



PGIS News

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The Quarterly Update of the work and progress of the Postgraduate Institute of Science (PGIS), University of Peradeniya, SRI LANKA

PGIS News

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

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↑ National Workshop on Scientific Writing

The PGIS and the National Science Foundation jointly organized a National Workshop on Scientific Writing from 15th to 17th September 2000 at the Faculty of Science, University of Peradeniya. This was an excellent opportunity for postgraduate

students in science based disciplines to familiarize themselves with the principles of scientific writing with emphasis on the thesis. 120 candidates enrolled for M.Sc., M.Phil. and Ph.D. degrees in physical, biological and other sciences in Sri Lankan universities participated in the workshop. Prof. K G A Goonesekera, Vice Chancellor, University of Peradeniya was the Chief Guest on the occasion of the inauguration of the workshop.

The topics covered at the workshop were: *Scientific Writing - An Introduction, Structure/layout of a thesis, Title & Abstracts, Introduction & Bibliography, Experimental/ Materials and Methods, Results/Discussion and Conclusion, Ethics in Scientific Writing, Problems in Thesis Writing - Sri Lankan Situation, Computer Aided Literature Survey, Computer Aided Statistical Data Analysis and Interpretation.* In addition, Group Discussions/Practical Sessions on Title and Abstract, Results, Interpretation and Conclusions were made available for M.Phil. and Ph.D. students. At the end of the workshop, a panel discussion was conducted by a group of senior resource persons led by the Director of the PGIS.

Eminent scientists drawn from various universities/institutes in the country served as the resource persons. The Senior Resource persons who delivered lectures included: Professors B M R Bandara, W R Breckenridge, M A Careem, K Dahanayake, C B Dissanayake, M A K L Dissanayake, I A U N Gunatilleke, C V S Gunatilleke, O A Ileperuma, R B Mapa, U Samarajeewa, C Santiapillai, K Tennakone, R.O.Thattil and S V R Weerasooriya. The Discussion Groups were led by active young scientists drawn from the Sri Lankan university system and they included Dr. Priyani Amarasinghe, Dr S B P Athauda, Dr. Maya Gunasekera, Prof. V. Karunaratne, Dr. Ruchira Kumaranatunga, Dr. H M D N Priyantha, Dr. R M G Rajapakse and Dr S.Samitha.

Professor P.G. Cooray, Chairman, Geological Survey & Mines Bureau, who has conducted similar workshops in Sri Lanka, other SAARC countries and African countries was the Chief Guest at the Closing Ceremony of the Workshop held on 17th September 2000. Dr Champika Bandara coordinated the workshop.

Each participant was asked to complete an evaluation form. Most of the participants expressed the view that the workshop helped not only to improve their writing but also to plan out the experimental work in their future studies.



Prof. K G A Goonesekera, Vice Chancellor, University of Peradeniya addressing the participants. Seated (L to R): Mr. M Watson (Director, NSF), Prof. S A Kulasooriya (Dean, Faculty of Science), Prof. K Dahanayake (Director, PGIS and Chairman, NSF), Dr. N C Bandara - partly covered (Workshop Coordinator).

↑MANAGEMENT OF BIODIVERSITY- PGIS Contribution

If the 20th century was regarded as the 'Age of Industry', the 21st century could well be the 'Age of Biology'. Among the multifarious challenges the new millennium encounters are two major ones: one of biological nature and the other of global significance. One of them is the sustainable management of biological diversity - the very foundation of human existence in a rapidly changing environment. The second is the harnessing and equitable sharing of benefits of modern biotechnology while minimizing the potential risks involved.

Biodiversity is part and parcel of our daily lives. It constitutes the variability among living organisms and ecological complexes upon which individual families, communities, nations and future generations depend for their existence. Sustainable management of biodiversity means the use of components of biological diversity in a way and at a rate that does not lead to the long term decline in biological diversity thereby maintaining its potential to meet the needs and aspirations of the present and future generations.

The conservation of biological diversity, its sustainable management and equitable transfer of its benefits including those from biotechnology among the stakeholders are embodied in the Convention of Biological Diversity which has been ratified by over 170 countries of the world including Sri Lanka. Much of Sri Lanka's biodiversity concentrated in

her rain forests is being subjected to degradation and fragmentation leading to gradual impoverishment and eventual disappearance. Having sensed the potential benefits of the fast disappearing biodiversity and associated cultural diversity, the commercial bioprospectors are racing in to cash in from the newly found technologies of splicing the genes from the "green gold". These bioprospectors or their agents at times are reported to display callous disregard and disrespect for even the basic human ethics in their search for this green gold. We in Sri Lanka are greatly handicapped in our efforts in conservation and sustainable management of biodiversity and countering this unsavoury biopiracy due to a severe dearth of expert scientists and legislators in our midst.

Having recognized this handicap, the Postgraduate Institute of Science (PGIS) of Sri Lanka initiated an M.Sc. programme to train local scientists in conservation management of biodiversity. The present batch of students includes officers drawn from the Departments of Wildlife and Customs, Provincial Councils, Research Institutions and the non-governmental sector. The training programme spread over 18 months includes lectures, laboratory classes and field classes - often of several days duration conducted in different ecosystems of the country. The resource persons are drawn locally from a number of government and non-governmental agencies dealing with Biodiversity Conservation Management. On several occasions, we also had the opportunity of obtaining the services of visiting or resident foreign expert scientists. The Board of Study in Plant Sciences of the PGIS under which this training programme is being conducted is of the view that this exercise would contribute significantly to the much needed capability building process within the country in order to address the issues related to conservation and utilization of biodiversity in this 'Age of Biology'. (See the poster highlighting the conservation value of Sri Lankan Biodiversity and research being carried out in the Sinharaja World Heritage site - page 5).

