saline was used for the control. The buccal and tongue mucosae of the animals were harvested at the allotted time intervals, fixed in para formaldehyde and processed for routine histology. Tissue section of 4-5µm were stained with haematoxylin and eosin. Selected tissue sections were stained with van Gieson and Masson's trichrome to confirm the fibrotic changes in the connective tissues. Histopathological criteria described by Pindborg and Sirsat (1996) were employed to confirm the diagnosis of OSF in the animal model. Quantitative histomorphometric measurements were taken for both buccal and tongue mucosae to confirm excessive deposition of collagen in the lamina propria and atrophy of the epithelium in the corresponding tissue.

Histopathological examination of tissues obtained form animals of every treatment interval clearly demonstrated cellular changes which were pathognomonic of OSF. Buccal mucosa of the test group showed excessive fibrotic changes both at qualitative and quantitative levels. Epithelia atrophy was increased throughout the treatment intervals except in the papillary epithelial compartment at 300-day interval. Polynomial regression plots showed that atrophy of the inter-papillary epithelial compartment occurred prior to the atrophy of the papillary epithelial compartment. Similar patterns of fibrosis and atrophy were observed in the tongue mucosae of the treated animals. Connective tissue changes preceded atrophic changes of the epithelium and a similar sequence of events has been observed in human subjects affected by this condition.

The results obtained in the series of experiments with BALB/c mice clearly demonstrated the classical histological features seen in OSF in human subjects. Concerning the site-specificity for the development of OSF, the buccal mucosa ranked above the lingual mucosa. Scanning the literature, it appeared that this is the first successful attempt in inducing oral submucous fibrosis in an animal model substantiating the causative role of areca nut in the pathogenesis of this disease.

Supervisors: **Dr. T K P K Kaluarachchi** (*University of Peradeniya & PGIS*)
Prof. P A J Perera (*University of Peradeniya & PGIS*)
Dr. E A P D Amaratunga (*University of Peradeniya*)

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M.Phil. (*Chemical Sciences*)

Synthesis of essential oil derivatives for development of insecticidal products against mosquitoes and houseflies

K S Kalhari, *PGIS, University of Peradeniya and Industrial Technology Institute, Colombo 7*

Public health pest control is a major priority to minimize the infections and transmission of vector-borne diseases in the tropical region. Increased public concern regarding the potential adverse effects of chemical insecticides has prompted the search for alternative methods of pest control. Plant essential oils having a rich source of bioactive chemicals have been considered potent alternatives to conventional insecticides as a natural means of pest control.

The objectives of the present study are to synthesise derivatives of essential oil compounds, menthol, thymol, α-terpineol, geraniol, eugenol, citronellol, cinnamyl alcohol and cinnamic acid and to evaluate their activity against mosquitoes and houseflies. The second objective is to establish the Structure Activity Relationship (SAR) of compounds with the aim of identifying structural features that are necessary for activity and the third to develop insecticidal products.

Insecticidal properties of oils of *Cinnamomum zeylanicum*, *Cymbopogon nardus*, *Cymbopogon citratus*, *Ocimum gratissimum, Ocimum canum, Toona ciliata* and *Mentha piperita* have been recognized and the principle active compounds were identified. Acyl, halo acyl, ether, cyclic acetal, epoxide and hybrid derivatives with structures based on insecticidal menthol, thymol, α-terpineol,geraniol, citronellol, eugenol, cinnamyl alcolol and cinnamic acid have been synthesized using standard reaction conditions. Synthetic derivatives were purfied by Dry Column Flash Chromatography and structures were elucidated by ^{1}H and ^{13}C NMR spectral data. Bioassay followed the WHO standard protocol for *Culex quinquefasiciatus*, *Anopheles tessellatus* and *Aedes aegypti* and topical application method for *Musca domestica*. Anti-mosquito creams/lotions. mosquito coils, repellent candles and housefly baits and liquids sprays were prepared incorporating active compounds and oils. The bio-efficacy of these products was tested in the laboratory and field.

Synthetic derivatives showed enhanced insecticidal activity relative to the parent compounds. SAR of the compounds identified lipophilicity of the molecule as one of the key activity enhancing factors. This was highlighted by the increased activity in the ester derivatives of menthol, geraniol, cinnamyl, alcohol and cinnamic acid relative to their analogues containing hydroxyl, ether and carbonyl functionalities. The majority of compounds with aliphatic ester groups, which are less bulky, showed increased activity than chlorinated and fluorinated derivatives. The presence of a nitrogen atom in the esterifying group retained the insecticidal activity and the replacement of hydroxyl functionality, for example with glycerin acetal moiety, increased the activity significantly. Aromaticity is another key factor, which contributed to either retain or enhance the activity as seen in thymol. Degree of unsaturation also contributed to either retain or enhance the activity of α-terpineol and geraniol derivatives. The structurally related analogues have either comparable or higher activity indicating that structural variations contribute positively towards insecticidal activity. SAR data also indicated that cinnamic acid ester derivatives are less toxic than their parent alcohol moieties.

