



UNIVERSITY OF COLOMBO
SRI LANKA
ANNUAL RESEARCH SYMPOSIUM 2018



Engaging with the Digital World in Higher Education

PROCEEDINGS

8 November 2018

PROCEEDINGS
ANNUAL RESEARCH SYMPOSIUM 2018
UNIVERSITY OF COLOMBO, SRI LANKA

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UNIVERSITY OF COLOMBO, SRI LANKA

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‘Buddhi Sarvathra Bhrajate’

Wisdom Enlightens

OUR VISION

To be a center of global excellence in education, research and stakeholder engagement to enrich human potential for the betterment of society.

OUR MISSION

To discover and disseminate knowledge; enhance innovation; and promote a culture of broad inquiry throughout and beyond the university through engagement and collaboration with industry and community.

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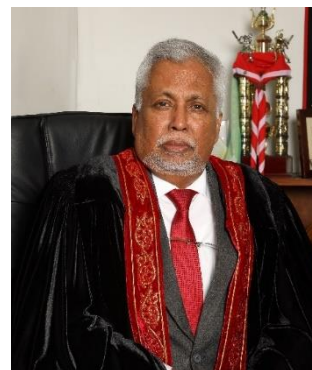
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MESSAGE FROM THE VICE CHANCELLOR
UNIVERSITY OF COLOMBO

Senior Professor Lakshman Dissanayake



It is indeed a pleasure to issue this message on the occasion of the Annual Research Symposium 2018 of the University of Colombo.

Research generates the kind of knowledge that makes innovations possible and it has a clear potential to make significant contributions to the quality of higher education. The research abstracts submitted for the symposium cover an impressive range of subjects and disciplines, a distinctive aspect of the Annual Research Symposium that makes it unique in the University of Colombo's calendar. The Symposium provides an ideal opportunity to exchange new information and strengthen the bonds among different groups of researchers working in varied domains and disciplines.

This year's symposium is held under the theme of **“Engaging with the Digital World in Higher Education.”** At present, many changes in university teaching and learning are occurring due to the emergence of new state/private universities and the growth of digital technology. In this context, I hope the theme of this year's research symposium will provide an opportunity to re-think the future path of university education in Sri Lanka.

It is my fervent hope that this year's symposium would prove to be a productive research forum that will facilitate the exchange of new ideas and make a significant contribution towards the advancement of research culture in the University of Colombo.

I would like to extend my best wishes to the Chairman and Organizing Committee of the Annual Research Symposium, the presenters and the participants. I wish the Annual Research Symposium 2018 of the University of Colombo all success.

MESSAGE FROM THE SYMPOSIUM CHAIR
ANNUAL RESEARCH SYMPOSIUM 2018

Professor Sandagomi Coperahewa



On behalf of the Organizing Committee, I warmly welcome you to the Inaugural Session and the Faculty Sessions of the Annual Research Symposium 2018. Every year, this is the premier academic congregation that brings together multidisciplinary research findings of the University of Colombo.

The theme of this year's Research Symposium is **“Engaging with the Digital World in Higher Education”** and each Faculty has its own theme which signifies its identity and discipline. This overall theme and individual Faculty themes recognize the rising importance of digital futures in higher education. Over 200 abstracts are included in this year's Symposium after a double-blind peer review process, under the guidance of Faculty Editorial Committees. This indicates the diversity of research interests on broad disciplines of the University of Colombo – Arts, Education, Law, Management, Medicine, Nursing, Science and Technology.

On behalf of the University of Colombo, I am thankful to His Excellency Mr. Bryce Hutchesson, Australia's High Commissioner to Sri Lanka and the Maldives for gracing this occasion as our Chief Guest and Professor Henrik Hansson of Stockholm University for accepting our invitation as the Keynote Speaker. I thank the Vice Chancellor Senior Professor Lakshman Dissanayake for his guidance and support in organizing this event.

I had a committed and dynamic team to help me in planning and organizing this Research Symposium. As Chair of the organizing committee, I take this opportunity to offer my sincere thanks to all academic and non-academic staff in the University of Colombo who have been working in different committees to make this symposium a reality. Special thanks to the SAR / Academic and Publications Branch for co-ordinating the work of all the sub-committees as the Convener of the Symposium Committee. I thank you all for your efforts, assistance and commitment.

INTRODUCTION TO THE CHIEF GUEST

Bryce Hutchesson

High Commissioner of Australia to Sri Lanka and the Maldives



His Excellency Bryce Hutchesson was appointed as Australia's High Commissioner to Sri Lanka and the Maldives in February 2016. He is a senior officer in the Australian Department of Foreign Affairs and Trade (DFAT). He joined the Department in 1988 after working for a time as a lawyer in private practice in Melbourne. He has served overseas with DFAT in New Delhi (as Deputy High Commissioner), Bangkok and Tel Aviv, as well as with the Office of National Assessments in Washington DC, USA.

Mr Hutchesson's work with DFAT in Canberra has focused primarily on foreign and security policy issues over a geographic spread from Southeast Asia through South Asia to the Middle East. Before taking up the position of High Commissioner in Colombo, he headed the division in DFAT responsible for the countries of South Asia covering foreign policy, economic diplomacy and aid management matters. Mr Hutchesson has Law and Commerce degrees from Melbourne University.

INTRODUCTION TO THE KEYNOTE SPEAKER

Henrik Hansson, PhD.

Associate Professor, Department of Computer and Systems Sciences, Stockholm University



Dr. Henrik Hansson is an Associate Professor at the Department of Computer and Systems Sciences at Stockholm University, Sweden. He has a PhD in Educational Sciences and Audiology and is a researcher and coordinator of 17 international projects. He has over 150 publications and has supervised more than 150 bachelor and master theses. He is currently supervising 10 PhD students. He was one of the first European Distance and E-learning Network (EDEN) Fellows in 2007. Dr. Hansson is a conceptual developer of the SciPro thesis management system and has several video productions to his credit, such as the SciPro overview and “The best Saturday.” He has conducted research in over 30 countries which includes two EU projects – “My University” focused on democracy processes in higher education and we.learn.it. focused on creativity and innovation in European schools. He is also engaged in a capacity building project for higher education in Rwanda. Some of the digital projects he is currently working on are The Global Idea Bank, the recruitment and matching of international distance PhD students with Swedish universities and Swedish language learning for migrants via the video-match system snackasvenska.nu. He is the founder and coordinator of the ICT4IID network.

KEYNOTE ABSTRACT

Digitalization of Higher Education

H. Hansson

Department of Computer and Systems Sciences, Stockholm University

UNESCO has forecast that universities need to almost double the intake of students the coming 10 years. ICT will play an important role in order to accomplish this. Banks, e-commerce and the media have quickly digitized their services. However, universities are not changing into digitalized services as fast. The Nordic countries with a strong ICT infrastructure and high maturity of ICT skills among its population are in the forefront of digitalized higher education. The focus of this presentation is on the Nordic experience and how this experience can be utilized in other countries.

FACULTY OF ARTS



***Challenges and Opportunities in the Advancement of the Humanities
and Social Sciences in the Digital World***

8 - 9 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF ARTS**

Professor Premakumara de Silva



It gives me immense pleasure to welcome you to the Annual Research Symposium of the Faculty of Arts 2018. The theme, ‘Challenges and Opportunities in the Advancement of the Humanities and Social Sciences in the Digital World’ was chosen to encompass a broad spectrum of topics with interdisciplinary relevance. The Annual Research Symposium of the Faculty is an important event because it brings into public view the current research being conducted by academic staff of the Faculty and facilitates the exchange of ideas and the establishment of interdisciplinary links and dialogue both locally and internationally. This event showcases the depth, breadth, and quality of academic research, scholarship, and creativity at the Faculty of Arts.

It is important to note that this year we received 72 abstracts for consideration, and after a rigorous review process we were able to accommodate 36 abstracts to maintain the quality of the presentations. Presenters this year include researchers from the University of Colombo’s Faculty of Arts as well as a few foreign researchers who have been working with the Arts Faculty academic staff. I welcome the Keynote Speaker, Dr. Ganeshan Wignaraja, a leading economist and the Executive Director at the Lakshman Kadirgamar Institute of International Relations and Strategic Studies. He will deliver a talk on “Is the Indian Ocean Economy a New Global Growth Pole?” I thank him for accepting our invitation.

I would like to thank the Vice-Chancellor of the University of Colombo for his support and guidance towards making this academic endeavour a success. My thanks should also go to this year’s University Research Symposium chair, Prof. Sandagomi Coperahewa and his dedicated team for supporting us to organize the Faculty symposium. The organization of this symposium was a team effort and many persons in the Faculty contributed towards the success of this event: I would

like to thank the Co-chairs of the symposium, the Organizing Committee and the Editorial Committee who were responsible for the Conference Programme and the publication of abstracts. Thanks are also due to the staff of the Dean's Office for logistical arrangements and the Computer Unit for technical support. I would also like to express my appreciation of the contributions made by the sponsors of this event, which include the University of Colombo Research Fund, and the Department Development Funds of the Faculty of Arts.

Finally, I also would like to thank everyone who submitted an abstract for the symposium. I offer my congratulations to the presenters and wish them the very best in their future endeavors.

FACULTY OF ARTS

PROGRAMME

9 November 2018

8.00 a.m.	Registration
8.50 a.m.	National Anthem and Lighting of the Oil Lamp
9.00 a.m.	Video Presentation
9.10 a.m.	Welcome Address by Professor Premakumara de Silva Dean, Faculty of Arts
9.20 a.m.	Address by Senior Professor Lakshman Dissanayake Vice Chancellor, University of Colombo
9.30 a.m.	Keynote Address: “Is the Indian Ocean Economy a New Global Growth Pole?” Dr. Ganeshan Wignaraja, Executive Director, Lakshman Kadirgamar Institute of International Relations and Strategic Studies
10.15 a.m.	Vote of Thanks
10.25 a.m.	Tea

INTRODUCTION TO THE KEYNOTE SPEAKER

Ganeshan Wignaraja, PhD.

Executive Director,

*Lakshman Kadirgamar Institute of International Relations
and Strategic Studies*



Dr. Ganeshan Wignaraja is the Executive Director at the Lakshman Kadirgamar Institute of International Relations and Strategic Studies (LKI) in Sri Lanka. He concurrently serves as a Member of the Monetary Policy Consultative Committee of the Central Bank of Sri Lanka and the Prime Minister's Task Force on the Indian Ocean. He is also a Senior Research Associate at the Overseas Development Institute in London. In a career spanning over 25 years in the UK and Asia, Ganeshan has had senior roles in international organizations (including the Director of Research at the ADB Institute in Tokyo) and the private sector (Global Head of Trade and Competitiveness at Maxwell Stamp PLC in London). His expertise covers trade and competitiveness, global supply chains and SMEs, infrastructure connectivity, development finance and macroeconomic policy. He has published 18 books on these topics and successfully led teams to deliver complex projects in over 30 countries in Asia, Africa, Europe and Latin America. Ganeshan has a DPhil in Economics from Oxford University.

KEYNOTE ABSTRACT

“Is the Indian Ocean Economy a New Global Growth Pole?”

G. Wignaraja

Lakshman Kadirgamar Institute of International Relations and Strategic Studies

This presentation based on a just published LKI Working Paper examines whether the Indian Ocean economy— comprising twenty-eight states across three continents – can become a growth pole for the global economy. It considers initial conditions, recent trade-led growth, portrays the near and medium context and various policy challenges. It finds that the strategically located Indian Ocean economy has become a pivotal global shipping hub. Its trade and GDP have grown faster than the global economy in recent years. Projections suggest that the Indian Ocean economy will likely account for over 20% of global GDP by 2025 and its GDP per capita is expected to almost double to \$6,150. However, realising this outlook will depend on tackling several pressing policy challenges including improving port quality and logistics, lowering barriers to trade and investment, narrowing development gaps and strengthening the regional economic governance. Tackling these challenges requires a combination of coherent national and regional policy measures.

FACULTY OF ARTS

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Determinants of public expenditure in Nigeria: An economic and socio-political analysis

C. Aluthge¹, D. H. Balami², A. Jibir³

¹*Department of Economics, University of Colombo, Sri Lanka*

²*Department of Economics, Gombe State University, Nigeria*

³*PhD candidate, Department of Economics, University of Colombo, Sri Lanka*

In Nigeria, the government activities vis-à-vis public expenditure has grown rapidly both in absolute and relative terms over the years. However, the implications of government expenditure expansion on the economy necessitates the need to understand factors that cause to increase government expenditure. For that, the study employs a slightly modified version of Wagner's law by incorporating new variables such as, oil revenue, corruption, public debt and democracy. The study tries to emphasise that these new variables are important factors to understand the nature of public expenditure in Nigeria. The study uses time series data for Nigeria from 1986 to 2016 to determine short- and long-term impact of real GDP, population, public debt, corruption, oil revenue and democracy on the size of government expenditure. Time series information were analysed using autoregressive distributive lag (ARDL) model. The findings of the study reveal that oil revenue, economic growth, population, corruption and democracy are important determinants of understanding the nature of the size of Nigeria's government expenditure in both short- and long-term. Public debt is found to be statistically insignificant. The study recommends strengthening of existing institutions/agencies and legislature to manage corruption in budgetary process and contract execution and to employ appropriate fiscal policy. It is revealed that the revenue base of the country should be diversified beyond oil sector. The reduction of the expenditure of governance at all levels and population growth are other recommendations of the study.

Keywords: *ARDL; government expenditure; Nigeria; Wagner's law*

Health consequences of resettled people in urban areas

W. R. V. W. Anuradhi

Department of Demography, University of Colombo, Sri Lanka

As an impact of the urbanisation process, urban underserved settlements have agglomerated in commercially valuable places. Health and morbidity are identified as key risk factors of displacement and resettlement in many developing contexts. Even though several studies have focused on resettlement related issues, such as joblessness, marginalisation, loss of access to common property, and social disarticulation, there is a lack of evidence about the health consequences of resettled people in urban settlements (Cernea, 2015). Therefore, the main objective of this study is to examine the impact of resettlement on the health behaviour of resettled people. The study was based on primary data obtained from a resettlement site, the Sahaspura Housing Complex, the first resettlement housing project built for low income people in 1998 under the Sustainable Township Programme (STP). Located in the Wanathamulla Grama Niladhari Division in Colombo District, 671 families were resettled originally, but only 224 resettled families lived there in 2017. 144 families were selected using a simple random sampling method. Primary data was collected using an interviewer-administered questionnaire. Open-ended questions were included to examine the respondents' perceptions of health. Data was analysed using uni-variate and bi-variate analyses. The research findings indicate both positive and negative health outcomes among resettled families. Compared to the previous place of residence, the majority of respondents experienced better sanitary facilities (63.9%), drinking water (87.5%), and housing conditions (63.8 %). Negative health outcomes were related to drug addiction and alcohol use among men (19.4%); the garbage disposal services/system (59%); access to health services (49%); and, incidence of non-communicable diseases (61.8%). The majority of the findings show a negative influence of resettlement on health behaviour and access to health facilities. So, effective programmes are required to ensure the health of people in resettled areas.

Keywords: *health behaviour; health consequences; resettlement*

Analysis of water quality near an open dumping site: A study of the Dambuwawatta garbage dumping site in the Gampaha District

P. M. H. Chakrapani¹, C. M. K. N. K. Chandrasekara²

¹*YORK International School, Sapugaskanda Branch*

²*Department of Geography, University of Colombo, Sri Lanka*

Open dumps are a major threat to water sources as the leachate generated by garbage disposal sites contains a large amount of pollutants. Focusing on the Dambuwawatta non-segregated garbage dumping site in Gampaha District, the study aimed to identify the quality of water and vulnerable areas for water pollution. A total of ten water sampling sites were selected, eight groundwater samples (G1-G8) and two surface water samples (S1-S2), considering the slope of the terrain and distance from the open dumping site. A standard Ruttner water sampler was used to collect undisturbed water samples. Laboratory analysis was carried out to measure the physio-chemical and heavy metal levels of water during the dry (August) and wet (October) seasons in 2017. The physico-chemical parameters of the selected water samples were ascertained by testing for pH, electrical conductivity (EC), turbidity, total dissolved solids (TDS), total suspended solids (TSS), total solids (TS), dissolved oxygen (DO), nitrate, and phosphate. The levels of lead and cadmium in the water samples were also measured. The Sri Lankan Standards (SLS) for drinking water was used to determine the threshold levels of different physico-chemical and heavy metal parameters. The water quality index and principal component analysis (PCA) were used to analyse the data. The pH results revealed that the water was acidic during both dry and wet periods. Turbidity level of groundwater samples of G3, G4, G5, G6, and G7 exceeded the SLS limit in both dry and wet periods. TS of most of the samples are above the SLS limits. The results of the water quality index show that during the dry season only one water sample (G7) could be defined as “good quality.” It was located 250m from the dumping site. All the other groundwater samples were found to be of poor quality. According to the PCA results in the dry season, three components have been extracted. Water quality parameters of EC, TS, TDS, and TSS were categorised under the first component. pH, turbidity and DO were categorised under the second component. Phosphate (PO_4^{3-}), nitrate (NO_3^-), and DO were classified under the third component. Dominant factors according to PCA analysis could not be derived during the wet season.

Keywords: *open dumping; water quality; water quality index*

Disaster risk and vulnerability of disaster affected populations: Case study based on Kuruniyawatta and Meethotamulla Grama Niladhari Divisions in Colombo, Sri Lanka

D. Chathumani,¹ D. D. Wicramasinghe,² W. D. K. Madushanka³

^{1 & 2} *Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka*

³ *Department of Geography, University of Colombo, Sri Lanka*

Disasters have become more devastating in the world as well as they are becoming more frequent in occurrence. Sri Lanka is also prone to disasters especially with hydro meteorological origin. Meethotamulla and Kuruniyawatta areas are located in the flood plain of the lower Kalani River basin, and in April 2017 many lives were lost due to the landslide at Meethotamulla garbage dump. The main objective of this study was to understand the disaster risk and the vulnerable population in the area. Methods of data collection consisted of a semi structured interview and a questionnaire survey, which were conducted in both Grama Niladhari (GN) Divisions. The questionnaire survey was conducted among fifty households from each GN Division, which are located within 100 meters from the Kalani River. For the interviews, key informants like government officials who are serving in the areas were selected. Methods of descriptive analysis along with some statistical methods of descriptive statistics were used as the methods of data analysis and to present the findings, maps, tables and charts have been used. The study revealed that epidemics are the most common disaster specially fever, with 80% of the sample agreeing on that. Also, the study identified diarrhea as another risk under communicable disease. Annual floods are identified as the worst disaster scenario. Compared to the 1989 flood, the 2016 flood had the highest impact. The study depicted, dengue as the most stated post disaster consequence of the flooding. People mentioned the garbage sliding risk, as potentially happening again in the future. These findings were common to both Meethotamulla and Kuruniyawatta. It is important to understand the risk especially in areas with multiple hazards when developing programmes to support affected populations and planning interventions.

Keywords: *disasters; risk; vulnerable communities*

Socio-cultural and health-seeking beliefs of maternal health care utilisation among women in rural Nigeria

M. Dafi,¹ I. M. Lakshman,² D. Abeyasinghe²

¹*PhD Candidate, Faculty of Graduate Studies, University of Colombo, Sri Lanka*

²*Department of Sociology, University of Colombo, Sri Lanka*

One of the greatest maternal health challenges facing Nigeria, particularly in the northern states, is the influence of cultural and health-seeking beliefs arising from women in different ethnic groups of the country. The objective of the study is to explore socio-cultural and health-seeking beliefs related to maternal healthcare utilization among women in rural areas of Bauchi state, Nigeria. The study uses qualitative exploratory research design guided by the Health Belief Model (HBM). The underlying concept of the HBM is that health behaviour is determined by personal beliefs or perception about a disease and the strategies available to decrease its occurrence. In-depth interviews are used to collect relevant data. All the participants were selected through convenience sampling. Fifteen in-depth interviews were conducted with five (5) pregnant/nursing women from each village in the three (3) randomly selected rural areas, making a total fifteen (15) women. The data collected was transcribed and analyzed using verbatim quotation and thematic analyses. The findings reveal that socio-cultural beliefs, health system-related beliefs, availability and accessibility of healthcare, structured by gender, social class, poverty and inequality seem to shape the utilization of maternal healthcare services in rural areas of Bauchi State. The study recommends that policies and interventions aiming at addressing the issues of maternal literacy, cost of maternal health services must be formulated and well implemented. Health workers should be culturally competent when carrying out their duties. The male's role in reproductive health and other health issues should not be neglected. Health campaign and counselling need to be intensified to shape maternal health seeking beliefs of women in rural areas of Bauchi state and to make men more aware of these.

Keywords: *health seeking behavior; maternal healthcare utilisation; Nigeria; sociocultural beliefs*

High stakes or raising the stakes? Using second language summative assessment results for high-stakes purposes

K. T. N. de A. Wijesinghe

Department of English Language Teaching, University of Colombo, Sri Lanka

The study concerns the students' current success rate in the Foundational English Language (FNDE) course, the possible impact of summative assessment on a newly introduced high-stakes situation for learners and motivation to learn. At present, it is compulsory to pass the first year Level in the FNDE course in order to graduate. From 2018, the FNDE results of summative assessment are to be added to the Grade Point Average (GPA). This study investigated the feasibility of the new requirement by exploring number of students in each first year Level for the past thirteen years; failure-rates for each Level in FNDE courses; numbers for each Grade per Level; changes made to the courses; and available resources during the past decade. Discussions with teachers and a questionnaire administered to a sample of 40 students were also used. The findings indicated that the student numbers for Level 1 is as high as for all other three levels combined each year. The average failure rate for FNDE is 6% for the period 2012-2016. The average percentages for obtaining grades of B Grade and above during 2014-2016 are 5%, 68%, 58%, and 77%, for Levels 1, 2, 3 and 4 respectively. Although human resource development for teaching has been high, infrastructural issues that affect learning and testing exist. The student-survey revealed that 38% are conducive to adding FNDE marks to their GPA while a majority 45% do not think so. Further, 82% believe this change may increase motivation to learn. However, this provisional survey of views needs to be supported through a larger sample group. The study concludes that due to the over 99% pass-rates between 2012-2016, adding FNDE scores to the GPA does not raise the stakes for students. Instead, it may gain recognition for their performances for an already high-stakes test.

Keywords: *English as a second language; high-stakes test; motivation; summative assessment*

The dark cave: Capacity building of communities for rural development

S. M. A. T. de S. Nandaseela, W. D. K. Madushanka

Department of Geography, University of Colombo, Sri Lanka

While Sri Lanka shows progress in many aspects of development, there are communities which require attention to be improved up to the benchmarks. The proper use of existing resources is an important factor in this regard. This study talks about a small rural community in Pelendakanda, not far from Opanayaka town. Due to difficulties in access, the village's infrastructure is poorly developed. Despite low income levels, the villagers are able to secure all their daily needs themselves. The main objective of the study is to identify the possibilities of rehabilitating the nearby *Andiri Lena* (Dark Cave) cave system as a tourist attraction for rural development. Data was collected through semi-structured interviews, field observations, and a transect study. No advanced analytical techniques were adopted; instead, descriptive statistics were used to analyse data from the questionnaires and interviews. Mapping of the cave system and the surrounding resources were visualised through maps. A SWOT analysis was conducted to identify potential development strategies. These investigations confirmed that the Dark Cave system is a resource for rural development and capacity building. If the caves can be improved as a tourist attraction, infrastructure like roads, electricity, water, etc. will be upgraded. Also, people will have greater economic opportunities, such as production and sale of local goods like treacle and jaggery. The majority of those interviewed would like to see such development. To minimise adverse impacts, gradual improvement, rather than overnight change, and environmental sustainability are essential.

Keywords: *capacity building; rural development*

Historical threads in Buddhist-Muslim relations in (pre)-colonial Sri Lanka

P. de Silva

Department of Sociology, University of Colombo, Sri Lanka

Understanding relations between Sri Lanka's Buddhist and Muslim communities should not commence with simple concepts of ethnic groups and boundaries and an associated identity politics. This assumes a consistency across time for such communities depicted as collective individuals; that is, as communities imagined in modern terms as discrete and internally homogenous. I would like the "Groups and Boundaries" approach from Barth's influential study, which highlights the representational capacity of culture, notably language, to act as an identity marker. My paper challenges this approach and argues for a more dynamic understanding that does not presume the boundaries to be always and everywhere the same, nor should it presume a simple transition from the past to the present via a process of reification born of colonial bureaucratic inscription that effectively created these groups and boundaries. Instead of imagining the Sinhalese and Muslim ethnicities according to the conventional and largely static cultural criteria of language, diet, dress, religion, etc., my paper explores, therefore, the relationship between the practices of agriculture and trade and the values attached. I argue that more important criteria of identity are both relational and emergent from practice and practical values. Such values display, moreover, a hierarchical logic of interiority and exteriority, between immovable and movable wealth as these become valued and devalued over time. Such a relation or assemblage entails dynamic configurations occasioning sometimes violence and sometimes accommodation according to the historical ebbs and flows of world systems and their commerce as these systems impact upon the polity and the society in the past as well as the present.

Keywords: *ethnicity; identity; polity; society*

North Korea and the predicaments of negative peace

S. De Silva

Department of International Relations, University of Colombo, Sri Lanka

In this context, negative peace is the absence of war due to the existence of a nuclear deterrent between North Korea and the US. The objective of this paper is to discuss the evolving risks to this negative peace. The *Songun*, or Military First, ideology has become the core of the North Korean strategic culture. The 2018 US nuclear posture states that a North Korean nuclear attack against the US or its allies would result in the end of the Kim regime. In June 2018, the North Korean and US leadership opened negotiations on denuclearising the Korean peninsula. Even before the dust had settled after the talks, US intelligence agencies revealed that Pyongyang was displaying clear signs of resuming its nuclear weapons programme. The author argues, by analysing available literature, that the behaviour of the North Korean and American leadership doesn't fit the framework of rational deterrence and will seriously damage the strategic stability between the nations. The research concludes that a nuclear war between the two states could be triggered by a fundamental difference in their strategic cultures and a multitude of other strategic factors, such as the aggressive and irrational behaviour of its leadership.

Keywords: *cross deterrence; negative peace; rational deterrence; Songun Doctrine*

Gender responsive policy framework on labour and employment: Challenges and issues

L. Dissanayake¹, S.P. Premaratne², P. Kailasapathy³

¹*Department of Demography, University of Colombo, Sri Lanka*

²*Department of Economics, University of Colombo, Sri Lanka*

³*Department of Human Resource Management, University of Colombo, Sri Lanka*

The changing nature of women's labor force participation has been a critical dimension of the development process since the first Industrial Revolution. Engendering employment policies and poverty eradication strategies is very key to attaining women's economic empowerment and Sri Lanka's sustainable development. The objective of the study is to address challenges and issues pertaining to formulate such a women policy framework. A desk review of local as well as international literature, focused group discussions, stakeholder meetings, KIIs and informal discussions with women have been conducted to gather information. Sri Lanka has made important strides in the journey towards gender equality. However, Sri Lanka still continues to encounter a number of challenges in the field of women employment. Key challenges include low level of labour market participation, wage differences and high level of unemployment among women, and high level of vulnerability of women in the labour market. Some more challenges add to the list, namely (a) Limited entrepreneurial and innovation skills (b) women mass engagement in the informal sector c) women spend much of their time on households care activities d) high dependency on family and husband revenues, (e) women are rarely invited to participate in decision-making processes, (f) women neglected in development planning (g) no mechanism to ensure the impact and the sustainability of the intervention and support given for women, (h) access gaps limit the opportunities for women to establish decent livelihoods, (j) lack of access to finance by women in formal sector, (k) increasing trend in elderly women population, and (l) female entrepreneurs get unusual disadvantage in a corrupted world. The CEDAW committee has clearly expressed its views on the lack of specific policy and law on workplace sexual and other types of female harassments. The challenges and issues lead several policy implications for empowering women.

Keywords: *challenges; labour and employment; livelihood; women's policy*

**Informal sector linkages in the tourism industry:
The evidence from four selected districts in Sri Lanka**

P. Dunusinghe

Department of Economics, University of Colombo, Sri Lanka

The tourism industry is identified as one of the key drivers of growth and development in Sri Lanka by successive governments. Despite the significant presence of the informal sector, the government policy framework pays limited attention on how to improve the livelihood of people engaging in informal economic activities around the tourism industry. This situation may have occurred due to a lack of comprehensive understanding on the sector and related value chain. The objectives of this study are to investigate the informal sector linkages in the tourism industry and map out characteristics of informal sector employees in selected districts in Sri Lanka. It employed a case-study approach in collecting information. Around 80 cases were selected based on type of business, gender of the owner, and the size. The case studies were conducted in Polonnaruwa and three districts in the Eastern Province. The case studies were conducted using semi-structured questionnaire. This study found that the existing tourism value chains have failed to connect with the local economy in the selected districts. The limited linkages between locals and the tourism industry is due to number of reasons ranging from local skill levels, domination of value chains by larger players, limited capacity of small and medium businesses, unfavorable state policies, poor quality, lack of market information, limited product market, as well as cultural concerns. In light of the findings, it is imperative to implement a comprehensive policy package in uplifting the livelihoods of people engage in informal economic activities around the tourism industry. These key elements require consideration: public investment in tourism site and product development, development of a regional talent pipeline in collaboration with the private sector operators, maintenance of law and order and ethnic harmony, enforcing agreed regulations on environment, health, and safety, consensus building among operators in the tourism industry.

Keywords: *case study; informal sector; Sri Lanka; tourism industry; value chain*

**The Sleeping Tiger of Asia:
Climate change as a potential challenge to developing Asia**

A. N. Fernando, K. N. Kandewatta

Department of Economics, University of Colombo, Sri Lanka

A significant portion of any economy is directly linked with environment, especially in Asia where agriculture and tourism are at the core of the economies. Therefore, adverse climate conditions could lead to devastating results. This study was undertaken to fulfill the need to analyse the potential threats to emerging Asian economies from climate change in order to design and alter policies to mitigate any adverse impacts. The analysis of the study employs a Basic Cross-Country Regression model designed for a cross section of developing countries located in the tropical climatic belt of Asia. Initially, findings of the regression model were diagnosed of potential Ordinary Least Square Technique's assumption violations. However, the study is subjected to few limitations due to the lack of data in the short-run, thus only annual data are used in the study. Level of initial per capita GDP and population growth in the region had a negative impact on per capita GDP growth during the period 1990-2014. In contrast, the total population has a positive impact on growth suggesting that regional economic growth is driven by demand. Further, an increase in temperature was observed to lower the per capita GDP growth; precipitation was identified to positively impact growth. The climate sensitivity on agriculture is uncertain but its impact on agricultural activities is an established phenomenon. The tourism sector is also highly sensitive to climate change. There is a very steady growth in the arrivals to the region. However, the departures have increased significantly. These findings create the need for sustainable approaches in both agriculture as well as tourism to safeguard the economy in the long-run. The study concluded that tropical developing countries need to take climate change seriously as it affects their economic stability significantly. All in all, it identified the need to incorporate the concept of climate change into policy planning and growth models.

Keywords: *agricultural activities; Asian economies; climate change; sustainable development; tourism*

The continuity of educational tradition: A study on medieval Islam

N. Gafoordeen, M. M. M. Sabir

Arabic and Islamic Civilization Unit, University of Colombo, Sri Lanka

This study aims to understand the role played by Islam in educational development. Through the analytical records from the manuscripts of Islamic history and the source of the Quran, Sunnah, it is evident how education has been an important field that Muslims have continuously shined in. It pushed the society to the front challenging the political and economic world power of the day. Schools for children and universities for continuing education were established during the period of Abbasid Empire. Great libraries and learning centers in places such as Baghdad, Cordoba, and Cairo were built for educational purposes. These establishments contributed to the advancement of sciences such as geometry, astronomy, medicine, geography, physics, and optics, as well as philosophy, and collected encyclopedic compilations. In addition, educating women has been a high priority. Women were perceived as able to gain knowledge and to teach others. Aisha, who was one of the leading academics of her time, was known as a teacher of many people in Madinah. In the 1800s when European power took over, the Muslim's educational system was removed from the curricula and was replaced by secular sciences. The leaders in Turkey, Iran and other Muslim countries sent their children to the western world to educate them on administration and military to ensure that they could survive and challenge the impacts of colonialism. They recognized western style of schools with traditional learning centers. Despite the new systems in place in much of the Muslim world, traditional education still survives.

Keywords: *Abbasid Empire; education; modern Islam; secular sciences*

Species composition and distribution of mangroves in dry and wet zones: A comparative study of Puttalam and Negombo lagoonal ecosystems on the Western coast of Sri Lanka

M. D. K. L. Gunathilaka, C. M. K. N. K. Chandrasekara

Department of Geography, University of Colombo, Sri Lanka

The present study compares the distribution and species composition of mangroves according to the salinity gradient in Puttalam and Negombo lagoons. The Puttalam lagoon is in the dry zone and Negombo lagoon is at the boundary of wet and intermediate zones respectively. Primary data on mangrove species and salinity of water in Puttalam lagoon were collected through a field survey using 25 samples where mangrove species are available maintaining distribution of species heterogeneity. The sample size was 5m X 5m quadrants. Published data (2016) on mangrove species in Negombo lagoon were used for comparison and a total of 15 quadrat samples were selected in the study. *In situ* field-testing of salinity in water was carried out at same locations where the mangrove species were enumerated in both studies. Shannon-Wiener diversity index was calculated to compare the diversity of mangrove species. The Inverse Distance Weighted (IDW) interpolation technique in ArcGIS was performed to prepare spatial distribution maps. A total of 577 and 367 individual mangrove species were enumerated in Puttalam and Negombo lagoon respectively. There are 15 mangrove species belonging to 13 genera and 9 families in Puttalam lagoon; 18 species belongs to 14 genera and 12 families in Negombo lagoon. Among them 8 and 14 species identified as true mangroves and 7 and 4 species identified as mangrove associates respectively in each lagoon. The number of true mangrove species are comparatively high in Negombo lagoon while associate mangroves are high in Puttalam lagoon. It was identified that “true” mangroves usually establish in the intertidal shores of the Negombo lagoon and inlet of the lagoon is nourished with both actual and associate mangrove species while true mangrove species were dominant close to the inlet of the Puttalam lagoon and mangrove associates were dominant towards the outlet of the lagoon.

Keywords: *dry and wet zones; mangrove species; salinity gradient*

Ethical significance of Buddhist practice of health: Opportunities and challenges

W. Hewamanage

Department of Buddhist Studies, University of Colombo, Sri Lanka

From the very beginning of human history, religion has immensely contributed to spiritual progress and physical advancement of the human being. Health has been of tremendous concern in many religions throughout history. The mental health of human beings in particular has been the central focus of religion, as well as physical and social aspects of health. The objective of this paper is to discuss Buddhist teachings on mental, physical and social aspects based on Sutta and Vinaya pitakas. These teachings highlight the necessity of looking into alternative ways and means to human hygienic issues without being restricted to western medicine alone. Recent statistics show the high rate of physical, mental and social disorders. Moreover, heart disease, strokes, HIV etc. have caused the reduction of life expectancy and contributed to the increase of mental health issues such as depression, stress and anxiety. Insecurity and war have spread throughout the world affecting social peace and harmony. Consequently, Buddhism, as a religion and philosophy, has an opportunity to intervene in the present discussion on well-being but overriding alternative methods of health is a challenge. Prophylaxis and therapy are two objectives of Āyurveda, the dominant medical system of India where Buddhism began. They seek the upholding the well-being of a healthy person and healing of a patient. Modern health science also appreciates prophylaxis and therapy. The Buddhist standpoint on the ethical significance of health frequently associates with prophylaxis and provides the therapeutic aspect as well. Thus, the ethical intervention of the Buddhist notion of well-being is unique and it helps to comprehend the significance of morality for physical, mental and social well-being in the present world.

Keywords: *alternative health; Buddhist health; ethics; prophylaxis; therapy*

Feedback on free writing for language improvement

S. R. Ilangakoon

Department of English Language Teaching, University of Colombo, Sri Lanka

Without adequate exposure to the language and effective teaching during secondary education, many Arts undergraduates in state universities struggle to reach an acceptable standard of English language proficiency. The limited classroom hours seem inadequate to provide students with practical activities to ensure automaticity of language rules learnt. This study aims to ascertain the impact of feedback on student writing by providing an out-of-class self-learning opportunity entailing teacher feedback. The study, using a mixed method approach, answers two research questions: 1) Does personalised written feedback enhance general language teaching in improving learner performance? 2) What are students' attitudes towards receiving corrective feedback? The intervention required a sample of 33 students, falling into Band 5 of the UTEL benchmarks, to write diary entries on topics of their choice (and specific topics towards the end of the semester) during their free time. Immediate feedback was provided on errors in the language areas taught in class. A content analysis of student writing was undertaken and a questionnaire administered to elicit student views and attitudes on the feedback they received, areas in which students would prefer to receive feedback, and the effects of the feedback on language improvement. Common errors were identified in the areas of capitalisation, verbs, articles, prepositions, vocabulary use, and spelling in the diary entries. Analysis of the students' later writing showed their ability to control the language more confidently to express more complex thoughts than at the beginning of the intervention. While some errors still persisted, better writing skills were observed in the overall sentence structures. Thus, an improved language ability and high enthusiasm towards receiving feedback were observed through this study.

Keywords: *diary entries; feedback; free writing; language improvement*

**An investigation on the inter-terminal productivity of the Port of Colombo:
A case analysis through vessel records of a shipping line**

M. Jayaweera¹, C. Karunanayake¹, T. L. Gunaruwan¹, R. Ranasinghe²

¹*Department of Economics, University of Colombo, Sri Lanka*

²*Aitken Spence, Sri Lanka*

Operations in maritime industry are nowadays unthinkable without effective and efficient association of terminals. In fact, it is one of the robust factors which affects the development of a nation and is an impeccable segment which influences national integration and world economy as a whole. The Port of Colombo, being one of the main transshipment hubs in the East-West main shipping route, is comprised of a state-owned container terminal (Jaya Container Terminal) and two privately-owned container terminals (South Asian Gateway Terminal, Colombo International Container Terminal). Their facilities and productivity levels differ from one another in terms of their capabilities, thereby differently demanded by shipping lines calling at the Port of Colombo. This paper attempts to comparatively assess the components of ‘Terminal Productivity’: namely, Berth Productivity, Vessel Productivity and Crane Productivity, vis-à-vis the three terminals of the Port of Colombo. Data pertaining to 102 vessel reports were gathered from a shipping company which works with all three Terminals. Gathered data were analysed deploying descriptive statistics and ANOVA test. While recognizing the limitations of this research, arising due to limited number of data points being examined and a single shipping line being considered, which compromise generalizability of its outcomes, the significant difference among the three terminals in Crane Productivity indicated through the results of the study merits consideration. It was not surprising that CICT, possessing modern and technologically advanced equipment, showed higher Crane Productivity. In spite of this, neither Berth Productivity, nor Vessel Productivity appeared significantly different among the three terminals; a quite unexpected result. The implicit hypothesis that could be advanced on these findings would be some “inefficiency” in factors that intervene between Crane Productivity and other dimensions of productivity at CICT and SAGT; examination of which warrants further research.

Keywords: *Berth Productivity; Crane Productivity; Port of Colombo; Terminal Productivity; Vessel Productivity*

Global production network trade in Sri Lanka in the fourth Industrial Revolution age

K. Kandewatta, A. N. Fernando

Department of Economics, University of Colombo, Sri Lanka

The remarkable growth in international trade in the last few decades has paved the way for new patterns in trade among nations. As a result, multinational companies have decentralised their production processes to exploit relative factor price differences across the world. This process of decentralisation is known as Global Production Sharing or the Global Production Network (GPN). It is important to identify the nature of GPN trade in the Sri Lankan context in order to grasp possible future complications as the Fourth Industrial Revolution unfolds. This study is based on data obtained from the UN Comtrade database and the Export Development Board. The findings suggest that there has been a continuous fluctuation in the total volume, although it shows an overall upward trend. The data indicates that Sri Lanka's contribution to GPN trade is predominately in two segments, lift truck parts and vehicle ignition wires, with India and the US as the main exporting destinations. Though there are a number of companies that engage in this trade pattern, almost all have deployed labour-intensive production technologies. Therefore, it is argued that the lack of proper human capital and production technology upgrading may render the country a less attractive GPN trade destination in the future.

Keywords: *Fourth Industrial Revolution; global production network; multinational companies; parts and component trade*

**Public attitudes and knowledge about drinking water in the Ponnagar Grama Niladhari
Division in the Kilinochchi District**

P. Kirishanthan, S. A. Norbert, M. A. D. Samanmali
Department of Geography, University of Colombo, Sri Lanka

Public attitudes and knowledge toward drinking water play a vital role in the availability, accessibility, protection, conservation, and sustainable management of drinking water. The main objective of the study was to investigate public attitudes and knowledge about drinking water in the Ponnagar Grama Niladhari Division in the Kilinochchi district. This research was an exploratory study, using simple random sampling. The research tools were questionnaires, given to 145 households, and key informant interviews. The data was analyzed statistically and findings presented using both descriptive and inferential statistics. This study revealed that most households (51%) depend on the Water Supply and Drainage Board, while 32% depend on tube wells, which are relatively safer for drinking as they are less contaminated. The remaining 17% obtained drinking water from dug wells, which are an open source and become easily contaminated. Based on the study, most households seemed to have adequate knowledge about drinking water, such as the importance of the drinking water quality; issues related with unsafe water, especially health issues; and safe practices of water collection, storage, and purification. But they do not practice that knowledge in a proper way due to economic and family burdens, household chores, carelessness, lack of support, etc. On the other hand, limited knowledge, misinformation, and attitudes negatively influenced drinking water safety. For instance, most households (54%) believed that drinking water from a particular water supply is safe, but field observation revealed that the sources were not suitable for drinking unless treated. This study highly recommends conducting awareness programmes, setting up water treatment facilities, and providing pipe-borne water to enhance and ensure the safety of drinking water and the wellbeing of the public. In addition to the above, the relevant stakeholders should integrate local communities' attitudes and knowledge about drinking water for sustainable management of water resources.