Prof. I A U N Gunatilleke
Chairman
PGIS Board of Study in Plant Sciences

Solid State Physics Research at Peradeniya *The role of International Programme in the Physical Sciences (IPPS)*

The dawn of the new millennium heralded significant progress in the Solid State Physics research activities at the Department of Physics, University of Peradeniya. Three students were awarded Ph.D.'s in April and another student has successfully completed her Ph.D. oral examination recently and is expected to get her degree soon. Before the end of the year, two more students are expected to complete their M. Phil. Degrees. These achievements were possible thanks to the generous financial support provided by the International Programme in the Physical Sciences (IPPS) of the Uppsala University, Sweden for research activities in the Department of Physics.

The IPPS support for research at the Physics Department commenced in 1983 with two fellowships being offered to two senior staff members (Prof. M.A. Careem, 1983/84 and Prof. M.A.K.L. Dissanayake, 1984/85) by the IPPS. As a follow-up activity, research on Solid Electrolytes was initiated in 1986 at Peradeniya in collaboration with Prof. Arnold Lunden's group at Chalmers University of Technology, Gothenburg, Sweden. A sandwich Ph.D. research programme also commenced simultaneously with a recruitment of a postgraduate student in 1986 to carry out his research at Peradeniya and at Gothenburg. After successful completion of five years of research, the Department was able to award a Ph.D. degree in Physics to this student in 1991 - the first ever Ph.D. in Physics offered by any Sri Lankan university.

Over the past 14 years, research activities at Peradeniya have expanded considerably and they now include Solid State Ionics, Conducting Polymers, Semiconductors and Ceramics. The collaborating institutions include Royal Institute of Technology, Stockholm, Sweden and Technical University of Denmark, Lyngby, Denmark in addition to Chalmers

University. The Solid State Physics research programme has resulted in the award of 10 Ph.D.'s, 2 M.Phil.'s and several M.Sc.'s so far. All these postgraduates are gainfully employed in universities, research institutions and industries in Sri Lanka and abroad. So far, the group has published more than 120 research papers, out of which about half are in international refereed journals. The IPPS continues to support our research group by way of providing student fellowships, equipment, spares and consumables, exchange visits and assistance towards participation at international research conferences. The total IPPS support received so far exceeds one million US\$.

The development and significant achievements of the research group during a short span of time have been possible due to several reasons: the closely followed up and cordial support given by the IPPS, Sweden; the proper research guidance and support offered by the host scientists in Sweden and Denmark and good team work by the senior group members.

Prof. M A Careem
Chairman
PGIS Board of Study in Physics

PGIS Director's term of office extended

The University Grants Commission has extended the period of office of the Director, Prof. Kapila Dahanayake for a second term of three years with effect from 1st July 2000.

The Poster

This is an abridged version of a poster* that was short-listed for the final selection in a Poster Competition held at the 21st World Forestry Congress in Kuala Lumpur, Malaysia in August 2000. * by I A U N Gunatilleke, C V S Gunatilleke, S Dayanandan, B Dayanandan, D Murawski, K S Bawa and P S Ashton [Click Here](#) to see the poster

↑Degrees Awarded (April - September 2000)

Ph.D. - Physics

Name of Awardee	Title of Thesis
1. Mr. L R A K Bandara	Synthesis, characterization and electrical properties of some solid polymer electrolytes based on polyethylene oxide (PEO)
2. Ms. R L N Chandrakanthi	Physical and electrochemical properties of polyanilines
3. Mr. K P Vidanapathirana	Polypyrrole based conducting polymers and their electrochemomechanical properties

M.Phil. - Plant Sciences

1. Ms. O D A N A study of the physicochemical characteristics of banana and response to postharvest acid and

Perera calcium treatment

***M.Phil.-
Zoological
Sciences***

2. Miss M H S Ariyaratne Some aspects of farm-rearing of post-larvae and fry of commonly cultured carps (Pisces: cyprinidae), and development of methodology suitable for rearing of post-larvae and fry by rural communities of Sri Lanka

***M.Sc.
Analytical
Chemistry***

1. Miss J M M A Jayasundara Analysis of proteins in infant milk formulae

2. Mr. K Vaheesar Groundwater pollution in Batticaloa

3. Miss K H M M M Jayawardane Defluoridation of water

4. Mr. H M A M C Herath Electrochemical detection of chromium(VI)

***Applied
Statistics***

1. Mr. A Jahufer Application of principal component analysis in response of Shorea seedlings in Sri Lanka

2. Mr. A M Razmy Trends in paddy production in Sri Lanka

3. Mr. H M M Naleer Development of a computer model representing low temperature thin film growth

***Medical
Physics***

1. Ms. W P C M Sirisena Assessment of the mammographic image quality using a test object

2. Mr. U G Jayasekera Study of fragmentation of upper ureteric calculi by Extracorporeal Shock Wave Lithotripsy (ESWL)

3. Mr. M G J Gunaratne Performance testing for scintillation camera

4. Mr. A H Dilip Kumar Investigation of dose accuracy of radiation in the treatment of breast carcinoma using glancing fields

5. Mr. H M S B Herath Radiation dose verification and radiobiological review of carcinoma cervix in Amersham brachytherapy manual afterloading system

6. Mr. J A Pillainayagam Proposed regimes for High Dose Rate (HDR) treatments for cancer of the cervix based on linear quadratic model