Field study data of anti-mosquito creams revealed that five formulations showed 100% protection and ten formulations greater than 90% protection in the field relative to the commercial formulations. It was also found that both citronella and neem oil function as a synergists in the above formulations. Bio-assay data of housefly baits indicated that seven baits showed good KT_{50} values in comparison to the reference bait.

Supervisors: **Dr. R Samarasekara** (*Industrial Technology Institute, Colombo*)
Prof. Athar Ata (*University of Winnipeg, Canada*)
Prof. N S Kumar (*University of Peradeniya & PGIS*)
Dr. K D P Hemalal (*National Aquatic Resources Research and Development Agency, Colombo*)

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M.Phil. (*Chemical Sciences*)

Investigation of the extent of acid precipitation in Sri Lanka

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The research described here reports the occurrence of acid rain in Sri Lanka and correlate acidic precipitation to air pollution from both local as well as transboundary sources. In this study, rainwater was collected from several meteorological stations throughout Sri Lanka, except north and the east representing different pollution levels such as rural, industrial and urban areas. A locally designed rainwater collecter was used to collect rainwater. Collected samples were brought to the laboratory at University of Peradeniya after preservation and subjected to chemical analysis. The parameters measured were; pH, conductivity, sulphate, nitrate, ammonium, chloride, potassium, sodium, magnesium and calcium.

During the initial phase of the project, classical methods were employed for the analysis. Nitrate was analyzed by the azo dye method using sulphanilamide and N-(1-napthyl)ethylene diamine hydrochloride after cadmium reduction. Sulphate was determined turbidimetrically using barium sulphate. Ammonium was determined by the indophenol blue method. Other parameters such as sodium, magnesium, calcium and potassium were analyzed using flame photometry and atomic absorption methods. Later ion-chromatograph was used for the analysis of rainwater samples.

It was found that acid rain occurs in Sri Lanka, specially in Colombo and the hill country. The percentage of samples having acid rain was found to increase during the period of study. There was also acid rain in the north central province

during the North East monsoon period of October to February indicating transboundary pollution in this area. Hill country and the Sabaragamuwa province also had acid rain but less than Colombo and the North Central province. The main contributing factors for acid rain are automobile exhausts and diesel power stations in Sri Lanka. Because the acid gases can get transported over long distances, pollutants from the Indian subcontinent may also be responsible for acid rain in Sri Lanka, specially in he North Central Province.

Supervisor: **Prof. O A Ileperuma** (*University of Peradeniya & PGIS*)

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M.Phil. (*Chemical Sciences*)

Chemistry and bioactivity studies of *Garcinia mangostana* L.

K G N P Piyasena, *PGIS, University of Peradeniya and Institute of Fundamental Studies, Kandy*

Garcinia mangostana L. is a tree found in Southeast Asia including Sri Lanka, and very popular due to it's delicious fruit. Medicinal uses such as for the treatment of diarrhea, dysentery, skin infections and as an anti-inflammatory agent are reported. Prenylated xanthones, benzophenones, terpenoids and sugars have been isolated from this species. ά–mangostin, one of the xanthones reported from *G. mangostana* has shown antibacterial activity against methicilin resistant *Staphylococcus aureus* (MRSA). Outbreaks of MRSA and vancomycin resistant *Enterococci* (VRE) infections in hospitals are frequently reported from different parts of the world. Prompted by above reports, chemistry and antimicrobial activity studies of *G. mangostana* were initiated with a special reference to MRSA and VRE. Further antifungal and antioxidant activity of isolates were also investigated.

In the present study, chemical investigation of the latex, fruit hull, stem bark and the root bark of *G. mangostana* yielded ά-mangostin, β-mangostin, γ-mangostin, methoxy-β-mangostin, Garcinone E, Gartanin and new natural products 3-hydroxy-4-geranyl-5-methoxybiphenyl and cycloart-22, 25-diene-3 β-ol. ά-mangostin was converted to 5,9-dihyroxy-8-methoxy-2,2-dimethyl-7-(3-methylbut-2-enyl)-2H,6H-pyrano(3,2-b)xanthen-6-one and methoxy-β-mangostin by cyclodehydro-genation and methylation respectively. Structural elucidation of two new compounds 3-hydroxy-4-geranyl-5-methoxybiphenyl and cycloart-22,25-diene-3β-ol and other isolates were carried out with the help of spectroscopic analysis, partial synthesis and comparison with literature data.