Keywords: *attitudes; drinking water, knowledge, public perception*

Using electronic corpora to identify language structure and use in special occasion speeches

E. Kithulgoda¹, D. Mendis²

¹*Postgraduate Institute of English, Open University of Sri Lanka*

²*Department of English, University of Colombo, Sri Lanka*

Teaching students the linguistic features of speech genres in English for Professional Purposes (EPP) programs in universities is a challenge due to the proliferation of pedagogical approaches based on introspection and intuition, and the lack of authenticity in lesson materials. This paper represents an attempt to fill this gap by adopting the approach of data-driven learning (DDL) to develop pedagogical activities to teach Special Occasion speech writing in a tertiary level Business English curriculum. A specialised corpus of 20 authentic Vote of Thanks speeches was compiled, and lexico-grammatical investigations were performed on the corpus data using AntConc and Compleat Lexical Tutor. A Move Structure Analysis (Swales, 1990) was conducted manually to identify typical rhetorical structures of the genre as it is found in professional contexts in Sri Lanka. Finally, the impact of the situational and institutional context of speeches on the genre structure was assessed using information recorded on text external factors. The results revealed differences between short and long Votes of Thanks in terms of moves. The long speeches (more than 500 words) consist of three obligatory moves and one optional move. The short speeches (less than 500 words) consist of two obligatory and two optional moves. The order of appearance of steps can change within the move in both speech types, and the situational context affects speech length. The results also revealed that Votes of Thanks are low keyword texts. Frequency lists, collocations, keywords and N-grams generated by using concordancing software revealed lexico-grammatical features characterizing the genre. In keeping with the tradition of corpus-based language pedagogy, the results were employed to develop activities and exercises reflecting authentic language use in order to raise awareness of EPP students' structural, rhetorical and lexico-grammatical knowledge of the given genre.

Keywords: *corpus linguistics; EPP; genre analysis; materials design; Vote of Thanks*

**Artificial intelligence (AI) in the Buddhist world:
A philosophical and religious study of the Xian'er**

V. Kumara

Department of Buddhist Studies, University of Colombo, Sri Lanka

Traditional religions have to contend with a rapidly changing world in order to survive. We find an example of religion accommodating modern technology in the robot monk, Xian'er, the result of a joint collaboration between Longquan temple in Beijing, China, and Artificial Intelligence (AI) experts in Chinese universities. Xian'er is able to answer 20 general questions, deliver fixed dhamma sermons, chant mantras, and perform religious ceremonies for funerals. Thus, the robot monk can substitute for human monks at the temple in some tasks. Though this innovation offers certain benefits to the Buddhist world, philosophically, it contradicts early Buddhist teachings. For instance, doubts arise whether the robot monk's religious performance is a vehicle for psychological blessings or merely the replication of sound; the inanimate Xian is incapable of practising loving kindness in its social engagements. This paper aims to examine the pros and cons of the application of AI in a Buddhist context. Data is mainly collected from online sources. The research will address to what extent AI could be applied to Buddhist context in a positive manner.

Keywords: *artificial intelligence; Buddhist culture; Buddhist philosophy; robot monk; Xian'er*

Children's international migration for education and its impact on parents left behind

A. S. Manamendra

Department of Demography, University of Colombo, Sri Lanka

International migration has become a global phenomenon. Today people migrate internationally for many reasons such as employment, education, better living standards etc. Migration for education is also considered as human capital development and hence many parents tend to send their children to foreign destinations with the intention of improving their future. Literature on international migration shows evidence that a significant volume of research has been done on the migration of parents and the children left-behind. However, there is a lack of knowledge on parents left behind by children due to education related migration. Therefore, the objective of this research is to examine how children's migration for overseas education impacts their parents who have been left behind. The study was based on primary data collected using an interviewer administrated questionnaire. The sample size was 100 and a snowball sampling method was used to select households with children who have migrated for education. Data was analyzed using uni-variate and bi-variate analyses. The results revealed that the majority of parents (80%) were satisfied with their children's higher education achievements. The majority of children; who had migrated for education, were between 25 and 29 years of age (77%). While 90% of the parents were over 55 years old. About 92% of the children who have migrated belong to nuclear families and had on average two children in the family. Most of the parents suffered from non-communicable diseases such as diabetes (63%), cholesterol (57%), stress (58%), heart diseases (28%), difficulties in hearing (9%), and difficulties in seeing (33%). Health seeking behaviours of parents were at a poor level. Majority of parents had a negative perception of their children's behaviour such as lack of intention to return home, postponement of marriage, less parental care, less communication with the parents. Further research is needed to explore psychological issues faced by these parents.

Keywords: *children's migration; education; international migration; parents left behind*

Google Scholar: Opportunity, threat, or seduction?

D. Mendis

Department of English, University of Colombo, Sri Lanka

The increasing competitiveness of obtaining permanent University positions, research awards and promotions has brought pressure upon scholars to prove the existence of and increase their research capital. Scholarly capital is usually measured by means of quantifying an academic's research output in terms of publications, and to what extent their ideas are used and acknowledged by their peers. Citations have thus become an integral part of assessment schemes in higher education, and data sources such as Google Scholar are popular means by which academic profiles are constructed. While there are advantages to metrics such as Google Scholar's h-index, its measurement of research capital is neither fair nor reliable. The h-index is calculated on the basis of a scientist has index h if h of his/her N_p papers have at least h citations each, and the other $(N_p - h)$ papers have no more than h citations each (Spicer, 2015). H-scores are usually much higher in the sciences and medicine than in the humanities and social sciences. Differences can be seen even between disciplines of the arts and humanities on the one hand, and social sciences on the other. The h-index can be manipulated, either through excessive self-citation or by encouraging peers to cite one's lesser known publications. Because the h-index gives no details of the length of a publication, there is a danger of research in the social sciences and humanities, where scholarly articles tend to be single-authored and greater in length, being underestimated in comparison to articles in sciences and engineering which are shorter and have multiple authors. Therefore, while a citation index like Google Scholar does present opportunities to increase scholarly capital, this paper argues that such metrics should be viewed critically, and that academics should be cognizant of the danger of being seduced by their pitfalls.

Keywords: *academic capital; Google Scholar; h-index*

The changing demography of Sri Lanka: Emerging issues, challenges, and policy implications

E. L. S. J. Perera, R. L. R. Malsha

Department of Demography, University of Colombo, Sri Lanka

The Sri Lankan population has grown more than eight times over the past decades, from 2.4 million in 1871 to 20.4 million people in 2012, with standard projections showing continued increase up to 26 million by 2062. These changes in the size of the population are accompanied by demographic transitions. The study of Sri Lanka's population involves an integrated analysis of three demographic processes, fertility, mortality, and migration, and their impact on the age-sex composition. The main objectives of this paper are to examine the significant demographic changes in Sri Lanka during the post-independence period and to discuss the emerging issues, challenges, and policy implications. Such knowledge of demographic behaviour at national and regional levels would be useful to understand population dynamics and to determine appropriate policy. This study is based on secondary data obtained from population and housing censuses and labour force surveys conducted by the Department of Census and Statistics and international migration statistics from the Sri Lanka Foreign Employment Bureau. Data was analysed using population pyramids and descriptive analysis. The findings reveal that Sri Lanka has made a tremendous achievement in longevity and other social indicators due to the rapid demographic transition during the second half of the 20th century. Though the age structure transition has produced a demographic dividend conducive for an economic take-off, so far it has not been utilised properly. The country is economically unprepared to face emerging challenges, like youth unemployment, low female labour force participation, human capital development, international migration, and an ageing population. The findings suggest that Sri Lanka needs short-, medium-, and long-term planning to address these population issues.

Keywords: *demographic challenges; demographic change; demographic issues*

Statistical and spatial analysis of social vulnerability in the Walapane hilly areas

U. T. G. Perera¹, S. G. N. C. Senanayake,² D. L. N. Egodage¹

¹*Department of Geography and* ²*Computer Teaching Unit*

University of Colombo, Sri Lanka

The concept of social vulnerability attempts to understand the social conditions that transform a natural hazard into a social disaster. Hence, the mapping of social vulnerability is critical in designing appropriate disaster management measures. In Sri Lanka, the risk and impact of natural disasters for communities living at high altitudes increases with their social vulnerability. This study was conducted in the Roopaha and Alakolawewa Grama Niladhari Divisions of Walapane Divisional Secretariat situated 3,000 feet above sea level in the Nuwara Eliya district. The main objective of the study is to determine the spatial distribution of social vulnerability in the region. Data was collected in the Roopaha and Alakolawewa areas using a stratified sampling method. A linear index was developed in order to value vulnerability in the study area. The results reveal that the Roopaha Grama Niladhari Division is more vulnerable than the Alakolawewa Grama Niladhari Division, with most household units in the former demonstrating high social vulnerability levels. High elevation was found to have a close relationship with high vulnerability. The results are important for future disaster management measures, as planners and management will need to pay special attention to communities in high altitudes where social vulnerability aggravates the risk and effects of natural disasters. Further, the results can be used for awareness and educational purposes and to strengthen future disaster and risk management programmes in the country's hilly areas.

Keywords: *disaster management; elevation; household units; social vulnerability; vulnerability index*

**Factors influencing the sustainability outcomes of women homestay entrepreneurs:
A case study of the Gampaha District**

F. R. Rafeekdeen and D. A. C. Silva

Department of Economics, University of Colombo, Sri Lanka

The participation of women in the homestay industry is a growing phenomenon; yet research in this area is limited in Sri Lanka. Anticipating the potential contribution of the homestay industry to the Sri Lankan tourism agenda, it is deemed timely that research on women in the homestay industry be undertaken to understand their entrepreneurial pursuit. This study explores the factors affecting the sustainability of outcomes of women homestay entrepreneurs. The research was conducted on 100 homestay entrepreneurs through a snowball sampling technique. Personal and online administered questionnaires were used to collect data. The findings reveal a majority of women homestay entrepreneurs are between 40-55 years, with 60% having completed their lower secondary education. They were more motivated by the “pull factors” (personal satisfaction, passion, and encouragement by a friend), as opposed to “push factors” (economic depression, unemployment, retrenchment, and dissatisfaction with former job). In addition, these women experienced moderate to high levels of empowerment, especially in terms of access to training and education services and making decisions on business matters. The women respondents view economic and social outcomes as more rewarding than environmental outcomes. The multiple regression analysis reveals that the motivation and empowerment of women homestay entrepreneurs are significantly related to both economic and social sustainability and to a lesser extent to environmental sustainability. The findings concur that women are important players in the homestay industry as it provides them an additional source of income and personal satisfaction that advances their personal and social positions; consequently, the industry emerges as an avenue to advance gender equality and empowerment in Sri Lanka.

Keywords: *empowerment; homestay industry; motivation; sustainability of outcomes; women entrepreneurs*

Intolerance in tolerance research: A brief review of the methodological debate in the study of tolerance

C. Ruwandika

Department of Political Science and Public Policy, University of Colombo, Sri Lanka

Among the multiple approaches to studying political tolerance, one of the most prominent is positivism. However, there is no unanimity among empiricist quantitative researchers on how to measure political tolerance. In this brief paper, I will survey a corpus of research studies conducted between the 1950s and the 1970s. I will discuss nuances in the research designs and measures adopted by these studies. I am writing this paper to support my own research study which attempts to understand the determinants of tolerance in the Sri Lankan community. In this paper, seven important empirical research studies on political intolerance have been taken into account. Stouffer's (1995) classic study suggested that tolerance norms in society would inevitably grow stronger as time passed. Prothro and Grigg (1960) and McClosky (1964) developed a utopian argument rather than an empirical analysis. Davis (1975) and Lawrence (1976) attempted to test Stouffer's prediction and found that tolerance has increased from 1954 to 1970. Similarly, Nunn, Crocket, and Williams (1978) had the same finding. This claim was almost immediately refuted by Sullivan, Piereson, and Marcus (1979, 1982). For them, Stouffer's methodology of tolerance was inadequate and time-bound, and the Nunn et al. findings were boldly optimistic and most likely illusory. Instead, Sullivan et al. introduced a method called "contend-controlled." Ultimately these two schools triggered an awkward debate in the empirical research on tolerance. The fundamental problem is that after about four decades, numerous empiricists simply copy either Stouffer's or Sullivan's measurements without considering the changing determinants.

Keywords: *empiricist; intolerance; tolerance*

Determinants of business development in agritourism in Sri Lanka
with special reference to the Kegalle District

L.R.A.N. Sanjeewani, D.A.C. Silva

Department of Economics, University of Colombo, Sri Lanka

The agriculture sector needs to rejuvenate with innovative product and services, such as agritourism which provides a farm-based experience for visitors. The main objective of the study is to identify and analyse the factors determining business development in agritourism. Currently agritourism sites are operated by private and public farms, community based organisations, and private hotels. Primary data was collected through questionnaires and interviews from a sample of 65 agritourism operators and non-agritourism operating farms in the Kegalle District. The former were selected via a snowball sampling technique, the latter using a stratified random sampling method. Correlation between factors and business development were analysed through hypothesis testing using Microsoft Excel and SPSS statistical software. The results reveal that location, investment capacity, stakeholder relationships, service quality, infrastructure, marketing and publicity, government support, operator's knowledge and experience, and attitudes towards agritourism are significant factors determining business development in agritourism. Issues in developing agritourism sites include a lack of knowledge and skill, poor investment capacity, lack of forward and backward linkages with tourism operators, remote farm locations, poor marketing, and insufficient infrastructure. Hotel operators and spice gardens, rather than actual farmers, currently derive the highest benefits of agritourism. The research makes several recommendations to develop agritourism, such as the need for farmers to improve relationships with tour operators to enhance their marketing channels; media promotion through online sources; and, maintaining the required quality and standards in agriculture and tourism.

Keywords: *agriculture; agritourism; farms; business development*

The impact of forced relocation on the underserved settlers in the Colombo Municipal Council: A case study of the Urban Regeneration Project (2011-2014)

A. C. Senanayake

Department of Sociology, University of Colombo, Sri Lanka

The emergence of shanties and slums (underserved settlements) is one of the most vulnerable outcomes in the process of urbanization. The Colombo Municipal Council with 68,000+ such settlements has implemented various projects addressing this issue by relocating the said communities to more secured housing units. This paper investigates the Urban Regeneration Project (2011-2015) (URP) executed by the Urban Development Authority. The main objective of this study was to understand the impact of the forced relocation on the underserved settlers in the URP (2011-2014). The impact was analyzed through the sub objectives of understanding the overall attitude towards the project by the officials and the residents, to investigate the social and economic impacts of forced relocation, and to understand the impact of the institutional framework on the project. This explanatory study was conducted using both secondary and primary data. Primary data was collected at Sirisara Uyana the first ever housing project which was completed under the URP. A mixed sampling technique was implemented in two phases. Firstly, a sample survey was carried out to assess the social economic background of the selected community. Secondly, in-depth interviews were carried out through purposive sampling with the community members. Simultaneously, structured interviews were carried out with officials. The study successfully employed Scudder's stress and settlement process (2005), Cernea's impoverishment Risks and Reconstruction Model (2000), Oliver Smith's development and dispossession (2009), Bohle's conceptual model on double structure of vulnerability (2001), and The Sustainable Livelihood Framework (1999) in recognizing the positive and negative impacts of the forced relocation. Data suggests that the forced relocation has been a failure in economic and mainly social aspects. In conclusion, it was seen that the attempt of reducing the vulnerability of the respondents through the project has exposed them into new dimensions vulnerabilities making them more unsecured.

Keywords: *forced relocation; sustainable livelihoods; underserved settlements; vulnerability*

Socio-economic factors affecting health problems and health seeking behaviour among employees in the agricultural sector: A case study of the Rambawa Divisional Secretariat Division

L. Senevirathna

Department of Demography, University of Colombo, Sri Lanka

The agricultural sector is key sector that generates employment in Sri Lanka. Health is one of the major factors affecting employees' quality of life. In recent years non-communicable diseases (NCDs) have been identified as the most common health issue among working-aged population. Many studies have focused on health behaviour and the prevalence of non-communicable diseases among industrial and services sector employees. However, studies are lacking on employees in the agriculture sector. Therefore, the objectives of this study are to examine the demographic and socio-economic factors influencing health problems and health seeking behaviour among employees in the agricultural sector in Rambawa DSD. The study was based on primary data obtained from Kadurugasdamana, Grama Niladhari Division (GND) in Anuradhapura. There were 551 households in this GND; among them 537 families had at least one member in agriculture related employment and had experienced NCDs. 100 families were selected for the study using purposive sampling method. Data was collected using an interviewer-administered questionnaire. Results were presented using descriptive and bi-variate analyses. Findings indicate that most of employees were in the age category of 55-59 years; 68% of employees were male while 32% were females. The majority had suffered from high blood pressure (29%), followed by diabetics (19%), and chronic kidney diseases (19%). About 41 % of them had suffered from respective NCDs 5 to 10 years. Majority were of the view that their health problems were due to low education (18%), high pesticides in agricultural farming (93%), unsafe drinking water (47%), lack of protective equipment (43%), lack of income, use of alcohol (55%) and unhealthy food (65%). Approximately 55% receive treatment for their health problems from government health services but about 10% had not taken regular treatment for NCDs. However, further research is needed to explore this issue further.

Keywords: *agriculture sector; health; non-communicable diseases*

The use of peacebuilding approaches to meet human restoration in post-civil war situations

M. Wakkumbura

Department of International Relations, University of Colombo, Sri Lanka

This paper offers a literature review on the nexus between peacebuilding approaches and human restoration during post-civil war peacebuilding. There is an overwhelming sense of hysteria in scholarly debates that contemporary post-war peacebuilding is challenged by prolonged violence and painful human consequences. The empirical literature argues that such human consequences are breeding “harm” and have a negative impact on peace. Furthermore, the challenges faced in human restoration have a major impact on victim-offender disconnections (in creating mistrust, ethnic disagreements, and psychological trauma). While addressing the applicability of transitional justice through judicial means, the literature emphasises non-judicial restorative justice to prevent some of the serious individual relational breakdowns (by working towards dialogue, accountability, trust, and healing). Therefore, the literature argues that unless peacebuilding contributes to human recovery, societies continue to be violent. In such a milieu, this paper examines how state and grassroots peacebuilding approaches result in peace failures when they are disconnected and in prolonged peace when they are cohesive. The paper proposes a valid proposition about state-to-grassroots peacebuilding and vice versa for realistic remedial human restoration in post-war societies where violence prevails. The paper aims to compare and contrast the empirical literature on different conflict situations (Nepal, Bosnia-Herzegovina, Guatemala, and South Africa), with special reference to Sri Lanka since the end of the civil war in 2009.

Keywords: *harm; human restoration; peacebuilding approaches; Sri Lanka; violence*

**Reflective analysis of the use of creativity in learner-centered undergraduate pedagogy
in International Relations**

M. S. Wanasinghe-Pasqual, V. G. Krishanthi, D. Wimalasiri, H. R. Liyanage, S. A. Yodunika,
B. K. Seneviratne, S. C. Manimelwadu

Department of International Relations, University of Colombo, Sri Lanka

This paper postulates that reflective practice coupled with creativity in a constructively-aligned syllabi is at the heart of learner-centered learning (LCL). The Department of International Relations (DoIR) has over 150 students in the First Year and around 40 students each in Special Degree classes in the Second to Fourth Years. Converting syllabi objectives to reflect LCL, although a continuous challenge (Weimer 2013), is at the heart of all courses taught by DoIR. Utilising primary data—selected DoIR course syllabi, class activities and assessments from two semesters in 2016, interviews, evaluations, and case studies of the activity and its outcome—this empirically rich research strives to present a Reflective Cycle (Kolb 2014) regarding the students’ knowledge-gaining experience. The paper examines how the use of multiple approaches, from the traditional (PowerPoint presentations, group discussions, and annotated bibliographies, field excursions) to the creative (panel discussions, poster competitions, roleplaying, Fish-Ball activity, art/theatre, and film reviews) help enhance LCL, while overcoming the obstacles to completing the syllabi on time. Furthermore, encouraging creativity in student-led activities and enhancing innate skills in post professionalism workshops also ensure LCL.

Keywords: *constructive alignment; creativity; Learner-Centered Learning; reflective practitioner*

**A step for poverty alleviation among poor rural women in Sri Lanka with special
reference to the Janashakthi bank system**

I. Wanniarachchi

Department of Sociology, University of Colombo, Sri Lanka

One of the main challenges faced by all the developing countries in the third world is poverty. Although Sri Lanka has reached up to a commendable level of the Human Development Index, a certain number of people are still suffering from poverty. However, due to the indifference perceived by women regarding the misidentification of different gender roles, locally and globally feminization of poverty has become a current trend. In the backdrop of this, Janashakthi banks which were established based on the Grameen Bank concept introduced by Mohammed Yunus in Bangladesh, are currently operating in Hambantota and Monaragala districts focusing on the upliftment of the status of poor women. Empowering women in poor families have become a turning point when eliminating poverty in those families. The objective of this research is to study the extent of intervention by these banks in eliminating poverty among poor women and their families. For this purpose, Julampitiya Janashakthi bank in Hambantota district was selected. Based on purposive sampling, 50 female bank members in the women's societies of 10 different villages and key informants were interviewed for the study sample. A set of qualitative data collection methods, in- depth interviews and observations, were utilized for primary data collection and key sources of secondary data were official documents and representations. As the study reveals, easy access to the bank has attracted the attention of more women compared to the other banks and a friendly environment has been created making a new discipline among the poor women on starting up loans and savings. By increasing the micro finance services and by establishing a corporate background for these types of underprivileged groups, these banks have taken steps to uplift the quality of life of the women who have been missed out of the opportunities in the society. In this background, this paper will analyze the effort of the Janashakthi bank in overcoming poverty among women in rural areas through financial and non-financial mobilisation.

Keywords: *feminisation of poverty; Janashakthi Bank; rural women; social mobilisation*

**Morbidity pattern and health seeking behavior of elderly population:
A case study of the Gampaha District**

M. K. Weeratunga

Department of Demography, University of Colombo, Sri Lanka

In Sri Lanka, there is a rapid increase of the ageing population. Among the issues faced by the elderly population in Sri Lanka, health can be regarded as one of their major concerns. Many older adults have multiple ailments. Understanding the health problems and health-seeking behaviour of the elderly is a prerequisite for providing them with comprehensive geriatric care. Although life expectancy at the elderly age has been increasing over time, the health status of the elderly population has been deteriorating as a result of the prevalence of non-communicable diseases. The main objective of this study is to examine the morbidity pattern and to study the health seeking behavior of elderly men and women by taking Gampaha District as a relevant case study. Data for the study were drawn from a sample survey conducted in Gampaha District covering 300 elderly persons by using a purposive sample. Subsequently, data were analysed through by-variate and uni-variate analysis with the use of SPSS. High blood pressure, diabetes, asthma and arthritis were identified as common and the prevalence of non-communicable diseases was higher among men than women. In contrast, the prevalence of disability seems to be higher among elderly women. It was found that one third of elderly women are more concerned about their health than elderly men. Both elderly men and women consider low health care cost as a major reason for seeking healthcare from public healthcare providers. It was very clear from the study that requiring treatment for longer periods forced them to look to the public health care service, irrespective of gender differences. Overall, the study found that the choice and use of health care services are mainly influenced by factors such as age, education, living arrangement, type of disease and income.

Keywords: *health seeking behaviour; morbidity; population ageing*

Religious Colombo: An anthropological incursion

C. West

Deakin University, Melbourne, Australia

Department of Sociology, University of Colombo, Sri Lanka

This study creates a rounded anthropological picture of Colombo, Sri Lanka. It selectively diverts attention to an area where the textual record is belied by the ethnographic reality: religious experience. As a city established and grown through the utilitarian activities of a trading port, Colombo's religiosity has understandably eluded focus. While studies of Sri Lanka have looked to the ancient cities and the rural areas for an essential identity (religious, national or otherwise), disciplines concerned with the urban have largely elided the religious. This project reviews the scholarly and anecdotal record of Colombo and compares it to the everyday life of the contemporary inner-city. Through participant observation, interviews and a broad range of textual data, this case-study of a bounded geographical area illustrates the richness, ubiquity and formative powers of Colombo's religious life. As well as the temples, churches and mosques that populate the site, the spatiality of religion extends to the street, parks, air, markets and homes of the city. Similarly, religious experience is more than worship and sanctioned ritual. This ethnography finds religion in domestic and familial arrangements, personal and communal aspirations, moral and political orientations, leisure activities, workplaces and virtually all aspects of Colombo residents' lives. When religious experience and innovation seem to determine the spatial and the social to such a high degree, why is it that history does not acknowledge its presence? The relationship between the social formation, the urban environment and religious experience indicates a resolution to this paradox. This study also reflects on how a more complete understanding of Colombo might change the perspectives that are available in the post-conflict era.

Keywords: *Colombo; ethnography; religion; social; urban*

The promotion of inclusivity among undergraduates with the combination of peace and knowledge through balancing diversity

K. Wijayabahu

Department of International Relations, University of Colombo, Sri Lanka

In the field of Social Sciences and Humanities in higher education, the undergraduates are encouraged to actively foster the core skills of building consciousness to integrate with diverse individuals and reach the intended objective of being intelligent while cultivating peace in respective society. In academic teaching, as a strategy used to attain the intended peace and knowledge among undergraduates, Small Group Activities (SGAs) have proven practical as a method of Teaching-Learning Assessments (TLA). The effectiveness of SGAs were tested by the authors through facilitating samples of International Relations undergraduates of second and third years, to work in evaluation-based tasks in SGAs constructed in arranging groups of forced blended and voluntary manner. The research intends to explore the effects that balancing diversity among undergraduates has on their performance and attitude and affecting the objectives of attaining knowledge and peace. To attain this goal, the authors used the students' feedback received at the end of the assessments both in forced group and voluntary groups as primary data and the observations made during the semester for the analysis. The conclusion of the research will recognize factors which could be utilised for the future references on the development of constructing SGAs and to identify which techniques would be suitable to achieve the said outcomes.

Keywords: *diversity; inclusivity; knowledge; peace; SGA*

FACULTY OF EDUCATION



Educating for the Digital World

16 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF EDUCATION**

Professor Manjula Vithanapathirana



I am pleased to present this message to the proceedings of the 2018 Annual Research Symposium of University of Colombo. This year in congruence with the University of Colombo theme, the Faculty of Education decided to focus on Digitization of Education with special reference to teacher education.

The Faculty of Education has earned a reputation as the first Faculty of Education to be established in Sri Lanka in early nineteen seventies. The mission of the Faculty is to develop the capacity of teachers, educators and researchers by equipping them with necessary knowledge, skills and attitudes to serve the system of education with their full potential.

This year's Keynote Address is delivered by Professor K. P. Hewagamage, Director of the University of Colombo School of Computing who is an eminent ICT education specialist.

I congratulate the Symposium Committee of the Faculty of Education for working hard to make this event a success. I wish to thank the reviewers who were obliged to keep to our time schedules. I also wish to thank the University of Colombo, Symposium Chairperson and committee for being very supportive to us.

My congratulations to all presenters and hope a majority of these deliberations will be further developed as full papers to be published in high quality journals.

FACULTY OF EDUCATION

PROGRAMME

16 November 2018

8.30 am – 9.30 am	Registration & Tea
9.30 am – 9.40 am	Opening Ceremony
9.40 am – 9.45 am	Welcome Address by Professor Manjula Vithanapathirana Dean, Faculty of Education, University of Colombo
9.45 am – 10.00 am	Address by the Chief Guest Senior Professor Lakshman Dissanayake Vice-Chancellor, University of Colombo
10.00 am – 10.40 am	Keynote address by Professor K. P. Hewagamage Director, University of Colombo School of Computing
10.40 am – 10.50 am	Vote of Thanks by Dr. Samudra Senerath Chairperson, Faculty of Education Annual Research Symposium 2018.
11.00 am – 12.30 pm	Research Presentation Session I
12.30 pm – 1.30 pm	Lunch
1.30 pm – 3.00 pm	Research Presentation Session II
3.00 pm – 3.30 pm	Tea

INTRODUCTION TO THE KEYNOTE SPEAKER

K. P. Hewagamage, PhD.

*Professor, Department of Information Engineering,
University of Colombo School of Computing (UCSC)*



Professor K. P. Hewagamage obtained his B.Sc. Special Degree in Computer Science (First Class Honors) from the University of Colombo and the Doctor of Information Engineering from Hiroshima University in Japan. He is a professor in Computer Science in the Department of Information Engineering at the University of Colombo School of Computing (UCSC) and current director of the UCSC.

Professor Hewagamage has key research interest in areas of Human-Computer Interaction, Software Engineering, e-Learning and ICT for Education and Development. He was the author or co-author of more than 125 research publications during last 20 years and his h-index is 12 in 2018 according to Google scholar. He also received more than 20 national and international awards for his scholarly work in research. Those awards include Professor Mohan Munasinghe Award for the outstanding computer science graduate in 1994 at the convocation of University of Colombo, the best paper award at IEEE International Conference of Visual Languages in 1999, research excellence award by the University of Colombo in 2004, 2006 and 2012, UNESCO award ICT for education in 2007, and the excellent paper award at the IEEE Ubi-Media conference in 2018. He is a senior member of IEEE, a member of ACM, and an academic advocate of ISACA. He was a chair of IEEE Computer Society Chapter in Sri Lanka.

Dr. K. P. Hewagamage was the Head of the Department of Information Systems Engineering, of UCSC and coordinator of e-learning Centre of UCSC. He was also coordinator of National e-Learning Project funded by Swedish International Development Agency (Sida) and was the principal investigator many international projects funded by international agencies. At the same time, he has helped the University of Colombo to establish the international collaboration with many foreign universities and agencies. He is a visiting researcher of Stockholm University, Sweden and Shimane University, Japan.

Educating for the Digital World

K. P. Hewagamage

*Department of Information Engineering, University of Colombo School of Computing
(UCSC)*

The Information and Communion Technology and the Internet has penetrated the every sector in the society including the Education from the Kindergarten to Higher Education. Hence, it is really difficulty to survive without being integrating the digital infrastructure and services in the twenty first century. At the initial stage two decades ago, things was started as a new value added facility for the education with many research and development opportunities. However, it is completely different in today's context such that we cannot operate or manage educational services without the support of the digital world. It is the evidence to show the penetration of digital world but the alarming message is that this is only the beginning of the digital revolution. Lot of possibilities which we imagined as things that could occur in the heaven are going to happen in our life time with or without our knowledge. For example, predicting the educational capability of a student or a teacher could be possible in advance using learner analytics and teacher analytics respectively. A click on a website, an image or video footage of a CCTV camera, a small text message sent to someone and an anonymous evaluation form could be integrated without the knowledge of the person to build the profile for the digital world. Hence, educating all stakeholders about the digital world for the better socio-educational context is not only a requirement but the right of a person. In this keynote, the speaker will present how the traditional ICT based education system such as Learning Management System could be enhanced using learning analytics and integrating with other systems for education such as e-portfolio to show the modern blended learning context in the twenty first century.

FACULTY OF EDUCATION

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Information seeking preferences of male and female students about higher educational opportunities in Sri Lanka: Online or offline?

K A.V Abeygunawardana¹, L. N. P. Wedikandage²

¹Faculty of Education, University of Colombo, Sri Lanka

²Department of Social Science Education, University of Colombo, Sri Lanka

At present (IDPs) are emerging in Sri Lanka in affiliation with private higher educational institutes (PHEIs) to fulfill the university level education. In today's digital age, marketing perspective of PHEIs are differently implemented to promote their Bachelor's degree (BD) programmes and social media platforms are rising as effective communication tools for the dissemination of marketing and other information. Therefore, it is imperative to identify whether these marketing tools have potential and capability to reach and attract future prospective students. Hence, this study attempts to understand how male and female undergraduates have used social media as information sources at an early stage of their decision making process in selecting a BD. Data for the survey study were collected from 420 first-year undergraduates of IDPs at randomly selected 7 PHEIs, where a questionnaire was administered with 59 predefined variables. Factor analysis was conducted in order to identify the importance of information seeking tools comparative to the other influential factors in selecting a BD. Even though, 'information sources' and 'peer' were influential in selecting a BD for the entire sample, the level of importance marked for these factors were different among gender. Apparently, male group preferred websites, paper advertisements, prospectus, parents and advice from peers as influential information seeking tools. However, none of these factors were influential for the female group and instead they believed joint discussions at open days, educational fairs, educational conferences and school programmes conducted by the PHEIs as highly influential when seeking information. In conclusion, penetration of social media still plays a secondary role in providing information for prospective students in their BD choice compared to traditional communication channels. This paper highlights the need of educating stakeholders for the digital world using various technological advancements to reach potential students in order to facilitate with more informed information.

Keywords: *Bachelor's degree; gender differences; higher education marketing; prospective students; social media*

What is blended learning? Evidence from the literature

P.D.H.S. Amarasinghe

Department of Science and Technology Education, University of Colombo, Sri Lanka

This study is based on an ongoing research study, a design-based research on Blended Learning (BL) to fulfil student centered constructivist learning. Data gathered from educational reports, related articles and e-journals as well as research papers have been analyzed in this study to develop themes such as definition of BL, BL modes, BL learning models, BL tools that can be used in higher education, comparison between traditional, web facilitated BL and online learning, and advantages and disadvantages of using BL in higher education. The main task of adopting BL classrooms rather than traditional classrooms in higher education institutes is to enhance the quality of learning and teaching in their institutions. BL is an education program (formal or non-formal) that combines online digital media with traditional classroom methods. It requires the physical presence of both teacher and student, with some elements of student control over time, place, path, or pace. The literature review revealed that there was no clear definition for BL. Definitions have been changing from time to time since 2006. Three modes of BL and four BL models were identified in the literature. Although many tools were identified, limited researches have been carried out on the advantages and disadvantages of the identified tools. Many definitions were identified for BL, traditional learning, web facilitated learning and online learning. However only a proportion of the content was delivered online in each learning method.

Keywords: *Blended Learning (BL); online learning; web facilitated learning*

ESL writing model tested: An action research

I. H. S. Fernando,¹ M. Perera²

¹*CINEC Campus, Malabe, Sri Lanka*

²*Department of Humanities Education, University of Colombo, Sri Lanka*

The present study is an attempt to measure the effectiveness of a writing model adopted to improve writing skills in the ESL learners. It consisted of three main components: the process approach, the product approach and the strategy instruction approach. It attempted to ease the cognitive overload taking place in the process of writing through guided writing activities, a notion drawn from the product approach and to train the learner in the use of L2 learning strategies and writing strategies. An action research was carried out with a sample of 22 students of grade 7 drawn from a Type 1C school in the Colombo South Zone to measure its effectiveness. The study utilized multiple data collection instruments: pre-test, activities, assignments and post-test for quantitative data and field notes and reflective journals for qualitative data. The intervention was executed over a period of six months which consisted of 20 sessions of 80 minute lessons. The comparison of the assignment marks and pre-test and post-test marks were used to measure the effectiveness of the intervention and they indicated a remarkable progress in learner performance. The analysis of the activities, field notes and reflective journals also confirmed that the intervention carried out to improve ESL writing adopting the tentative model was a success. Thus, it is appraised that a blended approach to writing which is accomplished through the use of strategies is effective in improving writing skills in ESL learners.

Keywords: *English as a second language; process approach to writing; product approach to writing; writing strategies*

An intervention in facilitating teaching- learning through reflection

H.M.G.D. Herath¹, M.Perera²

¹*Teacher Centre, Nikaweratiya.*

²*Department of Humanities Education, University of Colombo, Sri Lanka*

Teacher reflection on action has been an area of study for decades as it is identified as a key element in enhancing professionalism of teachers. Teacher diary/ reflective journal, peer observation, audio/ video recording, student feedback, etc. are identified as effective tools which can be used in reflection. The survey carried out administering a questionnaire to a sample of 354 teachers as a part of the main study, shows using aforementioned tools aiming at reflection on teaching is not a common practice among 97 percent of the sample. The semi-structured interview with 35 in-service teachers and classroom observations reveal that the absence of methodical reflection in the learning teaching process causes low productivity. Eight teachers of the sample who were in search of professional support were identified and a collaborative action research was carried out. It was observed that the participants had tried out different techniques to remedy the problems in classroom practice except critical practice. Motivating the participants to reflect on the classroom practices by giving them knowledge and awareness, and facilitating the participants' reflective practice were the main objectives of the intervention. Informal discussions between the researcher and each individual participant, and group discussions were held to enhance the knowledge and inculcate a sense of responsibility in reflecting on teaching as a professional. A reflective tool consists of a set of questions was introduced. It was observed that it had been a guideline for the participants in reflection. Reflections of researcher and teacher, student feedback, observation records provide evidence of effective intervention. Therefore, it is recommended that there should be a mechanism in making every teacher aware of the benefits of reflection on their classroom practice and parallel to that the mentoring process should be strengthened to facilitate the teachers to engage in the task meaningfully.

Keywords: *professional development; reflective practice; reflective tools*

Thirteen years of guaranteed education programme: A critical evaluation

M. Perera

Department of Humanities Education, University of Colombo, Sri Lanka

The Ministry of Education has introduced this project in order to provide education for all children, as some children under the current system do not have the opportunity to continue education beyond the 10th year. The new system is expected to allow the students, who do not pass the GCE Ordinary Level to proceed to Advanced Level, to pursue vocational studies to succeed in the future. The main objective of this paper is to critically evaluate this programme based on documentary analysis and survey of the four schools in the North Western Province (NWP) where the programme has been implemented since 2017. According to documentary analysis under the project, 26 new vocational subjects have been introduced for students who do not pass the GCE Ordinary Level. The students will be offered both theoretical and practical knowledge in subject areas. Once they finished the vocational education course they will be awarded a NVQ level 4 certification. The government has allocated Rs. 5 billion to implement the '13 Years guaranteed Education' covering the entire school system from 2019. The pilot project has been launched in 2017. In the first stage of the project four schools have been identified in the NWP and the programme has commenced. New teaching appointments have been given for some subjects. There is financial provisions guaranteed in getting physical and human resources. On the other hand, schools are unable to provide the subjects that students demand due to non-availability professionally qualified of teachers. Due to the focus on this programme there are deployment problems in the schools. Pupils may lack the basic literacy and numeracy skills needed to continue with the programme. The final outcome of the programme is not yet clear to most of the pupils and teachers. If the programme is to succeed these shortcomings need to be rectified.

Keywords: *Thirteen years of guaranteed education; vocational education; NVQ level 4.*

The effect of lecture breaks on students' attention in the teaching learning process

N.V.D.P. Priyadarshani

Department of Science & Technology Education, University of Colombo, Sri Lanka

Lecture method is one of the best methods to teach “information” to a large class of students within a short time period. Although lectures are scheduled for one to three hours, attention span of the students in a lecture is only 10 to 20 minutes. When attention is inadequate, then encoding and recalling of information are negatively affected and learning is interrupted. To allow the level of attention to recover approximately constant level lecture breaks can be introduced. This research was carried out on a random sample of 51 pre-service teachers who followed the Bachelor of Education degree in Faculty of Education, to study the effect of lecture breaks on student's attention in the teaching learning process. The main objectives of this research were; identifying the types of lecture breaks; identifying how lecture breaks can be introduced effectively in a lecture to recover the students' attention and identifying the effect of lecture breaks on student's attention in the teaching learning process. Both English and Sinhala medium students were selected and 18 students were selected from the English medium course. Data collection was done by using discussions, observations, questionnaires and interviews. Group activities, Pair-group activities, incomplete handout, Presentations, Discussion, Questioning, Five minutes lecture breaks, writing notes were identified as some of the effective lecture breaks which we can apply in a lecture. Out of those lecture breaks, most effective ones were five minute lecture break, discussion and pair group activities. However, doing presentations and group activities were not effective as lecture breaks. All the students were willing to attend morning lectures and the effective lecture duration was one hour. Approximately after one hour they expected a lecture break which helped to keep the student's active engagement throughout the lesson.