7. Mr. M P S S Gunawardana Quality assurance of image fusion of pinnacle-3 radiation treatment planning system and evaluation of treatment plans by dose volume histograms

Parasitology

1. Mr. T M D R de Alwis A survey of endoparasitic zoonoses in stray dogs at a selected locality (Thamankaduwa) in Polonnaruwa district

Physics of Materials

1. Miss N Y S Perera Artificial muscles using polypyrrole conducting polymer
2. Mr. H C S Bookoladeniya Solar cells based on dye sensitized nanoporous TiO₂ semiconducting films
3. Mr. S P Guluwita A study of electrical conductivity of natural rubber containing some selected additives

Science Education

1. Ms. P K Agalawatte A self study guide: to understand the Bernoulli's equation and its application
2. Ms. A A D D Amaratunga Developing a novel package for learning cell biology (At the G.C.E. Advanced Level)
3. Mr. R M T Bandara Use of computers in remedial teaching
4. Mr. A Indralingam Assessment of practical work in G.C.E. (A L) Physics in Sri Lankan schools
5. Ms. A Y C Kumarasinghe Study of the distribution and abundance of key mangrove plant species pambala mangal
6. Ms. S P A Nadeera How successful is the newly introduced Biology Curriculum in Schools-to date?
7. Ms, R W M D N K Ranawana Water pollution: how to teach and learn
8. Mr. T Rajakumar A demonstration experiment on Bernoulli's principle for advanced level Physics

↑ Abstracts of Ph.D./M.Phil. Theses

Ph.D. (Physics)

L R A K Bandara, Department of Physics, University of Peradeniya, Sri Lanka

Synthesis, Characterization and Electrical Properties of some Solid Polymer Electrolytes based on Polyethylene oxide (PEO)

The objective of the present work is to study the characteristics of PEO based solid polymer electrolytes. This thesis focuses on enhancement of ionic conductivity and ionic transport mechanisms in these electrolytes. Efforts have been made to increase the ambient temperature conductivity by decreasing the crystallinity and increasing the segmental mobility of the polymer by the incorporation of salts and plasticizers into PEO. The two systems, PEO-LiCF₃SO₃ and PEO-LiN(CF₃SO₂)₂, have been chosen for this work. Low molecular weight PEGM (M_w = 400), EC and PC were used as conventional plasticizers. Furthermore, nanocomposite electrolytes i.e. plasticized polymer-salt electrolytes with an added ceramic filler of small particle size, such as Al₂O₃, has been found to enhance ionic conductivity. PPFEMO (M_w = 4000) was introduced as a new type of plasticizer for PEO based polymer electrolytes. The characteristics of the electrolytes were investigated by Complex Impedance Spectroscopy, Complex Dielectric Spectroscopy, Differential Scanning Calorimetry and transference number measurements. The temperature dependence of the conductivity was studied in detail for all materials. Dielectric properties, dynamical mechanical properties, glass transition temperature and degree of crystallinity of these materials were also discussed in detail.

There are, up to now, no other examples of mixing this type of electrolyte with non-miscible liquids except with the PEO based electrolytes with PPFEMO systems presented here. The system PEO-LiX, with the addition of PPFEMO is a bi-phase stable emulsion. The micro-droplets present in the emulsion prevent or retard the crystallization of the electrolyte when it is cooled from the melting temperature to ambient temperature. The ion conductivity below the melting point temperature maintains stable values as long as the re-crystallization is prevented. Considerable amounts of ion pairs were present in both plasticized and unplasticized polymer electrolytes and if the relaxation frequency can be taken as a probe of the local flexibility of the polymer chain it can be concluded that the conductivity increases in parallel to the increases in the local flexibility of the polymer segments.

**Supervisors: Prof. M A K L Dissanayake (University of Peradeniya and PGIS)
Dr. B E Mellander (Chalmers University of Technology, Sweden)**

Ph.D.(Physics)

**R L N Chandrakanthi, Department of Physics, University of Peradeniya, Sri Lanka
Physical and Electrochemical Properties of Polyanilines**

Polyaniline (PANI) has emerged as one of the most promising conductive polymers for commercial development. The oxidation states of PANI can be varied from fully reduced leucoemeraldine base to the half oxidized emeraldine base and to the fully oxidized pernigraniline base form. In this study emeraldine base form of polyaniline was used as the starting material for the preparation of other oxidation and protonation forms. The fully oxidized form of polyaniline, pernigraniline base (PNB) has been prepared as a pure and stable powder. The protonated form of PNB has been obtained in highly acidic media by controlling the processing conditions such as solvent, temperature, drying procedure, etc. Conductivity measurements showed a metallic behaviour for the partially crystalline PNB salt form.

The thermal characteristics of emeraldine base form of PANI were studied by viscosity measurements, FTIR spectroscopy and thermogravimetric analysis. Thermal aging of PANI results in a decrease in conductivity.

The electrochemical behaviour of chemically and electrochemically synthesized polyaniline films have been investigated in aqueous functionalized acid solutions. Cyclic voltammograms of chemically and electrochemically synthesized PANI were found to be almost identical. PANI films obtained by these two processes were compared with respect to their conductivity and stability. The in-situ conductivity experiments enabled the determination of a finite window of conductivity for different functionalized acids.

Nanocomposite materials formed by cadmium sulfide (CdS) and copper sulfide (Cu₂S) with polyaniline were synthesized by chemical methods. Particle sizes of CdS and Cu₂S can be varied using this method. These nanocrystal sizes were obtained by TEM and XRD. The nanocomposites show good stability and high absorption in the visible light spectrum. The use of nanocrystals allows great flexibility in controlling the performance of photovoltaic devices by changing the nanocrystal size, concentration, and the material of the nanocrystals.