Antibacterial activity of above compounds was tested against five control strains *Staphylococcus aureus* (NCTC 6571), *Enterococci faecalis* (NCTC 12697), *Pseudomonas auregenosa* (NCTC 10662), *Klebsiella* PW (Pamilo Water strain) and *Escherichia coli* (NCTC 10418) and seventeen MRSA stains isolated from hospitals, using disk diffusion method. Of them ά-mangostin. γ-mangostin and 5,9-dihyroxy-8-methoxy-2,2-dimethyl-7-(3-methylbut-2-enyl)-2H,6H-pyrano(3,2-b)xanthen-6-one showed activity against *S. aureus* (NCTC 6571), at MIC values 1.04, 4.16 and 16.66 μg/mL respectively. Further, ά-mangostin and γ-mangostin showed activity against *E.faecalis* (NCTC 12697) at MIC values 1.04 and 4.16 μg/mL respectively. Anti VRE activity studies carried out with collaboration of Osaka Prefectural Institute of Public Health, Japan; showed the activity of ά-mangostin at MIC of 6.25 μg/mL. Synergisms between ά-mangostin and commercially available antibiotics against VRE and MRSA strains were also observed. Above antibacterial studies were carried out with the hope of preventing VRE and MRSA infections by introducing new natural products. MRSA and VRE activity of ά-mangostin and γ-mangostin are comparable with the presently used antibiotic gentamicin.

Antifungal activity of above isolates was tested against strains of human pathogen *candida* and plant pathogens *Aspergillus* and *Cladosporium*, using disk diffusion method. β-mangostin and γ-mangostin showed activity against *Cladosporium*.

Qualitative analysis of antioxidant activity of above isolates was carried out using free radical reagent 2,2-diphenyl-1-picrylhydrazyl (DPPH). ά-mangostin, γ-mangostin and Garcinone E showed antioxidant activity. EC_{50} value of each compound was calculated using EPA probit analayzer and γ-mangostin exhibited a higher activity with EC_{50} value of 61.6 μg/mL, which is more active than the positive control ascorbic acid (EC_{50}= 82.3 μg/mL).garcinone E showed EC_{50} value of 110.2 μg/mL.

The presence of the above highly bioactive compounds in *Garcinia mangostana* should be the causative factor for its medicinal value in indigenous medicine. Therefore, above antibacterial compounds should be investigated further in appropriate in *vivo* models.

Supervisors: **Prof. H R W Dharmarante** (*Institute of Fundamental Studies & PGIS*)

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M.Phil. (*Chemical Sciences*)

Chemical and biochemical modifications of electrode surfaces for sensor applications

R N Susantha, *PGIS and Department of Chemistry, University of Peradeniya*

Development of electrochemical methods and electrochemical biosensors for the detection of pesticides and hydrogen peroxide are described. Carrot callus tissues and rice plant tissues are utilized as molecular recognition elements to construct tissue modified biosensors with selectivity for the analytes of interest. Bare and chemically modified glassy carbon electrodes are utilized in voltammetric and amperometric analysis for the detection of important pesticides.

Cyclic voltammetric technique consisting of three-electrode system was used to investigate paraquat, the active ingredient of the herbicide Gramoxone. Sensor calibration was accomplished by employing an amperometric method based on glassy carbon electrode. Noise level of the amperometric signals has been lowered by surface modification of the glassy carbon electrode with non electroactive stearic acid. Levels of interference caused by structurally resembling compound, Diquat are also reported.

The development of an amperometric biosensor for the detection of hydrogen peroxide and the sensor application in determining hydrogen peroxide in milk is described. In vitro-cultured carrot callus which contains a high peroxidase activity was used as a molecular recognition element. The callus tissue was incorporated into the carbon paste matrix along with ferrocene as an electron mediator. This system is based on the enzymatic reduction of hydrogen peroxide by peroxidase and subsequent electron transfer from a carbon paste electrode to the enzyme via a ferrocene mediator. The sensor exhibits a remarkably long lifetime of about more than 45 days if it is stored in a pH 6.5 buffer solution at 4 to 10^{o}C when it is not use. Other important characteristics of the sensor include fast response time and very low detection limits.

The employment of rice plant tissues as a molecular recognition element for designing of biosensor for the detection of 3, 4-DPA, the active ingredient of the herbicide propanil, is examined. The resistance of rice plant to propanil is attributed to its ability to metabolize propanil into 3,4-Dichloro aniline by aryl carboxyl amidase. Rice plants containing aryl carboxyl amidase was utilized as molecular recognition element for the construction of biosensor.

Supervisor: **Dr. A N Navaratne** (*University of Peradeniya & PGIS*)

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M.Phil. (*Chemical Sciences*)

Bioactivity studies of some Sri Lankan flora & bioactive xanthones from *Calophllum thwaitesii*

M T Napagoda, *PGIS & Institute of Fundamental Studies, Kandy*

Antimicrobial properties of several *Calophyllum* species, *Garcinia xanthochymus*, *Hypericum mysorense* and few other plant species were evaluated in the present study and active compounds were isolated using activity guided fractionation structure elucidation of isolates were carried out using spectroscopic methods and partial synthesis.