Keywords: *attention span; lecture breaks; lecture method; pre-service teachers*

Teaching science as inquiry: The role of novice vs. experienced teachers' self-efficacy

D.V.K.P. Seneviratne

Department of Science & Technology Education, University of Colombo, Sri Lanka

Teacher self-efficacy is an important predictor in teacher's professional career for inquiry based instruction. This study investigated the science teachers' self-efficacy in student engagement, classroom management and instructional practices in planning scientific inquiry in association with teaching experience in science. A descriptive study under quantitative paradigm with a structured questionnaire was used for data collection from a quota sample of 157 practicing science teachers in state schools of Homagama zone in 2018. A General Linear Model (GLM) Univariate analysis was employed for data analysis. Fact findings revealed that student frequently engage in scientifically oriented questions (3.96 ± 0.8), developing explanations on them (3.85 ± 0.8) and formulating conclusions (3.86 ± 0.8). Yet, planning investigations to gather evidences in response to questions (3.64 ± 0.8) and communicating and justification of the proposed conclusions (3.66 ± 0.8) were not satisfactory. The overall perceived self-efficacy as well as self-efficacy in student engagement, classroom management and instructional strategies in planning scientific inquiry was considerably high. Planning scientific inquiry was comparatively higher among experienced than that of novice science teachers, which was not a statistically significant difference. Neither teacher self-efficacy in student engagement ($t=.606$, $p > 0.05$) nor instructional strategies ($t=.071$, $p > 0.05$) and teaching experience ($t=.109$, $p > 0.05$) were significant predictors of science teacher's instructional behavior of inquiry based instruction. However, results concluded that overall perceived self-efficacy ($t=.002$, $p < 0.05$) and self-efficacy in classroom management ($t=.001$, $p < 0.05$) were significant predictors of the enactment level of inquiry based instruction. Further research in the area is required for improving the science teacher self-efficacy in planning scientific investigations which also calls for a need to reorient in-service teacher education programme in terms of teaching experience.

Keywords: *classroom management; instructional strategies; teacher self-efficacy; scientific inquiry; student engagement*

Influence of parenting styles on the social development of children

P.K.S.S. Thilakarathna

Department of Educational Psychology, University of Colombo, Sri Lanka

The present study is an attempt to identify the influence of parenting styles on the social development of children. The parents, as primary agents of socialization are expected to socialize their children into their social milieu. Parenting styles create different social environments in the lives of children within the home. Authoritative, authoritarian, permissive and neglectful are the main parenting styles. The authoritative parent tries to direct the child in a rational manner. They are supportive, warm and responsive to the child. Authoritarian parent tries to shape, control and evaluate the behavior and attitudes of the children in accordance with a self -standard of conduct. This study focused on the dominant styles of parents and their influence on children's social development. Descriptive survey design was used to execute the study. One hundred and twenty students and eight teachers were randomly sampled from government schools. The sample survey employed a structured interview schedule and a questionnaire for the data collection. According to the study, majority of the students (68.7) perceived their parents to be authoritative and only few of them (16.7) perceived their parents to be authoritarian. It was also revealed that parenting styles have influence on student's social development. It is inferred that authoritative parenting based on reasoning, understanding, consensus and trust resulted in pro social behavior while authoritarian based on strict rules, force, threat, verbal and physical punishments resulted in anti- social behavior. It was revealed that the parents should endeavor to adopt authoritative parenting style to enable their children and wards to develop pro-social behavior. The most important aspect of this study was that the results would help parents, guardians, teachers and school authorities to understand and appreciate the relationship between parenting styles and children's social development.

Keywords: *authoritative; authoritarian; parenting styles; social development*

FACULTY OF GRADUATE STUDIES



AGENDA 2030: Way Forward to Sri Lanka's Sustainable Development

21 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF GRADUATE STUDIES**

Senior Professor Nayani Melegoda



The Faculty of Graduates Studies (FGS) will hold its Annual Research Sessions on November 21st 2018 on the theme “AGENDA 2030: Way Forward to Sri Lanka’s Sustainable Development.” This year, the Sessions will include presentations from all disciplines, and, as is the norm at the FGS, will encourage interdisciplinary discourse to enable our researchers and postgraduate students to learn from one another. I am happy to state that the Sessions will feature 44 research presentations on the sub-themes; People, Planet, Prosperity, Peace, and Partnership. These conference tracks reflect the profile of FGS as a leading Faculty addressing the 2030 agenda and taking Sri Lanka forward in its development work.

Sri Lanka Qualifications Framework (SLQF) is now implemented at FGS. For all postgraduate programmes the course modules and by-laws have been approved from 2019. All postgraduate programmes offered by the FGS are aligned to SLQF. In 2018, our postgraduate students have earned 16 PhDs and 2 MPhils empowering the society with new knowledge.

I thank Hon. Dr. Harsha de Silva, Member of Parliament, State Minister of National Policies and Economic Affairs, for accepting our invitation to be the Keynote Speaker at this event. I take this opportunity to place my sincere appreciation to all course coordinators and staff of the Faculty of Graduate Studies for organizing the Annual Research Sessions 2018. Finally, I would like to send my best wishes to all our guests, session chairpersons, researchers, postgraduate students and participants for a productive and enjoyable event.

FACULTY OF GRADUATE STUDIES

PROGRAMME

21st November, 2018

09.00am-10.00am	Registration
10.00am-10.15am	Arrival of Guests
10.15am-10.30am	National Anthem, Lighting of the Oil Lamp
10.30am-10.40am	Welcome Speech by Senior Professor Nayani Melegoda, Dean, Faculty of Graduate Studies
10.40am-10.55am	Address by the Vice Chancellor, Senior Professor Lakshman Dissanayake, on University of Colombo Research Culture
10.55am-11.00am	Introduction to Keynote Speaker
11.00am-11.20am	Keynote Address by Dr. Mallika Kumar Head, Department of Commerce & Coordinator, International Programmes, Sri Ram College, Delhi
11.20am-11.30am	Distribution of Token of Appreciation
11.30am-11.45am	Vote of Thanks by Professor K. Amirthalingam, Programme Coordinator
	Lunch
02.00pm onwards	Panel Presentations

INTRODUCTION TO THE KEYNOTE SPEAKER

Mallika Kumar, PhD.

*Head, Department of Commerce & Coordinator,
International Programmes, Sri Ram College of Commerce
New Delhi*



Dr. Mallika Kumar is the Head of the Department of Commerce, Sri Ram College of Commerce, Delhi, India. She is also the Coordinator for the Office of International Programmes at SRCC and Cultural Coordinator. She received her PhD from Jamia Millia Islamia, New Delhi in 2009 and completed the Professional Development Course on 'Managing yourself and Leading others' at Harvard University in 2014. She is a member of UNDP Microfinance Solution Exchange and coordinates with International Cooperative Alliance Asia Pacific Youth Committee for promotion of Cooperative Business model amongst the youth. She has been a member of the Committee for London School of Economics (LSE) India Summit 2016 and 2017, curated by Difficult Dialogue and the LSE South Asia Centre. With a teaching experience of 25 years, area of specialization includes Micro Finance and Financial Cooperatives. She has presented research papers in International Conferences and has published papers in national journals. She is associated with Saksham, a society that work for visually impaired and plays Sitar in her free time. She is a facilitator, encourager, connector and cooperator who believes anything is possible.

FACULTY OF GRADUATE STUDIES

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Flooding, vulnerability and environmental degradation in Sri Lanka: A sociological reading

D.M.Y. Abeywardhana

Department of Sociology, University of Colombo, Sri Lanka

Disasters are the events which are rapidly increasing in the present world. Among those disasters, flooding has been occupied a main place as it causes for a large number of impacts in various aspects. Therefore it can be defined as a risk and also a disastrous event which is making people vulnerable towards it. Apart from that, the human activities which are based on less consciousness cause environmental degradation and it creates more vulnerable context for hazards like floods. Consequently, this paper makes an attempt to develop a sociological discussion on the relationship between flooding, vulnerability and environmental degradation from a holistic perspective. The research was conducted by using exploratory method and questionnaires, semi-structured interviews and in-depth interviews were utilized to collect data from the respective field of Kohilawatta, Kolonnawa in Colombo district. People have been adapted to the vulnerability which comes through flooding, as they are facing those disaster events once or twice per year. Furthermore, cultural adaptation can be seen as cultural groups found their ethnic security within those vulnerable areas. And also disasters aggregate the societies which are separated by ethnic and other sort of differences. In spite of that, human activities which are based on political economy, are thoroughly contributes to environmental degradation as well as flooding. Coping mechanisms of victims are facilitated by neither government nor politicians as a result of patron-client relationship. It is obvious that unsustainable environmental management reasons to the most of politicized disasters and they are the results of the development models which are just based on human but not the environment.

Keywords: *cultural adaptation; environmental degradation, flooding; man-made disasters; vulnerability*

Managing Nigeria's government expenditure for fiscal sustainability: Does oil revenue matter?

C. Aluthge¹, D.H. Balami², A. Jibir³

¹ *Department of Economics, University of Colombo, Sri Lanka*

² *Department of Economics, Gombe State University, Nigeria*

³ *Department of Economics, University of Colombo, Sri Lanka*

It is evident that in oil exporting countries, government finance is heavily reliant on the oil sector. Hence, fluctuations in global crude oil prices in the international market make government revenue highly volatile. These characteristics make fiscal management more challenging in such countries and have very important implications for their spending. In such circumstances, the oil price volatility can be transmitted to the economy through the large fluctuations in government revenues. Nigeria is one of the oil exporting countries that has been facing the problem of fiscal unsustainability for many years due to shocks in crude oil prices. The paper examines the influence of oil revenue on Nigeria's government expenditure using time series data spanning between 1986 and 2016. The study utilizes the autoregressive distributive lag (ARDL) model for the analysis. The findings reveal that there is a positive and significant relationship between oil revenue and government expenditure. The Granger causality result confirms the tax-spend hypothesis for Nigeria. The policy implication is that oil revenue remains one of the key drivers of Nigeria's government expenditure. Therefore, fiscal sustainability cannot be achieved with heavy reliance on oil revenue since it is a volatile commodity that is exogenously determined by international oil price. Thus, the government needs to reduce its expenditure in the face of dwindling oil revenue in order not to undermine fiscal sustainability.

Keywords: *ARDL; expenditure; fiscal sustainability, Nigeria; oil revenue*

Organizational responses to bullying in the workplace: An integrative literature review

D.L.N.P. Amarawickrama¹, A. Adikaram²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Human Resources Management, University of Colombo, Sri Lanka*

Research on bullying and other forms of workplace harassment has proliferated over the years, with scholars exploring various dimensions and aspects of the phenomenon such as definitions, prevalence rates, antecedents and consequences. Research related to organizational responses and handling of bullying has also increased over the last few decades. Yet, the ineffectiveness and insufficiency of the organizational responses in eradicating and successfully handling workplace bullying has been repeatedly highlighted by researchers, indicating the need for further and deeper exploration into the area. Hence, the aim of the study is to examine the extent literature on organizational responses and responsibilities towards workplace bullying, to identify the common areas of interest of researchers and the gaps in the current literature in terms of handling workplace bullying and to offer possible future research directions. The study utilized the integrative literature review method in the process of data collection, analysis and finding synthesis. Data were collected using various online library databases such as JSTOR, Emerald insight, SAGE, ELSEVIER, as well as Google Scholar. Research articles were read in their entirety and a total of 50 studies were retained for the overall review. Through this review, several research gaps and areas for future research were identified. Accordingly, it was identified that, how organizations address the issue of bullying at work and the many dilemmas the handlers of bullying face has also been relatively neglected in bullying research. Further, the review highlight gaps in understanding of the issues curtailing effective implementation of organizational responses to workplace bullying.

Keywords: *bullying; HR professionals; legal, practical and ethical dilemmas; organizational responses*

(Dis)Empowering women: Implications of micro-financing on gender roles of women in the Anuradhapura and Polonnaruwa districts in Sri Lanka

M.L.K. Ariyaratne

Faculty of Graduate Studies, University of Colombo, Sri Lanka

This study explores the ways in which micro credit schemes have influenced in changing gender roles played by rural women in the selected two districts in Sri Lanka. The research was based on 10 case studies conducted during the period of May to July 2018 in the Districts of Anuradhapura and Polonnaruwa. Due to the qualitative nature of the study data were gathered through semi-structured interviews that were conducted with the selected women in their own settings. Micro finance institutions have reached out to these women giving them access to the credit, making them active participants of the credit management of the family. However, it is important to note that all male Credit Officers who issued and collected loans have been using filthy, aggressive and violent language against women who were unable to pay, making women to suffer in sense of grief, vulnerability and failure. On the other hand, the failure of the credit schemes has prevented them going back to the village committees. Rather, the pressure coming from fellow women who involved in joined loan schemes and also from their husbands have restricted these women's engagements in the community and made their lives difficult within the private sphere. Therefore, the author argues that micro-credit schemes have contributed to maintain the gendered relations, reinforce the subordination that they were already experiencing in their families and communities. Given the multiple and nuanced ways of reinforcing women's subordination by male-dominated micro-financing schemes in Sri Lanka, the ultimate objective of micro-financing, 'women's empowerment' has become questionable.

Keywords: *economy; empowerment; gender; micro-financing; women*

Achieving sustainable development goals through the protection of rights of online consumers

B.A.R.R. Ariyaratna¹, S. Segarajasingham²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department Commercial Law, University of Colombo, Sri Lanka*

Ensuring a high level of consumer protection would positively influence the achieving the seventeen Sustainable Development Goals (SDGs). Notably, the modern approach is to consider the e-commerce as a vehicle for achieving SDGs more effectively. It is obvious that consumers play an important role to contribute to the economic development of a country. Today, consumers are no longer limited to the offline context, and due to the advancement of e-commerce and information technologies, consumers are able to engage with online transactions. As per the Guideline 5 of the United Nations Guidelines on Consumer Protection, a level of protection for consumers using electronic commerce that is not less than that afforded in other forms of commerce. Accordingly, it is evident that both offline and online consumers should have equal consumer rights and equal protection from the consumer law. However, the contentious issue is that the online consumers are in a more vulnerable situation other than the offline consumers due to the complex nature of the information technologies. Information asymmetry, misleading advertising, security of the payments, privacy of the data and dispute resolution are some of the major problems which online consumers could be exposed during transactions. Therefore, a strong legal mechanism is necessary to safeguard online consumer's rights and enable them to access to justice as mentioned in the Goal 16 of the SDGs. Accordingly, this paper attempts to emphasize the importance of protecting consumer rights in the online context and analyze how it could be used to achieve the SDGs. This research uses the qualitative approach and a comparative analysis will be conducted between Sri Lanka and European Union, United Kingdom and Indian Jurisdictions.

Keywords: *consumer rights; consumer rights violations; electronic transactions; online consumer; sustainable development goals*

Implications of socio-emotional selectivity theory on contemporary ageing research: A review

B.S.K.Ariyaratne¹, M.P.Dissanayake², P. De Zoysa³

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *South Asian Institutes of Technology and Medicine, Sri Lanka*

³ *Department of Psychiatry, University of Colombo, Sri Lanka*

Early social gerontological theories have explained social inactivity, withdrawal, emotional deterioration as a natural part of ageing process. Contrarily, socio-emotional selectivity theory (SST) by L. Carstensen (1995) posits that the older adults tend to attain a greater sense of mastery of emotion regulation by engaging in selective pruning of social partners, distancing, emotion focused coping and positive reappraisal. Thus, older adults would not only be able to prioritize emotionally meaningful and maintain high-quality relationships, but they would also appear to be more skilled at managing emotionally charged interactions. The theory has postulated that the age related changes are determined by the individual's perception of time left in life and the availability of opportunities in the environment to satisfy basic human needs. Therein, it is argued that failure to acquire a sense of mastery in emotion regulation would have a direct impact on the psychological well-being of the older adults. The main objective of this review was to highlight that the tenets of SST could be combined with economic, social and technological advancement to help older individuals experience a sense of well-being and emotionally fulfilling lives. A narrative synthesis was produced incorporating the findings of fourteen empirical investigations after a literature survey. Analysis resulted in five broad themes where the principles of SST were used in studies of ageing: impact of time perspective on the social connectedness and psychological well-being, consumer and organizational behaviour, use of information technology and decision making in health care settings. It was concluded that the principles of socio-emotional selectivity theory such as emotionally fulfilling goal orientation, time perspective and social selectiveness could be incorporated into myriad of interventions involving older adults. Further, the implications of socio-emotional selectivity theory as a scientifically verified, parsimonious lifespan model of emotion regulation for improving the lives of older adults are discussed.

Keywords: *emotion regulation; lifespan development; older adults; psychological well-being; socio-emotional selectivity*

**Ensuring inclusive and equitable quality education through disaster resilient schools:
An assessment in the Badulla Education Division, Sri Lanka**

H.M.N. Chalalochani

Faculty of Graduate Studies, University of Colombo, Sri Lanka

Quality education can be attained by minimizing the disaster impacts on school community and social infrastructure. The purpose of the study was to identify the types of natural hazards and assess the level of resilience of schools through Disaster Risk Reduction activities. Badulla Education Division (ED) of Badulla District, among 23 ED's of Uva Province was selected as the study area. 21 (53.84%) Provincial Schools were selected for the study. The sample consists of schools of different types, language mediums, girls, boys, mixed Schools, estate, urban and rural sectors. Mixed method research approach was used; both quantitative and qualitative data were analyzed. Primary and secondary data sources were taken into the study. Primary data was gathered from Principals with the aid of structured questionnaire. The study founds the main natural hazards which effects schools were landslides, high wind and lightning. 52.38% of the sample was exposed to natural hazards and out of which 9.52% was exposed to multiple natural hazards. School Disaster Safety Programme (SDSP) is not functioning in many schools. 62% of the Principals were not aware about SDSP and circulars. School Disaster Safety Teams not established in many schools. Fire prevention measures were not established in all (100%) the schools. Updated vulnerability and evacuation maps lack in majority of Schools. Awareness and trainings regarding to DM is not enough. In 80.95% of the sample DM has not incorporated in School Development Plan. Hence, their ability to mitigate the impact of disasters is very low and it effects achieving the inclusive and equitable quality education. Effective monitoring and evaluation process, with regarding to SDSP must be established.

Keywords: *natural disaster; resilience; risk; School Disaster Safety Programme*

Best instructional strategies for the Flipped Model of blended learning

S.A.N. Danushka

Department of Education & Training, University of Vocational Technology, Sri Lanka

Blended approach has become a widely inspiring and pertinent instructional mode in higher education in the modern world. Due to the fact that blended approach is combined the different course delivery approaches like face-to-face and online, the advantages of each approach would be combined whereby the learners would be benefitted. Practically, four blended models can be seen and the effectiveness of any models depends on the efficacy of the instructional strategy which is used in the course delivery. The survey was focused on finding the best instructional strategy or strategies for Flipped Model which comes under Rotation Model of Blended Learning by reviewing 44 research papers published in peer reviewed journals. As the survey found out three instructional strategies have been frequently used in flipped model of course delivery: Self-Directed Learning (SDL), Self-Regulated Learning (SRL), and Self-Paced Learning (SPL). Certain potentials and limitations of each strategy have been given for effective selection of instructional strategies for flipped model in Blended Learning. Further, it has been suggested applicable measures to mitigate the identified limitations of each instructional strategy based on the survey. It is noticed in the survey that Self-Directed Learning (SDL) is suitable for flipped model of blended learning with proper integration of SRL and SPL skills. SDL is learning process-oriented while the other two instructional strategies are consequently learning task-oriented (SRL) and learning time-oriented (SPL). Strategic adaptation is contextual. Significantly, in the survey, it has been postulated two possible didactic strategies: Self-Adaptable-Strategy in Learning (SASL) and Self-Absorbable-Pace of Learning (SAPL) which impact on the learner-autonomy and individual learning efficacy in any Open and Distance Learning Environments (ODLE).

Keywords: *Flipped Model; Self-Absorbable-Pace of Learning (SAPL); Self-Adaptable-Strategy in Learning (SASL); Self-Directed Learning (SDL); Self-Paced Learning (SPL); Self-Regulated Learning (SRL)*

Evaluation of the performance of Soysapura waste water treatment plant

T. De Fonseka¹, R.U.K. Piyadasa²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Environmental Technology, University of Colombo, Sri Lanka*

This study was carried out to evaluate the overall efficiency of Soysapura wastewater treatment plant and to analyze its pollutant removing ability. Soysapura treatment plant is of Biological Nutrients Removal (BNR) type and is the first ever reverse A2/O (anoxic/ anaerobic/ aerobic) treatment plant in Sri Lanka. Secondary data obtained from treatment plant laboratory for 15 weeks from January to April 2017 for the dry period and for 15 weeks from September to December 2017 for the wet period were used to evaluate the overall efficiency of the plant and Primary data were collected for 4 weeks in the month of November 2017 were used to analyze the pollutants (Nitrogen and Phosphorous) removing ability in each compartment. Grab and composite sampling were conducted and duplicated for each of the five compartments (influent, anoxic, anaerobic, aerobic, effluent). Physical (pH, Temperature) and chemical [Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Total Phosphorous (TP), Total Nitrogen (TN)] parameters of each composite sample were analyzed. The overall efficiency evaluation has indicated 92.3% of BOD removal, 84.4% of COD removal, 84.8% of TP removal, 79.2% of TN removal and 97.4% of TSS removal in dry period and 94.4% of BOD removal, 90.8% of COD removal, 90.0% of TP removal, 85.1% of TN removal and 97.9% of TSS removal in wet period. Also, the chemical parameters obtained of the treated effluent as well as in each compartment were compatible with the discharge standards recommended by Central Environmental Authority of Sri Lanka. Therefore, it was shown that overall efficiency of the treatment plant lies almost within the expected level of 85% and pollutants removing ability of each compartment is satisfactory operating within the expected standards.

Keywords: *plant efficiency; reverse A2/O; wastewater treatment*

Blended mode of delivery in an online learning environment: Exploring the effectiveness within a Business English course

R.P. Dharmawardene

Department of English Language Teaching, University of Colombo, Sri Lanka

Most people learn best when they are actively engaged in collaborative activities. Greater levels of participation are more desirable for better learning outcomes. The traditional face-to-face teaching is able to outperform online teaching consistently because it attracts and interests students. Blended learning approach, that combines online digital media with traditional classroom method can be successfully applied for adult's learning to enhance the learning outcomes. This study investigates how effective it would be if blended mode of delivery is incorporated into online mode in teaching business English to adult learners. A comparison would be made in students' writing performance in the context of using correct Tenses when they are taught English as a Second Language (ESL) using blended and online modes of delivery. The setting will be the Department of English Language Teaching at the faculty of Arts in the University of Colombo. This study will have two cohorts in order to complete the course on two different modes of learning, blended and online. Students for the two groups will be randomly selected. Once they are grouped, one group, the experimental group, will be exposed to blended learning activities in the blended mode of delivery while the control group follows the course entirely online. The study intends to use pre and post Business English Writing tests, a questionnaire and an interview as the basis of data collection and measurement for the effectiveness of using blended learning activities in an online second language learning environment. The study will be conducted over a period of four months. It is expected that findings of this study will shed light on if or how the blended learning activities could be added to support students to develop Business English Writing skills. They could also potentially have application in future designing of English teaching course and projects.

Keywords: *adult learners; blended learning; business English; face-to-face learning; online learning*

The impact of sub agents and the labour Migration Industry on the sustainable development goals

S.N.D. Gomez

Faculty of Graduate Studies, University of Colombo, Sri Lanka

Potential migrants in Sri Lanka largely reside in rural villages. The geographical distance between recruitment agencies and potential migrants create a requirement for an intermediary between the two groups commonly known as sub agents. Unregulated intermediaries leave room for exploitation of migrant workers due to lack of transparency and accountability and in turn will create a negative knock on effect on the development process. As Sri Lanka is adopting the sustainable development goals (SDGs), Migration remains a cross-cutting issue that is integrated into multiple SDGs and targets. To this end, this paper analyzes the impact sub-agents have on agenda 2030, specifically on goal 5 and goal 8 on human trafficking while highlighting the importance of focusing efforts in regularization of sub-agents to reduce potential levels of migrant exploitation. Secondly, the paper draws efforts from similar countries in the region such as Nepal and Vietnam that have legalized sub-agent practices and have drawn harmonization in development policy that led to lower levels of exploitation and contributed positively to development. The paper also highlights the socio-economic impact labour migration has on the country through SDG goal 10 reduce inequalities specifically 10.7 c on migrant salary remittances. The research is based on a desk review of domestic and regional good practices on regularization of sub agents and migration development goals, compiled by International Organizations, scholarly articles and it is complemented with in depth interviews from recruitment agents and migrant workers. The paper strongly advocates for nations to make progress in migration-related SDGs by strengthening migration governance structures through the development of monitoring and evaluation systems for recruitment practices in order to formalize the recruitment process. More specifically, this paper advocates for orderly, safe and responsible migration through the implementation of planned and well-managed migration policies and regulations.

Keywords: *human trafficking; labour migration; SLBFE Act; sub agents; sustainable development goals*

**The reversal of postcolonial consciousness, towards an Asiatic revolutionary model:
Reading the movie ‘Gandhi’**

H.A.M.A. Hapugoda¹, B.D.K. Anandawansa²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

Western consumerism has generated global issues and the twentieth century Marxist revolutionary model provides no cure. Many issues today, especially in Asia, were instilled during British colonial times and revolutionary space towards ‘recovery’ remains. When searching for alternatives, postcolonial consciousness must be countered with alternative resistance forms for ‘liberation’, and thus the Gandhian revolutionary path becomes unique. Attenborough’s movie *Gandhi* displays a prime example of an Asiatic revolutionary model that can be adopted to ‘free’ the postcolonial mind from ‘trapped’ consciousness and ‘hurt ego’. The research problem identifies that the Gandhian revolutionary path has not been reinterpreted as an Asiatic revolutionary model against exploiters/imperialists, who believe *western-way-of-life* is the only developmental model. The objective is to investigate possibility of developing such that counters western capitalist consumerism/leftist radical uprisings. Content-based, semiotic analysis of *Gandhi* with Žižekian Marxism critique and reactions of the postcolonial ‘hurt ego’ is used to arrive at findings/conclusions. Results indicate *Gandhi* displays instances of developing an Asiatic model, based on simplicity, non-consumerism, self-sufficiency and non-violence; revolutionary potentials against exploiters/imperialists and fetish consumerism. Gandhi’s aesthetically beautiful, close-to-nature yet non-exploitative lifestyle and ‘friendship’ against western coitus reach profound postcolonial dimension when he chooses reactionary non-violence to recover ‘hurt ego’ during ‘white’ attacks. General Smuts’ words “we westerners have a weakness for these spiritually inclined men of India” suggest western materialism’s failure to pierce Asian spiritualism. The British judge’s act of standing up when Gandhi enters the courtroom suggests the exploiter has to accept Gandhian universalism/humanism. Thus, Gandhi becomes more modern/human than humanism of the modern west. In conclusion, Gandhi’s non-violent reactionary model that returns the object-desire to colonial Master is an authentic, non-violent, spiritually eastern, Asiatic revolutionary model towards sublime universalism/humanity that belittles western capitalist consumerism. Its ‘close-to-nature’ feature makes it the best Asiatic revolutionary model to be harnessed.

Keywords: *desire; Gandhi; revolutionary models; western capitalism*

**Clinical trial on user satisfaction of anti-inflammatory ointment of *Curcuma albiflora*
Thw. in two community based centers in Southern Sri Lanka**

H.M.I.C. Herath¹, L.M. Karunagoda², T.D.C.M.K. Wijayasiriwardene³, G.A.S. Premakumara⁴

¹ Faculty of Graduate Studies, University of Colombo, Sri Lanka

² Department of Ayurveda, Southern Province, Sri Lanka

^{3 & 4} Industrial Technology Institute, Sri Lanka

Harankaha is a medicinal plant used in Traditional Medicine in Sri Lanka. But, under the same name *Harankaha*, three plants are reported; *Curcuma albiflora* Thw., *Curcuma zedoaria* Rosc., and *Zingiber zerumbet* Smith. Among them, *C. albiflora* is an endangered and poorly explored endemic plant. Although, *C. albiflora* extract (50 % ethanol in water) showed marked anti-inflammatory activity. To assess anti-inflammatory action of *C. albiflora* further using clinical trial, pilot study was conducted on *C. albiflora* (CA) ointment and investigated the response of participants' satisfaction. Approval was taken from Forest Department and Ayurvedic Department. Plants were collected in 2017 in Sabaragamuwa province. Herbarium was authenticated from National Herbarium, Peradeniya, Sri Lanka. *C. albiflora* whole plant powder was processed with sesame oil and the ointments prepared in a manner of Ayurvedic ointments are prepared. Placebo was prepared without extract only. Patients (n=175) were selected from community based centers (n=2, Dedduwa and Mahawila) in Grama Niladari divisions of Bentota Divisional Secretariat, Southern Province, Sri Lanka. A preliminary clinical trial was conducted on 22/12/2017 and 14/01/2018. Patients were advised to use ointment for two weeks without using any other anti-inflammatory drug. After screening past diagnosis and current health status of patients were assessed by Ayurvedic doctors (n=2), patients with arthritis and joint disorders only have received the CA ointment. Out of these 175 people, 98 (56%) were eligible for receiving CA ointment. Nobody has experienced any side-effect. According to odd ratio, CA ointment treatment group satisfaction was about 31 times comparing the placebo group. The binary logistic models indicated that above 60 years of age, female, previous TM users, duration of current anti-inflammatory condition (≥ 1 y) were more likely to effectively response for CA ointment. But, it is suggested to further study the CA ointment to conclude its anti-inflammatory action.

Keywords: *Albiflora*; binary logistic regression; Chi square; *Curcuma*

**Peace and reconciliation through English language teaching in Sri Lankan universities:
A conceptual framework**

V.U. Jayasinghe¹, A.A. Barborich²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of English Language Teaching, University of Colombo, Sri Lanka*

Pursuance of peace is exigent for sustainable development. Sri Lanka has to re-consider this statement to create a harmonious society, not as a utopian concept but as a peaceful existence free from prolong rivalries among its ethnic groups. Ethnic and linguistic identity was recognized as two of the main root causes for the thirty year-ran war in Sri Lanka. In addition, recently reported conflicts between Sinhala and Muslim communities reemphasize the need for social integration, acceptance and reconciliation. In present Sri Lanka, English Language Teaching (ELT) emphasizes the importance of English language competency for socio-economic advancement. However, English as the link language for peace and harmony has not been considered in the ELT domain. In view of that, this study aims to present a conceptual framework for university ELT to promote peace and reconciliation. To this end, a thematic analysis was conducted based on the available local and global literature. The analysis shows that there is a high feasibility to utilize Content and Language Integrated Learning (CLIL) pedagogies in Sri Lankan university ELT that can contribute to peace and reconciliation. CLIL is a dual focused model that has innovative potential to teach language as well as another subject knowledge simultaneously. In addition, CLIL, already being used as a model for bi-lingual education in the country, has the novelty to approach a different domain, that is, ELT. Moreover, CLIL is identified as effective in disseminating cultural awareness and Intercultural Communicative Competence (ICC). The chances for more productive outcomes are high if the Sri Lankan university ELT adapts CLIL pedagogies creatively. It can produce freshly graduated young professionals with dual competencies of English and multiculturalism. Moreover, Sri Lankan ELT can broaden its horizons if considered achieving both specific and generic competencies in its output while contributing to peace linguistics, yet another novel, much needed discourse.

Keywords: *Content and Language Integrated Learning; cultural awareness; Intercultural Communicative Competence; language and peace; peace linguistics*

Cellular manufacturing and its impact on labor productivity in the Sri Lankan Apparel sector

H. Jayawickrama

Faculty of Graduate Studies, University of Colombo, Sri Lanka

With a population of over 20 million, Sri Lanka currently has a labor force participation rate of 53%, with only one in three Sri Lankan women participating in the labor force. Improvements in the manufacturing sector- mean increasing productivity and efficiency in people or in a sector by aiding the country to reach its full economic potential. At present, the apparel industry operates in a volatile environment, as the industry has been challenged by low labor productivity, shortage of labor supply and fluctuating economic conditions. These complications should be tackled using effective manufacturing tools to enhance - productivity levels. Cellular manufacturing is one such tool derived from the principles of lean manufacturing. The apparel sector in Sri Lanka is still - a labor-intensive industry. The researcher measured and analyzed the impact on labor productivity in terms of labor efficiency, multi-skilled percentage and net take-home salary of team members in three manufacturing facilities. A renowned apparel manufacturing company running parallel production modules using the traditional layout against those that have adopted the cellular manufacturing concept was chosen. It was observed that team members engaged in production modules converted to cellular manufacturing yielded higher labor productivity. These members had a higher multi-skilled percentage together with a higher net take-home salary. If apparel manufacturing companies can implement concepts such as cellular manufacturing in their manufacturing facilities through multiskilling, promoting self-learning and leadership skills, which lead to higher labor productivity, employees can perform well enough to - attract incentives and the country - can reach its fullest economic potential.

Keywords: *apparel sector; cellular manufacturing; labour productivity; lean manufacturing; manufacturing management*

Organizational citizenship behaviour of teachers: Perceptions of principals in the Kilinochchi District

I. Kailasapathy¹, N.N.J. Navaratne², K. Kajandra³

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Human Resources Management, University of Colombo, Sri Lanka*

³ *Department of Marketing, University of Colombo, Sri Lanka*

In the 21st century, the success of schools in construction of high learning outcomes in students, depends on teachers who are willing to contribute to the successful changes, regardless of their formal job descriptions (Pourgaz, Naruei, and Jenaabadi, 2015). This non-prescribed behaviour by teachers is recognized as organizational citizenship behaviour (OCB). The OCB of the teachers is defined as teachers voluntarily going out of their way to help their students, colleagues, and others as they engage in the work of teaching and learning (Dipaola and Hoy, 2005). The purpose of this study is to determine the level of organizational citizenship behaviour of teachers in schools of Kilinochchi District according to the perceptions of the school principals. The OCB of teachers are OCB toward schools, OCB towards team and OCB towards students (Somech and Zahavy, 2000). The scale developed by Somech et al, (2000) is used for this study with modification to suit the local context. Census method is employed. Data for this study were collected through self-administrative questionnaires with likert scale from fully disagree = 1 to fully agree = 5). The questionnaires were posted to all schools (104) in Kilinochchi District, but 69 schools sent back properly filled questionnaires. Descriptive analysis were employed to analyse the quantitative data.

The mean score of teachers' OCB are: the teachers' OCB toward school (M = 3.5), the teachers' OCB towards team (M= 3.5) and the teachers' OCB towards students (M= 3.1). The OCB of the teachers towards students is less than OCB of the teachers towards schools and teams. This indicates teachers are not interested to go beyond their work to support the students. Overall OCB of teachers' mean score is (M=3.3). It revealed that overall OCB of teachers is slightly weak in schools of Kilinochchi District.

Keywords: *organizational citizenship behavior; principals; teachers*

Deviant workplace behaviour of managerial level employees in the public sector of Sri Lanka

K.M.G.S.N. Kaluwewe¹, R.Senathiraja²

¹*Presidential Secretariat, Sri Lanka*

²*Department of Management and Organizational Studies, University of Colombo, Sri Lanka*

Deviant workplace behaviour which refers to a type of voluntary behaviour of employees that violates organizational norms, threatens well-being of an organization, undermines the rule of law and impedes development especially in the public sector. The recent literature (2000 -2016) of deviant behaviour predominantly concentrates on causes and implications of the Western context. However, contextual variations of deviant behaviour were rarely studied in different cultural contexts like Sri Lanka. The purpose of this study is to investigate different types of deviant behaviours of the managerial level employees in the public sector of Sri Lanka and the factors influencing such behaviours. A qualitative method of focus group discussions was used with the participation of thirty (30) randomly selected managerial level employees in the public sector of Sri Lanka to identify common types of deviant behaviour and influencing factors. The research has shown high prevalence of deviant behaviours in the public sector of Sri Lanka and more visibility at the managerial level. It was also found different deviant workplace behaviours such as no timely action, getting undue perks, nepotism, Machiavellianism, fraud, corruption, sexual harassment and misusing discretion as most common types. High level of discretion and autonomy were identified as most influencing factors at the organizational level whereas lack of appraisal system and lack of knowledge were the dominant factors at the work and individual levels. The research findings were indicated some of the types and influencing factors identified in the study were not observed elsewhere in the literature. Further, findings emphasises the requirement of comprehensive studies to understand the contextual dynamics of deviant behaviour of managerial level employees in the public sector of Sri Lanka.

Keywords: *deviant workplace behaviour; managerial level employees; public sector*

Effectiveness of the quota system on the political participation of up-country Tamil women: A case study

L. Kamaleswary¹, D. Thoradeniya²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

Sri Lanka introduced a 25 percent quota for women in the local government elections in 2017. The local government election in 2018 was the first election with the mixed electoral system with the quota for women in Sri Lanka. The Up-country Tamil Women is contributing equally to the Sri Lankan economy as women from urban and rural areas. Therefore, their access to political participation is equally important and must to be studied. This research will be a case study on the three Divisional Secretariats in the Nuwareliya District. The objectives of the study are to find out the positive and negative impact of the quota system on the political participation of Up-country Tamil women and to analyze the existing opportunities for active political participation of Up-Country Tamil women. The data will be collected using a structured questionnaire with 30 women voters who will be selected using a random sampling method and five in-depth interviews will be carried out with the women who contested in the local government election in 2018. Five Key informants' interviews will be conducted with the Grama Niladhari, a president of a women's wing of a Trade Union in the plantation sector, women rights activists and an academic using the purposive sampling method. The secondary data for this study will be collected from Annual Report 2017 and the Quarterly Report 2018 published by the Department of Census and Statistics, the Local Government Election Report 2018 by the Election Commission of Sri Lanka, Election Department, District Secretariat and three Divisional Secretariats in the Nuwareliya District. In conclusion, the study will address the positive and negative impact of the quota system on the political participation of Up-country Tamil Women and determine the opportunities available for ordinary Up-Country Tamil women to be nominated and elected in Sri Lankan elections.

Keywords: *Divisional Secretariat; local authorities election; political participation; quota system; Up-country Tamil women*

**Condominium development and its impact on the property value of surroundings: A
case study of Pamankada West**

L.H.M.K. Kumarasinghe

Faculty of Graduate Studies, University of Colombo, Sri Lanka

Nowadays Condominium housing is one of the prominent real property development type in cities. Condominiums increase the supply of housing in the vertical form. When considering the Colombo Municipal council area as well as immediate suburbs most of the areas are becoming vertically developed. There are ample of studies related to condominiums mostly focused to the factors create demand and supply of the condominiums, identification of issues of condominium development, gentrification and etc. But there is knowledge gap as to how condominiums effect to surrounding property values. Therefore in this context the research question is how the condominium development affects the value of the residential properties. Objective of this study is to identify the relationship between condominium development and property value changes of the adjacent land values. This paper discusses only the first part of the methodology, which is the literature review adapted to this study is still in progress. Literature review comprises in three segments. First it discusses the theoretical explanation of the external factors which determine the prices of real property. Secondly it focuses on concept of condominium development. Thirdly, hedonic pricing model is discussed as an analysis tool. Case study area is “Pamankada west”. Analysis method is mixed method centering to the ‘hedonic pricing’ method. The main findings of literature review were the variables which influence to the property values in general. Three main variables were identified: Locational characteristics such as distance to the Central Business district (CBD), Distance to the nearest bus stop and rail way station. Structural characteristics such as floor area, number of floors, age, number of rooms and Neighborhood characteristics such as households income, Religious composition, Ethnicity and crime rate. The study incorporates the three main variables and builds a model to capture the impact of condominiums on property values.

Keywords: *condominiums; Hedonic Pricing Method; residential property values*

The impact of financial inclusion on poverty in low and lower-middle income countries

S. Kurincheedaran

Faculty of Graduate Studies, University of Colombo, Sri Lanka

Promoting financial inclusion is considered as primary strategy in poverty alleviation efforts globally. However, the effectiveness of financial inclusion in achieving poverty free world is fairly inconclusive. This study examines the impact of financial inclusion on poverty in low and lower-middle income countries by employing multivariate OLS and the Ordered Probit Model. The estimation under multivariate OLS model confirms that the improvement in financial inclusion reduces poverty even after controlling for physical and human capital. The results are robust and statistically significant. It reveals that the Financial Inclusion Index (FII) has greater impact on poverty than Adults Account Holding Ratio (ADACC) indicating to policy makers that improving account penetration alone has little impact on poverty reduction. Thus a mixed approach is required for an effective poverty alleviation intervention. In addition, the positive and significant relationship between primary education and poverty signals that the failure of attending primary education at appropriate age induces poverty. The ordered Probit model takes into account of greater discrepancies in poverty among low and lower-middle income countries when estimating the impact of financial inclusion on poverty. This model estimates the likelihood of a country being exposed to different scale of poverty given the level of financial inclusion. While the sign and the significance of coefficient show that the financial inclusion lessens poverty the marginal effects indicate that the impact of financial inclusion varies based on the scale of poverty. Accordingly, financial inclusion is most likely to reduce poverty significantly in countries where poverty is very low and further increases poverty in countries where poverty is very high. This finding will help policy makers to reassess their poverty alleviation strategies for countries exposed to very high poverty.

Keywords: *financial inclusion; Financial Inclusion Index; lower-middle income countries; poverty; poverty gap*

Recruitment and selection and teacher performance in the primary section of ABC International School

V.K. Kurukulaarachchi¹, W.I. De Silva²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Emeritus Professor of Demography, University of Colombo, Sri Lanka*

Recruitment and selection are crucial employee resourcing strategies since all other activities depend on having qualified, experienced and competent staff. Similarly, Primary education is fundamental stage in learning teaching process. Therefore, recruitment and selection of primary teachers are the key activities lead to their performance. Specifically, the internationalization of education has been facing problems pertain to recruitment and selection of teachers, teacher's quality, issues in classroom management and lesson planning. The main objective of the study is to examine the recruitment and selection process and performance of primary school teachers at ABC International School. It further attempted to explore the challenges faced by the management in recruitment process. This research is mainly a quantitative study though qualitative measures have also been used and sample size is hundreds of primary school teachers in the headquarters. Questionnaires, interviews and other documents were used as data collection techniques. The study found that 43.8 per cent primary teachers were 20 - 25 years of age and 55.2 per cent teachers were single compared to married teachers 44.8 per cent, while all primary teachers were female. The teachers emphasized that the school uses the policies to less extent and recruiting the teachers with irrelevant qualification at moderate extent. Challenges of the management are identified as absence of panel interviews, policies and congested environment of the school. Further study revealed that neither there is strong relationship between education and performance of primary teachers nor strong relationship between recruitment methods and performance. Findings indicated the school has been facing teachers' retention problem since 56.3 per cent of teachers have less than two years of service. The study concluded that there is a relationship between performance of primary school teachers and recruitment and selection process and revealed that the performance of primary school teachers is in average category.