**Supervisors: Prof. M A Careem (University of Peradeniya and PGIS)
Prof. Paul Smith (Institute of Polymers, ETH-Z, Switzerland)**

Ph.D.(Physics)

**K P Vidanapathirana, Department of Physics, University of Peradeniya, Sri Lanka
Polypyrrole Based Conducting Polymers and their Electrochemomechanical Properties**

The influence of preparation conditions on the properties of electroactive poly-N-methylpyrrole (PNMP) films were investigated by varying preparation conditions with a view of obtaining highly conductive films. Characterizations were done using cyclic voltammetry and impedance spectroscopy. Conductivity of PNMP films was very much affected by the polymerization current density, pH and the polymerization temperature. Electrochemical Quartz Crystal

Microbalance (EQCM) studies revealed that anions are the moving species during the redox process in PNMP films that were prepared and cycled in aqueous electrolytes containing small anions.

Polypyrrole (PPy) films were prepared with large surfactant anion, dodecyl benzenesulfonate (DBS⁻), and their properties were compared with those of PPy films prepared with small anions. EQCM studies on PPy/DBS films showed a dual step scheme for the redox process in aqueous electrolytes. Lithium rechargeable cells were fabricated using PPy/DBS as the cathode. Continuous charge-discharge experiments showed that these cells could be cycled more than 1000 times without any appreciable charge decay.

Electrochemomechanical properties of PPy/DBS films were investigated by fabricating bi-layer and dry artificial muscles and obtaining the force exerted by these muscles. The highest force change is always associated with the main peaks of the cyclic voltammogram. It has been observed that appreciable force change occurred in a rather narrow voltage interval. Muscles fabricated with PPy films prepared using larger anions and higher polymerization current densities gave higher forces. Higher forces can also be obtained by limiting the cycling potential window so that only cation exchange occurs.

**Supervisors: Prof. M A Careem (University of Peradeniya and PGIS)
Prof. Steen Skaarup (Technical University of Denmark, Lyngby, Denmark)**

M.Phil. (Plant Sciences)

**O D A N Perera, Department of Botany, University of Peradeniya, Peradeniya, Sri Lanka
A study of the physicochemical characteristics of banana and response to postharvest acid and calcium treatment**

Some physicochemical characteristics (peel thickness, firmness, peel to pulp ratio, pH, % titratable acidity, and soluble solids content) were determined in six local cultivars of banana; 'Ambon' (AAA), 'Embul' (AAB), 'Kolikuttu' (AAB), 'Seenikehel' (ABB), 'Puwalu' (AAB) and 'Anamalu' (AAA). These characteristics were comparable to those of some commercially important cultivars in other countries. A tendency to a positive correlation ($p < 0.1$) was observed between pairs of physical parameters (peel thickness, firmness, and peel: pulp). The lowest peel thickness was observed in 'Kolikuttu' (1.27 mm) and highest in 'Anamalu' (2.73mm). These cultivars also recorded the lowest, ('Kolikuttu' 0.91 kg cm⁻²) and the highest ('Anamalu' 2.01 kg cm⁻²) firmness values, determined by a hand held penetrometer. Anthracnose development was most rapid in 'Kolikuttu'. In 'Puwalu' anthracnose development and spreading of lesions were also comparatively slow. The correlation between lesion diameters and each physical parameter was negative without statistical significance.

In this study, the effects of alternatives to pesticide usage were tried out, to delay ripening and disease development. Pressure infiltration treatments with 0.2% acetic acid and 0.05% citric acids effectively reduced disease development although ripening process detected by peel colour change was not affected. The bananas pressure infiltrated with 0.2% acetic acid showed a significantly ($p < 0.05$) higher firmness. A combined treatment of 0.1% acetic acid, 0.025% citric acid and 0.06% benlate reduced both anthracnose induced by inoculating *Colletotrichum musae* and total disease. The results of this study suggested that the effect of acetic acid on fruit firmness was not affected by the ethylene controlled ripening physiology.

When compared with the effect of benlate, the individual actions of these acids were not as effective. However their combined effect with half the active strength of benlate significantly ($p < 0.01$) reduced total disease development and anthracnose development. However dipping, pressure infiltration and vacuum infiltration of unripe bananas in 4% CaCl₂ solutions enhanced ripening and disease development of bananas ruling out the use of CaCl₂ for extending their shelf life.

Supervisor: Mrs. A M Karunaratne (University of Peradeniya and PGIS)

M.Phil. (Zoological Sciences)

M H S Ariyaratne, National Aquatic Resources Research and Development Agency (NARA), Crow Island Mattakkuliya, Sri Lanka

Some aspects of farm-rearing of post larvae and fry of commonly cultured carps (Pisces: Cyprinidae), and development of methodology suitable for rearing of post larvae and fry by rural communities of Sri Lanka

The major constraint in stocking water bodies and aquaculture ponds at present is the lack of fingerlings. As a result of the discontinuation of the state patronage for inland fisheries development in 1990, the development of a community-based method of fry and fingerling rearing became necessary more than ever before. In the present study the feasibility of producing fish fingerlings with community participation was investigated. Most of the raw materials and feed used in the study are cheap and available locally. Cement tanks were used as the rearing vessels. Such trials could be carried out in a suitable location where water is truly available.