The crude extracts of above plants were subjected to preliminary screening for antibacterial activity against human pathogenic bacteria *Enterococci feacalis, Escherichia coli, Klebsiella, Pseudomonas aeruginosa* and *Staphylococcus aures.* In addition, the active extracts were tested against 17 methicillin resistant *Staphylococcus aures* (MRSA) strains isolated from hospitals in Sri Lanka. The antifungal activity of crude plant extracts were investigated against plant pathogenic fungi, *Aspergillus* and *Cladosporum* and different strains of human pathogenic fungi *Candida.* Disk diffusion method was used to determine the antimicrobial activities of plant extracts against bacteria and the fungi *Aspergillus* and *Candida,* while TLC bioautography method was used to detect the antifungal activity against *Cladosprium*.

The results of the preliminary screening suggested that the methanol extract of root stem of *Calophyllum thwaitesii* possessed both antibacterial and antifungal activities. Activity guided fractionation of the above methanol extract resulted in several active fractions. Isolation and chemical characterization of these fractions contained seven xanthones. Apart from the previously isolated 1,7-dihydroxyxanthone, from the root bark of the same plant species, other compounds, 1-hydroxy-5,6-dimethoxyxanthone, 1,6-dihydroxy-5-methoxyxanthone, 1-methoxy-5-hydroxyxanthone, 1-hydroxy-5-methoxyxanthone, 1-hydroxy-7-methoxy xanthone and 1,5 dihydroxy-6-methoxyxanthone have not been reported before.

The isolation of methylated xanthones in the present study suggests the presence of methylating enzymes in the root stem of *Calophyllum thwaitesii*, contrary to previous reports.

The above xanthones along with thwaitesixanthone isolated from the inner bark of *Calophyllum thwaitesii* were screened for antibacterial and antifungal activities following the same procedures used previously. In addition, antioxidant activities of these compounds were determined both qualitatively and quantitatively by DPPH radical scavenging method. None of the xanthones showed prominent antibacterial nor antioxidant activities, although the crude plant extract exhibited those activities. This could possibly be due to the presence of other active minor constituents in the plant extract or some synergistic effect of combination of compounds present in the plant extract. However, four xanthones including 1-hydroxy-5,6-dimethoxyxanthone, 1,6-dihydroxy-5-methoxyxanthone, 1-methoxy-5-hydroxyxanthone and 1-hydroxy-5-methoxyxanthone were found to posses antifungal activity against *Aspergillus* and *Cladosporium*. Minimum inhibitory concentrations of the active compounds were found to be in the range of 50-200µg/spot. None of the xanthones were active against any of the *Candida* strains.

Supervisor: **Prof. H R W Dharmaratne** (*Institute of Fundamental Studies & PGIS*)

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M.Phil. (*Environmental Science*)

Air quality trends in the city of Colombo

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Clean air is an essential basic need of all living beings and purity of air we breathe is an important factor of human health. Continuous ambient air quality monitoring in Sri Lanka was started in January 1997 using two fixed ambient air quality monitoring stations, located in front of Colombo Fort Railway Station and in Colombo Meteorological Department Premises as information gathered from air quality monitoring is a vital component of air quality management. As comprehensive analysis of air quality monitoring data has not been done up to now, all collected valid data of major air pollutants [one hour average concentrations of nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone and 24 hour average concentration of particulate matter less than 10 microns in aerodynamic diameter (PM_{10})] were scientifically analyzed in this research using basic statistical parameters (average, 25^{th} & 75^{th} percentiles, minimum, maximum).

Trends over the period from 1997 to 2001 indicated that pollution levels with respect to sulfur dioxide, nitrogen dioxide and PM_{10} were slowly increasing. Carbon monoxide shows a declining trend during this period. Slightly decreasing trends of sulfur dioxide and nitrogen dioxide with slightly increasing trend of carbon monoxide and PM_{10} were shown over the period from May 2003 to June 2004.

Approximately 95% of concentration values of air pollutants at both monitoring stations are below the National Ambient Air quality Standard values. However one hundred and seventy seven occurrences of exceedences from the National Standard value were recorded with respect of sulfur dioxide at the Colombo Fort monitoring site. Rapid decrease of sulfur dioxide concentrations can be observed since January 2004 as a result of reducing the sulfur levels in Sri Lanka auto diesel from 0.5% to 0.3%.

The 24-hour average concentration of PM_{10} exceeded the USEPA standard on one occasion. However, the annual average of PM_{10} exceeds the annual standard stipulated by UEPA in all the years during the monitoring period.

Almost same seasonal variation patterns were shown for all measured air pollutions. High concentrations of air pollutants were observed during the dry period and low concentrations observed during the wet period. Pollutant concentrations are higher in the North- East monsoon period than in the other periods.