Keywords: *performance; primary school teachers; recruitment; selection*

Human resource management practices of medium scale enterprises in Sri Lanka

K.H. Malwenna¹, K. Dissanayake²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Management and Organizational Studies, University of Colombo, Sri Lanka*

Human resource management (HRM) is a new concept for Sri Lankan Medium-scale enterprises; there are few studies on HRM practices and its impact on enterprise performance in Sri Lankan Medium sized enterprises (MEs). The investigation of the influence of human resources management and the enterprise performance has mostly been carried out in big companies only. HRM practices of very small and large enterprises have been investigated, but those of MEs have been mostly unnoticed or unused. The objectives of the study were to study the existing HR practices in the medium-scale enterprises of Sri Lanka, assess the impact of the existing HR practices on the firm performance of medium-scale enterprises of Sri Lanka and identify any challenges affect HRM practices-performance relationship in the medium-scale enterprises of Sri Lanka. The response rate was 67.8% which represented 144 manufacturing MEs in the Western Province of Sri Lanka. A set of questionnaire used to achieve the objectives of the study. Cronbach alpha, descriptive statistics, Pearson correlation coefficient and Multiple Regression test were used for various analyzes of this study. The findings of the research revealed that most of the respondent of MEs in Sri Lanka is now practicing at least some elements of human resource practices within their firms. MEs indicated relatively moderate use of all areas of HRM practice. The results of this study revealed that Recruitment/Selection, Training/Development, Performance Appraisal and Reward/Compensation were independently and positively correlated with Enterprise Performance. As a result, correlation analysis showed that HRM practices had a positive relation with enterprise performance. The maximum correlation is existed between Reward/Compensation and Enterprise Performance. The study also found that RNS, TND, PA and COM are positively related to enterprise performance. RNC and enterprise performance had the strongest effect on enterprise performance. This study found that using formal HRM practices help MEs to improve their firm performance.

Keywords: *firm performance; human resource management; human resource practices; medium scale enterprises; Sri Lanka*

An inquiry into cyber bullying of adults in Sri Lanka

N.R. Mapalagama

Faculty of Graduate Studies, University of Colombo, Sri Lanka

With the rise in use of mobile Internet technologies and digital devices, more time is spent online and due to the anonymous nature of cyber bullying, these online platforms have become a breeding ground for cyber bullying of not only teenagers as widely believed but also adults. This study is focused on six main acts of cyber bullying i.e. flaming, harassment and stalking, denigration, impersonation, outing and trickery and exclusion. The primary objective of this study is to find out if creating awareness can be an effective mechanism to overcome cyber bullying of adults in Sri Lanka. The study consists of a sample of 106 eligible respondents and 3 mini case studies. The 100% rate of agreement by respondents proves the hypothesis that it is in fact an effective mechanism and a need of the hour. The survey results indicated 88.4% to have been cyber bullied in one of the six ways presented, comparatively a higher rate than in the UK or USA. Despite the escalating need, it is disheartening to find that no organized mechanism or awareness program is currently in place in Sri Lanka to address the phenomenon in addition to lack of a robust legal framework. The paper illustrates human rights violations of respondent's consequent to cyber bullying and makes recommendations to bullies, victims, government, corporate bodies, media, non-governmental organizations and social media platforms and calls for collaborations to effectively overcome cyber bullying. While global research on cyber bullying of adults is not widespread, in Sri Lanka research on cyber bullying in general is in its rudimentary stages, as such this study calls for further research on the subject in order to contextualise the findings of the same.

Keywords: *awareness; cyber bullying; human rights; internet; social media*

Toxicity assessment of waste water inputs in the South and North regions of the Negombo Estuary

B.R.C. Mendis¹, H.M.P. Kithsiri², M.M.M. Najim³

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *National Aquatic Resources Research and Development Agency, Sri Lanka*

³ *South Eastern University of Sri Lanka, Sri Lanka*

Industrial waste may contain complex chemical mixtures with potential toxic and nontoxic effects in water. The objectives of this study were to assess the contamination levels of physico chemical parameters namely temperature, pH, electrical conductivity, salinity, total suspended solids, biochemical oxygen demand, chemical oxygen demand and heavy metals (Pb, Hg, Cd) in water. Water samples were collected from four sites Dandugam Oya, Hamilton canal, Ja-ela canal, and Negombo sea mouth done during one year study period from January to December 2017. The levels of heavy metals and physico- chemical parameters were analyzed employing standard methods. The results revealed that the average concentration (μgL^{-1}) of metals in water range from, Pb (2.1 ± 0.80 to 40.4 ± 6.30); Hg (0.01 ± 0.01 to 0.07 ± 0.01); Cd (1.5 ± 0.3 to 4.6 ± 0.20). The results indicate that temperature (29.50 ± 0.40 to 30.50 ± 0.34 °C); pH (7.20 ± 0.22 to 8.30 ± 0.36); salinity (1.1 ± 0.30 to 24.72 ± 3.2 ppt); conductivity (17.86 ± 4.3 to 26.7 ± 6.30 mScm⁻¹), total suspended solid (10.3 ± 0.03 to 46.8 ± 4.10 mgL⁻¹) biochemical oxygen demand (9.45 ± 6.2 to 39.8 ± 3.7 mgL⁻¹; chemical oxygen demand, (32.7 ± 14.0 to 261.4 ± 70.0 mgL⁻¹) respectively. All the physico - chemical parameters indicated that significant variation between the sampling sites ($p < 0.05$). The results show that concentrations of heavy metals and physico - chemical parameters of temperature, pH, electrical conductivity, salinity and total suspended solids were below the maximum permissible limits and BOD and COD levels were above the (Dandugam Oya) maximum permissible limits in discharge of industrial wastewater quality standards of (CEA), Sri Lanka.

Keywords: *heavy metals; physico-chemical parameters; wastewater*

**Betraying the hopes for peace and sustainable development by undermining the
reconciliation process in Sri Lanka: A case study on land policy
implementation irregularities in the Seruvila Divisional Secretariat Division**

V.P. Munasinghe¹, C. Jayawardena², V. Madasamy³

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of International Law and Human Rights, University for Peace, Costa Rica*

³ *Post Graduate Institute of Humanities and Social Sciences, University of Peradeniya,
Sri Lanka*

Long lasting peace is a necessary prerequisite for sustainable development. It is a known fact that post-colonial land policies of the country have contributed to intense the ethnic conflict. In such a context it is really important to explore the manner in which state lands have been managed during the post war period and how these government decisions/ inactiveness have contributed to intense/ resolve ethnic tensions in the society. This research examines the post war reinforcement of state land policy in Seruvila Divisional Secretariat Division in Trincomalee District in Eastern Province. During the war time people in Seruvila moved to safer locations in the area due to security reasons. But when civil administration was restored after the end of the war it was found that most of these lands people occupied during the war are Forest Department reservations and state lands that come under the powers of Divisional Secretary. This has created tensions among the communities as they perceive that it is unjust to demand them to leave the lands which they have been enjoying and developed their livelihoods for last 2-3 decades. These tensions have worsened due to irregularities in the land policy implementation by the government institutions and officials. One can clearly identify the ethno-religious favouritism from the part of the government in these actions. This has become worsened with the intervention of the politically powerful Buddhist temple in the area which demands to create a new Sinhalese GN Division around the newly found archaeological site of 'Vilgam Vehera' which is situated in the mid of the traditional Muslim village of Narvakkernikadu. In sum ethno-religious favouritism in the post war land policy implementation is making negative effects for the long lasting peace in the country. Ultimately it will make our dreams of sustainable development unattainable.

Keywords: *development; land policy; peace; reconciliation*

Challenges in measuring sustainable development goals indicator 6.2.1 on sustainable management of safe sanitation services: A case study in the Colombo Municipal Council area

R.L.O. Muthunayake

Faculty of Graduate Studies, University of Colombo, Sri Lanka

This study aims to identify the challenges of gathering data for monitoring indicator 6.2.1 of Sustainable Development Goals (SDGs) on the WHO/UNICEF's Joint Monitoring Programme (JMP) for Water, Sanitation, and Hygiene (WASH), which is the official measuring method for SGD 6. Currently, there are no compatible national data sources feed to the JMP system. Therefore, primary data was collected through the household survey focusing on 120 houses in 40 random locations in the CMC area. The majority, 79% had a toilet connected with piped sewer, 15% had septic tank while 5% with an unimproved latrine, and 1% with shared toilet. According to JMP's Sanitary Ladder, 94% of the household has basic sanitary services and 6% has non-basic sanitary services. None of the households qualifies for safely managed sanitation services. About 29% of household complain sewer overflow in sewer network while 25% complain of the inefficiency of CMC's septic tank emptying service. The observations on hygiene practices were not permitted by 84% of the household. Major challenges during the survey were reluctant to answer questions related gender of members, hand wash practices, and frequency of emptying the septic tank by reasoning a lack of time to answer, fear of authorities and absence of the master of household. Measuring hygiene indicator is challenging due to personal dignity, cultural and privacy factors. The study had revealed that there is no sewer treatment facility available in the CMC area prior to discharge into the sea. Further, water, stormwater, solid waste, and sewer utility management were not integrated with each other. The drafting of national policy is required to meet the challenges of collecting data, measuring, monitoring of SDG 6, sustainable management of sanitary, and hygiene services.

Keywords: *Colombo city; improved sanitation; sanitation ladder; SDG; sustainable sanitation*

**A study of work stress and employee turnover: A case of sales staff of the XYZ
Insurance Company Limited**

M.L.S. Nishantha¹, N.N.J. Navaratne²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Human Resources Management, University of Colombo, Sri Lanka*

The employee turnover has been considered to be one of challenging issues in the contemporary workforce and creates significant impact on organizational output. As viewed by many researchers, retention of the employees is important, because skilled and trained employees are the key resources for any business orientated organization. The recent studies explore various reasons for employees' turn over issue and analyze its impact on organizational work force and business generating. The major intention of this study is to examine how the work stress affects the employee turnover among the sales staff of the XYZ Insurance Company Ltd. Particularly, four parameters of Workload, Rewards, Job role conflicts and Organizational support of insurance sales have been used to analyze how work stress affect the employee turnover of the XYZ Insurance Company Ltd. The study is guided by three following specific objectives; first it aims to explore the factors affect the employees' turnover at XYZ Insurance Company Ltd and subsequently assess the relationship between of employees' turnover and the stress level of employees at XYZ Insurance Company Ltd. Finally it suggests the possible remedial initiatives for reducing employee turnover at the organization. The sample for the study comprised a total of 100 permanent sales staff members among sales employees from Head office and branches in Colombo district. The study has used both primary and secondary data for the analysis. A structured questionnaire was used to gather primary data and the collected data was analyzed using Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Finally, the study found that the selected parameters are highly influential in determining employee turnover at XYZ Insurance Company Ltd and make number of recommendation to mitigate the issue.

Keywords: *employees' turnover; job role conflicts; organizational support; rewards; workload; work stress*

**An assessment of effectiveness on resettlement program of landslide victims: A case study in
Wanniyawaththa-Kurahana in Nivithigala**

P.V.N.U. Pallegangoda

Faculty of Graduate Studies, University of Colombo, Sri Lanka

The extreme weather condition caused a massive landslide in the May 2017, at Wanniyawaththa-Kurahana in Nivithigala at Rathnapura District made 248 families displaced and 26 people killed. Even though the displaced families resettled in the government donated land at Dobagammana-Nivithigala (50%) and their preference land which money donated by the government (21%), there is a debate that implemented resettlement program not achieved expected sustainable outcomes. Therefore, this study examined the effectiveness of the resettlement program practices at Nivithigala. The effectiveness of the program evaluated by the economic; environmental sustainability, the infrastructure facility, and the services obtained from the new location. A mixed method carried out for the data collecting and the sample compromised by 40 landslide victims' families. The key informant interview and field observation used to acquire much understanding. The result indicated that most of the victims were at a lower income level. The majority satisfied towards the capability to reach the previous income generating methods (47%) while there was no proper income generating method within the new location. It indicated the program did not achieve expected economic stability. The 40% very easily tolerated the new environment aspect, while 24% cannot bear up the heat, and lack of shade. The immature subsidiary road and drain system cause for soil erosion. The majority did not satisfy towards the water demand, electricity (66%), and all were not satisfied towards the waste management. The 34 % satisfied towards the security and safety while 35% were with uncertainty. The majority of them satisfied towards the communication and health facility (87%) while all satisfied towards the educational facility, road, and distance to the town. Overall, 84% satisfied towards the resettlement program where the 18% unsatisfied towards that. Accordingly, it is compulsory to establish the basic requirements within the new location before resettlement takes place.

Keywords: *durable solutions; landslide victims; Nivithigala Sustainable Resettlement; satisfaction of resettled community*

Green human resource management: Environmental sustainability through human resource practices

M.D.N.L. Perera¹, S.A. Norbert²

¹*Faculty of Graduate Studies, University of Colombo, Sri Lanka*

²*Department of Geography, University of Colombo, Sri Lanka*

Sustainable development focuses on economic, social and environmental sustainability. Corporate sustainable development is where business strategies are crafted in a way that it attempts to ensure the needs of the stakeholders are met without compromising the limited resources or the interests of the local community. There are three elements in corporate sustainable development i.e. economic, social and environmental development. There is an intensifying need to integrate environmental management to human resource management leading to Green HRM. The objectives of the study were to identify Green HRM practices, covering the employment cycle in ISO 14001 certified organizations and to establish the relationship between Green HRM practices, internal environmental orientation, and environment development/sustainability. The deductive approach was used in the study and the research strategy was the survey to establish the relationship statistically. The research choice was mono and cross-sectional. Organizations that have implemented a formal environmental strategy through the environmental management system, was the population and the element was HR Managers/Heads. Both descriptive analysis and inferential analysis were carried out. The results revealed that in ISO 14001 certified organizations focus on greening the human resource planning, job analysis, job design, induction/orientation, training and development, recognition and rewards, employee relations, disciplinary management, grievance, and resignation. However, the findings indicate that there is no integration of recruitment and selection policy and performance management policy with the environmental policy and strategy. The study concludes that Green HRM practices have a positive significant effect on environmental development/sustainability, where internal environmental orientation has a significant moderating effect on this relationship. The findings confirm that Green HRM leads to developing the green ability, motivating green employees and providing the green opportunity where organizations need to balance the needs of its stakeholders especially the internal environmental orientation to achieve the environmental sustainability through the application of Green HRM.

Keywords: *employment cycle; environmental development/sustainability; Green HRM; internal environmental orientation; ISO 14001*

Depression and predictors of psychological state in mothers of children with cerebral palsy below twelve years in Sri Lanka during the first five years since diagnosis

W.A.N.N. Peries¹, T.D. Wickramasekara², W.M.L.D. Jinadasa³

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Colombo North Teaching Hospital, Sri Lanka*

³ *Health Education Bureau, Sri Lanka*

Primary care givers of children with Cerebral Palsy, have increased stress related to the child, due to challenges they face, leading to depression, anxiety and stress (Dabrowska & Pisula 2010; Grein & Glidden 2014). It would hinder productivity in family, quality of life, work efficacy, care giving of children and ideal/ timely rehabilitation of the child with Cerebral Palsy (Guillanman et al 2013). The objective was to assess depression, anxiety and stress, and their predictors among mothers of children with Cerebral Palsy. A descriptive cross-sectional study was carried out at the rehabilitation clinic, Lady Ridgeway hospital, with their children having Cerebral Palsy. After eliminating common factors influencing mental health, related to stress, 200 mothers were systematically included. Pre-tested, CES-D & DASS-21 scales were used to measure depression, anxiety and stress (De Silva et al 2014; Aththidiya 2012/under review). Predictors of depression, anxiety and stress were analyzed by Binary-logistic-regression. Nearly three quarters of participants were clinically depressed. Majority (80.5%) of participants were having either one of the above conditions or a combination of them. Nearly half of them (44.5%) were having all three stresses, anxiety and depression at a significant level. Predictors of Depression were; type of CP, Low gross motor level, less time since diagnosis and perceived low social support. Predictors of Anxiety were; low gross motor level, perceived low social support and poor seizure control. Predictor of stress were; less time since diagnosis and perceived low social support. Close observation and follow up is needed for mothers of children with CP to identify, support and treat psychological imbalances. Emphasis should be made on early screening, intervening in these children to minimize complications and to provide good social support to families in view of improving psychological state of mothers while rehabilitating a child with Cerebral Palsy.

Keywords: *anxiety; Cerebral Palsy; depression; primary care givers; stress*

Impact of training and development on employee performance with special reference to ABC Authority administrative staff

S.R. Rajitha¹, G.R.P. Silva²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Human Resources Management, University of Colombo, Sri Lanka*

The research was conducted to identify the impact of training and development on employee performance with special reference to ABC Authority administrative staff. The theoretical foundation depicts that the employee performance management is aiming at enhancing employee performance and providing fruits for the training and development. The government organizations are expecting to establish “Triple Bottom Line” sustainability model by delivering the best services to the public and best outcomes to the ecological environment. To achieve that expectation, the organization should have right skill set with correct attitudes. Accordingly, the research provides academic and practical significance by providing solution for the empirical and the practical gap. Further theoretically developed hypothesis were empirically tested. The research pursued the quantitative research approach and statistical analysis was done for the research data inputs with respect of survey strategy. The unit of analysis of the research contained 500 of employees of Southern Regional Office of ABC Authority, in which 100 administrative staff selected through convenience sampling in line with the Anderson Table. During the analysis it was identified all four dimensions of enhancement, job knowledge, techniques, and competency illustrated a positive relationship with employee performances. The correlation values were above 0.5, defining the strong positive relationships with the dependent and independent variables of the research. The suggestions were made to considering the positive hypothesis acceptance of the research and it was identified that the option of improving the training and development functions would improve the employee performances while achieving the overall organizational sustainability in the environment.

Keywords: *employee performance; organisational development; public sector development; training and development; sustainability*

Socio-economic impact of human elephant conflict in Sri Lanka: Assessment of challenges in achieving sustainable development goals

P.R. Ranasinghe¹, D.M.S.B. Dissanayake²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Institute of Development Studies, Sri Lanka*

Target 1.4 of Sustainable Development Goals (SGD) is expected to ensure all men and women, particular the poor and the vulnerable, have equal rights to economic resources, including of ownership and control over natural resources, and the targets 2.3 is expected to double the agricultural productivity and incomes of small-scale food producers, particularly women, indigenous people, and family farmers. Direct impact of HEC includes human death, injuries, and property and crop damages. Indirect impact includes extra time and money for protection of crops and household, etc. Human Elephant Conflict (HEC) can suppressed social and economic growth in already poor and agricultural livelihood dependent communities. This study examined the challenges of achieving SGD target 1.4 and 2.3 due to HEC. The study was focused on Polonnaruwa district and the primary and secondary data obtained from the Departments of Wildlife Conservation, Census and Statistics and Agriculture for the period of 2013-2016. Both qualitative and quantitative data on HEC incidents, HEC related socio-economic factors and causes for food insecurity was analyzed. During the study period, HEC caused 64 human-deaths, 52 human-injuries and 943 property-damages were reported. Among the reported deaths, 88% were adult males which increases income vulnerability of poor, declining income generation, protection to women and children, crop production and crop protection. Food insecurity ratio was 6.7%, and among the causes, difficulty in finding food from surroundings (2%), death or sickness of family members (8%), difficulty in cultivating lands (9%) were reported. Poverty headcount ratio has increased up to 2.2% in 2016, while 23.74% of cultivated paddy land and 14.12% home gardening land were available. Socio-economic impact due to HEC, aggravate poor, negatively impact on life style of agricultural based local community in Polonnaruwa, alarming difficulties in achieving selected targets of SGDs.

Keywords: *agriculture; food insecurity; HEC; socio-economic status; SGD*

A review of contemporary human resource management issues in Sri Lanka's tea industry: A multi perceptual analysis

R.M. Samarakoon

Faculty of Graduate Studies, University of Colombo, Sri Lanka

This paper is based on ongoing research project which is connected to the doctoral study program. Sri Lankan tea industry has a very long history from the middle of 19th Century however currently the whole tea industry is facing many issues due to the external environmental changes. Within this context inconsistency of tea prices due to International Market downfalls can be identified as one of the major challenges but out of those human resources management issues are significant. This paper is basically focusing to review those significant Human Resource Management issues by applying multi perceptual model analysis. According to the developed multi perceptual model the most significant contemporary Human Resource Management issues which are affect to the Sri Lankan tea industry can be listed as high cost of production due to the low productivity of workers, High Labour Turnover, Absence of standard Human Resource Management Practices and absence of replacing qualified Planters. Review of literature was the primary method to develop multi perceptual model for illustrating the contemporary Human Resource Management issues in Sri Lankan Tea Industry. At the same time published industrial data and statistics also used for the analysis. All the conclusions and recommendations are based on the analysis and the findings of the study is very much helpful to all the stakeholders of the Sri Lankan tea industry.

Keywords: *human resource management; labour turnover; multi perceptual model; productivity; tea plantation industry in Sri Lanka*

Maritime domain awareness: Possibilities for cooperation in the Indian Ocean Region

W.B. Senaratne

Faculty of Graduate Studies, University of Colombo, Sri Lanka

The Indian Ocean is the third largest ocean and is abundant with a variety of mineral and biological resources. Maritime Domain Awareness (MDA) refers to the understanding of the various forms of threats in the maritime domain that affect the security of a country. As one of the world's busiest shipping routes, it is crucial that this ocean space, its natural resources and its environment are safeguarded for the future generations. Historically, this ocean space has been an area of great cooperation; however, in present times there has been very limited cooperation in ensuring the Indian Ocean is safe. As such, the objectives of this research were to analyse how the Indian Ocean littoral countries can cooperate via MDA in ensuring their countries' physical borders and the environment of the Indian Ocean at large can be safe and secure; and to identify the role to be played by extra-regional powers in ensuring the safety of this ocean space. Primary sources for the qualitative research included policy documents and correspondence whilst secondary data included newspaper articles, reputed journals and websites. The data gathered from these sources were coded to derive the analysis in this research. As present challenges are diverse and multifaceted, countries are singularly unable to ensure their maritime borders are safe unless they have shared intelligence and information from a variety of stakeholders. Maritime Domain Awareness enables intelligence sharing, as well as in exchanging capabilities and resources. It also generates actionable intelligence which is useful in formulating a Common Operating Picture (COP). In conclusion, there are many avenues for Indian Ocean littoral countries to cooperate on, for instance by way of sharing information and intelligence between countries such as China, India, Sri Lanka and the United States, especially in ensuring the Indian Ocean is safe for the future generations.

Keywords: *China; Indian Ocean; Maritime Domain Awareness; strategic cooperation; United States*

Assessing the relationship between information and communication technology usage and e-government employee adoption in Sri Lanka

J.B. Seneviratne¹, V. Upananda²

^{1 & 2} *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

This study examines the relationship between Information and Communication Technology (ICT) usage and e-government employee adoption. It is assumed that perceived ease of use, efficiency and effectiveness of the services and behavior intention towards technology use contributes significantly to the actual usage of ICT together with employee attitudes towards technology use. The primary data was collected through interviews and semi structured questionnaire with 17 variables and the field work was carried out by Information Communication Telecommunication Agency of Sri Lanka in October 2017. The sample of the survey consisted with 305 executive and non-executive employees across 52 government organizations. Factor Analysis and logistic regression were the analysis methods. According to the results, Kaiser-Meyer-Olkin test is 0.934 which is over 0.7. Correlation among variables is highly significant ($p < 0.05$). Thus, the Principle Component Method was selected as the extraction method. The extracted three components were renamed as Employee Attitude Towards Technology Use (EATU_1), Perceived Ease of Use (PEOU-2), and the new component generated through extraction was named as Time Consumption Factor (TC_3). These results (independent variables) were carried out a logistic regression with the ICT usage (dependent variable). The variation of the dependent variable is (Nagelkerke R Square) 2.4%, which is a very low variation of dependent variable. Despite the fact that independent variables are highly correlated with each other, the relationship between dependent variable and independent variables are non-significant ($p > 0.05$). In overall, the findings of the survey illustrate that the employee's attitudes, behaviour intention is positive but in order to improve the efficiency and effectiveness of the government organizations, invest in ICT infrastructure, software solutions, user platforms and electronic intergraded services are essential. Capacity building programme targeting employee behaviour is also indispensable. Further, senior management staff should also be trained to be able to provide digital transformative vision for the organizations.

Keywords: *employee Adoption; e-government; factor analysis ICT usage*

Rapid urban expansion in Sri Lanka is a constraint to achieving Agenda 2030

C.H. Talpahewa, K.A.H. Pamoda

Faculty of Graduate Studies, University of Colombo, Sri Lanka

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The Agenda 2030 is a commitment to achieve the SDGs by 2030. The globe's increasingly urban population means that sustainable cities will be central to achieving the SDGs: today, more than half the world's population lives in cities; by 2030, it is projected that 6 in 10 people will be urban dwellers. This paper argues a key constraint to achieving the SDGs in cities is related to urban sprawl, using the case study of Sri Lanka. It identifies the extent of urban sprawl, proposes measures of sprawl expansion, and discusses the challenges sprawl poses to achieving Agenda 2030. The research draws on spatial analysis, desk reviews of published and unpublished data, and expert interviews. It finds that current population-based representations of urban growth in Sri Lanka mask its true extent, because much growth has occurred in areas administratively classed as rural. Spatial analysis captures urban expansion in 'rural' areas, indicating that Sri Lanka's cities are growing rapidly through low density sprawl expansion. The paper identifies the challenges of sprawl in relation to the SDGs, highlighting urban mobility, environmental sustainability, climate change vulnerability, basic-service provision, and public health issues. It proposes policies that ensure the true extent of urban growth is understood and planned to progress towards the SDGs, including redefining urban boundaries so that peripheral areas where the challenges are greatest are included in urban policy. In addition, the paper suggests measures to combat sprawl, including promoting a 'compact cities' model, and the development of a national urban policy and legislative instruments to ensure cities develop in line with government priorities, SDGs, International Guidelines for Urban and Territorial Planning and the New Urban Agenda.

Keywords: *rural; sustainable; SDGs; urban; urban sprawl*

Effects of leadership styles on the military organizations

P.I. Wanasinghe¹, N.N.J. Navaratne²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Human Resources Management, University of Colombo, Sri Lanka*

The main objective of this study was to analyse the impact of transactional and transformational leadership on employee engagement in an organization. In order to understand the impact of transactional and transformational leadership on employee engagement a comprehensive review of literature was conducted. Findings from the literature review revealed that transformational and transactional leadership influences the emotional and psychological state of employees which in turn influence employee engagement. Based on these key findings from literature review the conceptual framework of the study was developed. Conceptual framework assumes that transformational leadership and transactional leadership individually influence the emotional state and psychological state of employees, which in turn individually impact employee engagement. Research methodology to test the conceptual framework and achieve the objective of the study was a survey research methodology, the main data collection instrument used in the study was a structured self-administered questionnaire, whilst the study sample consisted of 175 officers and other employees in the organization. Quantitative data obtained from the study was analysed statistically. The relationship between the variables in the study was analysed using Pearson's Correlation, whilst the impact of the independent variables on the dependent variables was analysed using regression analysis. Findings from the data analysis indicated that transformational leadership has a positive impact on employee engagement, as it has a positive influence on emotional and psychological state of employees in the organization, which in turn have a positive impact on employee engagement. Findings also indicated that transactional leadership has a negative impact on employee engagement, as it has a negative impact on the psychological and emotional state of employees of the organization which in turn have a negative impact on employee engagement.

Keywords: *employee engagement; leadership styles; psychological and emotional state; transactional leadership; transformational leadership*

Soft Power of the United Nations: A positioning theory analysis of the UN's second-order positioning of states in the global system

M.S. Wanasinghe-Pasqual¹, S.C. Padmakumara²

^{1&2} *Department of International Relations, University of Colombo, Sri Lanka*

The idea of Soft of Power has been largely confined to the state level analysis and need be conceptualized with non- state actors. The United Nations (UN) emerged into a war weary world in 1945. The current argument leveled against the UN is its lack of 'power' and relevance in the international arena. While empowered with the ability to use hard power if necessary – i.e. through interventions, sanctions and peacekeepers – the UN has predominantly used 'soft power' throughout the decades. Soft Power, as expressed by Nye, "rests on the ability to shape the preferences of others to want what you want." (Nye, 2008: 29). This is mainly because the UN has to 'borrow' its hard power from its members (Nye 2007) but its soft power is part of its Charter, norms, presence, among others. This paper argues that the UN uses its soft power in multiple ways: (a) by defining terms, introducing news words and concepts, and creating approaches that are globally acceptable; (b) by consigning a people as human rights violators or not, citizens as living in 'failed' states, and entire countries as hostiles; and (c) by creating norms on interactions at the elite levels. Gathering primary data – from Resolutions to policies such as Millennium Development Goals to speeches – along with secondary data, this research focuses on an otherwise under-analyzed area of International Relations: the use of soft power by non-state entities. Positioning theory is used as an analytical lens to comprehend the impact of this soft power as it "allows for ... analysis of the dynamics of ... unfolding ... interactions between nation states" (Moghaddam, et al. 2009: 6). The impact of UN's soft power use is explored through second-order positioning (Warren and Moghaddam 2018:322).

Keywords: *hard power; positioning theory; second-order positioning; soft power; United Nations*

Reading practices among Sri Lankan adults: Implications for assessment and treatment of post-stroke reading deficits

N.C. Weeraratne¹, D.W.N. Dissanayake², B.B. Shadden³, V. Weerasinghe⁴

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Physiology, University of Colombo, Sri Lanka*

³ *Program in Communication Disorders, University of Arkansas, USA*

⁴ *Faculty of Medicine, University of Peradeniya, Sri Lanka*

There are no standardized aphasia assessments on reading comprehension in Sri Lanka. Limited interventions for post-stroke reading impairments are due to lack of language and culture specific resources and limited knowledge of reading practices. This study was designed to identify the reading habits and importance of reading for adults in Sri Lanka, using a unique self-administered questionnaire that probed importance, nature, and frequency of reading for both work and pleasure. The questionnaire was completed by 120 Sri Lankan healthy adults between 30 to 80 years of age who were recruited from the community through purposive sampling. Descriptive statistics were used to analyse data and response distributions were compared using chi-square ($p=0.05$) procedures. The mean age of the sample was 54.3 ± 14.4 years. More than half ($n=78$; 65%) were paid employees: unskilled ($n=21$; 17.5%), semi-skilled ($n=19$; 15.8%) and skilled ($n=38$; 31.7%). There were no gender-related differences in responses to questions. The majority of the employees ($n=48$; 61.5%) reported reading as ‘very important’ for their occupations. Chi-square tests revealed that the importance of reading for employment varied significantly with occupation type and educational level in the expected directions. High importance of reading for personal lives was reported ($n=99$; 82.5%) with the majority reading ‘daily’ for pleasure ($n=75$; 62.5%). The frequency of personal reading was associated with differing educational levels and skill level of employment; however, age was not a factor. Newspapers were the most popular reading material ($n=94$; 78%) among the 106 self-described readers. In summary: reading was found to be very important for adults in Sri Lanka, for both employment and pleasure. Therefore, aphasic reading impairments can affect the quality of life of stroke survivors. Development of assessments and interventions for rehabilitation of reading skills post-stroke should receive focus in future.

Keywords: *aphasia; language assessment; post-stroke; reading comprehension; reading habits*

The significance of problem-based learning in language education: A literature review

W.M.M.M.J.T. Weeraratna¹, A.A. Barborich²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of English Language Teaching, University of Colombo, Sri Lanka*

Problem-based Learning (PBL) is a student centered learning method that can bring about a positive impact on language education. PBL started with medical studies, but gradually marked its effectiveness in language learning as well. The significance of PBL is that problem situations in day to day life are used as learning experiences to develop learners' higher order cognitive skills such as problem solving skills and critical thinking abilities while their communicative skills are developed as a by-product. The research aims to find out the impact of PBL in English language education through a literature survey; it examines the role played by 'problems' to develop problem solving skills and the effectiveness of 'contextualized situations' in the development of language skills. Research shows that language learners' effective engagement with the language is more important than using language for mere communication. PBL, as a learning model, has marked its solid foundation in language learning as well with multiple benefits. It gives the learners an opportunity to actively engage in language acquisition while solving real-world problems. The facilitator stimulates the learning processes, monitors them and evaluates the progress while providing necessary feedback. It produces learners who can think critically and solve problems logically. PBL leads the students to work towards a flexible and updated knowledge. The biggest defect in PBL is noted as the lack of research in language education. Its advantages are development of long-term knowledge retention, use of diverse instruction types, development of transferable skills and improvement of critical and analytical skills, team work and interpersonal skills. Through the implementation of PBL, students will uniquely engage in and take the responsibility of learning. Thus PBL will eventually help improve Cognitive Academic Language Proficiency (CALP) of the learners as questioning, problem solving, greater communicative skills and critical thinking are essential characteristics of PBL.

Keywords: *communicative skills; critical thinking; language learner; problem-based learning; problem solving*

Heterogeneous informal sector employment in Sri Lanka: An econometric analysis

C. Wijebandara

Faculty of Graduate Studies, University of Colombo, Sri Lanka

The informal sector provides jobs for three fifths of employed Sri Lankans and plays a crucial role as a potential job creator and an income generator. However, the sector is also characterized by unsafe and unhealthy working conditions, low levels of skills and productivity and a close relationship to working poverty. While formalizing informal employment is one of the Sustainable Development Goals, more information about the extent of heterogeneity in the sector is needed to develop appropriate policies to achieve it. This is because the sector may actually be the preferred sector of employment for certain groups of workers because of the advantages it offers, even while it is the employer of last resort for workers who are unable to access jobs in the formal sector due to labour market segmentation. The existing literature on informal sector employment in Sri Lanka has thus far focused on measurement issues and there has been no attempt to test for heterogeneity within the sector. Hence the objective of this study is to contribute to the existing knowledge on informal sector employment in Sri Lanka by identifying the unobserved heterogeneity and number of different segments within the sector. The analysis uses the nationally representative labour force survey data of 2016 and a fixed mixture model using semi-parametric techniques which also correct for sample selection bias due to self-selection of individual to the labour market. The study finds that an individual's self-selection into labour market is critical for model building. In addition, it finds three different segments with different wage/income equations. The expected wages/income differs across segments and varying individual characteristics, such as the level of education. These preliminary findings suggest that a nuanced policy framework may be necessary to address issues of decent work conditions in the informal sector.

Keywords: *decent work; fixed mixture model; heterogeneity; informal sector employment*

Retention of aquaculture extension officers: Towards a sustainable aquaculture sector in Sri Lanka

W.M.I.K. Wijesekara¹, K. Dissanayake²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of Management and Organizational Studies, University of Colombo, Sri Lanka*

Fishing has been a major economic activity in Sri Lanka from the ancient times and the major livelihood of the coastal communities. The sector plays a vital role with respect to provision of direct and indirect employment opportunities for 560,000 and livelihood for 2.6 million people. To ensure that the Sri Lankan population enjoys an acceptable nutrition intake it is required to maintain a protein requirement level through a per capita fish consumption of 22kg per year. The ABC Aquaculture Authority of Sri Lanka has reported a high turnover rate of its aquaculture extension officers throughout the past. As this has affected badly on the achievements of ABC Authority, it had taken numerous efforts for retaining its extension officers. Despite it being a semi-government job with many benefits, still the Authority has found the difficulty in retaining the said workforce. Thus, building on this puzzle, the present study attempts to examine the factors affecting to the retention of aquaculture extension officers of ABC Authority. A conceptual model is developed subsequent to a pilot survey carried out at the Authority. In that, a set of organizational, personal, and socio-cultural factors are identified for probing into the matter of concern. The study objectives were achieved through a quantitative survey, covering the total population (census) of the aquaculture extension officers at the ABC Authority (n = 80). As per the analysis, all the hypotheses formulated and tested were acceptable. Thus the relationships predicted in the conceptual model were justified. The result of the data analysis shows that there is a relationship between perception of salary, working conditions, job security and the employee retention. The above findings of the study highlights a few points that the Authority should pay its attention in retaining its extension officers as providing nonfinancial benefits, field facilities, and job security.

Keywords: *ABC authority; aquaculture extension officer; retention*

Reducing public speaking anxiety through scaffolding

M.T.N. Wijetunge¹, A.A. Barborich²

¹ *Faculty of Graduate Studies, University of Colombo, Sri Lanka*

² *Department of English Language Teaching, University of Colombo, Sri Lanka*

In this modern technological world, English language plays a massive role in acquiring knowledge, information, and communication technology. English is widely used in higher education, trade, business, travel etc. Having recognized the importance of learning English, since the early 1950s, the successive governments in Sri Lanka have been taking initiatives to teach English in all public schools in the country. Consequently, English has become the medium of instruction at a majority of higher education institutions in Sri Lanka today. However, undergraduates show reluctance to speak English and demonstrate a kind of phobia towards public speaking. With this as the main research problem of the study, it sets out to find out the effectiveness of using “scaffolding” to develop the confidence for public speaking. The objectives are to identify the factors that cause a phobia for public speaking and to find out whether scaffolding can improve public speaking skills. A sample of 39 undergraduates were selected based on purposive sampling and a pre- and a post-test on public speaking was conducted. Following the pre-test, the students were offered feedback in the form of scaffolding by the teacher and Toastmasters. Effective presentation skills were discussed. Theories of Scaffolding were used as guidelines and it was hypothesised that student marks would be higher in the post-test. A mixed approach was used to analyze data. For quantitative data, a t-test was performed to identify the significant difference between the test marks. Qualitative data was gathered via observations and interviews. The overall findings revealed that scaffolding in the form of constructive feedback within a friendly environment assisted to improve students’ motivation and confidence to speak in public. Among many other factors, the main reason for public speaking anxiety was recognized to be having lack of opportunities to communicate. Therefore, it was concluded that scaffolding assistance improved public speaking confidence of undergraduates.

Keywords: *presentation skills; public speaking; scaffolding*

Challenges in implementing rights protection policy for children admitted to certified schools in Sri Lanka

M.I. Wimalasekera

Faculty of Graduate Studies, University of Colombo, Sri Lanka

This study attempts to contextualise the practice of rehabilitation in juvenile justice system in Sri Lanka by examining its policy, legal and governance aspects with a child rights focus. A child offender or a victim of abuse in the age group of 12 – 16 is directed by the courts to certified schools for rehabilitation. This study strives to examine the factors and circumstances contributing to the desertion by a substantial number of children of certified schools despite the state guaranteeing their well-being flanked by a compendium of legal and child protection measures. Mixed research methods were employed and case studies were carried out in Western Province. The study was based on pragmatic observations and explanatory narrative approach in which stakeholders expressed their experiences while at service based on the principle of best interest of the child. Theory of Street– level bureaucracy was employed to understand the phenomena. In the certified school system, the study revealed that, lack of awareness/attention to operational standing orders, lack of comprehensive monitoring mechanism pertinent to rights protection and requirements of the children admitted, political interference in recruitments, ad hoc implementation of the provincial council system and unequal distribution of facilities among provinces and lack of follow up mechanisms for children who are reintegrated with the society paves the way to infringe rights of the children admitted to certified schools. To avoid violation of rights of the children in conflict/contact with the law, a comprehensive policy document on child rights should be approved and implemented, admitting children in conflict with the law to non-state organisations managed volunteer homes should be discontinued. It is recommended to remove certified schools from provincial council authority and re-establish them under the central government which will prevent the discrimination faced by children who live in provinces.

Keywords: *certified schools; child rights protection; juvenile justice; rehabilitation; Sri Lanka*

FACULTY OF LAW



Rethinking Law: Loss of Ignorance or Innocence?

16 - 17 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF LAW**

Prof. W. I. Nanayakkara



As the Faculty of Law, University of Colombo reaches a milestone year since its establishment, I take immense pleasure in forwarding this message on the occasion of the Annual Research Symposium of the University of Colombo.

Commemorating its 70th Anniversary, the Faculty of Law is organizing the International Legal Research Conference - 2018 themed “Rethinking Law: Loss of Ignorance or Innocence?” coinciding with the Annual Research Symposium of the University. The theme underlies the fruition of the vision of the academics to explore and rethink aspects of law and their impact on areas which have a direct impact on the socio-economic realities of Sri Lanka. In this context, the attempt of all research parties contributing to this dialogue is to extensively delve into the respective research areas and produce a tangible documentation of the investigations and researches.

The international conference is an occasion where the Faculty celebrates its long-standing tradition of legal research and showcases its research potential. Similar to every year, the Faculty is intending an academic exchange on increasingly relevant and current legal issues related to Sri Lanka and those which transcend beyond its borders. The Faculty of Law, this year, submits Abstracts of its staff members for this publication under the same theme as the International Conference, in keeping with the overall objectives of the University Symposium.