Tanks were cleaned, dried, disinfected and filled with screened water, which was followed by fertilization with cow dung. The earlier seed production method has been modified by changing some steps and adding new steps in order to improve the survival and growth. Cow dung was found to be a better organic manure for the rearing of post-larvae (PL), although chicken manure could also be used. In the rearing of *Cyprinus carpio* fry, a high stocking density (380 fry m⁻²) could be used in the first two weeks followed by a low stocking density (95 fry m⁻²) in the next four weeks. The suitable stocking density for the rearing of PL of *Aristichthys nobilis* and *Ctenopharyngodon idella* was found to be 600 PL m⁻², and that for the PL of *Labeo rohita* and *Cyprinus carpio* was found to be 500 PL m⁻². Higher stocking densities affected the growth and percentage survival of the PL and also increased the duration of rearing period. Supplementary feeding was essential for the PL for better growth and survival. Rice bran showed better results than a locally formulated feed (C2) in the rearing of *Labeo rohita* PL but *Cyprinus carpio* PL showed better results with C2. Fertilization with cow dung improved the population of rotifers in 7-10 days after the initial dosage. This period, therefore, is suitable for PL stocking. Subsequently application of fertilizer (cow dung) could be done on every 7th day.

Supervisor: Prof. P K de Silva (University of Peradeniya and PGIS)

News Update of the PGIS Boards of Study

Mathematics

The first batch of students of the M.Sc. programme in Industrial Mathematics has completed the course work requirements and are in the process of finalizing the research projects. The second batch of the programme consisting of 9 students started the preliminary courses in August 2000. The Board of Study in Mathematics also has decided to participate in the M.Sc. programme in Science Education. The course structure of the Mathematics Education component of this programme is currently being prepared.

Dr. A A S Perera

Chairman, Board of Study in Mathematics

Science Education

The Board of Study in Science Education has received a grant of 7.3 Million Rupees from the Ministry of Education and Higher Education to upgrade the M.Sc. programme in Science Education and the teacher training activities at postgraduate level. Bulk of these funds would be used to develop a computer based interactive Science Teaching Unit. Some funds will also be used to improve the audiovisual facilities of the PGIS. Equipment, books and other accessory items will soon be available for these activities.

Prof. M A K L Dissanayake
Chairman, Board of Study in Science Education

Statistics and Computer Science

The computer laboratory, which was set up recently at the PGIS, is now providing services to the Postgraduate students. Twenty-five Pentium computers have been networked to a server. They can also be used as stand-alones. Hardware accessories have been installed to enable state-of-the-art computer facilities at the PGIS. A wide range of software is available to fulfil the requirements of all fields of study. Internet facilities are also available for both students and staff. With the installation of the computers, we are now geared to offer courses on computer literacy to all postgraduate students. In addition, the PGIS students will be able to use computers for their data analysis work. Further expansion of facilities are also envisaged. The technical aspects of the computer unit are under the care of Dr. Kithsiri Liyanage, Director, Computer Centre, Faculty of Engineering, University of Peradeniya.



Newly established computer laboratory of the PGIS

PGIS now offers an M.Sc. programme in Computer Science and 25 students have enrolled for the programme which commenced on May 6, 2000. The students of this programme having completed the preliminary courses, started the second semester in September 2000. The second batch of students (1999/2000 entrants) of the M.Sc. programme in Applied Statistics commenced the second semester in June 2000. Six students in the first batch (1998/99) of the M.Sc. programme in Applied Statistics have already completed the degree. The Board of Study in Statistics and Computer Science also plans to hold a short course on 'Sampling Techniques' in Colombo. The University of Kelaniya will coordinate the course in collaboration with the PGIS.

Prof. R O Thattil
Chairman, Board of Study in Statistics and Computer Science

↑Members of the PGIS Boards of Study (as of 15th September 2000)

Note: The Director (PGIS) is a member (ex-officio) of all the Boards of Study

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 Dr. (Ms.) H M R K Ekanayake

↑ Workshops and Training Programmes

**Workshops (WS), Short Courses (SC) and Training Programmes (TP)
 conducted from April to September 2000**

Event	Coordinator/s	Period	No. of Participants
Aug 15 - 19 Food Security and Nutrition (TP)	Dr. P H Amerasinghe Mrs. A M Karunaratne	Ongoing	18
Enzyme-Linked Immunosorbent Assays (ELISA) (TP)	Dr. P H Amerasinghe	Apr 3 - 8	20
Insect Toxicology (TP)	Prof. S H P P Karunaratne Dr. H M R K Ekanayake Prof. I A U N Gunatilleke ,	Apr 25 - 27	24

Plant Systemstics (WS)	Dr. D Dissanayake, Prof. R Saunders, Mr. U Dhanasekera	June 23 - 26	33
Postgraduate Education and Research in Sciences (WS)	Prof. M A K L Dissanayake	June 30	40
Plant Tissue Culture (WS)	Dr. K Fernando	Aug 7 - 12	5
Weather Forecasting and Meteorological Instruments (SC)	Mr. R K A Bandara	Aug 8 - 11	16
Geology for Engineers (WS)	Mr. U Amerasinghe	Aug 15 - 19	9
Postgraduate Certificate Course in Advanced Biochemistry I	Dr. S B P Athauda	Sep - Nov	20
Methods in Plant Eco-Physiology (TP)	Dr. K U Tennakoon, Dr. W Seel Prof. I A U N Gunatilleke	Sep 4 - 6	43
National Workshop on Scientific Writing	Dr. N C Bandara	Sep 15 - 17	120

Coordinators? Reports

Training Programme in Food Security and Nutrition

A novel training programme in Food Security and Nutrition was conducted for school teachers by the Departments of Botany and Molecular Biology & Biotechnology, Faculty of Science, through the PGIS and Science Education Unit (SEU) at the University of Peradeniya. This programme was the first of its kind, as highlighted below.