The diurnal pattern of concentrations of air pollutants indicates that mobile sources are the major contributor for air pollution in the Colombo city. In general the concentration of air pollutants are higher during the weekdays than weekends.

Supervisor: **Prof. O A Ileperuma** *(University of Peradeniya & PGIS*)

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M.Phil. (*Physics*)

Electrochemical and electromechanical behaviour of polypyrrole films

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In the present study the doping of polypyrrole with large anionic detergent Dodecyl Benzene Sulfonate (DBS) has been investigated by using cyclic voltammetry, optical spectroscopy, and electrochemical quartz crystal microbalance techniques. The study focused on improving the use of PPy/DBS films with respect to the actuation mechanism and on providing an experimental test of the proposed osmotic mechanism for the motion of species between the film and the electrolyte.

The analysis of the results indicated that the kinetics of the electrochemical doping of a conducting polymer films depends on the history of the electrochemical events undergone by the film. The influence of different parameters (Wait-time at the starting potential, number of cycles) on the redox process is described, when doping is achieved by a potential scan.

During the redox process water is also inserted or expelled in two ways: as molecules bound to the moving ions and as a result of the osmotic effect. It was found that while the dominant cation motion does not depend very much on the speed of cycling; the water transport strongly depends on the rate of the potential scan, since the insertion caused by the osmotic mechanism is much slower, and does not follow the cations directly.

Significant changes in the redox properties of the films were observed with the increase of the cycling electrolyte concentration. The effective diffusion coefficient of counterions in 0.1 M, 1M and 3M NaCl are nearly 3 x 10^{-12} m^2 s^{-1}, 20 x 10^{-12} m^2 s^{-1} and 55 x 10^{-12} m^2 s^{-1} respectively. The diffusion coefficient in 3 M NaCl is approximately 18 times the value in 0.1M NaCl reflecting that the amount of salt and solvent taken up the polymer is linked to the electrolyte composition by osmotic balances. These findings have implications for the design of polypyrrole based electrodes and actuators that are required to operate at higher frequencies.

Experiments were carried out for the purpose of elucidating the precise nature of the mobile species during redox cycling, and to seek confirmation for the osmotic mechanism of actuation.

Three testable aspects of the model were confirmed:

- The number of inserted H_2O molecules decreases with electrolyte concentration.
- At the same time the mechanism gradually changes from almost pure cation transport to nearly equal amount of anion transport.
- Exchanging Br^- for Cl^- ions has only negligible effect at lower concentrations at equal osmotic pressures.

Nearly 4 H_2O molecules are tightly bound to each Na^- ion at concentrations below 1M.

The electronic conductivity of the PPy/DBS film has been characterized. The conductivity was measured by van der Pauw measurements on PPy/DBS in the oxidized, dry state as function of temperature. Synthesis at lower temperatures generally leads to higher conductivity.

The force and strain change during redox process of a PPy/DBS actuator was measured by using a potentiostat combined with force measurement set up. The results show that the time constants for the change of length and for the stiffness change are significantly different. The change in stiffness is faster process than the change in strain. In addition to this the Young's modulus of the PPy/DBS actuator during the redox process was measured using the force measurement set up. The results indicated that the Young's modulus is not a constant and it depends on the oxidation state of the actuator.

To improve the lifetime of the polypyrrole actuators, PPy films were cycled in an ionic liquid composed of 1-butyl-3-methyl imidazolium cations together with anion hexafluorophosphate. The results revealed that the films cycled in ionic liquids have enhanced lifetimes without failure (up to 4700 cycles). Experiments were performed under ambient conditions in four consecutive days, yet the polymer film showed negligible loss in electroacitivity.

Supervisors: **Prof. M A Careem** (*University of Peradeniya & PGIS*)
Prof. S Skaarup (*Technical University of Denmark, Denmark*)

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M.Phil. (*Physics*)

Fracture toughness and crazing behaviour of virgin and filler added polystyrene films

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Brittle fracture commonly observed in many glassy polymers under tension is due to the formation and breakdown of crazes. This fracture behaviour can be reduced by adding fillers to the polymer matrix. Fillers exist in a variety of systems such as organic, biological and polymeric materials. In polymer systems, nanoscale fillers not only reduce the cost of the material but also improve mechanical properties, such as hardness and tear resistance. The broad aim of this study was to investigate the fracture behavior of virgin and filler added polystyrene thin films by the trouser leg tearing test. Critical strain energy release rate (G_c) can be regarded as a material property, often equated with toughness.

The thin films, required for the tearing test, were prepared by two different methods. In the first method, a glass slide was dipped and drawn with different speeds using a motor driven lifter through a polystyrene solution. The other method was spin casting, in which the prepared solution was placed on a clean glass slide and spun with different speeds using a photo resist spinner. Toluene was used as a solvent. The virgin polymer films were prepared with a moderate solution of 14 wt% of polystyrene in toluene. A solution of 14 wt% of polystyrene and filler in toluene was used for filler added films preparation. The composition of the filler – added films was varied from 0 to 5 wt% of fillers with respect to polystyrene content. In this study, carbon black (0.05 μm), alumina (0.075 μm) and fumed silica (255 m^2/g) fillers were used.