FACULTY OF LAW

PROGRAMME

16 November 2018

08.30 a.m.	Registration
09.00 a.m.- 9.10 a.m.	Lighting the Oil Lamp
09.10 a.m. - 9.25 a.m.	Cultural Event I
09.25a.m. - 09.35 a.m.	Welcome Address by Prof. W. I. Nanayakkara, Dean, Faculty of Law, University of Colombo
09.35 a.m. - 09.50 a.m.	Address by Senior Prof. Lakshman Dissanayake, Vice-Chancellor, University of Colombo
09.50 a.m. - 09.55 a.m.	Introduction to Keynote Speaker by Prof. V.T. Thamilmaran, Conference Chair
09.55 a.m. – 10.35 a.m.	Keynote Address by Justice Dipak Misra, Former Chief Justice of India
10.35 a.m. – 10.50 a.m.	Cultural Event II
10.50 a.m. – 11.00 a.m.	Vote of Thanks by Dr. Shanthi Segarajasingham, Head, Department of Commercial Law
11.00 a.m.	Tea and break up for Sessions

INTRODUCTION TO THE KEYNOTE SPEAKER

Justice Dipak Misra

Former Chief Justice of India



Justice Dipak Misra, the outgoing Chief Justice of India is a renowned Advocate and a Judge. During his tenure as the 45th Chief Justice of India, Justice Misra was the architect of several landmark judgments, which changed the course of justice in India.

Justice Misra was enrolled as an Advocate in 1977 and practiced in Constitutional, Civil, Criminal, Revenue, Service and Sales Tax matters in the Orissa High Court and the Service Tribunal. He was appointed as an Additional Judge of the Orissa High Court in January 1996 and transferred to the Madhya Pradesh High Court in March 1997 where he became a permanent Judge on 19th December 1997. Justice Misra assumed the office of Chief Justice, Patna High Court, on 23rd December 2009 and of the Chief Justice of the Delhi High Court on 24th May 2010.

He was appointed Chief Justice of India (CJI) on 10th October 2011 and retired from the post on 2nd October, 2018. Justice Misra grew in stature by issuing many groundbreaking judgments including the passive euthanasia case (2018), the case lifting the ban on women entering a Hindu Temple (2018), the case declaring adultery not a crime (2018), the case on LGBT rights (2018), the Delhi gang rape case (2012) and the Mumbai blasts case (2011). These judgments progressively changed the jurisprudential landscape in India, and positively influenced Sri Lanka in law reform and the interpretation of the law.

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Emerging challenges to presumption of legitimacy: A case study of surrogacy practices in Sri Lanka

A.H.M.D.L. Abeyrathna

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Presumption of legitimacy is a concept of paramount importance in terms of succession, property rights, parental responsibility and in ensuring the best interests of the child. According to section 112 of the Evidence Ordinance, a child born into a valid marriage or within 280 days of dissolution of a valid marriage, provided the mother remains unmarried, is considered the legitimate child of the male spouse. This presumption is rebuttable on grounds such as access and the impotence of the man. However, recent trends in medical practice, particularly those of surrogacy, pose significant challenges to this presumption. Since Sri Lankan law does not recognize surrogacy, this leaves room for ambiguity regarding the validity of surrogacy contracts. In this light, this paper aims to analyse the consequences of such ambiguity for the surrogate child. For this purpose, this research will look at: a) the validity of a surrogacy contract; b) challenges and consequences faced by the surrogate child or the mother with regard to the parenthood; and c) the role of the State in ensuring the best interests of the child. A qualitative study of the international human rights instruments will be followed by a comparative analysis of domestic and foreign legislation, academic articles and case law from Sri Lanka and South Africa. Interviews with key informants in the field will be used in this process. In conclusion, the paper recommends that it is in the mandate of the State, as the upper guardian of the child, to intervene in enhancing the presumption of legitimacy beyond its traditional paradigm, in a manner that best captures such growing fields of medical practice to ensure the best interests of the child.

Keywords: *best interests of the child; presumption of legitimacy; surrogacy*

Land, development and public use: A Pandora's Box?

M.D.M. Abeyratne

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Land, its acquisition and disposition, is key to promoting development. Today, development opportunities can occur on a global scale, be of significant magnitude, and generate fiercely competitive bidding. Development opportunities offered by Amazon, the American electronic commerce and cloud computing company, is a case in point. Recently, it generated a bidding war in calling for bids for a site for its new headquarters and corporate campus, from governments and economic development organizations. The measure is expected to bring in 50,000 jobs and a capital infusion of US\$ 5 billion by Amazon, making it a mammoth corporate-civic project even in a global context, not counting substantial peripheral economic activity it would necessarily generate in the existing community. Principles of property law and contract law facilitate sellers and purchasers of private property ready to engage in development activity. However, when private property owners are unwilling to part with their property to benefit national development, property law is also armed with compulsory land acquisition orders, or use of 'eminent domain powers', to allow the State to push through development. Does State's use of such mechanisms constitute the opening of Pandora's Box? A process that appears ordinary but once begun, produces unpredictable and harmful results? Similarly, can the State, unconstrained, commit public land for developmental activity, such as to grow and farm marijuana for large scale cannabis companies? This paper analyses selected key jurisprudence of national Supreme Courts, in the jurisdictions of Sri Lanka, the United States of America, the United Kingdom and South Africa, regarding the use of compulsory land acquisition orders or eminent domain powers, the 'public use' requirement therein, and the role of apex courts in development. It attempts to ascertain, on a comparative basis, whether unpredictable and harmful results are engendered by the legislature, the executive or the judiciary.

Keywords: *compulsory land acquisition orders; land development; eminent domain powers, Supreme Court*

**From the role of being a forgotten party to being an active participant: ICC
victims' participation regime and international criminal justice**

C. L. Akurugoda

Department of Public & International Law, University of Colombo, Sri Lanka

One of the great innovations of the Statute of the International Criminal Court (ICC) and its Rules of procedure and evidence, is the series of rights granted to victims. At the outset of the introduction of the ICC, the participation of the victims in the criminal proceedings was generally a new phenomenon. On the one hand, it is claimed that the introduction of the victims' participation regime was able to add value to the international criminal justice and on the other hand, it is argued that the participation regime is just a decoration to the ICC Statute. There are many criticisms which are leveled against the said regime which are discussed in the main body of this paper. In this context, this paper attempts to examine whether the victims' participation regime had added any value to the international criminal justice, and in that process this paper draws examples from the decisions of the ICC in order to prove the contention that this victims' participation regime has been developed through the interpretations employed in those decisions. Hence it has been able to enhance the legitimacy of the international criminal justice in many aspects. In addition, this paper explores the future prospects and challenges which are attached to this comparatively young legal regime and examines possible avenues to address those challenges and to enhance the quality of the justice which is served through the ICC in the future.

Keywords: ICC; international criminal justice; judicial interpretations; victims' participation

Property Rights in *Thesawalamai* in the light of international standards: An analysis of gender inequalities in Sri Lanka

E.M.Y.G. Ekanayaka

Department of Private & Comparative Law, University of Colombo, Sri Lanka

This study examines the discriminatory legal provisions relating to women's property rights under the Jaffna Matrimonial Rights and Inheritance Ordinance No. 1 of 1911 (JMPIO), in comparison with state obligations under the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW) and the Sustainable Development Goals (SDGs). Women continue to be subject to gender based discrimination globally. Sri Lanka's plural legal system too encompasses certain provisions in its special laws, that indicate discriminatory practices against women in respect of property rights. The JMPIO (as amended by the Ordinance No. 58 of 1947) is an example for this. Section 6 of the Ordinance overtly discriminates against women. It mentions that a wife can dispose her separate property only with her husband's written consent; even though this property belongs to her as her separate property, she still has to obtain her husband's consent. The same restriction does not apply to a husband. Hence, women governed by *Thesawalamai* are subject to discrimination based on ethnicity and marital status. Access to and ownership of property is vital for ensuring equality and empowerment of women. Article 16(d) of CEDAW and General Recommendation No.35 to CEDAW emphasise on equal enjoyment of property rights. Moreover, under SDG 5, the State has an obligation to ensure land and property rights of women without any type of discrimination. Thus, this paper intends to establish that legislative intervention is necessary for revising the existing statutory provisions in order to align it with international standards. Such guarantees would enable married women governed by *Thesawalamai* to be treated equally. This research is a qualitative research, mainly based on domestic legislation, case law, academic writing, policies and international standard setting documents.

Keywords: *gender discrimination; property rights; Thesawalamai*

Law relating to cumulative provocation: A critical analysis

T.R. Galappaththige

Department of Public & International Law, University of Colombo, Sri Lanka

According to the Penal Code of Sri Lanka, an unpremeditated murder, committed under grave and sudden provocation, where the offender has lost his/her self-control, lowers the degree of culpability of murder to culpable homicide not amounting to murder. The term cumulative provocation is used to describe cases involving a prolonged period of maltreatment of a person at the hands of another, which culminates in the killing of the abuser by the victim. A long course of domestic violence or battered woman syndrome, which ends up in the killing of one spouse by the other offers a typical example. Cumulative provocation is not recognized expressly in the Penal Code of Sri Lanka and some of the judgements that have discussed the matter have also been unable to bring clarity as to the interpretation of the term. This research has three objectives. Firstly, to describe the existing legal structure relating to provocation in Sri Lanka. Secondly, to compare how other countries, such as United Kingdom and India have modernized the law relating to provocation. Thirdly, to suggest reforms for Sri Lanka. This research is primarily a qualitative research, carried out with reference to case law, legislation, texts of authority, existing research studies, electronic databases, etc. It is observed that, as the emerging trend in most of the jurisdictions, law on provocation has been reformed. This is because it was recognized that leniency should be shown towards the homicides which are committed as a cumulative result of a course of exacerbated relationship between the offender and the victim or in relation to people who kill in response to a fear of serious violence. This paper proposes necessary and comprehensive Penal Code amendments relating to cumulative provocation considering needs of the society, as opposed to continuing the traditional approach.

Keywords: *criminal law; culpable homicide; murder; Penal code; provocation; offender*

The rights of irregular migrants on the high seas: An international law perspective

N. Janani

Department of Public & International Law, University of Colombo, Sri Lanka

One of the major legal issues confronting the state today is the question of how to deal with irregular migrants. This paper intends to address one of such issues - the irregular migrants on the high seas and violations of their basic rights. In assessing the legal protection available to them, by way of discussing various treaty obligations undertaken by the states and the development of the law in respect of the primacy of individual human rights, it has become necessary to highlight the need to pay adequate attention to the protection of those migrants. The emergence of certain principles in light of international human rights law and international humanitarian law demand that those migrants should be treated humanely under any circumstances. Leaving the country illegally or otherwise can't deprive a person of any human rights. As such, the obligations of the states which are finally entrusted with the protection and promotion of human rights should be extended to those on the high seas as well. The status of individuals in international law is continuing to evolve and such growth should be reflected in the case of the rights of irregular migrants as well. This argument will be supported by sources, mainly of secondary nature, drawn from international treaties and case law. If irregular migrants' rights have fallen into danger while they are in the high seas, ostensibly no one is there for them, including international law. Therefore, both origin and habitat states should take obligations on the subject of rights of irregular migrants. At the same time, it is essential to make people aware of risks and consequences of irregular migration and other relevant information regarding this, to feasibly address the issue of irregular migrants.

Keywords: *high seas; humane treatment; individual rights; irregular migrants*

Promoting green technology for sustainable development in Sri Lanka: A patent law perspective

J. Jeyakala

Department of Commercial Law, University of Colombo, Sri Lanka

Technology plays a pivotal role in economic development and global climate change in the 21st century. Brundtland Report 1987 defines sustainable development as, “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The World Intellectual Property Organization (WIPO) launched an innovative concept titled ‘WIPO GREEN’ system for green technology solutions in 2013, as harmful technologies affect both global climate change and sustainable development. At present, numerous environmentally sound technologies are available such as, bio-fuels, bio-mass to protect the environment and to use the resources in a more sustainable manner. Nevertheless, there is a number of issues that can be identified as to the use of the patented green technologies. Obviously, the exclusive intellectual property rights accorded to these technologies restrain the others from using the technology, without the consent of the owner. Even though global climate change is an international issue, Article 4.6 of the Kyoto Protocol has minimized the responsibility of the developing states. However, developed states use this advantage and most of their harmful technology is being transferred to the developing countries through the Foreign Direct Investments (FDI). And also green technologies are not easily accessible to the developing States like Sri Lanka as the patented technologies create a monopolistic situation and lead to high prices of the technologies. This research is carried out as a qualitative research and comparative analysis of laws in other selected jurisdictions. The main objective of this research is to explore the best possible ways to mitigate global climate change and attain sustainable development through the use of green technology in the Sri Lankan context. This paper makes recommendations from some developed countries as to how the States can expedite the patent procedures and suggests the importance of using ‘patent pledges system’ for green technologies.

Keywords: *climate change; green technology; patent pledges; sustainable development*

Power and the right to retaliate: What the WTO does not understand

N. Kamardeen

Department of Commercial Law, University of Colombo, Sri Lanka

The principal weapon in the World Trade Organisation (WTO) arsenal is the power to “retaliate” that is given by the Dispute Settlement Understanding (DSU), which document empowers the Dispute Settlement Body (DSB) of the WTO to operate. Retaliation, or the unilateral suspension of concessions, allows the prevailing party in a WTO dispute to raise tariffs on a product emanating from the losing party without consulting that party. That product’s price would then become higher in the market of the prevailing party and lessen its sales, resulting in a net loss for the losing party. Retaliation works on the basis that, in the absence of a global enforcing authority, parties should be allowed to take some measures that safeguard their interests, without which DSB rulings would not be adhered to. Though hailed as one of the most progressive measures offered by the WTO, the reality of the retaliation provision is that it can be used advantageously only by countries with large economies. The example of the *European Union Bananas case* will be used to illustrate this point. In that particular case, the US, and Ecuador, both won the right to use retaliatory measures against the EU. However, the impacts of these measures on each of these economies were vastly different. Through this and other examples, the paper attempts to indicate that developing nations with small economies are actually disadvantaged by this provision, and that they are left with no proper means of redress in a WTO dispute. The paper suggests that compensation is the better option for developing states. This should be supported by appropriate measures ordered by the WTO, and monitored by its administrative mechanism, to ensure compliance.

Keywords: *dispute settlement; retaliation; World Trade Organisation*

The need for a combined sustainable development and human rights approach to disaster management in Sri Lanka

K. Konasinghe

Department of Public & International Law, University of Colombo, Sri Lanka

Sri Lanka has been facing serious problems of floods, droughts, landslides and other disasters in the last few years. These issues are only partially ‘natural’ as they are caused by a combination of factors including anthropogenic climate change, unsustainable land use and mismanagement of harm prevention strategies and failure to carry out full environmental impact assessments for development projects. This paper intends to investigate the rights-based approach to administrative involvement in disaster management sector. Thus, policy and regulations governing these environmental management issues need to take into account not only the implementation of environmental law and policy, but also the human rights impacts. Therefore, this research explores human rights approach and application of sustainable development goals such as good health and wellbeing, gender equality, clean water sanitation, reduced inequality and sustainable cities and communities in facing natural disasters. A human rights approach in environmental and disaster prevention and response will highlight the needs of the human beings affected and assist in creating a holistic framework for necessary action. It is vital that the law and policies relating to disasters in Sri Lanka should be read with environmental and human rights obligations of the State. It is highlighted that ‘environmental rights’ have developed beyond the right to a clean environment and should be argued as extending to *a human right to be protected from preventable natural disasters*. This argument can be supported with reference to the precautionary principle in environmental law and other principles under the umbrella of ‘sustainable development’ and the Sustainable Development Goals (SDGs), as well as the full extent of human rights law.

Keywords: *disaster management; environmental rights; sustainable development*

Rethinking the culture of competition and conformity at Law School: Perspectives for reform

A. M. Kumarage

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Legal education has taken multiple interesting shifts during the past century. In examining it globally, legal education has opened up for women and for people of different races and ethnicities, revamped its curriculum, experienced change of its pedagogy and is attempting experiential learning. Nevertheless, the culture of competition and conformity at the Law School, which has withstood the test of time, has remained a barrier hindering the effective adoption of reforms. Legal education has gained and lost over the years through continuous adherence to the culture of competition and conformity. Exploring this conception, it is the purpose of this paper to analyse how the law school culture of competition and conformity results in failing to breed the '21st century lawyer.' This paper primarily argues that performing this culture shuts down the learner's mind to the dynamic and imaginative thinking, the 21st century legal practice and scholarship demands. The analysis examines profound impacts this culture creates on the students, Faculty and the legal community. An inevitable difference between the philosophy of law and the legal practice may be contributing to make legal education more like the practice and less like an academic discipline. To contextualize the analysis, pragmatic insights are drawn from anecdotes from Law School in Sri Lanka and the U.S. The paper draws inspiration from the feminist method of problem analysis and utilizes tools from critical legal studies and post modernism to propose an alternate model to replace the culture of competition and conformity.

Keywords: *culture; competition; conformity; legal education; feminist methods*

At sea: A framework for the protection of those displaced by climate change

Y. Kumaraguru

Department of Public & International Law, University of Colombo, Sri Lanka

There is imminent necessity for the development of an adequate legal framework governing cross border displacement due to climate change. Discussion on displacement and resettlement pales in comparison to efforts towards mitigation of climate change, and developing a new legal mechanism for climate change induced displacement appears unlikely. As with all forms of forced displacement, recognition of the right to reside must overcome increasingly prominent concerns of national and job security, opening floodgates. A framework providing for those displaced by climate change, however, comes with additional baggage. Complexity of individual decisions, for example, makes a direct causal link between climate change and movement that is difficult to establish. The international framework is ill-equipped to tackle climate displacement. The general consensus is that those fleeing the impacts of climate change would not fall within the 1951 Refugee Convention. Further, case law illustrates that although climate change impacts may be extremely harmful, they do not meet the threshold of 'persecution'. Persecution, even if established, would have to fall within categories enumerated within the 1951 Convention; a requirement that cannot be satisfied where displacement occurred due to climate change alone. The law pertaining to migrants, addresses those who do not face compulsion in movement, affording lesser protection than is necessary for those forcibly displaced by climate change. The climate change displaced thus fall through a gap in the international legal framework. This paper examines the present legal framework and determines how it may be modified to carve out a place of protection for those displaced by climate change. The author proposes the extension of the 1951 Convention to include protection for 'climate change refugees'. In the interim, States should be encouraged to provide subsidiary or temporary protection, at the very least. Inter-state agreements allowing for and streamlining migration from affected nations should also be considered.

Keywords: *climate change; displacement; refugees*

Are we quibbling about the child's participation rights? Responses of the Sri Lankan and South African laws

T. Kumarasoorier

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Article 12 of the United Nations Convention on the Rights of the Child (UNCRC) guarantees a substantive right to children to express their views in the matters that affect their life. The significance of the shift that Article 12 places in the international discourse are inevitable. In one perspective, it has raised the debate as to whether children should be given extensive right to self-autonomy as such. Compared to the historical journey of child rights, provoking such a debate itself should be seen as a success of Article 12. The tension arises when the child's expressed view under Article 12 does not co - relate with the requirement of Article 3 as a substantive right. Article 3 warrants the best interests of the child as a paramount consideration. When the view of the parent/ guardian or the State is more towards the benefit of the child rather than the child's own view, is it justified to hand pick the parent's or the State's view as per Article 3 and decline to honour the child's right under Article 12? Is there a best way to determine the trade – off between these rights? This paper devotes attention to these questions in the backdrop of the child rights regime of Sri Lanka and South Africa. The analysis is to be based on the theories namely, Hart's ladder of participation and paternalism.

Keywords: *best interest of the child; child's participation rights; child rights law; key power relationships; self-autonomy of the child*

Impact of post-traumatic stress disorder in Delict: A medico-legal appraisal

D.S.E.U.S. Liyanage

Deapartment of Private & Comparative Law, University of Colombo, Sri Lanka

Post-Traumatic Stress Disorder (PTSD) is known as a psychiatric condition in medical science. One may undergo such a condition if one faces a tragic event. Recognizing such a condition may be difficult, as symptoms are not physically apparent. With the development of medical science in western societies, PTSD has been recognized as a medical condition. It would attract legal liability, if the said condition is occasioned as a result of a negligent act. The judicial approach to this issue is not encouraging, because of the fear of opening flood gates of litigation with fabricated cases. In Sri Lanka, this kind of cases are not rare. However, the court is of the view that this is a non-patrimonial loss, therefore, PTSD cannot be recognized under the existing delictual principles which are founded on Roman Dutch Law (RDL). As a result, no remedy is recognized under the existing law. The research examines why PTSD is not recognized as 'patrimonial' damage despite its prevalence and the ability to prove it medically. The study aims to examine the existing law on PTSD and find its improvements in selected jurisdictions and how it could be used as a guideline to improve delictual action. As a specific objective, the study examines how to avert difficulties in proving a PTSD case medically. The study has adopted qualitative methodology, to conduct a comparative study addressing the policy implications regarding the recognition of PTSD. It uses an unstructured interview method and library-based research to gather qualitative data. English law also has a strict approach towards PTSD claims and does not categorize as a physical injury. However, comparatively in South Africa, common law court has recognized the condition as a physical damage and includes such claims in the regime of patrimonial loss. It is argued that the approach of the South African court could be a guideline in imposing liability in delict for PTSD.

Keywords: *compensation; foreseeability; negligence; PTSD; secondary victims*

Serving the ends of criminal justice: A critical analysis of the jury system in Sri Lanka

G.I.M. Liyanage

Department of Public & International Law, University of Colombo, Sri Lanka

In an effective criminal justice system, it is extremely important to strike a balance between all the parties involved in the criminal procedure. There are several avenues which enable us to reach this goal and the jury system is one of them. In jury trials, parties to the crime will get certain exceptions, privileges, etc. Among those parties, an accused person will get more benefits. A jury process enables the judiciary to take into account a myriad of connected social factors, thereby ensuring that the judgement receives public acceptance. For instance, in the U.S., which has a strong jury system, trial by jury is a constitutionally protected right. In Sri Lanka, procedural requirements for the jury trial fall under the Code of Criminal Procedure Act No. 15 of 1979. Although the jury system is recognized under the procedural laws in Sri Lanka, recent practice indicates that the jury system has not been used lately. In this backdrop, this paper analyses the existing laws and procedures relating to the jury system in Sri Lanka and suggest reforms through a comparative study of several jurisdictions. This research will also propose reforms to existing jury practices in Sri Lanka for a more efficient and productive criminal justice system. An analysis of the Sri Lankan judicial practice suggests that the lack of a functioning jury system may result in certain factors related to the crime might not be addressed. Although this system recognizes the participation of the layman in criminal trials, due to the trial cost, lack of enthusiasm among lawyers, and longer trial periods, it has lost its popularity in Sri Lanka. Given the objective of the criminal justice to promote social stability and reintegration, a jury system can be of great support. Hence, it is strongly recommended that Sri Lanka reinstates its jury practice in criminal trials.

Keywords: *criminal justice system; criminal procedure; jury system*

A jurisprudential analysis on the obedience to law: Sri Lankan perspective

D. Madhushan

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Jurisprudence carries a set of answers for the question of why people obey the law based on opinions of various legal schools. The purpose of this research is to explore answers from the legal philosophy to describe why Sri Lankans obey laws. The paper develops a set of recommendations for the law-making authorities to consider when they are enacting laws in Sri Lanka's multi-cultural, multi-religious and multi-ethnic social context, where people bear different perceptions about the law. This research uses a mixed method of both qualitative and quantitative research methods. The quantitative element of the research will gather responses from the public concentrated on aspects such as, the general public ideology of law, necessity of law for Sri Lankans, the focal point of compliance to laws, law's ability to serve the intended ends, law's ability to command obedience of people, general view on the existing legal framework/system of the country and effectiveness of the current legal system to serve justice. It is of utmost importance to identify the reason for compliance with the law and obedience to law for an effective legal functioning. Also, the law has to fulfill the desires of the people serving as a tool of social engineering. In the diverse religious context of Sri Lanka, contours of morality play a huge role in compliance and obedience. The paper also analyses aspects such as fear of sanction when the law is violated regardless of any morality.

Keywords: *faith of law; fear of sanction; morality; obedience; public ideology*

Doctors under a microscope: Nuances of law in literature

D. S. Medawatte

Department of Public & International Law, University of Colombo, Sri Lanka

Interdisciplinary study of law and literature is critiqued as possessing ‘controversial’ ‘political’ ambitions. Nevertheless, literature’s take on socio-political and socio-legal factors affecting the contemporary realities may aid one to understand the ‘rationale’ for the existence of particular laws or the ‘necessity’ of introducing new laws. In the Sri Lankan context, the interdisciplinary study of law and literature remains in its foetal stage, thereby providing a hitherto uncharted territory of abundant resources that can be delved into by those interested in exploring both ‘law as literature’ and ‘law in literature’. In this paper, an attempt has been made to assess the sufficiency of laws in Sri Lanka to regulate medical negligence, experimentation, medical research, and the private medical practice of doctors with reference two short stories - ‘*Disonchinahamy*’ and ‘*Gamanaka Awasaanaya*’ - selected from Gunadasa Amarasekere’s short story collection entitled ‘*Ektamen Polowata*’. This selection was influenced by two fundamental reasons. Firstly, both stories belong to Amarasekere’s second generation writings which are socially connected with the lived realities of people, whereas his first-generation writings, belonging to ‘*Peradeniya School of Thought*’, have been regarded as ‘superficial’. Secondly, both stories assess the lives of two doctors, who, when scrutinised microscopically within the covert plot of the stories, violate fundamental rules of conduct and professional ethics applicable to medical professionals. In the above light, the stories are assessed with reference to case law and existing regulatory framework pertaining to medical professionals, with intent to assess whether contemporary issues concerning the medical profession and ethics can sufficiently be regulated by law.

Keywords: *law in literature; medical practice; regulations*

The ownership of land in Sri Lanka: Registration of documents vs. registration of title

R.A.H. Menaka

Department of Private & Comparative Law, University of Colombo, Sri Lanka

This study is based on the system of Land Registration in Sri Lanka. The greatest advantage of land registration is that a person who is about to purchase or deal with the property, in any way, knows how far it was previously involved. This objective of land registration could be achieved either by registration of deed or registration of title. This paper explores the scope and contours of the principles underpinning the enactment of the Registration of Documents Ordinance No. 23 of 1927 (RDO) and Registration of Title Act No. 21 of 1998 (RTA) and engages in a critical analysis of their substantial provisions as to whether such provisions serve the desired objectives and their merits. The research question is whether the existing deed registration system and the title registration system of Sri Lanka adequately address the present needs of the country. In doing so, the paper examines four important issues such as, a) what would have been the objective of the deed registration system and title registration of Sri Lanka, b) what is the objective of the existing deed registration and title registration system as intended by the lawmakers? c) does the RTA obviate the problems identified under the RDO? d) If yes, to what extent and if not, what should be the objective of the title registration system in Sri Lanka? The research focuses on, to what extent the deed registration system and title registration system in Sri Lanka serve the desired rationale and objective? This research argues that a more nuanced approach is required to ensure land rights in this country. In doing so, the author focuses on the past experience of the country and a trade-off for land title registration. The design of the research is mainly qualitative.

Keywords: *blanket approach; registration of documents; registration of title; system of land registration; trade-off*

Judicial bias and injustice as depicted in the Buddhist *Jataka Tales*: A comparative analysis of ancient morality and modern legal standards

N. Mendis

Department of Public & International Law, University of Colombo, Sri Lanka

Judges and legal professionals build their individual understanding of legal concepts like judicial bias from their own socio-cultural context. Students of law can discuss the concept of bias in the classroom through guided reading of existing case law, but law teachers can also use fictional stories for a ‘law in literature approach’. Such pedagogical discussion of stories can be particularly compelling if it corresponds to cultural and historical literature already embedded in the consciousness and experiences of students. For this initial research, Buddhist Jataka Stories have been chosen since they are some of the first stories which many Sri Lankan children experience as a teaching-learning tool on moral values. Furthermore, some of the Jataka Tales are also archetypal stories which have echoes in fables of other religious tales in Jewish, Christian or Hindu literature, and thus they have a universal appeal. The key research question is whether there are Jataka stories which depict judicial bias in a similar way to how it is seen in the modern legal framework. The sub questions include a.) What kinds of bias are depicted in the stories and do they correspond to modern classifications? b.) What are the consequences for the biased judge according to the story? c.) Is the ideal situation of ‘lack of bias’ and/or a process for the correction of the bias described in the story? The initial research of the texts identified relevant Jataka Stories, including the *Kukkura Jataka* (No.22), *Bharu Jataka* (No.212), *Dharmadhvaja Jataka* (No.219) and *Padamjali Jataka* (No. 246). It is argued that using culturally relevant stories can help in clarifying the nature of judicial bias when learning the law and generate further discussion and research on the nature of judicial bias and on the use of literature in law teaching.

Keywords: *Judicial Bias; jataka tales; law in literature*

Combating money laundering: Is Sri Lanka doing enough to safeguard its financial institutions?

W.I. Nanayakkara

Department of Commercial Law, University of Colombo, Sri Lanka

The illegitimate use of banking and other financial channels by those with malevolent intention, for safety of wrongfully accumulated wealth is referred to as money laundering (ML). It is considered a global threat and its ramifications has drawn international attention. Due to technological advancements in globalization, ML is easily committed, especially via financial systems with weak controls, undermining the integrity of financial institutions. The negative repercussions of this adverse phenomenon are difficult to quantify and has the effect of stunting the overall financial stability and viability. In the new era of economic transactions, the creativity of criminal mind competes to evade the controls in place, compromising the existing structures of economic and financial security. In this paradigm, a strict and effective legal framework, which facilitates a sustainable economic practice with checks and balances to efficaciously negate the threat has become imperative. Sri Lanka was ahead of a number of South Asian countries in passing necessary legislation to prevent ML and Countering Financing of Terrorism (CFT). Despite these initiatives, cases have been reported of perpetrators attempting to evade the law and seek refuge for the ill-gotten money. More recently, Sri Lanka (SL) has made advances, particularly in the legal spheres of administrative changes in the prison procedures, seizing of assets and other measures with various compliance obligations have been introduced in the right direction with the objective of rooting out the perception that Sri Lanka is in fact a facilitator of money laundering. This research investigates the impact of money laundering on financial sector and measures taken by financial institutions to suppress the illegal money inflow into the financial system, to guarantee a safe and sound financial service to the nation and assure long term sustainability of the financial sector. The study explores the importance of combating ML and the legal framework related to anti-money laundering in Sri Lanka. The international perspective and the global responses in pursuance of eliminating this crime is examined.

Keywords: *countering financing of terrorism; financial institutions; money laundering; regulation*

**Potential use of the concept of trust to ensure benefit-sharing in TK-based innovation:
Proposals for Sri Lanka**

N. S. Punchihewa

Department of Commercial Law, University of Colombo, Sri Lanka

At present, benefit-sharing in Traditional Knowledge (TK) based innovation is hotly debated and has come to the centre-stage of international and domestic intellectual property (IP) discourse. As many other South and East Asian jurisdictions, Sri Lanka is a TK-rich country. In recent years, a number of incidences of misappropriation of Sri Lankan TK by multinational companies have attracted attention among legal and traditional communities. However, there is no adequate legal framework that provides a fair and equitable benefit-sharing mechanism, sparing real owners from the exploitation of TK. Existing legal regimes such as customary laws, contract law, and IP are neither adequate nor satisfactory. Therefore, there is a compelling need to explore an alternative approach to address the issue of benefit-sharing. Emerging experience from South African jurisdictions show that the tension created by ‘clash of two worlds,’ namely the traditional communities and outside users of TK, would be minimized by using the concept of trust. Arguably, the principles of equity with its central concept of trusts provide a sound foundation to address this contentious issue. The core principles of trusts focus on the beneficiary which will give maximum flexibility to national authorities in protecting the desired generator communities of TK. The three main legal mechanisms of trusts: express trusts, charitable trusts, and constructive trusts, will be of particular use to give effect to the principles of protection. Trusts mechanism provides for the imposition of rights, duties and liabilities that are essential in the protection of TK. The primary purpose of this research is to examine from legal and policy perspectives the appropriateness of the concept of trusts as an instrument of benefit-sharing in Sri Lanka. Further, legal reforms will be proposed based on successful experience from other countries. The potential use of the trusts concept as a tool for benefit-sharing is currently being discussed in the context of drafting of the National Policy on TK.

Keywords: *concept of trusts; innovation; Traditional Knowledge*

Gendering ‘the Legal Complex’: Women in Sri Lanka’s legal profession

D. Samararatne

Department of Public and International Law, University of Colombo, Sri Lanka

This paper focuses on women as a distinct category within the ‘legal complex’ in Sri Lanka. Literature on ‘the legal complex’ in South Asia has, thus far, considered the Bar in general in understanding its relationship with other actors in the complex. This paper expands the concept to reveal the complexity and the diversity of the Bar and its implications for the ‘legal complex’ by drawing attention to the experiences of women within the legal profession. Traditionally, the profession has been perceived to be male dominated leading to the low visibility of women. A significant change has taken place over the last two decades in that a high proportion of women are joining the legal profession due, among other things, to their higher performance at secondary level examinations in schools. The higher number of women entering the profession is viewed as a changing condition within the legal complex in Sri Lanka. Within this context, this paper explores the following questions. What were the internal structures of the profession that the older generations of women lawyers encountered as they entered the profession and as they took up positions of leadership? In what ways was the ‘culture(s)’ within the legal profession patriarchal, if it was at all? In what ways, if any, did the entry and advancement of women impact these internal structures of the legal profession and its culture(s)? And what can be learned from these experiences in predicting the future trajectory of the legal profession? This paper draws upon interviews with pioneering women lawyers in Sri Lanka, a statistical analysis of the actual number of women in the different legal institutions and archival research in seeking to answer these questions.

Keywords: *legal complex; legal profession; Sri Lanka; women and the legal profession*

Reflection on job security of probationers in the private sector in Sri Lanka

A. Sarveswaran

Department of Private & Comparative Law, University of Colombo, Sri Lanka

In the private sector, uncertainties prevail with regard to probationers. This is particularly evident in the instances of confirmation of service at the completion of the probationary period, extension of probationary period, assessment of the performance of probationers, requirement to disclose expectations during the probationary period, application of *contra proferentem* rule to probationary clauses and the question whether probationary employment could be terminated without giving reasons or having reasons. In *Jayasiri Lankage* case, the Supreme Court deviated from the principle that probationer will continue in probation unless and until confirmed and held that, “equity will regard as done what ought to be done with regard to confirmation of probationers who have satisfactorily completed their probationary period.” In *State Distilleries Corporation* case, the Supreme Court held that an employer cannot rely on undisclosed expectations to terminate the services of a probationer. In this case, the Supreme Court emphasized the importance of having reasons for termination of services of probationers. In *Parakrama* case, the Supreme Court ordered seven years salary as compensation to a probationer although non-confirmation of his services was conceded by the Court. The principles developed in these cases promote job security of the probationers. However, the judicial trend failed to continue to promote job security of probationers. After the *Jayasiri Lankage* case and the *State Distilleries Corporation* case, the Supreme Court delivered its judgment in *Brown and Company* case with regard to probationary employment. However, in *Brown and Company* case, the Supreme Court had overlooked its judgments in *Jayasiri Lankage* and *State Distilleries Corporation* cases and cited the cases that followed the traditional principles favouring employers’ freedom. An examination of relevant cases reveals that the judiciary is not consistent in developing legal principles with regard to job security of probationers.

Keywords: *confirmation; job security; probationers; termination*

The interdependence between economic policy and corporate law: Study of certain successful theories

S. Segarajasingham

Department of Commercial Law, University of Colombo, Sri Lanka

The application of economic principles affects various laws; corporate law is no exception. Economists say that economic analysis of law gives a scientific prediction and it is best suited for corporate law. The 18th century writing of ‘Wealth of Nations’ by Adam Smith analyses the economic effects on mercantile law and during his time corporate law was not well developed. All business entities are generally referred to as ‘firm’ which in economics terms would mean ‘organizational and productive entity’, ‘collection of non-human assets’ and ‘institutional device’. Many economic concepts have a direct impact on corporate law. Corporate law is an economic structure. From an incorporation of a company to its winding up, corporate law is affected or influenced by economic concepts. The underlying concept of limited liability in company law has its close links with economic law and it is often criticized by economists stating that the whole concept is illogical. The concept of equity finance has transformed into economic capital where the concept of risk management comes to play. The duties of directors under modern law directly or indirectly expect them to work with the aim of achieving profits for the company. This turns the company into an economic fiction rather than a legal fiction. The emergence of stakeholder concept and corporate social responsibility complements to the blending of the two areas of the law. There is also an increase in capital market transactions which exist on the economic premise of supply and demand. This research explores the links between economic law/policies and corporate law (in selected areas); to what extent economic law/policies have their impact on corporate law and whether the influence of economic law/policy is shaping corporate law or *vice versa*. Research reveal that the concepts of economic law/policies have its roots in corporate law from its origin although it was not visible at inception. It is seen that economic concepts have always been promoting the development of corporate law and that it is the economic force that paved way for the development of corporate law.

Keywords: *corporate law; economic law and policies*

International law pedagogy in Sri Lanka at the undergraduate level: A proposal to integrate an Asian perspective to the curriculum

W. Seneviratne

Department of Public & International Law, University of Colombo, Sri Lanka

This research paper examines the possibility of integrating an Asian perspective to international law pedagogy at the undergraduate level in Sri Lankan law schools. The crux of the research is: ‘whether teaching international law should be limited only to discussing the history and the principles of international law and whether it should integrate an analysis of theories from an Asian perspective.’ It adopts a mixed research method, that includes both primary and secondary data with a case study approach. Specific objectives are to examine the pedagogy of international law in Sri Lankan law schools, to reflect on contents and approaches of current international law teaching, to analyze the different perspectives that could be used to assess principles of international law and to recommend introducing Asian approaches of teaching the subject. Some Asian international law scholars approach fundamental principles of international law from perspectives based on values and beliefs attributable to the Asian region. Sri Lankan Law schools are not sufficiently exposed to this dynamism arising in Asia. Hence, there remains a gap in international law pedagogy in Sri Lanka, which is to teach the subject from a non-Eurocentric perspective. This requires introduction of new teaching methodologies to motivate the students to evaluate international law principles from an Asian perspective; also, to discuss topics of other law subjects from an international law perspective inspired by an Asian approach. The research proposes a model curriculum for Sri Lankan law schools to fill this gap by invoking insightful thinking from a range of Asian and ‘Third World Approaches to International Law’ (TWAIL)’. It attempts to bring the undergraduate level international law pedagogy in Sri Lanka to be in par with the emerging global and regional dynamics.

Keywords: *asian perspectives; international law pedagogy; TWAIL*

Threats to personal reputation in the internet age: Impacts of defamation law of Sri Lanka in social networking

D. Suthakar

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Litigation involving Internet Service Providers (ISPs), web hosts and social networks is new to Sri Lankan Law. Social media is providing online web services which allow consumers to participate in social networking. It has unique potential to promote free expression and access to information, compared to conventional media. The number of consumers of social media has increased rapidly in Sri Lanka since it is an accessible means of communication. However, the growth in the use of social media brings with it a number of legal issues. The question arises whether laws in Sri Lanka are sufficient to regulate defamatory statements on social media so as to restrict the defence of free expression. To answer this question, this paper analyses the rights and remedies available for users and liabilities of wrongdoers, while focusing on whether the liability is imposed only on the person posting, or if it includes the person who is tagged. The objective is to examine the relationship between the principles of free expression and personal reputation in the context of social media. The research is qualitative in nature. The conclusion reached is that social media is a rather recent concept to the Sri Lankan legal system. This area of law is largely under-developed. It is a real challenge to the law enforcing authorities to solve the issues created by advent of technology. Legislation should ensure that users should know the extent of free expression since most believe that their profiles are their private domain. The law should specify whether the ISPs and social media are liable for the content created by the users. Making them liable for the wrongs of its consumers could badly affect the growth of social networking. Hence, it is recommended that laws should be duly developed to capture such technological advancements.

Keywords: *defamation; delictual liability; free expression; personal reputation; social media*

A critical analysis of the Land Development Ordinance and related international legal standards

G.I.D.I. Udani

Department of Private & Comparative Law, University of Colombo, Sri Lanka

As a fundamental obligation of being a State party to the Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW), Sri Lanka is obligated to abolish all laws, policies and practices which reinforce the patriarchal roots of gender-based discrimination against women. However, some provisions included in the Land Development Ordinance No. 19 of 1935 of Sri Lanka (LDO) violate the core principles of gender equality, non-discrimination, and State obligations, especially the principle of primogeniture of male descendants still couched in LDO, in relation to the State land succession. Although, gender equality is guaranteed by the Articles 12 (1), and 12 (2) of the Constitution of Sri Lanka, section 48 (A) and the rule (1) of the third schedule of the LDO demonstrate a situation where female relatives are discriminated against in succeeding to the state lands by giving preference to the male relatives, in the absence of nomination. This paper explores the failure of the country to eliminate discriminatory legal provisions included in the LDO. The main research objective is to highlight the State obligation of Sri Lanka to respect, protect and fulfil the constitutional guarantees, international treaty obligations and commitments towards achieving Goal 5 of the SDGs in terms of guaranteeing gender equality in property rights. This study recommends the repeal of the discriminatory hierarchy in the LDO, which favours males as against females. The jurisprudential underpinning of this research will be established by the Feminist school of thought. This is a qualitative research, mainly carried out with reference to secondary data such as legislation, case law, international conventions, and academic writing.