The programme was conducted in two phases (Phase I and II). The Phase I, conducted from 4th June to 21st August 1999 consisted of lectures, practicals, tutorials and field studies for the participating teachers. The field activities were carried out at two sites (urban and rural) close to the university. In the field, the teacher acted as an external facilitator and conducted nutrition awareness programmes and also trained community facilitators to disseminate knowledge on nutrition to the community at large. Therefore, the role of the schoolteacher as a community leader was emphasized.

The Phase II which is still continuing, included a longitudinal study to assess the nutrition status of the children under five years using anthropometric indices. The activities during Phase I revealed the need for community level interventions such as improvement of sanitation facilities, water supplies and home/school gardens. It is envisaged that such interventions would contribute towards improvement of the nutritional status and overall quality of life of individuals of this community under study.

The programme was funded by UNICEF and FAO. The Resource persons included personnel from the Faculties of Medicine and Agriculture of the University of Peradeniya and Dept. of Natural Sciences of the Open University of Sri Lanka. In addition, personnel from the National Institute of Education, UNICEF, Bandaranaike Memorial Ayurvedic Research Institute, Department of Agriculture also conducted lectures and practicals.

Training Programme on Enzyme-Linked Immunosorbent Assays (ELISA)

A workshop on Enzyme-Linked Immunosorbent Assays for the detection of malarial antigens, antibodies and vector blood meals was organized for the Regional Malaria Officers and Medical Officers of the Anti Malarial Campaign Head Quarters, at the Department of Molecular Biology and Biotechnology, Faculty of Science, University of

Peradeniya, from April 3 to 8, 2000. The workshop was organized through the PGIS, University of Peradeniya. Twenty participants received hands-on experience on Enzyme-Linked Immunosorbent Assay techniques that could be used in malaria diagnostics, surveillance and epidemiological studies. It is envisaged that this training would also help the participants in setting up their own regional level laboratories, a project to be implemented utilizing World Bank funds, in the not too distant future. The overall training is seen as an integral part of the capacity building programme outlined on the Roll Back Malaria Initiative in Sri Lanka.

Coordinator: Dr. P H Amerasinghe

Training Programme in Insect Toxicology



The Board of Study in Zoological Sciences conducted a training programme in Insect Toxicology with the collaboration of the Horticultural Crop Research and Development Institute (HORDI), Gannoruwa, Peradeniya from April 25 - 27, 2000. 24 participants including two from overseas were present. The programme was mainly organized for the research officers of the Department of Agriculture.

Eminent resource persons who are specialists in their own fields conducted lectures, followed by practicals. Topics covered during the programme included insect pests in agriculture, synthetic pesticides (mode of action, production, regulation, legal aspects, residues and environmental fate), natural pesticides, modern crop protection compounds, insecticide resistance in insects, bioassay methods and statistics, mechanisms of insecticide resistance, molecular basis of increased metabolism and altered insecticide target sites in insects.

Dr. S H P P Karunaratne, Workshop Coordinator addressing the participants. Seated (L to R): Dr. H M R K Ekanayake (Workshop Coordinator), Dr. C Kudagamage (Director, HORDI), Prof. K Dahanayake (Director, PGIS & Chairman, NSF), Prof. P K de Silva (Chairperson, PGIS Board of Study in Zoological Sciences).

Coordinators: Prof. S H P P Karunaratne & Dr. H M R K Ekanayake

Workshop on Plant Systematics

A workshop on Plant Systematics was conducted by the Board of Study in Plant Sciences in collaboration with the Department of Botany, University of Peradeniya, Royal Botanical Gardens Peradeniya and Department of Ecology and Biodiversity of the University of Hong Kong from June 23 to 26, 2000. Systematics being a discipline that underpins most areas in Biology and with the recent development in the Phylogenetic Systematics - Cladistics together with Molecular Biological techniques, the field has emerged as a frontier science. Therefore, this workshop was intended to disseminate the recent developments in the field of Plant Systematics and was attended by academics of universities, officers of Agriculture and Wild Life Departments and a selected group of undergraduates. The course was conducted by bringing together experts from different institutions. According to the participant survey carried out at the end, the most popular areas were the Traditional, Cladistic and Phenetic approaches in systematics, use of different type of data other than morphological in systematical studies specially the use of molecular data and the use of internet facilities in obtaining information. Most of the participants expressed the view that it would be beneficial to

have a follow-up course in the future.

Coordinators: Prof. I A U N Gunatilleke, Dr. D Dissanayake, Prof. R Saunders & Mr. U Dhanasekera

Workshop on Postgraduate Education and Research in Sciences

A successful workshop on Postgraduate Education and Research in Sciences was conducted on Friday, 30th June, 2000 at the National Science Foundation (NSF) auditorium, Colombo. The workshop was jointly organized by the Postgraduate Institute of Science (PGIS) and the National Science Foundation in response to a suggestion made by the Board of Management of the PGIS. The objective of the workshop was to discuss the status of postgraduate education and research in sciences in the country.

The welcome address was given by Prof. K Dahanayake, Director of the PGIS and Chairman of the NSF. The objective of the workshop was explained by Prof. Lakshman Dissanayake, coordinator of the workshop. There were about 40 participants including senior university academics. The Director, PGIS, Deans, and several senior academics participated actively in the follow-up discussions. Professor R P Gunawardena, the Secretary to the Ministry of Education and Higher Education despite his duties at the Ministry spent sometime with the participants discussing important issues. The vote of thanks was delivered by Mr. M Watson, Director of the NSF.