The slides were dried in a vacuum desiccator oven at 80^oC for 12 hours for complete evaporation of toluene from the films. The samples used in this study were of rectangular shape (40 mm x 15mm). They were stripped off from the substrate onto the surface of a water bath. The thickness of the films was measured using a Michelson interferometer and a locally made thickness measuring instrument. A cut of 10 mm was made along the center line of the sample and two free ends were separated at constant rates using a mechanical testing machine. Tearing was done in two different directions, one parallel and the other perpendicular to the film drawn direction.

The study revealed that the G_c values of virgin polystyrene were strongly dependent on the film drawing speed. When the films were torn parallel to the film drawn direction, there was a significant increase in G_c, with increasing film drawn speed from 0.5 cm min^{-1} to 2.5 cm min^{-1} and there after almost a plateau was observed. On the other hand, value of G_c for all the samples torn perpendicular to the film drawn direction there was a clear decrease in G_c with increasing film drawn speeds. The value of G_c for the films which were prepared by spin casting, torn in both perpendicular directions is 0.24 KJm^{-2}.This is almost constant for the all the films which were prepared with different spin speeds and this value is comparable with the G_c value corresponding to the above mentioned plateau. The reason for such a variation in the above films could be the high degree of orientation of the polymer chains in the film drawing direction due to the very slow drawing speed. When the drawing speed was increased the degree of polymer chain orientation decreases and becomes randomly oriented.

The study also revealed that a significant decrease in G_c with the increasing filler wt% in the films which contained alumina and carbon black fillers, prepared by both methods On the other hand, the films which contained fumed silica and torn in the film drawn direction showed a decrease in G_c value with increasing filler wt% in contrast, an increase in G_c was observed, when the fumed silica added films were torn perpendicular to the film drawn direction. The spin cast films also showed an increase in G_c with fumed silica filler wt%. The most likely reason why such a decrease in G_c was observed in alumina and carbon black filler added films is the propagation of the fracture mostly along the filler particles. It can be speculated that there may not be any extra - ordinary interaction between the polymer and fillers. Unlike other fillers, fumed silica has a chain –like particle morphology. The decrease in G_c value in the fumed silica added films which were torn parallel to the drawn direction may be due to the fumed silica chains and polystyrene chains aligning parallel to the film preparation direction. Tearing parallel to the direction of preferential alignment requires the rupture of fewer bonds as orientation increases and hence, less stress is needed to tear the film in this direction. The polymer chains and fumed silica chains, in the spin cast films, were randomly oriented. These fumed silica chains give additional strength to the polystyrene.

Optical microscopic study shows the formation of craze areas ahead of the crack tip in a torn virgin polymer film. In addition to this, micro shear bands were also observed ahead of the craze region and on the sides of the fracture surfaces. The craze area ahead of the crack tip in torn polymer films showed birefringence indicating that there exists a certain degree of orientation of polymer chains in these areas. It was also observed less amount of crazes in the alumina filler added films. Though the fumed silica added films which were torn perpendicular to the film drawn direction showed higher G_c values, the amount of craze in the films was less compared to the virgin film. On the other hand, the film which contained carbon black fillers showed very low G_c value and no crazes were observed. Unlike cracks, crazes are load bearing since their surfaces are bridged by many fine fibrils. Crazes are the major toughing mechanism in the polystyrene amorphous polymer.

Supervisor: **Prof. B S B Karunaratne** (*University of Peradeniya & PGIS*)
Dr. P Ekanayake (*University of Peradeniya & PGIS*)

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M.Phil. (*Plant Sciences*)

Vegetation structure and floristic composition in the irrigation extension area of the lower Walawe basin, Sri Lanka

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A survey on plant diversity was carried out to gather base line information, prior to irrigation development in the lower Walawe basin of Sri Lanka. Vegetation was investigated by plot sampling along transects. One hundred and six transects, each 50m ×5m, were enumerated. The plots were subjected to cluster analysis. Ten clusters in vegetation > 1m in height (91 transects) and three clusters in vegetation < 1m height (15 transects) were recognized separately. These clusters were treated "plant communities".

The following community types were distinguished: moderately degraded woodland, open rock outcrop vegetation, tall shrubland, dry zone woodland, dwarf shrubland, mixed vegetation, high density degraded forest, agricultural herbland, chena lands, mixed cropland *Croton bonplandiamus*/ herbland, Black-eye-bean /vineland and paddy/ annual herbland. A detrended correspondence analysis (DCA) ordination was performed on the plot data. Studies on the structure and floristic composition of plant communities gave a total of 260 plant species belonging to 209 genera and 67 families, including two endemics (*Barleria nutans* and *Diplodiscus verrucosus*) in the vegetation greater than 1m in height. In the vegetation less than 1m in height 72 plant species belonging to 58 genera and 23 families were enumerated. Further, six timber species (2%), 107 (41%) medicinal plant species, 60 (23%) food crop species and seven invasive alien (3%) were recorded.