Keywords: *CEDAW; gender equality; Land Development Ordinance; non-discrimination; state obligation*

Beauty or beast? A critical review of the regulation of cosmetics in Sri Lanka

P.S.P.G. Vithanage

Department of Commercial Law, University of Colombo, Sri Lanka

Everyone likes to look nice and young. Having considered the Sri Lankan consumer patterns will make anyone realize that the trend is more towards being fair and artificially beautiful than to protect the natural beauty. Exaggerated marketing strategies and irresponsible recommendations by well known personalities have accelerated the usage. Despite of gender, people visit saloons and get subjected to treatments using unregulated and untested cosmetic products. Mushrooming beauty parlours are allowed to run without proper registration process and continuous monitoring of a responsible authority. Therefore, regulation of cosmetics has created a loophole that is mostly misused in Sri Lanka. This research is conducted based on the main question; whether regulation of cosmetics in Sri Lanka is at a satisfactory level? The objective of this research is to critically examine the existing framework for regulating cosmetics in Sri Lanka and to suggest a suitable and effective legal framework where both the interests of consumers and industry are protected. This research utilizes a mixed method in which both qualitative and quantitative researches are carried out based on primary and secondary sources. Comparative jurisdictions of USA, UK, Australia, China and Malaysia were studied in suggesting recommendations. Considering the observations, it can be stated that the existing legal framework to regulate cosmetics in Sri Lanka is not effectively implemented. As a result, consumers, manufacturers, importers, sellers and owners of beauty parlours are not properly aware of their rights and responsibilities under the existing laws and regulations. Therefore, More effective legal framework, which includes a properly enacted legislation addressing matters connected to cosmetics, needs to be brought in creating a safer and quality consumer culture in Sri Lanka.

Keywords: *consumer rights, cosmetics, imported products, regulation of cosmetics*

A search for law relating to maintenance obligations in respect of needy orphaned youth: A rights-based approach based on the theory of necessity

R. Wijeyesekera

Department of Private & Comparative Law, University of Colombo, Sri Lanka

Presuming that children are not capable of taking care of themselves, law imposes a legal duty on parents or any other legal guardian to maintain their children. Where parents fail, the state under its authority of *parents patriae*, take over the duty to support the child. The purpose of child support is to provide for the welfare of an offspring who is incapable of supporting himself or herself. Obligation of support contain features of private law as well as public law. The Maintenance Act No. 37 of 1999 of Sri Lanka demarcates twenty five years as the point of departure from parental support, extending parental obligations of support beyond childhood of their offspring. However, the law is silent with regard to support obligations in respect of youth leaving institutional care when they reach nineteen years of age. The forced transition from institutional care to unsupported and unstructured lifestyle can be extremely challenging for these young men and women, especially for those with disabilities, and can be worse for female adolescents. Sri Lanka National Youth Policy is silent on this issue. This legal lacunae violates the right to equality and non-discrimination of hundreds of youth who leave alternative care annually. Analysing the possibility of applying the doctrine of capacity to youth leaving alternative care, the paper proposes extension of the state's *parents patriae* to them, through statutory reform and extra-legal state interventions, guaranteeing them the fundamental rights to equality and non-discrimination, ensuring opportunities to develop their capabilities to live the life one values.

Keywords: *maintenance; necessity; orphans; youth*

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16 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF MANAGEMENT AND FINANCE**

Dr. M.P.P. Dharmadasa



I am delighted to send this message for the Annual Research Symposium – 2018 of the University of Colombo.

The Faculty of Management and Finance integrates the faculty sessions of the Annual Research Symposium with the Annual International Research Conference on Management and Finance (IRCMF) organised by the Faculty which will be held on 16th November 2018. A growing body of research is vital for management practices and for improving organizational outcomes. Certainly, this type of a conference not only brings all the researchers to one platform, but it also inculcates the research culture among the fraternity, thereby contributing to the development of the nation. In this light, IRCMF strives to create a research culture among academics and it is a platform for academics to discuss and debate scholarly dilemmas from different theoretical, methodological and practical lenses by bringing different ideologies under one roof to provide opportunities to exchange ideas face to face and to establish research relations. The abstracts submitted here are fitted with the overarching objective of our research symposium and underwent a peer reviewed process to maintain quality.

I am sure that the symposium and conferences of this type will inculcate the much needed research culture among the academics and trigger interactions among researchers to exchange ideas of recent advances in the area of management. I take this opportunity to thank the staff, reviewers and the organising committee for their contribution in successfully organising and managing this event.

I wish the Annual Research Symposium - 2018 of the University and the Annual International Research Conference on Management and Finance (IRCMF) - 2018 of the Faculty a grand success.

FACULTY OF MANAGEMENT AND FINANCE

PROGRAMME

16 November 2018

07.45 a.m.	Registration
08.30 a.m.	Arrival of Guests
08.35 a.m.	National Anthem and Lighting of the Oil Lamp
08.40 a.m.	Welcome Address Dean, Faculty of Management and Finance Dr. M.P.P. Dharmadasa
08.50 a.m.	Address by the Chief Guest Vice Chancellor, University of Colombo Senior Professor Lakshman Dissanayake
09.00 a.m.	Address by the Guest of Honour
09.10 a.m.	Guest Speech
09.20 a.m.	Keynote Speech Professor Jason D. Shaw
10.00 a.m.	End of the Inauguration Ceremony and Morning Tea
10.30 a.m.	Commencement of Parallel Sessions
12.45 p.m.	Lunch Break
02.00 p.m.	Industry Dialogue
04.00 p.m.	Plenary Session
04.15 p.m.	Award Ceremony
04.30 p.m.	Vote of Thanks
04.35 p.m.	Concluding Remarks

INTRODUCTION TO THE KEYNOTE SPEAKER

Jason D. Shaw, PhD.

*Chair Professor of Management & Head, Department of
Management and Marketing
Hong Kong Polytechnic University*



Jason D. Shaw is Yeung Kin Man Professor in Business Administration, Chair Professor of Management, Head of Department of Management and Marketing, and Director of the Centre for Leadership and Innovation in the Faculty of Business at The Hong Kong Polytechnic University. He received his Ph.D. from the University of Arkansas in 1997. He is the Editor of Academy of Management Journal (2016-2019). His research has appeared or been accepted for publication in the Academy of Management Journal, Academy of Management Review, Journal of Applied Psychology, Organization Science, Strategic Management Journal, Organizational Behavior and Human Decision Processes, Personnel Psychology, and Journal of Management, among other scientific outlets. He has served or is serving on the editorial boards of Academy of Management Journal, Academy of Management Review, Journal of Applied Psychology, Personnel Psychology, and Journal of Management, among others. He has been invited for visiting scholar positions and other speaking engagements in China, Finland, Austria, Denmark, Norway, England, Germany, Hong Kong, Spain, Israel, Macau, Taiwan, Singapore, Australia, Canada, Belgium, Thailand, and the USA. Prior to his appointment at PolyU, he was the Curtis L. Carlson School-wide Professor in the Carlson School of Management at the University of Minnesota, the Clark Material Handling Company Professor at the University of Kentucky, an assistant professor at Drexel University, an analyst for the Boeing Company, and the Editor of Academy of Management Journal (2016-2019).

FACULTY OF MANAGEMENT AND FINANCE

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Antecedents of organizational citizenship behaviour in the semi-government sector of Sri Lanka

D. Athulathmudali¹, N. N. J. Navaratne²

*¹Department of Human Resources Management, Faculty of Management and Finance,
University of Colombo, Sri Lanka*

*²Department of Human Resources Management, Faculty of Management and Finance,
University of Colombo, Sri Lanka*

This is a descriptive study that examined the relationship between four antecedents and organizational citizenship behavior (OCB) in a Sri Lankan semi-government context by selecting 109 employees from two esteemed organizations in Sri Lanka. Three individual level antecedents: self-esteem, emotional intelligence and job satisfaction and organizational level antecedent: transformational leadership were identified as the four antecedents based on previous literature. The relationship between the four antecedents and OCB including the level of OCB was studied pertaining to the two organizations. The empirical data were gathered through a survey questionnaire and analyzed using the correlation and regression analysis of SPSS 21.0 version. The results showed a high level of OCB with a mean value of 4.39. The self-esteem, emotional intelligence, job satisfaction and transformational leadership were positively and significantly related with OCB in the selected two organizations. It was further revealed that all four antecedents individually as well as collectively have a positive relationship with OCB. It is concluded that if employees have a high level of self-esteem, emotional intelligence, and job satisfaction together with transformational leadership style of their supervisors, they tend to show high level of OCB in the forms of pro-social, voluntary, and helpful behaviors.

Keywords: *Emotional Intelligence; job satisfaction; Organizational Citizenship Behavior (OCB); self-esteem; transformational leadership*

Job satisfaction of field officers of the tea industry in Sri Lanka: A case study of the Sri Lanka Tea Board

N. Abeyratne¹, K. A. S. P. Kaluarachchi²

¹District Project Officer, Sri Lanka Tea Board

*²Department of Management and Organization Studies, Faculty of Management and Finance,
University of Colombo, Sri Lanka*

This study examined the job satisfaction of field officers at the Sri Lanka Tea Board. It analyzed the impact of selected factors of job satisfaction (five factors of Hackman and Oldham model) on job satisfaction of the field officers. Overall, the study found a positive impact of the five factors on the level of job satisfaction of field officers. According to the results of the correlation analysis, task significance, skills variety, autonomy and feedback factors evaluated with the field officers positively and significantly associated with their level of job satisfaction. But the factor of task identity evaluated with them did not significantly associated with their level of job satisfaction. All five factors jointly influenced the level of job satisfaction of the field officers as per the regression analysis. The detailed analysis based on the answers given to questions of the questionnaire by the respondents showed that the acceptance by society with the job, opportunity to serve people, way the superiors handle work, ability to be fully occupied in the job, authority exercised in the respective jobs, support from co-workers, working conditions, other benefits, variety in the nature of work, feeling of accomplishment, freedom to work independently, recognition and appreciation from superiors, and the chance to use own abilities are most important aspects contributing to the job satisfaction of field officers.

Keywords: *field officers; job satisfaction; Sri Lanka Tea Board; tea industry*

**Organizational culture and user adoption of ERP systems:
A case study of a leading food manufacturing company in Sri Lanka**

V. S. Matharaarachchi¹, W. P. G. De Alwis²

¹*Faculty of Management and Finance, University of Colombo, Sri Lanka*

²*Former Associate Professor, Faculty of Management and Finance, University of Colombo,
Sri Lanka*

The aim of this study was to explore how culture of a leading food manufacturing company in Sri Lanka has influenced its Enterprise Resource Planning (ERP) system implementation. The study was based on the interpretivism research philosophy, case method and qualitative methods of data gathering and analysis. Hofstede's six-dimensional model of organizational culture and the Technology Acceptance Model (TAM) of Davis were used as the theoretical lenses. Semi structured and unstructured interviews and documentary evidence were used as major data collection instruments. Thematic analysis was used to gain rich understanding of user adoption of the ERP system. The quality and trustworthiness of qualitative data used in the study was addressed with criteria proposed by Lincoln and Guba. In addition, findings were linked appropriately with the reviewed literature for the study. The study revealed that the current level of usage of ERP system in the company is about 30% hence it has not leveraged its full potential to achieve the expected level of usage of the system. The study found twenty-two sub elements which have caused low user adoption of the ERP system. The low user adoption was mainly because of that culture of the company has impacted negatively on the ERP system implementation. The negative culture of the company was evidenced with unfavourable beliefs, attitudes, assumptions, norms, values and behavioural patterns of its employees which hindered their support towards the ERP implementation. In addition, the study found lack of top management support, poor leadership style, poor change management, and lack of training and discipline of users have also caused low user adoption of the ERP system.

Keywords: *ERP System; leading food manufacturing company in Sri Lanka; organizational culture; user adoption*

The effect of equity market timing on the capital structure of listed companies at the Colombo Stock Exchange

H.M.N.K. Mudalige,¹ D.L.P.M. Rathnasingha²

¹*Department of Business Finance, University of Peradeniya, Sri Lanka*

²*Department of Finance, University of Colombo, Sri Lanka*

This study attempted to examine the effect of equity market timing on capital structure of listed companies at Colombo Stock Exchange (CSE) with data gathered from published annual reports from year 1994 to 2014. Book leverage and market leverage taken as dependent variables where market to book ratio and external finance weighted average market to book ratio were taken as proxies for market timing. Data were analyzed using descriptive statistics and regression analysis. Four regression models were used to capture short-term and long-term effects. Usage of book leverage value provided contradictory findings compared to the market timing theory while showing a positive relationship between market to book ratio and external finance weighted average market to book ratio. These findings are inconsistent with previous research which argued that developing economies have the effect of concentrated ownership structures on share market performance. In terms of financing activities, average net equity issues were higher than average debt issues only in the following year after the Initial Public Offering (IPO). Usage of market leverage provided a negative relationship between market timing and capital structure, even though results are not strong as the theory predicts. The findings also support the pecking order theory where it states that firms prefer debt over equity. Therefore, it cannot be verified that the companies listed in CSE tend to increase the equity through issuing new shares when their market value for shares are high.

Keywords: *capital structure; Colombo Stock Exchange; market timing; share price*

FACULTY OF MEDICINE



Engaging with the Digital World for the Advancement of Medicine

9 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF MEDICINE**

Professor Jennifer Perera



All over the world digital technology has revolutionized higher education. Similarly, the current generation of students who are engaged in higher education are eager to engage in technology based learning. The universities in the meantime are trying to improve the capacity to provide such services.

There are many modes by which digital technology is used in higher education to optimize learning. Video lectures are becoming the norm and on-demand access to lectures and presentations supplement just in time learning. These are not only used for conventional learning but also for an expanding the array of learning modes including flipped, blended, and online learning. To encourage deeper learning approaches by students the learning spaces need to be redesigned to accommodate active learning. Smart classrooms is one approach to achieve this.

Digital pedagogy will also provide opportunities for collaborative learning as these approaches encourage students and educators to work together in an interactive environment that focuses on developing solutions to real-world challenges. Further adaptive learning technologies have to be incorporated into digital learning platforms which can adjust to an individual learner's needs and progress. Smart devices have become essential components to enable portable learning, and educational apps are an important element in creating a flexible and personalised online learning experiences.

In the near future, development of natural user interfaces which allow users to interact with technology by using natural physical gestures such as taps, swipes, body movements, facial expressions will make learning a real-life experience for learners.

During digital education innovations, a challenge that one may encounter is the resistance to use of new instructional technologies and resources by faculty, which may be overcome in the presence of evidence of benefit. It is imperative to measure the outcome of such interventions. Thus researching into the actual impact of digital initiatives on student learning and outcomes is an important component that should not be ignored to enable us to provide evidence to justify use of high cost technology in the student learning experiences.

The availability of relevant infrastructure in mobilizing learning innovations is another challenge we encounter in resource poor environments. The infrastructure must include instructional support assistance for faculty. The faculty who leverage digital pedagogy in their instructional activities should be rewarded meaningfully to make it a successful venture.

It is important to realize that the use of technology in learning environments is inescapable. Therefore it is important to look ahead and work towards making learning a pleasurable experience to the current generation of ‘wired’ students.

FACULTY OF MEDICINE

PROGRAMME

9 November 2018

8.15 am	Registration
8.30 am	Breakfast & Tea
9.30 am	Academic Procession
9.40 am	National Anthem and Traditional Lighting of the Oil Lamp
9.50 am	Welcome Address by the Chairperson, Faculty of Medicine Annual Research Symposium
9.55 am	Address by Professor Jennifer Perera, Dean, Faculty of Medicine
10.00 am	Address by Chief Guest, Senior Professor Lakshman Dissanayake Vice Chancellor, University of Colombo
10.10 am	Keynote Address, “The Emerging Digital Health Ecosystem of Sri Lanka – driven by frugal innovation, a goldmine for Health and Medical Researchers” Professor Vajira H. W. Dissanayake Chair Professor of Anatomy; Director, Human Genetics Unit; Chairperson, Specialty Board in Biomedical Informatics, University of Colombo
10.50 am	Vote of Thanks by Dr. Kalum Wetthasinghe Secretary, Faculty of Medicine, Annual Research Symposium
11.00 am	Research Symposium 1

INTRODUCTION TO THE KEYNOTE SPEAKER

Vajira H. W. Dissanayake

Professor, Chair Professor and Head, Department of Anatomy, University of Colombo



Professor Vajira H. W. Dissanayake is the Chair Professor and Head of Department of Anatomy; Director of the Human Genetics Unit, and the Chairperson of the Specialty Board in Biomedical Informatics of the University of Colombo, Sri Lanka. He was the Founder Secretary General of the Health Informatics Society of Sri Lanka (HISSL) on 18 November 1998 of which he is now the President. He is a Past President of the Sri Lanka Medical Association (SLMA); a Board Member of the Global Genomic Medicine Alliance (G2MC); a Board Member of the Forum for Ethical Review Committees in Asia and the Western Pacific (FERCAP); the President of the Commonwealth Medical Association (CMA); the Chairman of the Commonwealth Centre for Digital Health (CWCDH); and the President Elect of the Asia Pacific Association for Medical Informatics (APAMI). He was elected a Fellow of the National Academy of Sciences of Sri Lanka (NASSL) in 2013 in recognition of his outstanding contribution to the field of Medicine in Sri Lanka.

KEYNOTE ABSTRACT

The Emerging Digital Health Ecosystem of Sri Lanka – driven by Frugal Innovation, a Goldmine for Health and Medical Researchers

V. H. W. Dissanayake

Chair Professor of Anatomy

Director, Human Genetics Unit

Chairperson, Specialty Board in Biomedical Informatics, University of Colombo

At the turn of this century when it was recognized that Internet and other related technologies could be used in the healthcare industry to improve access, efficiency, effectiveness and quality of clinical and business processes utilized by healthcare organizations, practitioners, patients and consumers to improve the health status of patients, the world eHealth was coined to refer to such applications. Today with the realization that the scope of the application of such technologies is wider than what could be defined by the term electronic, the term Digital Health has come into being. The academic discipline that underlines Digital Health is Biomedical and Health Informatics.

Sri Lanka embarked on a journey of sustainable Digital Health development in the country by focusing on capacity building in Digital Health with the commencement of the MSc in Biomedical Informatics at the Postgraduate Institute of Medicine, University of Colombo in 2008. This was followed by the commencement of a MD course in Health Informatics with board certification in 2017. Sri Lanka thus became only the second country in the world, after USA, where Health Informatics has been recognized as a medical specialty with board certification. The students and graduates of these courses who are employed as Medical Officers in Health Informatics in the Ministry of Health have been spearheading the development of the Digital Health ecosystem of the country and laid the foundation for an interoperable integrated Digital Health Ecosystem in Sri Lanka.

This ecosystem consists of a system to identify patients uniquely through a personal health number, a master patient index for the country, hospital information systems, public health information systems, systems to support collection of morbidity mortality statistics, as well as systems to monitor people in the community. This ecosystem is driven by frugal, i.e. low cost by highly effective, innovation. In this talk I shall describe the emerging Digital Health ecosystem of Sri Lanka and explain how health and medical researchers could benefit from the large body of almost real-time health and medical data that is now available to them.

FACULTY OF MEDICINE

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Outcomes and complications related to abdominal surgery based on electronic surveillance data from three tertiary hospitals in Sri Lanka

A. U. Abayadeera, S. Sivaganesh, S. Kannangara, D. Weerasekara, M. Wijeyarathne, A. P. De Silva, P.L. Athapattu, G.D.D. Priyadarshani, P.C. Sigera, A. Beane, S. Mirando, R. Haniffa

Department of Surgery, University of Colombo, Sri Lanka

Efficient evaluation of surgical care is essential for guiding service delivery and care quality improvement. Increasingly, electronic surveillance is being used to help overcome challenges of continuous data collection and timely analysis. Following the implementation of a regional surgical surveillance platform in three tertiary hospitals in Sri Lanka, prospective data on all adult patients who underwent elective and emergency abdominal surgery (laparotomy and laparoscopy) was gathered electronically. This abstract describes the outcomes, complications, use of perioperative antibiotics and blood products for patients whose surgical care was gathered through the platform between March 2016 and December 2017. The cohort comprised of 1143 adult patients, of whom, 1035 (92.0%) underwent elective surgeries. Majority were females (79.7%). Mean age was 46.6 years. Surgical cases included obstetrics and gynecology 527 (46.6%), lower gastrointestinal 345 (30.5%) and hepatobiliary 167 (14.8%). Seven hundred and forty-nine patients (65.53%) underwent a laparotomy procedure. Overall mortality at hospital discharge was 2.4%. Of the elective population in this cohort, 984 (95.07%) were prescribed antibiotics in the first 24 hours following surgery. Infection was suspected or confirmed in 145 (14.01%) of cases. Ninety-nine patients (9.57%) received a blood transfusion within the first seven days following elective surgery. Two hundred ninety-one (28.12%) elective patients had one or more reported complication. The findings show that almost one in ten elective patients required blood transfusions and post-operative infection rates are approximately 14%. Gathering the data electronically facilitated this preliminary evaluation of surgical care among this cohort. Further work to standardise infection surveillance is underway. This implementation highlights the potential role electronic surveillance systems can have in evaluating existing surgical care and guiding future research and health service improvement priorities.

Keywords: *abdominal surgery; electronic surveillance; laparotomy; laparoscopy*

The development of a culturally sensitive psychological intervention for Sinhalese undergraduate University students with social anxiety disorder

B. G. R. De Silva¹, P. de Zoysa, ², S. S. Williams ³

¹ *Department of Psychiatry, University of Kelaniya, Sri Lanka*

² *Department of Psychological Medicine, University of Colombo, Sri Lanka*

³ *Department of Psychiatry, University of Kelaniya, Sri Lanka*

University students in Sri Lanka appear to display a high prevalence rate for social anxiety disorder according to preliminary studies. Yet, only a few specific psychological services are available and accessible to this population. The aim of this study was to develop a culturally sensitive psychological intervention for Sinhalese undergraduate university students with social anxiety disorder. The Cognitive Behavioral Group Therapy (CBGT) which is the gold standard in the psychological treatment for social anxiety disorder, was used. Group therapy interventions that had been modified to suit the university students study population were reviewed. Following a discussion with socially anxious university students, an intervention plan was created considering cross-cultural therapy adaptation models, to suit the Sinhala undergraduate university student culture. The intervention program was then subjected to a three-step protocol; The therapy series was assessed for content by a panel of clinical psychologists, The English layout and activity sheets were translated to Sinhala and retranslated to English for accuracy and re-evaluated by a panel of mental health experts for consensus. The resulting psychological intervention constituted of a 12 session CBGT plan that was adjusted to suit the current study population based on the review of existing therapies. The session number was reduced to eight in order to address the suitability of the intervention for undergraduate university students. The activity sheets and the session plan were modified to include culturally and contextually sensitive metaphors and examples from Sinhala undergraduate student culture until consensus was reached. A culturally sensitive series of cognitive behavioral group therapy sessions for social anxiety disorder among Sinhalese undergraduate university students were developed to test for effectiveness.

Keywords: *social anxiety; Sinhalese; undergraduate; psychological intervention*

**Cross-cultural validation of the cognitive styles inventory and an assessment of the
cognitive styles of first year Medical students**

P. de Zoysa¹, S. D. Amarasuriya², N. S. R. Mendis¹, S. Anusha², A. N. T. Weerasinghe²

¹*Department of Psychiatry, University of Colombo, Sri Lanka*

²*Department of Medical Humanities, University of Colombo, Sri Lanka*

Cognitive styles indicate the way individuals process and utilize information. The Cognitive Styles Inventory (CSI) assesses four cognitive styles: Analytic style, where an individual prefers structure and uses linear decision-making process; Intuitive style, which relies on holistic/non-linear thinking/decision-making and uses more intuitive information sources; Adaptive style, which involves a balance of the Analytic and Intuitive styles; and Quasi-Intuitive and Quasi-Analytic styles involving a tendency towards, but not full adoption of the Intuitive and Analytic styles, respectively. Examination of the cognitive styles of learners could help determine if they suit the degree they are pursuing and assist in identifying their educational needs. This research, a part of a larger study, aims to validate and use a Sinhala version of the CSI to examine the cognitive styles of first-year medical students. The CSI was translated to Sinhala and presented to 10 experts in the fields of psychology/psychiatry/counseling, for content (whether each item and overall scale measures the construct) and consensual (appropriateness for target population, cultural-relevance, and retention of conceptual meaning after translation) validation using a Delphi process. The internal consistency and two-week test-retest reliability of validated CSI was assessed among first-year medical students conversant in Sinhala (Time-one: n=106; Time-two: n=84). Time-one data was analyzed to examine these students' cognitive styles. The Sinhala CSI showed good content and consensual validity (consensus of >70% experts), good internal consistency ($\alpha=0.68$) and test-retest reliability ($r=0.68$). Quasi-Analytic (30.2%) style was the most dominant cognitive style followed by the Adaptive style (28.3%). Analytic and Quasi-Intuitive styles were seen in 17% and 19.8%, respectively. Intuitive style was found the least (4.7%). The two dominant cognitive styles of these students lead themselves to the medical curriculum, which requires an analytic learning approach, in addition, a holistic approach in thinking, problem solving characteristic of the quasi-analytic and adaptive cognitive styles, respectively.

Keywords: *adaptive; analytic; cognitive styles; quasi-analytic style*

**Prevalence of nomophobia and its effect on psychological wellbeing in smart phone
using undergraduates of a selected Medical Faculty in Sri Lanka**

N. Gunathilaka, V. J. Meegoda, A. S. Matharage, Y. Mapa

Department of Community Medicine, University of Colombo, Sri Lanka

Nomophobia, the anxiety of being away from mobile phone contact is a specific phobia. Medical undergraduates are more prone to develop nomophobia because of their time constraining schedules and high dependency on smart phones. This study aims to assess the usage patterns of smart phones, prevalence of nomophobia and its effects on some aspects of psychological wellbeing in smart phone using undergraduates of a selected medical faculty in Sri Lanka. A cross sectional analytical study was carried out among 150 medical undergraduates of Faculty of Medicine, Colombo. A self-administered questionnaire including the validated nomophobia-questionnaire was used. The main reason for acquiring a smart phone was to use in case of an emergency and the main use was identified as voice calls. Majority accessed internet for social media and majority checked internet during academic activities mainly to look up study material. The prevalence of nomophobia in the study population was seen as 100.0% with 28.2% having mild, 62.0% moderate and the remaining 9.9% having severe nomophobia. People with higher degree of nomophobia were more frequent internet users, updated software as soon as available, checked smart phone during academics, never switched off their phones, kept their phones near the bed when sleeping, used it while charging, spent more time with the smart phone than with family and friends and was dependant on it to maintain their social identity. A higher degree of nomophobia was associated with decreased sleep quality, waking up due to phantom vibrations, reduced total sleep time and quality, difficulty concentrating on studies, irritability, restlessness, low energy, diminished trans-active memory, difficulty in socializing directly with people, loneliness and unease at public places without a smart phone. A high prevalence of nomophobia, was noted in a selected population of medical undergraduates in Sri Lanka and was associated with lower psychological wellbeing and difficulty in concentrating on studies.

Keywords: *anxiety; internet; Nomophobia, smart phone; undergraduates*

Cadmium and arsenic levels in autopsied kidneys from an urban population in Sri Lanka to identify baseline reference values

S. A. Gunawardena, E. H. M. Ranasinghe, J. W. Gunawardena, P. T. Kaumal

*Department of Forensic Medicine and Toxicology, University of Colombo,
Sri Lanka*

Increasing exposure to toxic heavy metals through environmental pollution is a growing global concern. Bioaccumulation of Cadmium and Arsenic have been postulated by some authors as potential causes for the current epidemic of Chronic Kidney Disease in Sri Lanka. In order to monitor and assess individuals for possible exposure risk over time, it is important to have baseline reference values specific to local populations. Our objective was to describe the levels of Cadmium and Arsenic in the kidneys of autopsied individuals from an urban population in Sri Lanka. Whole kidneys collected during autopsies of 75 residents from Colombo over a period of two years were acid digested and analysed using ICP-MS. Individuals with poisoning and/or kidney disease were excluded. Mean age of the cohort was 54.9 years. M: F ratio was approximately 4:1(61:14). Age range was 18-94 years. 10(13.3%) were young adults(18-30years). 36(48%) were middle-aged (31-60) and 29(38.7%) were old-aged (>60). Renal Cadmium(Cd) and Arsenic(As) levels based on dry weight ranged from 1-111.6µg/g and 0.05–0.32µg/g respectively. Mean Cd levels in males(31.90µg/g) were twice as high as females(19.32µg/g) while mean as levels were similar in both genders(0.10µg/g). The mean as levels increased with age, while the mean Cd levels were highest in the middle-aged category(31.95µg/g) and lowest in the elderly(25.91µg/g). Mean Cd level was higher in male(32.07µg/g) smokers compared to non-smokers (26.96µg/g, P=0.399). However, these differences did not show statistical significance at P=0.05. This is the first reported study that provides renal tissue levels of Cd and As in a Sri Lankan population which could be used as a baseline reference to periodically monitor environmental exposure to heavy metal contaminants. Comparisons with similar studies from other countries indicate that these levels are below toxic limits and show similar trends of bioaccumulation according to age and risk factors such as smoking.

Keywords: *arsenic; autopsied kidneys; bioaccumulation; cadmium; chronic kidney disease*

A case series of rare genetic diseases associated with novel variants

D. Hettiarachchi, N. Nethikumara, S. Pathirana, T.K. Wetthasinghe, V.H.W. Dissanayake

Department of Anatomy, University of Colombo, Sri Lanka

Rare diseases are those disorders that affect 0.065-0.1% of the general population as defined by the World Health Organization (WHO), most of which are heritable and untreatable. There is a dire need for accurate genetic diagnosis of these conditions. This work aims to identify disease causing variants in patients with rare genetic diseases. The aim of this study was to identify contributing genetic variants in previously undiagnosed diseases. This is a case series, conducted at the Human Genetics Unit, FOM, UOC. Whole exome sequencing was performed on extracted DNA on an Illumina® HiSeq 4000 Next Generation Sequencer using the SureSelect® Human All Exon V6 kit. Data analysis was performed using an in-house developed variant calling annotation pipeline. Novel variants were identified and scrutinized using public databases. The conservation and functional impact on the protein were analysed. This was followed by Sanger validation. Once a variant was identified, family members of the proband were screened using Sanger sequencing. Five novel variants were identified as follows: A deleterious homozygous mutation (c.1348A>G) in the LRP4 gene associated with Cenani-Lenz Syndactyly syndrome, a homozygous frame shift mutation in exon 77 of the HSPG2 gene (c.10466_10467insC) associated with Schwartz-Jampel Syndrome (SJS), type 1, a missense mutation in exon 5 of EIF2B4 gene, (c.614C>T) associated with vanishing white matter disease, a missense mutation in exon 3 of NAGLU gene (c.587C>T) associated with Sanfilippo syndrome type B and a homozygous missense mutation in exon 7 of the MFN2 gene (c.587C>T) associated with hereditary motor sensory neuropathy. These five cases showed novel variants which were likely to be pathogenic according to population databases, thus helping us to arrive at a clinical diagnosis and facilitate appropriate treatment options.

Keywords: *novel variant; rare genetic disease; whole exome sequencing*

**Clinico-pathological study of Cutaneous Leishmaniasis caused by *Leishmania Donovanii*
in the North-Central Province, Sri Lanka**

F.H. Riyal, T.N. Samaranayake, A. A. H. Priyani, D. Munidasa, N. D. Karunaweera

Department of Parasitology, University of Colombo, Sri Lanka

Cutaneous Leishmaniasis (CL) is a growing medical concern in Sri Lanka with most patients being reported from Southern and North Central provinces. Remarkably, *Leishmania donovani* species which usually causes Visceral leishmaniasis (VL) in other regional countries mostly causes CL in Sri Lanka. This paper describes the epidemiological and clinical findings in a cohort of patients attending Teaching Hospital Anuradhapura with lesions suggestive of leishmaniasis. Ninety-seven (n=97) skin biopsies were collected from patients attending the dermatology clinic at Teaching Hospital, Anuradhapura. A standard questionnaire was used to collect epidemiological and lesion history data. Weekly follow ups were done with the patients to evaluate the pattern of recovery. The data was analyzed using basic statistical tools in Excel. 86 patients (88.66%) were parasitologically confirmed to have cutaneous leishmaniasis. 62 (71.26%) were males and 24 (28.74%) were females. 39 patients (39/86, 45.3%) had nodules. 15% of the patients sought medical care only when the wound was older than 6 months. 56 (65%) of the patients were either farmers or soldiers. 21 (24%) patients did not engage in any outdoor activities or occupation. Five of these patients (5/21, 6%) were the first to be reported from their neighborhoods. The average number of Sodium Stibo Gluconate (SSG) doses per lesion until complete healing was 12 weeks. Majority of parasitologically confirmed leishmaniasis patients attending Anuradhapura TH were males and were engaging in outdoor occupation types. Five patients were identified to be the first reported from the neighbourhood which may indicate areas where the disease is newly emerging. Case detection by active surveys involving larger populations are recommended.

Keywords: *clinical features; Cutaneous leishmaniasis; healing pattern; L. donovani; skin biopsy*

Acknowledgements: Financial support given by Colombo University Research Grant (AP/2016/3/2/CG/24) and National Institute of Allergy and Infectious Diseases of the National Institutes of Health under Award Numbers R01AI099602 and U01AI136033

Biochemical characterization and insecticide susceptibility of sand flies from selected areas of Sri Lanka

K. P. D. Ruwanika, N. D. Karunaweera, S. H. P.P. Karuaratne

Department of Parasitology, University of Colombo, Sri Lanka

Phlebotomus argentipes is the known vector of *Leishmania donovani*, the causative organism of leishmaniasis. A major challenge of an effective vector control program is the development of insecticide resistance in the vector. To determine the susceptibility and biochemical mechanisms of resistance of *P. argentipes* to selected insecticides. Galgamuwa in North-Central Province and Pannala in North-Western Province of Sri Lanka were selected for sand fly collection. Identification of *P. argentipes* was confirmed using standard taxonomic keys. F1 progeny was essential here to obtain same maturity. Flies were exposed to different concentrations of DDT, malathion, deltamethrin and propoxur and LD₅₀ was determined using mortality curves. Results were validated with the control mortalities using Abbott's formula. For biochemical analysis, esterase assay, glutathione S-transferase assay, oxidase assay and protein assay were performed with individually homogenized sand flies in 80µl of ice cold distilled water. Another set of the population was homogenized in 50µl of ice-cold distilled water for acetylcholinesterase assay. LD₅₀ was determined as 0.6%, 0.7%, 0.007% and 0.016% for DDT, malathion, deltamethrin and propoxur respectively. Resistance was seen at lower concentrations. Most of the flies had protein activity <0.3µmol min⁻¹ mg⁻¹, esterase activity <1.00 µmol min⁻¹ mg⁻¹ and GST activity <0.4µmol min⁻¹ mg⁻¹. All protein, esterase and GST activity were < 0.35 equivalent units of monooxygenase amounts. Over half of this population had <30% residual AChE activity in the presence of propoxur. However, 6.5% had >60% residual activity. The majority of the sand fly population within the selected areas showed susceptibility to insecticides used for control programmes in Sri Lanka. Resistance through high ACHE residual activity was seen in a small percentage of sandflies. Further research is being conducted to ascertain the genetic mechanism behind the susceptibility patterns of Sri Lankan *P. argentipes* to synthetic insecticides.

Keywords: *bio-chemical analysis; insecticide susceptibility; phlebotomus argentipes*

Association between plasma leakage in dengue infection and body mass index in adults

P.C. Sigera, S. Rajapakse, P. Weeratunga, N.L. De Silva, S. Jayasinghe, S. Handunnetti,
S.D. Fernando

Department of Parasitology, University of Colombo, Sri Lanka

Nutritional status, particularly body mass index (BMI), is considered to have a relationship with dengue plasma leakage. However, contradictory findings have been reported besides the fact that very few studies have focused on adults. The study was conducted at the National Hospital of Sri Lanka, from October 2017 to July 2018 to determine the association between BMI and the plasma leakage in dengue patients. Patients with clinically suspected dengue presenting within four days of onset of fever were screened. Dengue NS1 antigen test was used to confirm dengue infection. Patients were categorized as underweight, normal and overweight based on BMI of <18.5 kg/m², 18.5 to <23.0 kg/m², and 23 kg/m² or higher respectively, as recommended for individuals of Asian descent. The Risk Ratios (RR) with 95% of Confidence Intervals (CI) were calculated to measure the risk of developing plasma leakage, among different BMI categories. Plasma leakage was defined as the presence of ultrasound evidence of pleural effusion/ascites and/or pericholecystic fluid, and/or clinical evidence or haemoconcentration. Out of 255 patients screened, 123 (48.2%) were confirmed to have dengue. Forty-five (36.6%) had plasma leakage. There was no significant difference in the increase in the risk of plasma leakage among the overweight group compared to those with normal BMI (RR-1.030, 95% CI 0.63-1.70). There was no significant difference in the risk of plasma leakage between those who were underweight and those with a normal BMI (RR-0.971, 95% CI 0.46-2.04). The stratified subgroup analysis showed no relationship between BMI and the risk of plasma leakage in different age groups (≤ 30 or >30 yrs.) or on gender. However, numbers were inadequate to determine the effect of other confounders. This study concluded that body mass index does not have an association with plasma leakage of dengue patients. Further analysis is required with a larger sample size.

Keywords: *body mass index (BMI); dengue; plasma leakage*

Thinc-IT[®] App for measuring cognitive functions: Ease of use and norms in healthy people in Sri Lanka: A preliminary study

K. D. S. Sirisena, I. A. G. M. P. Gunathilake, V. A. de Silva, R. C. Hanwella

Department of Psychological Medicine, University of Colombo, Sri Lanka

Thinc-IT is a free self-administered mobile application which can be used to measure cognitive functions. It consists of 4 objective tests and a self-reported test of cognitive functions. It has been validated for assessment of cognitive impairment associated with major depressive disorder (MDD). The aim of our study was to establish the range of normal scores in a sample of healthy Sri Lankans and to assess user friendliness of the app in a Sri Lankan setting. The original English version was presented to 20 healthy participants (9 females; 11 males) through an android tablet. Participants were asked to complete the four objective tasks on the app. Mean values and mean errors were calculated. In 3 out of the 4 tasks the mean of the least latency was looked at, whilst in the Trail Making Test (TMT), the mean completion time was assessed. Feedback on user-friendliness and suggested modifications were obtained through a questionnaire. The mean completion time for the TMT was 26.57 seconds, with 2 out of 17 errors noticed while completing the task. The means for the least latency for the Choice Reaction Time (CRT) was 368 milliseconds, 1-Back Test 360 milliseconds and Digital Symbol Substitution Test (DSST) 554 milliseconds with 2/40, 15/40 and 3/62 errors respectively. The ease of understanding the task and instructions, were graded as moderately easy-easy by 90% (18). 15 (75%) suggested translating the app to a native language. 17 (85%) thought that this app will be helpful in the management of MDD. The study provides baseline value on the cognitive functions obtained using the Thinc-IT app among a sample of healthy Sri Lankans. The app can be regarded as a user-friendly tool to assess cognitive impairment in a Sri Lankan setting. Further studies using translated versions of the app in larger and diverse settings are recommended.

Keywords: *cognitive functions; depressive disorder; mobile application*

Use of virtual reality (VR) in the management of specific phobias: A Sri Lankan experience

K. D. S. Sirisena, R. C. Hanwella

Department of Psychological Medicine, University of Colombo, Sri Lanka

Recent development and access of virtual reality (VR) based technologies is now being utilized in the management of anxiety disorders. Now due to its realism efficacy can be ensured in psychotherapy while using VR rather than in vivo or imaginal exposure. Our intention was to look at the clinical utility of using VR technology in managing anxiety disorders, which might be extended to other disorders, and other treatment strategies. A 54-year-old retiree presented with a twelve-year history of phobia of lightning, thunder and hurricanes with avoidance and refusal to travel on a boat. He was initially assessed at ward 59 of National Hospital of Sri Lanka Colombo, A plan to engage the patient in behaviour therapy via exposure was devised with a goal set at exposing himself to aversive stimuli of a hurricane for more than 20 minutes with self-rated anxiety levels at 35%. He was educated about the therapy and a hierarchy of aversive/avoidant situations with self-rated anxiety scores from 0-100. Exposure sessions were arranged with gradual pacing that ranged from sound of rain and thunder which was then followed by using a VR oculus, with the use of publicly accessible videos (through You Tube) to aversive situations. He attended twice weekly sessions for 6 weeks, with [gradual improvement of his anxiety symptoms as per patient perceived anxiety dropping from an initial 80% to 30% in the hurricane video], which was the last item in the hierarchy. Therefore, behavior therapy can be augmented with the use virtual reality (VR), effectively in the management of specific phobias, where the exposed stimuli could be made constant. Its use in other conditions needs further exploration.