Professor K Dahanayake outlined the status of the postgraduate programmes of the PGIS. The nature of the postgraduate programmes in the faculties of science and related issues were discussed by the respective Deans - Prof. (Ms.) K Abeynayake, Dean, Faculty of Science, University of Colombo, Prof. S Vidanapathirana, Dean, Faculty of Graduate Studies, University of Kelaniya, Prof. M J S Wijeyaratne, Dean, Faculty of Science, University of Kelaniya, Prof. (Ms.) Uma Coomaraswamy, Dean, Faculty of Natural Sciences, The Open University of Sri Lanka, Prof. S A Kulasooriya, Dean, Faculty of Science, University of Peradeniya, Dr. N J De S Amarasinghe, Dean, Faculty of Science, University of Ruhuna and Prof. W S Fernando, Dean, Faculty of Graduate Studies, University of Sri Jayawardenapura.

The highlight of the afternoon session was the presentation by Dr. Kamal Weerapperuma, Group Chief Executive, Delmege - Forsyth Group of companies, Colombo on 'Relevance of postgraduate science education to industry?' followed by a lengthy discussion on various issues related to postgraduate education in sciences in the country.

The following recommendations were made at the conclusion of the discussion:

1. It was stressed that the majority of present and future employment opportunities are in the private sector, and that the private sector generally looks for persons with postgraduate science qualifications mainly for managerial positions. As such, knowledge in 'Business Management?' should be an important segment of postgraduate training. Therefore it was recommended to include a course module in 'Business Management?' in all postgraduate programmes.
2. Manpower needs of the state and private sector industries and commercial enterprises should be taken into account when designing/updating postgraduate programmes. In this context, PGIS Boards of Study are encouraged to consult the relevant private sector personnel.
3. A permanent working committee on Industry-University linkage must be established in order to exchange ideas and make recommendations on improving the course contents of the postgraduate programmes.
4. More funding and more staff cadre should be provided to handle the increased workload of postgraduate programmes in universities. More scholarships should be made available for postgraduate students. Some of these may be co-sponsored by both the state and the private sector.
5. State sector should be requested to give priority for persons with postgraduate qualifications when recruiting them for employment and nominating them for foreign scholarships.
6. The possibility of conducting some selected postgraduate programmes jointly, when necessary, by two institutions

should be looked into.

7. The services of expatriate Sri Lankan scientists should be sought for supervising and examining M.Sc. theses via Internet.

8. A meeting of researchers/scientists and industrial managers should be convened to discuss possible areas of collaboration and corporation and strengthening the research and development sections of state and private sectors.

Coordinator: Prof. M A K Lakshman Dissanayake

Short Course on Weather Forecasting and Meteorological Instruments

A four-day short course on Weather Forecasting and Meteorological Instruments organized by the PGIS Board of Study in Physics of the Postgraduate Institute of Science (PGIS) jointly with the Department of Meteorology was held at the Department of Meteorology, Colombo from August 8 to 11, 2000. The resource persons included personnel from the Department of Meteorology and the Ministry of Forestry and Environment.

Lectures delivered in the workshop covered a number of topics including weather and climate parameters, ITCZ climate seasons of Sri Lanka, meteorological observations, weather systems, satellite technology, weather forecasting, climate change, greenhouse gases, global warming, El-Nino and La-Nina. Practical sessions covered pilot balloon and radar observations, cloud observations and instruments measuring temperature, pressure wind and radiation. Sixteen participants received hands-on experience on measuring instruments in the field of meteorology.

Coordinator: Mr. K R Abhayasingha Bandara

Workshop on Plant Tissue Culture

A workshop on Plant Tissue Culture was held from August 7 to 12, 2000 organized by the PGIS Board of Study in Biochemistry and Molecular Biology and conducted in collaboration with the Plant Genetic Resources Centre (Dept. of Agriculture) and the Department of Crop Science (Faculty of Agriculture, University of Peradeniya).

The workshop focused on application of Tissue Culture to plant propagation, crop improvement and germplasm conservation in addition to detection of variation in Tissue cultured material. The programme included 15 hours of lectures and 30 hours of practicals providing knowledge and hands-on experience on leaf culture, nodal culture, callus culture, suspension culture, anther culture, embryo culture, in vitro pollination, in vitro grafting, virus detection by ELISA, virus elimination by meristem culture, cryopreservation of meristem tips, detection of variation by isozyme and RAPD analysis. The participants were requested to evaluate the workshop and excellent ratings were received.

Coordinator: Dr. Kumudu Fernando

Workshop on Geology for Engineers

A five-day workshop on Geology for Engineers was conducted from August 15 - 19, 2000 at the Department of Geology, University of Peradeniya. The PGIS organized this workshop and Mr. Udeni B Amarasinghe served as the coordinator. The main objective of this workshop was to discuss basic principles of geology and engineering geology with a group of practising civil and mining engineers. They were exposed to applications of geology in engineering practice. The knowledge of geology is essential for civil and mining engineers to investigate, plan, design and maintain engineering structures with success. It was an occasion for engineers to carry out an effective communication with geologists and working with them as a team. Nine engineers participated in this workshop.