A total of 220 plant species, 157 genera representing 56 families were recorded during the dry season, whereas only 200 plant species, 153 genera belonging to 57 families were recorded during the wet season. The percentage cover values of species were significantly higher in the dry season compared to that in the wet season (Kruskal-Wallis test, $H = 4.66$, $d.f = 1$, $P<0.05$: Mann- Whitney U test, $P<0.05$).

The plant communities recognized in this study across the climatic gradient provide a preliminary scientific basis for delineating conservation areas and for monitoring the vegetational changes in them with time. The moderately degraded woodland, open rock outcrop vegetation, dry zone woodland and high density degraded forest should be prioritized for conservation.

Supervisors: **Prof. C V S Gunatilleke** (*University of Peradeniya & PGIS*)
Dr. D Yakandawela (*University of Peradeniya & PGIS*)
Dr. C Bambaradeniya (*The World Conservation Union – IUCN, Colombo*)

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M.Phil. (*Plant Sciences*)

Development of propagation techniques & agronomic practices of two medicinal plants *Asparagus racemosus* willd. & C*yperus rotundus* L.

K K S K De Alwis, *PGIS &Department of Botany, University of Peradeniya, Peradeniya*

Asparagus racemosus willd. and *Cyperus rotundus* L. are widely used in Ayurvedic medicine. However, scientific information on their propagation techniques and agronomic practices are scarce. The present study was therefore focused on the development of simple, rapid and cost effective propagation techniques and the initial establishment methods of these two species.

The mature seeds of *A. racemosus* treated over night with 500 ppm gibberalic acid followed by piercing the seed coat with a fine needle gave only 70% germination. Propaglues comprising parts of the shoot in the primary growth stage, tuber and condensed stem grown in a coir and sand medium gave 94% success. The best growth performance of *A. racemosus* after 15 months of growth in terms of fresh shoot weight (20 ± 1.5 g), fresh root weight,(137 ± 8g). dry shoot weight (7.8±0.5g). Harvest index of shoot (56%) and biological yield (34 ± 2g) was observed when grown in the media comprising soil: sand: manure mixed in 1:2:1 ratio. Exposure to average shade gave the highest fresh shoot weight (41.3±2g). Fresh root weight,

shoot dry weight, root dry weight and biological yield of plants grown for 12 months under full sun light and the average shade were significantly higher than those parameters obtained under high shade.

Percentage sprouting of *C. rotundus* (95%) and total biomass and mean number of leaves per plant were highest when plants were raised from propagules comprising the full tuber without parts of the mother plant treated with rooting hormone IBA (3000mg/l). mean plant hight (27 ± 1.4cm) and average leaf length (14 ± 0.73cm) were highest in the plants raised from the same propagule type grown in coir and sand medium, but the number of buds per plant were the highest (1.7 ± 0.2)when the propagules were grown in water. The best growth performance in terms of harvest index (88%) was observed when plants were grown in the medium comprising one part each of soil, sand and farmyard manure. Plants grown under full sun ensured the highest harvest index (53%), biological yield (25 ± 1.5 %) and tuber weight (13.5 ± 0.7g) 360 days after planting. Plants grown in containers and harvested 255 days after the initial establishment gave the best tuber yield.

The thesis concludes with a synthesis of research findings.

Supervisors: **Dr. K U Tennakoon** (*University of Peradeniya & PGIS*)
Prof. C V S Gunatilleke (*University of Peradeniya & PGIS*)
Prof. I A U N Gunatilleke (*University of Peradeniya & PGIS*)

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M.Phil. (*Zoological Sciences*)

Insecticidal activity of *Euphorbia antiquorum* L. latex against agricultural insect pests

W A P P De Silva, *PGIS & Department of Zoology, University of Peradeniya, Peradeniya*

Insecticidal properties of *Euphorbia antiquorum* (Euphorbiaceae) (in sinhala: Daluke) latex was studied using the plants collected from Eppawala (Anuradapura District), Ibbagala (Kurunegala District) and Haloluwa (Kandy District) during 1999 - 2002. Latex extractions (10%) were prepared in seven solvents *i.e.* dichloromethane, petroleum ether, acetone, menthanol, n-hexane, distilled water and xylene.