Keywords: *anxiety disorders; phobias; virtual reality*

Comparison between the classical salting-out method and a newly developed method in extracting genomic DNA from gram negative bacteria

L. R. Weerakkody, C. Witharana

Department of Biochemistry and Molecular Biology, University of Colombo, Sri Lanka

At present, there are various methods to extract bacterial genomic DNA based on different principles. However, most of these protocols have certain drawbacks such as the heavy use of toxic organic solvents including phenol and isochloroform and the usage of expensive enzymes such as RNases and Proteinases. Moreover, the yield and the quality of extracted DNA are insufficient with most of these methods. This study was designed to introduce a novel method to extract genomic DNA from Gram-negative bacteria and to compare this newly developed method with the classical salting-out method in terms of quantity and quality of the extracted DNA. The novel procedure is simple, rapid, and effective in extracting genomic DNA and it does not require any toxic and hazardous chemicals or costly enzymes. Genomic DNA from Gram negative bacteria including *C. manganoxidans*, *E.coli* and *P. aeruginosa* have been extracted successfully by this novel method and the quantity and quality of the extracted DNA were compared with the classical salting-out method. DNA yield was assessed by agarose gel electrophoresis whereas the quality was analyzed by Polymerase Chain Reaction (PCR) technique. To assess the quality of the extracted DNA, the MAF (Multicopy Associated Filamentation) gene of *C. manganoxidans* was amplified. MAF gene is responsible for the inhibition of septum formation in *Caldimonas* when it is over-expressed. The novel protocol showed better results with regard to the quantity and the quality of DNA and it was less time-consuming compared to the other method. No inhibition was observed in subsequent PCR amplifications. The presented method is simple, rapid, user-friendly and inexpensive and useful for routine DNA isolation from gram negative bacteria. Quality and repeatability of the novel method were found to be adequate for subsequent molecular applications such as PCR.

Keywords: *Caldimonas*; DNA extraction; Gram-negative bacteria; MAF gene; salting-out

Comparison of phenotypic and genotypic methods for the detection of *Methicillin Resistant Staphylococcus Aureus* (MRSA)

S. J. Wijekoon¹, H. A. Abeygoonawardena², H. M. S. Karunaratne³, N. S. Chandrasiri⁴,
N. P. Senanayake⁵

¹*British College of Applied Studies*

²³*Faculty of Medicine, General Sir John Kotelawala Defence University*

⁴*Department of Microbiology, Colombo South Teaching Hospital*

⁵*Department of Microbiology, University of Colombo, Sri Lanka*

Cefoxitin is a potent inducer of the *mecA* regulatory system. It is being recommended for the detection of methicillin resistance in *Staphylococcus aureus* when performing disc diffusion test. The objective of the present study was to compare the efficacy of phenotypic methods (cefoxitin disc diffusion and HiCrome MRSA screening agar tests) with the gold standard genotypic method (PCR) for the detection of MRSA. A total of 72 clinical isolates of *Staphylococcus aureus* (*S. aureus*) received from January to April 2017 at the Department of Microbiology, Colombo South Teaching Hospital (CSTH) were included in the study. *Staphylococcus aureus* isolates were initially identified by Gram stain, colony morphology, catalase and slide/tube coagulase tests. Cefoxitin disc diffusion test (using 30 µg discs) and Hi Crome MRSA rapid agar test were performed as phenotypic methods. PCR was performed for the detection of *mec A* gene, *PVL* gene and *fem B* gene as the gold standard genotypic method. out of the 72 *Staphylococcus aureus* isolates, 30 isolates were identified as MRSA by cefoxitin disc diffusion test and 27 isolates were identified as MRSA by Hicrome rapid MRSA agar test. *Mec A* gene, *PVL* gene and *fem B* gene were detected in 26, 4 and 24 clinical isolates respectively. However, the presence of both *Mec A* gene and *fem B* gene confirms MRSA which was observed in 24 isolates in our study. Therefore, Cefoxitin has given 6 false positives. *PVL* gene is a marker for community acquired MRSA. The introduction of PCR technique for the accurate identification of MRSA will reduce the unnecessary treatment of false positives and will be very important in the surveillance of global anti-microbial resistance.

Keywords: *cefoxitin; fem B; mec A gene ; MRSA; PVL,*

FACULTY OF NURSING



Towards Excellence in Nursing Education: Challenges and Opportunities

9 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF NURSING**

Professor Devaka Weerakoon



It is with great pleasure that I write this message on the occasion of the Annual Research Symposium- 2018 of University of Colombo and the very first Research Symposium of newly established Faculty of Nursing of University of Colombo. The Faculty of Nursing plans to produce Nursing Graduates that can serve in the Global Health Care Sector. Thus, the theme for this year's research symposium of the Faculty of Nursing is "Towards Excellence in Nursing Education - Challenges & Opportunities", which will be held on 9th November 2018 at the Auditorium of the Faculty of Nursing.

Faculty of Nursing recognises the importance of Research in the relevant disciplines of Nursing and related sciences thus expects to provide all necessary facilities for its faculty members and students to become involved in high quality research in the years to come. Being a new faculty, it is very encouraging to have 14 technical papers accepted for presentation at this year's symposium and all the abstracts that will be presented are in the disciplines of Biomedical and Nursing related Sciences.

The Faculty also decided to hold a Mini-symposium as part of the research symposium under the theme "Digitizing the Healthcare Sector - Challenges and Opportunities" keeping in line with the General Theme of the Research Symposium "Engaging with the Digital World in Higher Education". The mini symposium will focus on the possible application of digital health in the discipline of Nursing Science. Four eminent speakers will give presentations on different aspects of the Digital Health and Medical Informatics during the Mini-symposium.

I take this opportunity to congratulate all the presenters, the Keynote Speaker and the plenary speakers for their kind contribution to this research symposium. I also thank the Vice-chancellor, Symposium Chair and his team, the Faculty Symposium Committee and my Faculty Members for the efforts rendered towards a very successful Research Symposium 2018.

FACULTY OF NURSING

PROGRAMME

9 November 2018

09.00 am	Opening Ceremony: National Anthem & lighting of the oil lamp
09.15 am – 09.30 am	Welcome address by Professor Devaka Weerakoon, Dean, Faculty of Nursing
09.15 am – 10.00 am	Keynote address by Emeritus Professor Narada Warnasuriya “Towards Excellence in Nursing Education: Challenges and Opportunities”
10.00 am – 10.30 am	Tea break
<i>Mini-symposium: 10.30am -12.30pm</i>	<i>“Digitizing the Healthcare Sector – Challenges & Opportunities”</i>
10.30 am – 11.00 am	Speaker 1 - Prof. Vajira Dissanayake – Faculty of Medicine, University of Colombo
11.00 am – 11.30 am	Speaker 2 - Dr.R.B.Marasinghe – Faculty of Medical Sciences, University of Sri Jayawardanepura
11.30 am – 12. 00 noon	Speaker 3 – Dr Azeema Farid – Telly-Health Program, COMSATS Secretariat, Islamabad, Pakistan
12.00 noon – 12.30 pm	Speaker 4 - Dr.Sudath Warnakulasuriya – Faculty of Nursing, University of Colombo
12.30 pm – 12.45 pm	Closing of opening session & Mini-symposium: Vote of Thanks
12.45 pm – 1.30 pm	Lunch
01.30 pm – 03.30 pm	Technical session - 1
03.30 pm – 03.45 pm	Tea
03.45 pm – 05.30 pm	Technical session – 2

Closing remarks – Chairman, Research Symposium Committee, Faculty of Nursing

INTRODUCTION TO THE KEYNOTE SPEAKER

Narada D. Warnasuriya

Senior Professor of Pediatrics

General Sir John Kotelawala Defense University



Professor Narada D. Warnasuriya is currently the Senior Professor of Paediatrics at the General Sir John Kotelawala Defense University. He is also Emeritus Professor of Paediatrics of the University of Sri Jayawardenepura (USJP) where he was the Founder Professor of Paediatrics. He has held the post of Dean, Faculty of Medical Sciences and the Vice Chancellor of USJP. He is currently a member of the Sri Lanka Medical Council (SLMC) and the Standing Committee on General Education of the National Education Commission (NEC).

Professor Warnasuriya graduated from the University of Colombo and had his postgraduate training at the Lady Ridgeway Hospital, Colombo and the Royal Victoria Infirmary, Newcastle upon Tyne, UK. His career as a medical teacher / paediatrician spans over 43 years. He has served as a Senior Lecturer in Paediatrics at the University of Colombo and a Consultant Paediatrician at The Royal Gwent Hospital, UK and the North West Armed Forces Hospital, Kingdom of Saudi Arabia, prior to joining the USJP.

He is a past president of the Nutrition Society of Sri Lanka, the Sri Lanka College of Paediatricians (SLCP) and the Sri Lanka Medical Association (SLMA). He is also a past Chairman of the Committee of Vice Chancellors and Directors (CVCD) of Sri Lanka. In 2009 he was accorded the honour of “Outstanding Asian Paediatrician” at the Asian Congress of Paediatrics in Shanghai, China. His professional and academic interests include Nutrition, Social Paediatrics and Education.

KEYNOTE ABSTRACT

Towards excellence in Nursing

N. Warnasuriya

General Sir John Kotelawala Defense University, Sri Lanka

Nursing has always been recognized as a caring profession and a noble one. However, until recently it was viewed as a practical vocation with a relatively light knowledge base and was ranked low in the hierarchy of ‘learned’ professions. Especially in the South Asian context it is one of the most under valued and under remunerated professions.

The epidemiological transition with a shift of the morbidity burden to noncommunicable diseases requiring greater emphasis on health promotion and behavioral aspects of health and disease coupled with the rapid technological advances in nursing practice have vastly added to the knowledge base of nursing as an academic discipline. It is now poised for a transformation into a fully fledged learned profession.

This presentation will outline the evolution of nursing education towards this transformation in Sri Lanka emphasizing the push and pull factors and identifying the stumbling blocks. It will attempt to visualize the future prospects including postgraduate education in nursing. It will briefly examine the potential for inter professional education in the health related clinical disciplines including medicine and nursing.

FACULTY OF NURSING

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Molecular dynamic simulation of angiotensin converting enzyme with Malabaricone C

S. M. Abdulla¹, G. A. S. Premakumara², P. Ranasinghe¹, M.S.S. Weerasinghe³,
C. Udawatte⁴

¹*Herbal Technology Section, Industrial Technology Institute, Colombo, Sri Lanka*

²*Department of Sciences & Social Sciences, University of Colombo, Sri Lanka*

³*Department of Chemistry, University of Colombo, Sri Lanka*

⁴*College of Chemical Sciences, Rajagiriya, Sri Lanka*

Many drug discovery programmes include computational methods as an important part now, starting from hit identification to lead optimization and further and methods like ligand or structure-based virtual screening practices are vastly used in many discovery efforts. Hypertension has affected a large part of the world population and is predicted to be the concern in approximately half of the deaths from stroke or cardiovascular disease. One of the most effective methods to treat hypertension is the use of an angiotensin converting enzyme (ACE) inhibitor. ACE is an important enzyme of the renin-angiotensin system (RAS). Hence, inhibitors of ACE are type of drugs found to be vastly used in the treatment of hypertension. In this study we used the x-ray structure of human testicular ACE (tACE) of PDB id 1O86. Through molecular docking studies, it was found that malabaricone C had stable interactions in the active site of ACE. Malabaricone C is an anti-bacterial resorcinol. It is found in the dried seed covers of *Myristica fragrans* and *Myristica malabarica*, commonly known as nutmeg. It was also found to possess strong antifungal activity. Hence, an MD simulation of the crystal structure of tACE along with Malabaricone C was done. As a control, the well-known inhibitor of ACE, lisinopril was used. Molecular Dynamics was carried out using AMBER with GPU acceleration to determine the stability of the receptor-ligand complex in solution medium and for free energy calculations. The MD simulations and the molecular docking interaction diagrams clearly showed that Malabaricone C remains quite stable within the active site gorge. Few RMSD fluctuations were observed here due to the presence of higher number of rotatable bonds in Malabaricone C. Hence, Malabaricone C could be a successful inhibitor of ACE.

Keywords: *angiotensin converting enzyme; hypertension; molecular docking; molecular dynamics*

**Rehospitalisation of psychiatric patients in the National Institute of Mental Health
(NIMH), Sri Lanka**

G.R.R.L. Abesekara¹, B.A.A.C. Bamunusinghe¹, H.M.W.S. Herath¹, N.A.R. Nettasinghe²,
A.R. Jayamaha¹

¹ *Department of Nursing, Kaatsu International University (KIU), Sri Lanka*

² *Department of Fundamentals of Nursing, University of Colombo, Sri Lanka*

Prevalence rate of psychiatric rehospitalization (RH) was 74.14% during first three months of 2018 at NIMH. Bed strength of the NIMH is nearly 1500 and annually ~8000 patients are admitted, for all types of mental illnesses. Readmission rate is considered as an indicator of the mental health care quality. Risk factors associated with RH remains poorly understood. Identification of the responsible factors may help to improve mental health care quality. A descriptive cross-sectional study was conducted among purposive sample of randomly selected 200 relatives of patients with psychiatric disorders at NIMH, Sri Lanka. Ethical approval was obtained from KIU and NIMH. Researcher-administered structured questionnaire was used to collect the data from relatives who visit readmitted patient in wards 5, 8, 10 and 12. Among readmitted patients 64% were male patients and majority of them were 30-45 years age group. Common causes for the RH were poor drug compliance (79%), poor community support (80.5%), lack of permanent care giver (84%) and lack of awareness related to proper patient management (56%). Medical comorbidities, unplanned discharge, substance abuse considered as other factors and overall contribution is 62%. Among readmissions 84% of patients were not attended to the regular follow up clinics. There is association between age and noncompliance to the medication ($P > 0.05$). RH rates were high among schizophrenia patients (40%) and bipolar affective disorder (36%). Other disease conditions were manic disorder, depression, psychosis, post-partum psychosis, intellectual disabilities and disorders due to drug abuse. There is an association between clinical diagnosis and medication noncompliance ($P > 0.05$). RH rates were high among schizophrenia patients and patients with bipolar affective disorder. Other disease conditions were manic disorder, depression, psychosis, post-partum psychosis, disorders due to drug abuse and intellectual disabilities. Factors related to RH were lack of permanent care giver, poor drug compliance, lack of awareness related to the proper patient management of the relatives, medical comorbidities, unplanned discharge, and substance abuse.

Keywords: *NIMH; psychiatric patients; rehospitalisation*

Bark extracts of Ceylon cinnamon potentiate growth inhibition and cytotoxicity in human breast carcinoma (MCF7), hepatocarcinoma (HepG₂) and endometrial carcinoma (AN3CA) cell lines

W. P. K. M. Abeysekera¹, G. A. S. Premakumara², W. D. Ratnasooriya^{3,4}

¹*Modern Research & Development Complex (MRDC), Industrial Technology Institute (ITI), Sri Lanka* ²*Department of Sciences and Social Sciences, University of Colombo, Sri Lanka*

³*Department of Zoology, University of Colombo, Sri Lanka*

Cancer remains to be one of the leading causes of death in the world. Although recent advancement therapies have shown some promising results still there is no permanent cure for majority of advanced stage cancers. Thus, development of novel effective anti-cancer agents preferably from natural products for management, to reduce or prevention of cancer incidence is necessary. Ceylon cinnamon (CC) (*Cinnamomum zeylanicum* Blume) the ‘true cinnamon’ is one of the earliest known and most popular spices in Sri Lanka and reported to possesses diverse pharmacological activities. However, anti-cancer activity of CC is not well investigated to date. The present study therefore, investigated the growth inhibition (GI) and cytotoxicity (CT) of bark of CC on human breast carcinoma (MCF7), hepatocarcinoma (HepG₂) and endometrial carcinoma (AN3CA) cell lines. Ethanolic (95%) and dichloromethane:methanol (DCM:M, 1:1 v/v) bark extracts of authenticated CC were used in this study. GI and CT of both bark extracts were evaluated on human breast carcinoma (MCF7), hepatocarcinoma (HepG₂) and endometrial carcinoma (AN3CA) cell lines at different concentrations (25, 50, 100, 200 and 400 µg/ml; n=4 for each cell line) via sulforhodamine-B cytotoxicity (SRB) assay. Paclitaxol was used as the reference drug (0.625, 1.25, 2.5, 5 and 10 µg/ml; n=4 for each cell line). Results clearly indicated that both ethanolic and DCM:M bark extracts possess GI and CT for investigated carcinoma cell lines and were dose dependent (ethanolic and DCM:M bark extracts r²: MCF7: 0.99 & 0.80; HepG₂: 0.99 & 0.98; AN3CA: 0.80 each respectively). However, ethanolic bark extract demonstrated significantly (p<0.05) high GI (GI₅₀: MCF7 and HepG₂: 51.29±0.57 and 24.68±2.98 µg/ml respectively) and CT (GI₅₀: MCF7 and HepG₂: 179.76 ± 0.80 and 89.85 ± 4.91 µg/ml respectively) compared to DCM:M bark extract. Both bark extracts showed moderate GI and CT for all carcinoma cell lines compared to the reference drug paclitaxol. In conclusion bark of CC possesses GI and CT against human breast (MCF7), hepatic (HepG₂) and endometrial (AN3CA) carcinoma cell lines at varying degrees of potential and indicates its potential in managing breast, hepatic and endometrial cancers.

Keywords: anti-cancer; Ceylon cinnamon; *Cinnamomum zeylanicum*; cytotoxicity; growth inhibition

Geospatial mapping of thyroid cancer incidence in the Southern Province of Sri Lanka

H.R.T. De Silva ¹, F.I. Nazeer², S.C.R Perera³

¹*Department of Clinical Nursing, University of Colombo*

²*Lecturer, Department of Community Medicine, University of Sri Jayawardenepura*

³*Onco Surgical Unit, Teaching Hospital Karapitiya, Galle*

Thyroid cancers in Sri Lanka are on the rise and making it the second commonest cancer among females (9%) and the commonest cancer in the age group of 15-34 in females (36.5%) in 2010. Three districts of Southern province, Galle, Matara and Hambanthota belong to five districts that report the highest incidence of thyroid cancers in the country. Geospatial mapping to understand the epidemiology of diseases is a vast and rapidly growing field throughout the world. This study was aimed to determine the distribution of thyroid cancers in Southern Province using geospatial mapping and to identify the socio-demographic characteristics of thyroid cancer patients. A descriptive cross sectional study was done among thyroid cancer patients who were registered for Iodine therapy at Teaching Hospital Karapitiya, Galle from 2013 to 2015. Patients' demographic data were obtained from oncology clinic records. Data of 662 patients residing in the Southern province having primary thyroid cancer were used. Mapping of cases and incidence densities was done using Google maps and open source GIS software (QGIS Version 2.12). Population statistics were obtained from the Census and Statistics Department. Female: male ratio of thyroid cancer was 8:1 with peak age of incidence being 30-55 years in both sexes. Papillary and follicular carcinomas accounted for 74.4% and 20% respectively. District secretariat divisions with high and low thyroid cancer incidence and age standardized rates showed similar patterns across the years. Coastal areas of Southern province reported a higher burden of cases than the interior areas. Preliminary results of this study provide the base maps for further investigations and emphasize the need for in depth analysis of the aetiology and causative factors for high incidence of thyroid cancers in coastal belt of Southern province.

Keywords: *geospatial mapping; Southern province; Sri Lanka; thyroid cancer*

Five and ten year survival of breast cancer patients treated at the Teaching Hospital Karapitiya, Galle from 2004 to 2008

H.R.T. De Silva¹, A.R.Wickremasinghe², S.C.R. Perera³

¹*Department of Clinical Nursing, University of Colombo, Sri Lanka*

²*Department of Public Health, University of Kelaniya, Sri Lanka*

³*Onco Surgical Unit, Teaching Hospital, Karapitiya, Galle, Sri Lanka*

Breast cancer is the commonest cancer in women worldwide and in Sri Lanka. Early detection and improvements in therapy will help to improve survival of breast cancer patients. Data on survival of patients treated for breast cancer are limited in Sri Lanka. The aim of this study was to determine five and ten year overall survival and its predictors of breast cancer patients treated at Teaching Hospital, Karapitiya, Galle from 2004 to 2008. A retrospective study was done among 590 female breast cancer patients who were registered at the oncology clinic of Teaching Hospital, Karapitiya, Galle from 2004 to 2008 and followed up till 31st July 2018. Patient details were extracted from oncology clinic records. The patients who have stopped clinic visits were contacted via telephone or a letter to determine their current status. Kaplan Meier curves were generated with and without controlling for other variables. The log-rank test was used to compare survival times between the groups. Cox's proportional hazards model was used to model survival after controlling for other variables. The mean survival times of five year and ten year survival were 56.3 months (SD=31.67) and 102.34 months (SD=51.93) respectively. The median survival times of five year and ten year survival were 62 months and 125 months respectively. The commonest age group presenting with breast cancer was between 45-54 years. Tumour status, nodal status, presence of metastases, Nottingham grade and status of treatment were statistically significant ($P<0.001$) independent predictors of survival. Nodal status, presence of metastases, Nottingham grade and treatment status were significant predictors of survival after controlling for other variables. More than two third of patients (68%) survived five years and nearly two third of patients (63%) survived ten years. Nodal status, onset of metastases, Nottingham grade and treatment status were significant predictors of survival in breast cancer patients.

Keywords: *breast cancer; Sri Lanka; survival*

Difference in anti-viral responses in individuals with past asymptomatic and symptomatic Dengue fever

A.I. Kamaladasa^{1,3}, L.Gomes¹, G.S.Ogg^{1,2} and G.N. Malavige^{1,2}

¹*Centre for Dengue Research, University of Sri Jayawardanapura, Sri Lanka,*

²*MRC Human Immunology Unit, Weatherall Institute of Molecular Medicine, Oxford NIHR Biomedical Research Centre and University of Oxford, OX3 9DS, UK*

³*Department of Sciences and Social Sciences, University of Colombo, Sri Lanka*

Dengue viral infection in humans present with a wide spectrum of clinical manifestations. We sought to investigate the differences in initial immune responses to the dengue virus (DENV) in those who had previously had either severe disease (SD) or asymptomatic disease (AD) following a secondary dengue infection. Monocytes from healthy individuals who had either AD (n=6) or SD (n=6) were infected at MOI one, with DENV serotype 2 (DENV-2) and DENV serotype 3 (DENV-3) and incubated for 24 hours. Culture supernatant was assayed for IFN- α , IFN- β , TNF- α , IL-10, IL-8, IL-6, IL-12p70, IL-17 and IP-10 with luminex assays. Infection with DENV induce significant production of IFN- α from monocytes in individuals with AD (DENV-2; $p < 0.0001$, DENV-3; $P = 0.0001$) while monocytes from individuals with SD (DENV-2; $p = 0.2988$, DENV-3; $P = 0.4435$) failed to produce significant levels of IFN- α when infected with DENV. Further monocytes from SD spontaneously produced more than twice the amount of TNF- α ($p = 0.01$) and three times the amount of IL-8 ($p < 0.0001$) compared to monocytes of AD. In addition, DENV infected monocytes of those with SD produced significantly more TNF- α (DENV-2, $p = 0.002$; DENV-3: $p = 0.02$) and IL-8 (DENV-2: $p = 0.008$; DENV-3: $p = 0.002$) when compared to AD. Significant amounts of IP-10 were produced by DENV infected monocytes of individuals with AD compared to SD. IL-10, IL-12p70 and IL-6 from infected monocytes was not significantly different between SD and AD. Failure in producing significant quantities of IFN- α in response to dengue virus by monocytes of those with past SD, is suggestive that they could be having impaired antiviral responses to the virus. In addition, since monocytes of those with past SD spontaneously produce significantly higher levels of TNF α and IL-8, an altered immune response generated by their monocytes could contribute to severe clinical disease.

Keywords: *asymptomatic; cytokines; dengue; symptomatic*

Factors influencing diet management behaviors of patients with hypertension in Sri Lanka

M. G. A. S. Malkanthie¹, S-Y. Shin²

¹*Department of Fundamentals of Nursing, University of Colombo*

²*Department of Nursing, Graduate School, Inje University, Busan, Republic of Korea*

Maintaining a healthy diet management behavior is an essential and important strategy to effectively manage hypertension (HTN). However, a large proportion of Sri Lankans have a high intake of fat, salt, starch, and sugar in their diet when compared to World Health Organization (WHO) recommendations. The purpose of this study was to identify the factors influencing HTN diet management behaviors among patients with HTN in Sri Lanka. Therefore, a cross sectional, descriptive, quantitative study was conducted in a teaching hospital in Sri Lanka. A set of interviewer administered questionnaires, which included general nutrition knowledge questionnaire, diet self-efficacy scale, and a modified version of the hypertension beliefs and behaviors questionnaire were used to collect the data. Collected data was analyzed using descriptive statistics, t-test, and ANOVA. The relationships among variables were assessed using Pearson's correlation coefficients and the factors that might influence HTN diet management behaviors were assessed by a stepwise multiple regression analysis. A total of 91 subjects were interviewed in this study. Out of these 91 respondents, 68 (74.7%) were females. Further, 69 (76%) of the respondents belonged to the 55-74 year age group. Most of the respondents (84.6%; n=77) were unemployed and the monthly income of 83 out of the 91 respondents (91.2%) was less than 20,000 Sri Lankan Rupees. The overall mean nutrition knowledge score received by the respondents was 54.10 ± 14.73 . The mean scores received for health beliefs and diet self-efficacy were 34.40 ± 5.69 and 31.44 ± 5.54 respectively. The mean score received for HTN diet management behaviors was 19.44 ± 3.02 . Diet self-efficacy was the most significant factor ($\beta=0.29$, $t=2.75$, $p=0.007$) followed by nutrition knowledge ($\beta=0.25$, $t=2.50$, $p=0.014$) influencing HTN diet management behaviors. The findings of this study can be used as valuable database for further research on nutrition knowledge, perceived self-efficacy, and diet management behaviors of patients with HTN. Furthermore, various interventions for improving nutrition knowledge and self-efficacy should be explored to help HTN patients to have long, functional, and independent lives.

Keywords: *health behaviors; hypertension; knowledge; nutrition; self-efficacy*

Challenges of Nursing students in their clinical learning environment in three selected Nursing schools in Sri Lanka

W. A. R. P. Menike

Department of Fundamentals of Nursing, University of Colombo, Sri Lanka

The principal of nursing profession is the clinical practice during the training of nursing students. Identifying challenges in this environment could improve the quality of nursing training. The purpose of this study was to explore challenges of student nurses in clinical environment in Sri Lanka according to the view- points of ward sisters and nurse tutors. The nursing tutors from three selected nursing schools (the nursing schools in Badulla, Sri Jayawardenepura & Hambanthota) and ward sisters (n=18) from three General hospitals were selected as participants. The participants who had more than 05 years experiences as nurse tutors and as ward sisters were selected through judgmental sampling method. Focus group discussions were attended to collect data. The focus group schedule was planned according to main themes developed by Saarikoski (2009, 2011). The main themes were the pedagogical environment, role of the tutor and the supervisory relationship. The content analysis approach was used to analyze data. Theme pedagogical environment - sub themes identified were insufficient role models, poor communication within health team, insufficient clinical teaching due to lack of proper formal clinical teaching guidelines. Theme role of the tutor - one sub theme identified as the inadequate support to reduce the theory practice gap. Theme supervisory relationship - lack of mutual interaction with the nursing staff due to workload was the sub theme identified. The challenges identified by the stake holders were inadequate role models, poor communication within the health team, inadequate clinical teaching, the theory practice gap, poor relationship with nursing staff due to their workload. Creating an environment that supports positive role modeling, improving communication skills, designing new models to focus the creativity and innovation in clinical teaching methods and guidelines, bridging the gap between theory and practice and effective human resource management that match supply nurses to demand are some recommendations to challenge the challenges.

Keywords: *clinical learning environments; quality, role models; supervision*

Screen time and associated psychosocial, academic and health problems among undergraduates at the University of Sri Jayewardenepura

N.M. Patterson¹, S.S.P. Warnakulasuriya²

¹*Department of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka*

²*Department of Clinical Nursing, University of Colombo, Sri Lanka*

Television viewing, Internet use and video game playing are collectively called Screen Time. Today, screen time usage has become a global challenge. It has been changing daily routines, social behaviors, emancipative values, family relations and social interactions. Therefore, excessive screen time behavior holds the potential to be harmful to one's health. This study was aimed to investigate screen time and associated psychosocial, academic and health problems among undergraduates at University of Sri Jayewardenepura. This descriptive cross-sectional study was conducted among 430 randomly selected participants in the University of Sri Jayewardenepura. A self-administered questionnaire was provided to each participant. Results indicate that the mean screen time on weekdays was 315.8 minutes (SD=256.2) while the mean screen time on weekends was 456.5 minutes (SD=294.2). University students spend more time in internet and television rather than playing videogames both during weekdays and weekends. Excessive screen time was associated with low Grade Point Averages (GPA), delaying main meals frequently, headache and sleep latency, but no association with backache. Excessive time on social media was associated with loneliness. In conclusion, university students have higher screen time on both weekdays and weekends and weekend screen time was higher than weekdays. Using the internet was the noticeable screen activity among the students rather than other screen activities. All these findings indicate that higher screen time can lead to a string of academic, health and psycho-social problems.

Keywords: *academic performance; health problems; psycho-social problems; screen time; undergraduates*

Physical activity and quality of life among university students: Investigating self-esteem as a potential mediator

R. Piratheep¹, S.S.P. Warnakulasuriya²

¹*Department of Allied Health Sciences, University of Sri Jayewardenepura, Sri Lanka*

²*Department of Clinical Nursing, University of Colombo, Sri Lanka*

Physical inactivity is one of the leading risk factors for death worldwide and key risk factor for non-communicable diseases. Globally, 1 in 4 adults is inactive. Regular physical activity such as walking, cycling, or participating in sports has significant benefits for health. The aim of the study is to determine level of physical activity, quality of life (QOL), self-esteem and identify the association of physical activity with quality of life and self-esteem, among the students of University of Sri Jayewardenepura. This descriptive cross sectional study was done among 325 students from the selected four faculties of University of Sri Jayewardenepura. Self-administrated questionnaire was used to collect data. Descriptive statistic and chi-square test were performed to analyze the data using SPSS statistical software (version 23). Ethical approval for the study was obtained from the ethic review committee of faculty of Medical Sciences University of Sri Jayewardenepura. Results indicate that majority (54.2%) is physically active to a moderate level followed by one fifth inactive (18.4%) and about one fourth (27.1%) had a high level of physical activity. A majority of them had good QOL (58.5%) related to physical, psychological and environmental domains. The overall QOL of students was good and a majority (54.4%) was satisfied with their health. Large (90.5%) had good self-esteem. Students who did vigorous physical activity had more satisfaction with their health. Those who performed physical activity in a high level had reported good QOL and more satisfaction with their health. Participants who were inactive had low QOL, low satisfaction with health. There was a significant association between self-esteem and four domains of QOL ($p < 0.05$). In conclusion, majority is only moderately physically active and about one fifth is physically inactive. High self-esteem has significant impact on QOL. The physically inactive group should be made aware regarding the risk involved in physical inactivity.

Keywords: *physical activity; quality of life; self-esteem*

Impaired dengue virus type 2 and 4 transmission in transgenic *Aedes aegypti*

H. P. B. K. D. Ramyasoma^{1,2}, R.S. Dassanayake¹, Y. I. N. S. Gunawardene², M. Hapugoda²,
W. Abeyewickreme²

¹*Department of Chemistry, University of Colombo, Colombo 03, Sri Lanka*

²*Molecular Medicine Unit, University of Kelaniya, Ragama, Sri Lanka.*

Genome manipulation through germ-line transformation is a powerful tool for the development of transgenic mosquitoes for combating the spread of mosquito-vectored diseases. This study aims for the development of dengue virus resistant transgenic *Aedes aegypti* strain using RNA interference (RNAi) technique. This was achieved by expressing miR-shRNAs under the control of *A. aegypti* Carboxypeptidase A (*Ae.CPA*) promoter and simian virus 40 terminator in mosquitoes, following the blood-meal induction in the midgut and salivary glands. Plasmid containing designed miR-shRNAs, a DsRed fluorescent reporter gene and *PiggyBac* transposable element was synthesized and this together with *PiggyBac* transposase expression plasmid was introduced to *A. aegypti* mosquito eggs using microinjection. G₁ mosquitoes were screened for DsRed fluorescent protein expression in ommatidium units of eyes. Transgenic lines were subjected to nested PCR to identify transgenic lines with genomic integration of transgene and expected size were shown in 2 lines, which showed ommatidium expression in their eyes. Selected transgenic and non-transgenic wildtype *A. aegypti* mosquitoes were fed with cattle blood to induce the expression of the effector molecule. Blood meal induced transgenic and non-transgenic mosquitoes were dissected to separate midgut and salivary glands, and miRNA was extracted and analyzed using a sequence specific qPCR assay followed by agarose gel electrophoresis. Product-sizes of miR-shRNAs of transgenic mosquitoes were observed to be in the range of 60bp to 90bp, which are of expected sizes showing blood meal induced expression of siRNAs in midgut and salivary gland tissues of transgenic mosquitoes. Dengue challenging was carried out using dengue virus serotype 1,2 and 4 with induced blood meal to activate transgene in mosquito midgut tissues. Dengue virus expression was analyzed using qPCR and results of the dengue virus challenging showed the knockdown of viral titer of transfected dengue virus 2 and 4 in transgenic mosquito. Currently, dengue challenging assays are underway to ascertain the effectiveness of the designed effector molecule in blocking dengue virus type 1 and 3 transmission in transgenic *A. aegypti*.

Keywords: *Aedes aegypti*; gene transformation; microinjection; *PiggyBac*

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In-vivo evaluation of *Setaria digitata* novel protein as an anthelmintic drug target using RNAi

M.B.C.L. Somarathne¹, R.S. Dassanayake¹, Y.I.N.S. Gunawardena²,

N.V. Chandrasekharan¹, D.A.S. Elvitigala³

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Molecular Medicine Unit, University of Kelaniya, Sri Lanka*

³*Department of Sciences and Social Sciences, University of Colombo, Sri Lanka*

Functional analysis of animal parasitic nematode genes is a challenge due to the scarcity of *in-vitro* culture conditions of the nematodes and lack of effective tools to be used in gene alteration of the animal. This study was intended to use the post transcriptional gene silencing tool; RNA interference (RNAi) to specifically shut down the gene of interest and take a novel *in-vivo* approach to culture the nematode. We focused on culturing the animal parasite nematode *Setaria digitata* using a novel *in-vivo* technique and characterizing an uncharacterized animal parasite specific gene *SDNP*. *Culex quinquefasciatus* was utilized as the *in-vivo* culture platform for *S. Digitata* larvae. After the RNAi treatment, larvae displayed red colour fluorescence in their body suggesting the larvae exposure to the exogenous siRNA. q-PCR analysis following the *SDNP* siRNA treatment to the larvae indicated a significant reduction in the *SDNP* transcript levels. Furthermore, larvae motility reductions and moulting deformities were also associated with the siRNA treatment. Larvae migration in the mosquito was noticeably irregular in the test subjects and survival rate of the test mosquitoes were elevated compared to the control groups. Collectively, all the results suggest that the *SDNP* play a vital role in muscle contraction or development and larvae moulting processes. Hence these characteristics of *SDNP*, suggest its' potential candidature to be used as a credible drug target.

Keywords: *in-vivo*; RNAi; *SDNP*; *Setaria digitata*

Analysis of Volatile Constituents of Wild Variety of *Cymbopogon nardus* (L.) Rendle found in Nilgala Forest Reserve

H.D.Weeratunge¹, G.A.S.Premakumara², E.D. de Silva³

¹*Herbal Technology section, Industrial Technology Institute (ITI), Colombo 7, Sri Lanka.*

²*Department of Sciences & Social Sciences, University of Colombo, Sri Lanka.*

³*Department of Chemistry, University of Colombo, Sri Lanka*

The genus *Cymbopogon* comprises of 140 species, well established in tropical and subtropical areas. There is no evidence of *Cymbopogon nardus* (L.) Rendle variety growing in Sri Lanka with high Elemicin content which is a good flavour compound in commerce. This study was carried out to compare the chemical constituents of essential oil of wild variety of *Cymbopogon nardus* (L.) Rendle, grown extensively in Nilgala Forest Reserve with the commercially available essential oil of Ceylon citronella, *Cymbopogon nardus* (L.) Rendle.

The oil contents of wild variety of *Cymbopogon nardus* (L.) Rendle were 0.6% (v/w) in leaves, 0.5% (v/w) in inflorescence and oil content of commercial variety of leaves of *Cymbopogon nardus* (L.) Rendle was 1.1% (v/w) on dry basis. The chemical composition of the essential oils of two varieties was studied by Gas Chromatographic - Mass Spectrometry (GC-MS). The leaf essential oil of wild variety of *Cymbopogon nardus* (L.) Rendle, contains thirty compounds with Elemicin (28.5%), Camphene (17.9%) and d-Limonene (8.7%) as the major compounds. Twenty-nine components were identified in the inflorescence essential oil of the same wild variety and the main components were Elemicin (36.6%), γ -Murolene (10.6%), Caryophyllene (8.4%), d-Limonene (7.0%), and D-Germacrene (5.2%). However, leaf oil of commercial variety of *Cymbopogon nardus* (L.) Rendle contains totally different type of major components (32 components) compared to leaves and inflorescence oils of wild variety. The major components of commercial variety were Geraniol (25.2%), Methyl Eugenol (10.8%), Camphene (9.6%), α -Farnesene (7.8%), d-Limonene (7.0%) and Endo-Borneol (6.9%). However, the Geraniol content is very low in wild variety and Elemicin is the major compound, which will be very promising for flavour industry in future. Further, this study confirmed that this particular wild species of *Cymbopogon* has some affiliation to commercial variety of *Cymbopogon nardus* (L.) Rendle.

Keywords: Elemicin, Geraniol, Nilgala Forest, Flavour

Recombinant expression of *S. digitata* ARV1 protein in bacterial expression system for validation of anti-filarial drug target

P.G.T.S. Wickramatunga¹, Y.I.N.S. Gunewardana², W.W.P. Rodrigo³, R.S. Dassanayake¹

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Molecular Medicine Unit, University of Kelaniya, Ragama, Sri Lanka*

³*Biotechnology Unit, Industrial Technology Institute, Sri Lanka*

The ‘ARE2 required for viability1’ (*ARV1*) gene encodes an evolutionary conserved, potential lipid transporter which is localized on the endoplasmic reticulum and Golgi complex membrane. The current study was undertaken to clone, express and purify the ARV1 protein of *Setaria digitata*, filarial nematode that infects livestock and cause significant economic losses in Far East and Asia to be used for structural and functional analyses. The open reading frame that encodes ARV1 protein was identified from the cDNA library of *S. digitata*. The derived protein sequence showed a significant consistency with the homologues of *Loa loa*, *Brugia malayi*, *Onchocerca volvulus*, *Wucheraria bancrofti* etc. The cDNA encoding ARV1 was amplified by PCR using two primers containing *Kpn1* and *Xho1* sites at n-terminus and c-terminus respectively and cloned into pET expression system. The recombinant construct was transformed into BL21 (DE3) competent cells orderly by electroporation method and transformed recombinant colonies were selected by colony PCR method. The expression of the recombinant protein was carried out according to the guidelines given in pET vector system user manual. Optimum expression was observed with induction of 1.0 mM IPTG at 30 °C incubation for 3 hrs and the protein expression was analyzed by using SDS PAGE. ARV1 recombinant protein was purified and confirmed by western blotting using chemically synthesized ARV1 primary antibodies and alkaline phosphatase conjugated secondary antibodies. Adult *S. digitata* male and female worms and microfilaria were brought to the laboratory and total protein extraction was done using tissue lysis buffer. The Western blot analysis showed that the ARV1 protein is expressed in *S. digitata* male and female worms and microfilariae and purified recombinant ARV1 protein was used as positive control to verify the ARV1 protein expression. Collectively, these result inferred the ARV’s potential candidature to be used as a anti-filarial drug target.

Keywords: ARV1; expression analysis; recombinat protein; *S. digitata*

FACULTY OF SCIENCE



Advances in Science with Digital Applications

9 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF SCIENCE**

Senior Professor K. R. Ranjith Mahanama



It is with great pleasure that I am forwarding this message to the souvenir issued on the occasion of the Annual Research Symposium 2018 of the University of Colombo. This year's theme for the Faculty of Science is "Advances in Science with Digital Applications" and it complements with our degree programmes deeming to strengthen the competent human resources in the disciplines of sciences and mathematics.

Each of our departments is dedicated to offering superior and innovative academic programs in a supportive environment that promotes the highest levels of learning. Our faculty members have been trained at some of the world's leading universities. While many of these individuals could work at top research institutions, they choose to work at the Faculty of Science, University of Colombo because they value the opportunity to train students in the classroom and laboratory and to mentor students in their research programs.

At this Annual Research Symposium 32 abstracts will be presented on 9th November 2018 at the Faculty of Science research sessions reflecting innovative research carried out by our postgraduate students under the able guidance of the proficient academic staff.

The endeavor in the preparation of abstracts and making the presentations are affectionately acknowledged. My sincere gratitude is extended to the reviewers and the research committees at the Faculty and the other committees of the University for the successful completion of their assignments. On behalf of all the academic and nonacademic staff of the Faculty of Science, I send my profound gratitude to the organizing committee and all the participants at this Annual Research Symposium 2018 and my noble wishes for a very rewarding and productive event.