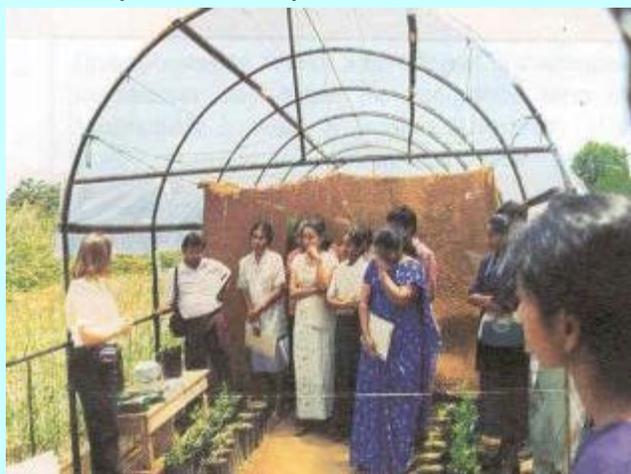
Prof. K Dahanayake (Director, PGIS & Chairman, NSF) addressing the participants. Seated (L to R): Mr. U Amerasinghe (Workshop Coordinator) and Dr. A Senaratne (Chairman, PGIS Board of Study in Earth Sciences).

The workshop consisted of twenty lectures covering mineralogy, petrology, structural geology, field mapping, engineering geological site investigations, physical geology, rock blasting, civil engineering project planning, slope stability and landslides, foundation engineering and geology of Sri Lanka. On August 19, 2000 the participants went on an excursion to the Teldeniya-Udadumbara area to familiarize themselves with field mapping techniques, soil profile studies, and landslide investigations at Halyala. They also witnessed the Aniwatta Historic Tunnel for understanding tunneling technology.

Coordinator: Mr. U Amerasinghe

Training Programme on Methods in Plant Eco-Physiology

A successful three-day training programme on Methods in Plant Eco-Physiology was conducted by the Board of Study in Plant Sciences in collaboration with the Department of Botany, University of Peradeniya and Department of Plant and Soil Science, University of Aberdeen, UK from September 4 - 6, 2000. This training programme was organized as one of the activities of the link programme between the University of Peradeniya and the University of Aberdeen through a higher education link scheme of the British Council. The objective of this workshop was to impart knowledge of the principles of Plant Eco-Physiology and its investigative tools to researchers, academics and undergraduates. There were 43 participants including academics and postgraduate research students from Sri Lankan universities (Eastern, Jaffna, Kelaniya, OUSL, Peradeniya, Ruhuna, Rajarata, SJP), research officers from crop research institutes, representatives from private sector and the final year Botany students of the Department of Botany, University of Peradeniya.



A field demonstration during the Training Programme at the Meewatura Plant Houses, Peradeniya.

The programme consisted of lectures, laboratory work and field visits covering plant-house design, use of automated data loggers in monitoring environmental conditions, preparation and use of plant-nutrient solutions, allometric measurements, leaf measurements, measurements of carbon assimilation and water use efficiencies of plants, concepts of plant-water relations, plant microtome techniques and analytical techniques used for the investigation of plant composition. The resource persons for the workshop were from the University of Peradeniya, University of Sri Jayawardanapura, University of Aberdeen (UK), the Rubber Research Institute and the Coconut Research Institute. The programme was conducted using the latest equipment available for Eco-Physiological studies to provide hands-on experience to participants. Most of them requested similar short courses in the fields of Plant Ecology, Molecular Biology and Post-Harvest Technology.

Coordinators: Dr. K U Tennakoon, Dr. Wendy Seel and Prof. I A U N Gunatilleke

↑ PGIS RESEARCH GRANTS (2000)

Name of Applicant/s	Board of Study	Project Title
1. Prof. B S B Karunaratne	Physics	Preparation and characterisation of ZrSiO ₄ based materials for fuel cell applications
2. Dr. D M D Dissanayake	Plant Sciences	Species delimitation of the genus <i>Stemonoporus</i> (family Dipterocarpaceae)
3. Prof. M de Silva	Zoological Sciences	Diversity and distribution of macrodecapods in the mangroves and associated estuaries in the Puttalam and Negombo areas
4. Dr. P H P Fernando Prof. P A J Perera	Biochem. & Molecular Biology	Modification of coconut based dietary fat in the Sri Lankan diet with soya oil to reduce the risk of coronary heart disease: Analysis of serum lipids of guinea pigs fed with coconut and/or soya based diets
5. Dr. P H Amerasinghe Prof. F P Amerasinghe	Biochem. & Molecular Biology	Molecular taxonomy of cattle ticks <i>Boophilus</i> sp. and <i>Rhipicephalus</i> sp. in Sri Lanka
6. Prof. M A Careem	Physics	Applications of electronically conducting polymers
7. Prof. M A K L Dissanayake	Physics	Synthesis and characterization of novel solid polymer electrolytes based on polyethylene oxide (PEO) and polyacrylonitrile (PAN)
8. Dr. D Jayawickrama	Chemical Sciences	Investigation of intermolecular interactions using molecular modeling techniques

↑ FORTHCOMING EVENTS

- M.Sc. Programme in Engineering Geology & Hydrogeology (To commence in October 2000)
- Training Programme in Ceramic Technology (November 3 - 5, 2000)
- Workshop on Rocks, Minerals and Groundwater (November - December 2000)
- Workshop on Sampling Techniques
- Postgraduate Certificate Course in Advanced Biochemistry - Part II (January - March 2001)

FOREIGN APPLICANTS FOR PGIS PROGRAMMES

PGIS entertains applications from foreign students for admission to its M.Sc., M.Phil. and Ph.D. Programmes. Special reduced rates of fees are available to students from SAARC countries. For details, please contact Assistant Registrar, PGIS.

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