Insecticidal components were best extracted by less polar solvents like xylene. Out of the four-bioassay methods tested *(i.e.* potters, sprayer, leaf-dip, hand sprayer and microapplicator), potters sprayer method gave the best performance. Xylene-latex extraction was tested against three species of vegetable infesting aphids, three species of rice insect pests, two species of predatory insects and one species of spider. Results revealed that the latex is an effective insecticidal agent but not effective against the insects with a thick cuticle cover. Significant differences of insecticidal activity were observed in the latex collected from dry (highest insecticidal activity), intermediate and wet (lowest activity) zones. Monthly collected latex samples showed that there is no significant seasonal variation of the activity. Field experiments showed that cheap and common detergents like soap could be used to prepare an effective spraying formulation using the crude extraction.

Only the xylene and methanol extractions gave clear spots in thin layer chromatography (TLC). Comparative TLC's showed that the xylene extraction had two additional spots. This extraction was subjected to florisil column chromatography (FCC) and eluted with n-hexane followed by petroleum ether and dichloromethane. Fourth n-hexane fraction had the highest insecticidal activity (53.25% mortality). Only the 4^{th} n-hexane fraction gave a clear spot in TLC and a peak at 1.006 min in high performance liquid chromatography (HPLC).

However, these peaks were present in HPLC chromatogram of crude xylene-latex extraction also and may represent the compound/s, which are responsible for the insecticidal activity of the *E. antiquorum* latex. Gas chromatography (GC) showed that the 4^{th} n-hexane fraction of FCC comprise of several minor peaks with one major peak at 0.528 min.
On storage, both the xylene-latex extraction and the 4^{th} n- hexane fraction of FCC were highly stable showing only a 3% decline of insecticidal activity after one year suggesting that stable commercial products can be formulated from these two.

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FORTHCOMING EVENTS

- *Short Course on 'GIS and its Applications'* ..... *July 5 – 10, 2006*
- *Short Course on Health & Anesthesia in Captive Elephants* ..... *July 7, 2006*
- *Short Course on 'Applications of RS and GIS in Coastal Hazard Studies'* ..... *July 7 - 10, 2006*
- *Workshop on Mineral Water & Water Bottling Industry* ..... *July 27 - 28, 2006*
- *Commencement of the following Postgraduate Diploma Programmes:*
  - *Science Education* ..... *Aug. 25, 2006*
  - *Information Technology* ..... *Aug. 28, 2006*
- *Commencement of the following M.Sc. Programmes:* ..... *Aug. 25, 2006*
  - *Analytical Chemistry*
  - *Clinical Biochemistry*
  - *Experimental Biotechnology*
  - *Gemmology & Industrial Minerals*
  - *GIS and Remote Sensing*
  - *Industrial Chemistry*
  - *Science Education*

  ..... *Aug. 28, 2006*
  - *Applied Statistics*
  - *Computer Science*
  - *Environmental Science*
  - *Industrial Mathematics*
  - *Medical Physics*
  - *Physics of Materials*
- *Workshop on Scientific Writing* ..... *Aug. 31, 2006*
- *Commencement of M.Sc. programme in Postharvest Tech. of Fruits & Veg* ..... *Oct. 27, 2006*
- *Postgraduate Certificate Course in Advanced Organic Chemistry* ..... *from Oct. 14, 2006*
- *Commencement of M.Sc. programme in Gemmology & Industrial Minerals* ..... *Oct. 14, 2006*
- *Half-day seminar session organized by PGIS-YRF* ..... *Oct. 17, 2006*
- *Workshop on PC and Network Management* ..... *Nov. 4 - 5, 2006*
- *Workshop on Identification of Snakes and Management of Snakebites* ..... *Nov. 11, 2006*
- *Peradeniya University Research Sessions* (*PURSE-2006*) ..... *Nov. 30, 2006*
- *Seminar on 'Earthquake & Tsunami Risk Mitigation'* ..... *Dec. 3, 2006*
- *WS on Assessment, Evaluation & Management of Groundwater Resources* ..... *Dec. 5 – 9, 2006*
- *6th Short Course on 'GIS and its Applications'* ..... *Jan. (4 - 9) & (10 - 13), 2007*
- *Postgraduate Diploma in IT for Education* (*2004/2005 batch*) – *Certificate Awarding Ceremony* ..... *Feb. 12, 2007*
- *Workshop on 'Identification of Common Ants of Sri Lanka'* ..... *Feb. 13 – 15, 2007*
- *YRF - A half-day Seminar Session* ..... *Feb. 14, 2007*
- *7th Short Course on 'GIS and its Application'* ..... *March 12 - 14 & 24 - 26, 2007*
- *Workshop on Biofertilizers and Biopesticides* ..... *June 2007*
- *Commencement of the M.Sc. programme in Plant Sciences* ..... *June 2007*
- *Workshop on Management of Disease in Fresh Produce supplied for Local and Export Market* ..... *June 2007*
- *Workshop on Computational Mathematics* ..... *June 2007*
- *National Conference on Advanced Materials for Emerging Technologies* ..... *July 2007*