FACULTY OF SCIENCE

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Determination of oscillation frequencies of Delta Scuti star KIC 1162150

J. Adassuriya¹, K. P. S. C. Jayaratne², P. T. L. V. Cooray³, M. L. C. Attygalle³

¹ *Astronomy Division, Arthur C Clarke Institute, Katubedda, Moratuwa, Sri Lanka.*

² *Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka*

³ *Department of Physics, University of Sri Jayewardenepura, Sri Lanka*

The Delta Scuti stars are intermediate mass stars of spectral types A2-F5. Their luminosity classes vary from III to V. Most of the Delta Scuti stars belong to Population I but some of them show metallicities and space velocities typical to Population II. To date, several thousands of Delta Scutis have been found in our galaxy and these are among the most common types of pulsating stars. The light curve analysis of Kepler long cadence dataset of Delta Scuti star KIC 1162150 is presented. The full data set of KIC 1162150 from quarter 0 (Q0) through quarter 14 (Q14) was obtained from the Kepler Asteroseismic Science Operations Center's (KASOC). In total 65605 magnitudes, spanning a total time of 1209 days, normalized to the median magnitude were used to generate the entire light curve. The pulsation frequencies were determined by applying Lomb-Scargle algorithm and discrete Fourier transformation with whitening process to eliminate the effect of post-frequencies detected. The oscillation frequencies were searched for in the range of 81 μHz to 230 μHz in the step size of 1×10^{-4} μHz . The pulsation frequencies were determined using the frequency spectra of the KIC 1162150. Six pulsation frequencies were detected in this study. The detected fundamental pulsation frequency is 189.9060 μHz , and rest of the frequencies are 199.4351 μHz , 214.0093 μHz , 187.3122 μHz , 176.1775 μHz , and 159.0771 μHz .

Keywords: *Delta Scuti stars; KIC 1162150; pulsation frequency*

Gray level co-occurrence matrix in polar orientation

M.S. Bandara, J.P. Wansapura

*Bio-Medical Imaging Research Group, Department of Physics, University of Colombo,
Sri Lanka*

Classification of gray images based on their textural features is one of the main tools in medical image processing. Gray Level Co-occurrence Matrix (GLCM) is such a widely used technique which represents how frequently the different gray level combinations occur in an image, traditionally in Cartesian directions. Contrast, correlation, energy and homogeneity are features based on the calculated GLCM. However, in human anatomy, structures often take a curvilinear pattern and therefore the Cartesian GLCM may not be very efficient in medical imaging. In this study, an algorithm was developed to calculate the GLCM in radial and circumferential directions. The texture parameters calculated using the polar GLCM were then tested against those calculated using the traditional Cartesian GLCM, by means of simulated images with varying speckle features. Our results show that the Polar GLCM is better at detecting changes in number of speckles in radially and circumferentially oriented speckled images than the Cartesian GLCM even in the presence of noise.

Keywords: *circumferential gray distribution; GLCM; Gray Level Co-occurrence Matrix; radial gray distribution*

Acknowledgement: National Research Council (NRC Grant 16-044)

Modified carboxymethyl cellulose and nanocellulose based materials for water purification

M. S. Fernando¹, A.K.D.V.K. Wimalasiri¹, D. P. Dissanayaka¹,
W. R. M. de Silva^{1*}, K. M. N. de Silva^{1,2}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Sri Lanka*

Drinking water free of contaminants is an essential requirement for every human being. Carboxymethyl cellulose (CMC) is a cheap anionic polysaccharide which has many uses such as in the food industry and in biomedical applications. It has also been extensively studied in water purification due to its interesting chelating properties for metal ions. However, CMC itself cannot be directly applied in water purification as it is soluble in water. In this work, a novel route was developed to convert water soluble carboxymethyl cellulose in to an insoluble form (crCMC) by a simple crosslinking method using biocompatible materials. In addition, nanocellulose (NC) was also produced by acid hydrolysis of cotton, followed by dialysis according to reported methods but with some modifications. Then a composite of crosslinked CMC embedded with nanocellulose (NC-CMC) was prepared and tested for the removal of Ca^{2+} and Mg^{2+} from water. Synthesized materials were characterized using FTIR. Studies on Ca^{2+} and Mg^{2+} adsorption by crCMC and NC-CMC were conducted using Atomic Absorption Spectrophotometry (AAS). The synthesized materials were further tested using water samples collected from the Cheddikulam area (hardness = 222 mg/g in equivalents of CaCO_3) in the North-central province of Sri Lanka. According to the results NC-CMC shows greater improved adsorption properties than crCMC as it could reduce the total water hardness by 60% to meet the required standards (88.42 mg/g) within 10 minutes while the reduction given by crCMC was 37% within a time of 15 minutes.

Keywords: *Carboxymethyl cellulose; nanocellulose; water hardness*

Acknowledgement: National Research Council (Grant: NRC-TO 16-18)

Effect of interfacial properties on the stability of nano hydroxyapatite coatings

N. L. Fernando¹, N. Kottegoda^{2,3}, J.K.D.S. Jayanetti¹, V. Karunaratne^{3,4}, D. R. Jayasundara^{1,*}

¹*Department of Physics, University of Colombo, Sri Lanka*

²*Department of Chemistry, University of Sri Jayewardenepura, Sri Lanka*

³*Sri Lanka Institute of Nanotechnology, Sri Lanka*

⁴*Department of Chemistry, University of Peradeniya, Sri Lanka*

Functional coatings have increasingly become popular in recent times in the design and development of smart surfaces. Hydroxyapatite (HA) plays a major role as a functional coating due to excellent biocompatibility, slow biodegradability, osteoconductivity and mechanical properties. Hydroxyapatitebased coatings are fabricated with deposition of thin films *via* different techniques with subsequent high temperature sintering. The high temperature treatment greatly limits the choice of materials that can be used in the sensor fabrication and will also not be economically viable. Therefore, obtaining stable functional coatings without sintering is of great interest. Moreover, *in situ* stability of coatings in most aqueous media for a prolonged period of time, especially of those coatings used in bio sensing applications, is essential for their accurate performance. However, in most studies the stability of nano-hydroxyapatite (HA-Np) coatings and the interactions of HA-Np with aqueous media over an extended period of time were not investigated adequately. In this research the fabrication of HA-Np films on quartz crystal microbalance sensors and the stability of the HA-Np films after fabrication and after prolonged exposure to water and phosphate buffer (PBS) are reported. The stability is measured by monitoring the changes in the quartz crystal microbalance resonance frequency, which is proportional to the mass accumulation or removal, at each of the above steps. Results indicate that the dissolution is triggered in the prolonged exposure to water due to a combination of particle and ionic dissolution. On the contrary when the coating is immersed in PBS a dynamic equilibrium of phosphate ions is created due to the interchange of phosphates in the medium of the PBS with phosphates on the surface of HA-Np films. As a result of the dynamic equilibrium, the dissolution is controlled in the PBS medium. Moreover, the salting out effect created at the interface of the HA-Np films and the PBS medium suppresses the dissolution.

Keywords: *interface; nano-hydroxyapatite; quartz crystal microbalance; stability; thin films*

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A single stock of *Euthynnus affinis* (kawakawa) around the coast of Sri Lanka revealed by molecular analysis

D.R. Herath^{1,2}, H.A.C.C. Perera¹, C.D. Dangalle³, G.H.C.M. Hettiarachchi^{2*}

¹ *Marine Biological Resources Division, National Aquatic Resources Research and Development Agency, Sri Lanka.*

² *Department of Chemistry, University of Colombo, Sri Lanka.*

³ *Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka*

Euthynnus affinis (kawakawa, ‘Atawalla’) is a neritic tuna species commercially very important in the coastal fishery of Sri Lanka. The species consists of about 23% of the neritic tuna catch of the total coastal fishery. This species is seen in combination with the other common neritic tuna species such as *Auxis thazard* (frigate tuna) and *Auxis rochei* (bullet tuna). Though it is a commercially very important species, the relationships of the different stocks found around the coast of Sri Lanka for this species have not been studied before. In this study, the two molecular markers, the mitochondrial COI region and the mitochondrial D-loop region were used to compare the stocks of *E. affinis* found around the coastal regions of Sri Lanka. Samples were collected during the period October 2015 to September 2017 from Negombo and Beruwela in the Western Province, Galle, Dodanduwa, Mirissa and Weligama in the Southern Province, Chilaw and Kalpitiya in the Northwestern Province and Trincomalee in the Eastern Province of Sri Lanka. 103 sequences of the COI region and 105 sequences of the D-loop region were used to compare the stocks of the different regions. Phylogenetic analysis was conducted using MEGA version 7.0 and maximum likelihood trees were constructed for the two markers. Bootstrap value was set at 1000. The phylogenetic analysis did not show sample clustering according to geographical location and revealed that the samples of all the regions were mixed together. This indicates that it is highly possible that the stocks of the different regions have originated from a common ancestor and that therefore, the stocks of *E. affinis* of the coastal regions studied could be considered as one stock when management plans are being formulated for this species.

Keywords: *Euthynnus affinis*; mitochondrial COI; mitochondrial D-loop; stock identification

A bacterial biosensor: An attempt to develop a suitable microbial candidate to detect heavy metals in ground water

H.M.L.P.B Herath ^{1,3}, Y.I.N.S Gunawardene ², P.W.A.I.D Panvilawaththa ¹, D.M.C.S

Dissanayake ¹, K.M.N de Silva ¹, L.O.B Afonso ³, R.S Dassanayake¹

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Molecular Medicine Unit, University of Kelaniya, Sri Lanka*

³*School of Life and Environmental Sciences, Centre for Integrative Ecology, Deakin*

University, Australia

Heavy metal contamination in drinking water is a major health problem at present. Due to industrialization and environmental effects, the drinking water quality has been greatly affected in many countries around the world including Sri Lanka. The consumption of water polluted with heavy metals in agricultural paddy fields under reservoir-based cascade irrigation in Sri Lanka had led to Chronic Renal Failure. Therefore, the early detection of heavy metals in drinking water by a novel molecular-based technique is a prerequisite to prevent associated health risks. In the current study, we have designed a genetically modified bacterial strain that is capable of fluorescing when exposed to heavy metals contaminated water. A cadmium resistant operon in bacteria regulated by cadR protein and *cadR* gene sequence was retrieved from the *Pseudomonas* genome database and a DNA cassette capable of heavy metal sensing was bioinformatically designed incorporating the enhanced Green Florescent Protein gene sequence. The cassette was chemically synthesized and subsequently it was cloned into the pJET1.2 vector and transformed into *Escherichia coli* BL21 cells. The PCR confirmed transformant cells were subjected to the florescent emitting heavy metal sensitive assays and observed under the florescent microscope. In the preliminary calibration experiment, genetically modified *E. Coli* BL21 cells exposed to 0.2 mM Cd (II) elicited a strong green florescent signal when treated with IPTG (0.57 μ M), while no detectable signal was observed with the wild type BL21 cells under the same conditions. The current study demonstrated a successful construction of a bacterial-based biosensor.

Keywords: *bacteria; biosensors; heavy metals; operon*

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Preparation of sustained release naproxen loaded electrospun nanofibres for transdermal delivery

V. U. Godakanda¹, K.M.N. de Silva¹, W. R. M. de Silva¹, G. R. Williams²

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*UCL School of Pharmacy, University College London, UK*

Arthritis is a disease identified with chronic progressive inflammation and destruction of joints leading to stiffness and pain. Naproxen (Nap) is a nonsteroidal anti-inflammatory drug (NSAID) used by arthritic patients, which gives analgesic and anti-inflammatory effects through non-selective inhibition of COX-1 and COX-2. It is used to relieve symptoms of arthritis such as inflammation, swelling, stiffness, and joint pain. The transdermal route of administering Nap avoids side effects of the oral route and extends the period of therapeutic action. One major drawback in topical application of NSAID is the need to frequently apply the dressing/ dosing, which is expected to be difficult for patients suffering from arthritis due to their stiffness in joints and pain. A better solution would be to have a smart fabric in the form of a dressing with sustained release of NSAID over a period of time, thus eliminating the need for frequent change of dressings. The aim was to develop a rationally designed transdermal drug delivery system with sustained release properties to avoid frequent applications and improve patient compliance. A series of Polyvinylpyrrolidone (PVP)/ Ethylcellulose (EC) blended fibers were prepared by electrospinning solutions. Electrospinning was carried out at 16 kV, flow ratio 1.0 ml/ hr with nozzle to ground distance of 20 cm. Fibers were characterized using DSC and XRD to confirm the presence of the drug in its amorphous form in the fibers. The drug release profile of the fibers shows a similar burst release in all samples. This is thought to result from the presence of Nap at the surface of the fibers that can rapidly diffuse irrespective of the solubility of the polymer constituents. After the initial release, all fibers exhibit gradual release over 80 h. The rate of Nap release is fastest in 3:2 PVP/EC/Nap and this formulation showed the best zero order release profile.

Keywords: *arthritis; electrospinning; Naproxen; pain*

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Daily-binned GeV Gamma-ray flux variability of BL Lacertae object from 2011 - 2017

K. L. I. Gunawardhana¹, K. P. S. C. Jayaratne¹, A.U. Abeysekara²

¹*Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka*

²*Department of Physics and Astronomy, University of Utah, USA.*

Blazars are extragalactic very high energy sources that belong to the subcategory of Active Galactic Nuclei (AGNs). They are bright point sources of Gamma-Rays that have relativistic jets pointing along the Earth. Blazars are highly variable in each wavelength band from radio to Gamma-Rays. The variability timescale of the flux is a key measurement to identify the location and the size of emission zones. The BL Lacertae object (also known as 1ES 2200+420, TeV J2202+422 or 3FGL J2202.7+4217) is a foremost example of one such Blazar. The GeV (1 GeV – 100 GeV) Gamma-Ray flux variability of the BL Lacertae object from 2011 to 2017 was studied using a Fermi-Large Area Telescope (Fermi-LAT), an important scientific instrument on the Fermi Gamma-ray Space Telescope Spacecraft. This work discovered one micro flare on 04th October 2016 and data points are fitted to 9th order polynomial ($R^2=0.869$). The daily binned Mean Fractional Variation (MFV) too is calculated for the BL Lacertae. The obtained daily binned GeV Gamma-Ray MFV of the BL Lacertae is 0.92 for the time period of 2011 - 2017. This high MFV value indicates that the BL Lacertae object has a GeV Gamma-Ray flux that is variable in the daily scale (daily-bin).

Keywords: *blazars; BL Lacertae; Fermi-LAT; Gamma-rays*

Development of an ex-vivo ultrasound system for tissue evaluation

D. K. Hewadikaram¹, H.E. Perera², D. C. Wickramrathna², M. Bandara², A. N. Pattividana²,
H.H.E. Jayaweera², J. P. Wansapura²

¹ *Department of Electrical, Electronics and Telecommunication Engineering, General Sir
John Kotelawala Defense University, Sri Lanka*

² *Department of Physics, University of Colombo, Sri Lanka*

Frequency dependence of scattering from small structures has been used to extract details about the structure of different materials and media. Further, it has been found that the tissue properties significantly change with disease process and it was hypothesized that these alterations cause observable changes in acoustic scattering properties. In this study, we developed an ultrasound probe to acquire and quantify frequency dependence of scattered ultrasound waves from *ex vivo* samples using a single transducer. A new tissue characterization parameter, the Full Width at Half Maximum (FWHM) of the frequency spectrum was introduced to characterize the frequency dependence of the tissue. The system consists of a single element 5 MHz ultrasound transducer, a 3-axis Cartesian positioning system and a pc oscilloscope. Data acquisition, storage and motor controlling were all combined to build a single interface in MATLAB. Acquired radio frequency data were subjected to Hamming windowing followed by Fast Fourier Transformation and Gaussian curve fitting. The FWHM is calculated from the fitted Gaussian curve. Data from a homogenous Gel phantom shows the variance of repeated measures of FWHM from this system to be at 1% which is well within the variance of tissue characteristics between samples.

Keywords: *frequency dependence; FWHM; tissue evaluation; ultrasound*

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Determination of iodine and saponification value of coconut oil using an FT-NIR technique

H. G. T. H. Jayatunga¹, H. P. P. S. Somasiri¹, K. R. R. Mahanama²

¹*Industrial Technology Institute, Sri Lanka*

²*Department of Chemistry, University of Colombo, Sri Lanka*

Coconut oil is the main edible oil used in Sri Lanka. Determination of quality parameters, iodine value (IV) and saponification value (SV) are important for the oil industry. The current standard methods are time consuming, laborious and require large amounts of organic solvents, resulting in higher cost, and environmental and health impacts. It is possible to overcome the above disadvantages with near infrared (NIR) techniques. Virgin, copra, desiccated coconut oil samples and commercial vegetable oil samples (palm, sunflower, sesame seed, olive, soya bean and corn oil) were used for the method development. IV and SV were determined by ISO 3961:2013(E) and ISO 3657:2013(E) respectively. NIR spectra of oil samples were obtained by FT-NIR (Antaris II, Thermo Scientific, USA) at a resolution of 4 cm⁻¹ in transmission mode, accumulating 36 sample scans and background scans per spectrum. Partial least square (PLS) calibration (TQ analyst version 9, Omnic Softwares, USA) was done by feeding spectral data in the region of 4776-4555 cm⁻¹. Validation was done by full cross validation technique. The obtained calibration model was used for quantification of unknown samples. In the above mentioned range, significant spectral variations were observed due to CH combination of unsaturations and CH₂ combinations. Upon PLS calibration, the correlation coefficient (R²) between actual and calculated values for IV and SV were 1.00 and 0.99 and Root Mean Square Errors (RMSE) were 0.16 and 1.12 respectively. Validation was done leaving out one sample at a time; R² = 0.99 and RMSE = 0.47 were obtained for IV, and R² = 0.99 and RMSE = 2.09 were obtained for SV. Using the developed models, the IV and SV values of unknown coconut oil samples were estimated to be $\leq \pm 0.5$ and $\leq \pm 5.0$ respectively, compared to the values determined by standard methods. Since the predicted values of IV and SV are well correlated with the values from standard analysis, the method can be used to estimate the iodine and saponification values of coconut oil.

Keywords: *edible oils; Fourier transfer infrared spectroscopy (FT-NIR), iodine value, saponification value*

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Cu₂O/rGO nanocomposite for photocatalytic degradation of methylene blue

K.D.R.N. Kalubowila¹, J.M.D.R. Jayasundara¹, K.M.D.C. Jayathilaka², M.S. Gunewardene¹,
D.P. Dissanayake³, J.K.D.S. Jayanetti^{1*}

¹ *Department of Physics, University of Colombo, Sri Lanka*

² *Department of Physics, University of Kelaniya, Sri Lanka*

³ *Department of Chemistry, University of Colombo, Sri Lanka*

Due to the superior electronic properties of graphene that improve the photocatalytic behavior of semiconductor materials, there is increased attention on graphene based semiconductor photocatalysts. The objective of this study was to evaluate the enhancement of photocatalytic activity of cuprous oxide (Cu₂O) nanoparticles supported on the graphene (rGO). The Cu₂O/rGO nanocomposites were prepared by reducing copper hydroxide-embedded graphene sheets by using ascorbic acid. The Cu₂O/rGO nanocomposites were characterized by X-ray diffraction (XRD) and Scanning Electron Microscopy (SEM). The results showed that the aggregated spherical Cu₂O particles of an average diameter of 100 nm were distributed on layered graphene. A preliminary study on the photocatalytic activity of the Cu₂O/rGO nanocomposites was made using the photo-degradation of methylene blue (MB) under visible light irradiation. The synthesized Cu₂O/rGO nanocomposite showed excellent photocatalytic activity by photodegrading MB completely within 60 minutes. Pure cuprous oxide particles did not show a significant photodegradation against visible light. The resulting enhanced photocatalytic activity of the Cu₂O/rGO nanocomposites is attributed to the increased adsorptivity to the organic dye (MB) and the efficient charge separation and transportation process at the Cu₂O/rGO nanocomposite and liquid interface.

Keywords: *cuprous oxide; graphene; methylene blue; photodegradation; visible light irradiation*

A preliminary investigation of the diversity and distribution of zooplanktons in relation to the water quality in selected locations of the Kala Oya river basin, Sri Lanka

K. Kamalendran^{1,2}, D.D.G.L. Dahanayaka², D. Wickramasinghe¹

¹ *Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka*

² *Department of Zoology, The Open University of Sri Lanka*

Secondary production of water bodies / aquatic environments is predominantly influenced by the zooplanktons and quality of water which directly affect fishery production. The current research focused on finding a relationship between zooplankton and water quality in some selected locations in the Kala Oya river basin. Distribution and diversity of zooplanktons and selected water quality parameters in three flowing and a stagnant habitat were examined along Kudagama (8°13'N; 80°25'E) to Lady of Lourdes Church, Kala Oya (8°2'N; 80°10'E) from May to July 2018 using standard methods. In total, eight genera of zooplanktons of Rotifers (2), Copepods (3), and Cladocerans (3) were identified by using available keys. The zooplankton population consisted mainly of Cyclopidae (copepods- 50.9%), Brachionidae (rotifers- 18.62%) and Chydoridae (cladocerans- 10.08%) families with a few ostracods. Species diversity was higher in the stagnant part of the water body with Shannon Wiener Diversity Index (1.88) compared to that of flowing water (0.656) indicating that stagnant water could have favorable ecological conditions for colonization, and growth of zooplanktons. Moreover, flowing water contained high zooplankton abundance (0.966 individuals/ml). Density of the zooplanktons were negatively correlated with pH ($r = -0.97$), dissolved oxygen ($r = -0.98$), conductivity ($r = -0.91$) and total dissolved solids ($r = -0.91$). Although, this study presents a basic picture of the zooplankton in the water body, more information including the species specific variation in body sizes, presence of planktonivorous fish, escape responses and a complete biochemical profile is required to come to a conclusion.

Keywords: *abundance and diversity; Kala Oya basin; water quality parameters; Zooplanktons*

Analysis of dengue viral loads present in asymptomatic mothers of symptomatic children

W. W. Kumbukgolla^{1,2,3}, P. V. Udagama¹, S. Gunasena², E. E. Ooi³, A. Weerasinghe⁴

¹ *Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka*

² *Medical Research Institute, Colombo, Sri Lanka*

³ *DUKE-NUS Medical School, National University of Singapore, Singapore*

⁴ *Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka*

Worldwide annually, 390 million people suffer from dengue infections that can be asymptomatic or symptomatic. Comparison of viral loads in asymptomatic individuals, with different stages of symptomatic patients would be useful to understand the aetiology of asymptomatic infection. Blood samples of 178 children symptomatic for dengue infection were collected from the Lady Ridgway Hospital in Colombo in 2015/2016. Apparently healthy mothers (N=178) of these symptomatic children, who did not show any febrile illness for 3 weeks prior to the time point of obtaining the sample, were included in the study. After collecting blood samples, mothers were observed for another 3 weeks for any febrile illness. Samples were collected from mother and child at the same time-point. Viral RNA was extracted from plasma samples using Qiagen RNA extraction mini-kit. RT-PCR was performed using SYBR green in a Roche Light Cycler amplifier. Universal primers that amplify E-prM region of all 4 dengue serotypes were used and the RT-PCR products were analyzed on agarose gels to confirm a band between 200-300 bp. The viral load in the plasma was quantified using a standard curve with a known number of viral copies vs Ct value of RT-PCR. Of these asymptomatic mothers, 31 (17.4%) scored positive on dengue RT-PCR. Viral loads were calculated in samples of 3-4 days and 5-6 days after onset of fever, and in symptomatic individuals. Highest mean value of viral load (10^6 copies/mL) was observed in 3-4 days that subsided in 5-6 days (Viral load: 10^4 - 10^5 copies/ml) after onset of fever with the start of the convalescent phase. The viral load of asymptomatic infection (10^4 - 10^5 copies/ml) was approximately similar to that of early convalescent phase (5-6 days after infection) of symptomatic infection. Therefore, viral loads of asymptomatic infections were about 10-100 fold less than that of acute symptomatic infections.

Keywords: *Asymptomatic dengue; RT-PCR; viral load*

Acknowledgement: Financial assistance from the HETC Project, Sri Lanka and DUKE-NUS Medical School, Singapore

Rotational dynamics of the proton-proton vector of water molecules in very short time regime

W.A.M. Madhavi^{1,3}, S. Weerasinghe², K. Momot³

¹*Department of Physics, University of Colombo, Colombo, Sri Lanka,*

²*Department of Chemistry, University of Colombo, Colombo, Sri Lanka*

³*School of Chemistry, Physics and Mechanical Engineering, Queensland University of Technology, Brisbane, Australia*

We have previously reported that the rotational dynamics of water molecules occur as a combination of small step diffusion and large angle jumps. We have also reported that the rotational diffusion of spherical-top molecules in liquids such as methane, can be described using a combination of two models; free rotation and Debye rotational diffusion. In this study, we investigated the librational dynamics of water molecules in liquid at extremely short time regime (< 1 ps) using molecular dynamics simulations performed at the temperature of 298 K and 1 atm pressure. The MD simulations were performed with the use of 10000 water molecules in a cubical simulation box. The TIP4P/2005 water model was used with CHARMM compatible force field parameters and NAMD software was used to run the simulations. The length of the simulation was 30 ps with the MD time step of 1fs and atomic coordinates of molecules were saved in every step. The Legendre polynomial functions of the angular displacement of the proton-proton vectors of water molecules were sampled at 1 fs intervals for each molecule. Ensemble-averaged Legendre polynomial functions of order 1–4 were calculated and then the functions were least-squares fitted with two theoretical models; the free rotation model and the Debye diffusion model. The results indicate that in the extremely short time regime (< 0.02 ps), the librational motion of the water molecules can be described by the free rotation model. At relatively long time regime (0.4 – 1 ps) the rotational diffusion can be described by a Debye-compatible, exponential function. However, the ratios between the apparent diffusion coefficients extracted by the fitting of Legendre polynomial functions of order 1–4 deviate from the theoretically predicted ratios.

Keywords: *Debye model; free-rotation; molecular dynamics; rotational diffusion*

Evolution of structural changes during oxidation of graphene oxide

B. Nissanka, D. R. Jayasundara

Department of Physics, University of Colombo, Sri Lanka

The evolution of oxygen functionalities and the structure of graphene oxide (GO) during the oxidation was investigated by varying the oxidation parameters. GO was synthesized using modified Hummer's method. The chemical and structural characterization of the synthesized GO membranes was carried out using X-ray diffraction (XRD) and Fourier Transformed Infrared Spectroscopy (FTIR). XRD spectra of GOs show the appearance of new diffraction peak (001) of GO at $\sim 10^\circ$ while the diffraction peak (002) of graphite disappeared upon the oxidation of graphite. This indicates that all GOs are completely oxidized with no residual graphitic components. Simultaneously, these results further indicate the complete interlayer expansion from that of graphite due to the rapid incorporation of oxygen functionalities between graphite layers during oxidation and intercalation of water molecules. As the oxidation proceeds from GO-1 to GO-4, the interlayer distance is effectively increased due to the inhomogeneous distribution of oxygen functionalities and the extent of hydration. FT-IR was carried out to identify the oxygen functionalities on GO. These results confirm the incorporation of oxygen functionalities such as COOH, C=O, C-OH and C-O-C on GO during the oxidation of graphite. It can also be observed that with the increment of oxidation time, the stretching vibrations of C-OH is blue shifted by 20 cm^{-1} from GO-1 to GO-2. This clarifies the structural variations that arise on the basal plane of GO during the oxidation due to the formation of vacancies and the change in the spatial distribution of oxygen functionalities. Therefore, a detailed understanding about the time evolution of oxygen functionalities and structure of GO is of great importance in order to synthesize GO with controllable oxygen functionalities.

Keywords: *graphene oxide; oxidation; oxidation time; oxygen functionalities; structure*

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A study on the factors associated with wage distribution of the permanent employees in the year 2011 in Sri Lanka

R.D.C.S. Rajapaksha, E.R.A.D. Bandara

Department of Statistics, University of Colombo, Sri Lanka

Employees in Sri Lanka are more focused on permanent employments due to job security and various other benefits. Among the permanent employees, some earn a considerably higher monthly wage due to the association of various factors. The aim of this study was to identify the socio-economic and demographic factors associated with the wage distribution of permanent employees in Sri Lanka in the year 2011. This study was conducted based on a secondary source of data on 5095 permanent employees from the Labour Force survey-2011 in Sri Lanka. Binary logistic regression model was used to identify the associations by considering wage as a binary response variable where the average wage of Rs. 20,000/= of a permanent employee in the year 2011 was used as the cut-off point of the response variable. According to the fitted model, factors such as gender, province, age, level of education, English literacy, major occupation category, nationality, marital status and work sector were identified as the significantly associated factors with wage. Hosmer & Lemeshow test and ROC curve showed that the model was fitted adequately. Based on the significant parameter estimates of the fitted model, odds of receiving a wage greater than Rs. 20,000/= are about twice higher for males than for females. Furthermore, as the level of education increases odds of receiving a wage greater than Rs. 20,000/= also increases. Odds of receiving a wage greater than Rs. 20,000/= are about twice higher for an English literate group than for the non-English literate group.

Keywords: *job security; permanent employees*

Investigation of Violaceae plants from the Horton Plains for the presence of cyclic peptides and transcriptomic analysis to identify peptide sequences

S. Rajendran^{1,2}, S. Mohotti², U. Göransson¹, S. Gunasekera¹, C.M. Hettiarachchi²

¹*Division of Pharmacognosy, Department of Medicinal Chemistry, Uppsala University, Sweden*

²*Department of Chemistry, University of Colombo, Sri Lanka*

The plant families Rubiaceae, Solanaceae, Fabaceae, Cucurbitaceae and Violaceae are known to contain bioactive peptides known as cyclotides. Cyclotides are a unique class of ribosomal synthesized cysteine-rich mini proteins. Their compact structure consists of a head-to-tail cyclized backbone stabilized by the knotted arrangement of three conserved disulfide bonds, in the combination known as cyclic cysteine knot (CCK) motif. Cyclotides have a wide range of biological activities such as antimicrobial, anti-HIV, antineurotensin, cytotoxic, hemolytic and insecticide activity. In this study, the focus will be on plants that belong to the family Violaceae investigated for the presence of cyclotides. Species belonging to the genera *viola* were screened for the presence of cyclotides using LC-MS techniques. Plants were collected from Horton plains and Ohiya, and the arial dried part was extracted with aqueous methanol. Size exclusion column (G15) was carried out to concentrates the higher molecular masses of cyclotide. LC-MS was carried out to separate individual molecules and to identify masses. All chromatographic peaks were manually investigated for the presence of cyclotide-like masses. We assumed that peaks stemmed from cyclotide like substances if their masses fell within the range of 2,500–3,300 Da. The presence of cyclotide were confirmed in three *viola* species (*Viola pilosa*, *Viola betonicifolia*, *Viola hamiltoniana*). The next generation sequence (Transcriptomic analysis) was carried out with *Viola betonicifolia* to identify gene encoded cyclotide sequences and their processing enzymes. For this, uncontaminated plant tissues were preserved in a RNA later solution and sequenced by the platform Illumina HiSeq 2000 Sequencing System with the library TruSeq RNA. Interestingly, 22 new sequences and three known (Kalata S, Viba 17, Viba 11) cyclotides were discovered.

Keywords: *amino acid sequence; chromatography; Cyclotide; transcriptomic analysis*

Establishment of a MAGDAS-9 magnetometer in Sri Lanka and the study of magnitude of daily geomagnetic variation around Sri Lanka

A. D. M. P. Ranasinghe¹, K. P. S. C. Jayaratne¹, A. Yoshikawa²

¹*Astronomy and Space Science Unit, Department of Physics, University of Colombo, Sri Lanka*

²*International Center for Space Weather Science and Education (ICSWSE), Kyushu University, Fukuoka, Japan*

Sri Lanka is a very important place for studying geomagnetic variations as the geomagnetic dip equator is currently crossing the middle part of the country. MAGDAS (MAGnetic Data Acquisition System) is a global network of ground-based magnetometers at different locations in the world. As an extension of the MAGDAS project, a geomagnetic field measuring station was established in Sri Lanka in 2016. The observatory was established in a site isolated from roads in the Dompe area (6.97°N, 80.07°E) after inspecting several locations close to the places in the dip equator region across the whole country. This site was selected because it showed minimum noise ($< \pm 400$ nT) on the geomagnetic horizontal (H) component averaged over a one-hour period compared to the other sites inspected. Sri Lanka's MAGDAS observatory has a Three-Component Ring-Core Flux Gate type magnetometer and the magnetometer takes measurements within a $\pm 64,000$ nT range with a noise level of 0.02 nTp-p. This study shows the diurnal variation of the horizontal (H) component of the geomagnetic field around Sri Lanka. For the study, geomagnetic field measuring data of 2016 March, 2016 April, 2016 June, 2017 March and 2017 April were used. The MAGDAS-9 magnetometer takes geomagnetic measurements each second and one-minute averaged values are used in this study. Using one-minute averaged values, the daily minimum (min) and daily maximum (max) of the geomagnetic field's H component were calculated. The diurnal variation of the H component shows a peak around local noon. The magnitude of the daily variation in geomagnetic field was calculated by reducing the minimum value from the maximum value of the daily geomagnetic field measurements. The results show that the magnitude of the daily variation in the geomagnetic field varies between 63.89 nT and 259.78 nT with an average of 125.90 nT. This variation of geomagnetic field is expected due to changes in core related factors like solar wind speed, particle density of the solar wind, changes in interplanetary magnetic field and changes in the Earth's current systems: Sq current, equatorial electrojet (EEJ), counter equatorial electrojet (CEJ), and Ring current. Further studies are needed in order to understand the relationship between the geomagnetic variation around Sri Lanka and the above core related factors.

Keywords: *dip-equator; equatorial electrojet (EEJ); geomagnetic variation; MAGDAS; magnetometer*

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Use of native phosphate solubilizing microorganisms for improved phosphorus nutrition of cinnamon (*Cinnamomum zeylanicum*)

R. K. R. S. Ranasinghe¹, C. M. Nanayakkara¹, D. N. Samaraweera²

¹*Department of Plant Sciences, University of Colombo, Sri Lanka*

²*Cinnamon Research Station, Department of Export Agriculture, Sri Lanka*

Being a low solubilized phosphate fertilizer, Eppawala Rock Phosphate (ERP) is recommended for long term crops such as cinnamon, a highly priced export agricultural crop. Since ERP is a non-renewable resource, exploring a way of sustainable utilization is vital while improving plant P nutrition. This study was focused on the sustainable utilization of ERP amended with native Phosphate Solubilizing Microorganisms (PSMs): *Aspergillus* sp. and *Burkholderia* sp. A pot experiment of cinnamon was carried out with three inoculum levels i.e. *Aspergillus* sp. alone (F), *Burkholderia* sp. alone (B) and the combination of both species (FB), and three fertilizer levels i.e. no P (P₀), ERP at recommended level (P₁) and ERP at half recommended level (P_½). The treatments were combinations of inoculum and fertilizer level i.e. FP₀, FP₁, FP_½, BP₀, BP₁, BP_½, FBP₀, FBP₁, FBP_½ and their counterparts with no inoculum, while P₀, P₁ (recommendation), P_½ served as controls. All the treatments had urea and muriate of potash at the recommended levels. *Aspergillus* sp. and *Burkholderia* sp. were mass propagated in two different mass cultivation media i.e. rice straw supplemented with broken maize seeds (2:1) and rice straw supplemented with rice bran (1:1), respectively. Treatments were applied for 8 month old plants. Four replicates were maintained and completely randomized design was employed. Shoot dry weight, root dry weight, plant height, available soil P, plant P uptake and soil microbial counts were quantitatively determined. Three destructive samplings (DS) were done at 10 week time intervals after inoculation. The results were statistically analyzed using SAS 9.0 version, at 5% level of significance. Plant growth parameters were not significantly different. However, soil P levels were significantly different ($p \leq 0.05$). The treatments with (F) and combination of (FB) showed high soil P levels and were significantly high compared to the recommendation (P₁). An enhancement of plant P uptake was also observed in those treatments. It was revealed that the soil P levels in P_½ along with PSMs were not significantly different to P₁ with PSMs. Hence, the study concluded that the PSMs are capable of improving available soil P level in the presence of 50% P fertilizer, leading towards the sustainable utilization of ERP.

Keywords: cinnamon; Eppawala rock phosphate (ERP); Phosphate Solubilizing Microorganisms (PSMs)

Whole genome sequencing of *Setaria digitata*: Towards an ideal model organism and eliminating nematodiasis

N. Rashanthi¹, H. M. L. P. B. Herath¹, N. F. Neththikumara³, W.A.S. Darshika¹, G.L.Y.

Lakmali¹, Y. I. N. S. Gunawardene¹, N. V. Chandrasekaran¹, R. S. Dassanayake¹

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Molecular Medicine Unit, University of Kelaniya, Sri Lanka*

³*Human Genetics Unit, University of Colombo, Sri Lanka*

Setaria digitata is an animal filarial nematode that infects cattle, the natural host, causing mild disease. However, when this nematode infects goat, sheep and horses it can cause cerebrospinal nematodiasis that leads to lumbar paralysis inflicting considerable economic losses to livestock farmers in Asia and the Far East. Thus, it is important to unravel the biological, biochemical, physiological processes etc. in this organism. The current study was undertaken to sequence the whole genome of *S. digitata* and to annotate important processes through *de novo* assembly and bioinformatic analyses. *S. digitata* genomic DNA was extracted from adult worms (DNA Micro kit, QIAGEN) and the sample was subjected to next generation sequencing (NGS). An Illumina library preparation kit optimized for whole-genome sequencing (WGS) was used (TruSeq™ DNA PCR-Free Kit). After initial trimming and quality filtering, a total of 11,933,095,844 bases in 79,292,174 reads were obtained. GC percentage was 31.77%. 97.32% of the total reads were above the Q30 quality threshold level. 21bp was identified as the optimum k-mer size. A total of 2,083 contigs were generated with the longest contig being 37,817bp and the shortest being 70bp. N50 value was 113,368. After the genome assembly analysis, 15,987 genes were predicted. The total length of the transcripts was 15,762,118bp and total length of the proteins was 5,225,492 amino acids. The outcome of the current study shed light on the hitherto unknown genome structure and organization of *S. digitata* and the biological, biochemical processes etc., that *S. digitata* genome encodes.

Keywords: lumbar paralysis; nematodiasis; *Setaria digitata*; WGS

Assessment on salinity intrusion into the Kelani River up to the intake of the Ambatale water treatment plant

Y.M.I.B. Samarakoon^{1,2}, E. A. N. V. Edirisinghe¹, M.R. Lamabadusuriya²

¹*Sri Lanka Atomic Energy Board, Sri Lanka*

²*Department of Nuclear Science, University of Colombo, Sri Lanka*

The demand for drinking water in Colombo city has increased over time. Therefore, the extraction of fresh water from Kelani River for water treatment plants has also increased. However, the impact of salinity intrusion, particularly during low flow conditions in Kelani River has complicated the water purification process. Hence, it is important to understand the salinity distribution in the Kelani River to take precautionary action to prevent salinity intrusion into water treatment plants. The isotope technique in hydrology was adopted to determine the salinity distribution in the Kelani River. River water samples were collected at two different depths each at a 500 m distance along the river, upstream from the river mouth up to Ambatale, during low and high river flow conditions. Electrical conductivity (EC) of river water was measured during sampling and samples were analyzed for stable water isotopes at the Sri Lanka Atomic Energy Board using a liquid water isotope analyzer (LWIA). Results revealed that the surface water of Kelani River is not significantly affected by salinity intrusion compared with deep water. However, salinity intrusion is higher in surface water during low flow conditions than during high flow conditions. Salinity intrusion in deep water is found to be high even up to 13-14 km from the river mouth during low river flow conditions. This would affect the water purification process at Ambatale water treatment plant. A significant amount of salinity intrusion is observed for deep water up to 6.5 km from the river mouth during high flow conditions. Although the salinity of surface water fluctuates considerably under different river flow conditions, the salinity of deep water generally shows a steady state downstream of the river. The study showed a good correlation between % sea water contribution (% SWC) and EC; hence, a correlation was constructed to find the salinity in Kelani River using EC values.

Keywords: *isotope technique; Kelani River; salinity intrusion*

Fractal dimension analysis of pixel DCE-MRI parameters for discrimination of benign and malignant breast lesions

L.P.G. Sherminie^{1,2}, M.L. Jayatilake²

¹*Department of Nuclear Science, University of Colombo, Sri Lanka*

²*Department of Radiography / Radiotherapy, University of Peradeniya, Sri Lanka*

Breast cancer is the most frequent cancer in women worldwide. Yet the diagnosis of breast cancer depends mostly on the visual examination of radiological images. Therefore, a quantitative approach is needed to analyze the images. Dynamic contrast enhanced - magnetic resonance imaging (DCE-MRI) has emerged as a promising imaging modality in screening and detecting breast cancers facilitating quantitative analysis through pharmacokinetic (PK) modelling. However, these PK parameters lack information on parameter heterogeneity and a texture-based analysis is required to quantify PK parameter heterogeneity. Therefore, this study is focused on finding the usefulness of fractal dimension as a potential imaging biomarker of tumour heterogeneity for discriminating benign and malignant breast lesions. The data of 18 subjects who had undergone DCE-MRI examinations were obtained and parametric maps for PK parameters, K^{trans} (Extravasation rate of contrast agent from blood plasma to extravascular extracellular space) and v_e (Volume fraction of extravascular extracellular space), were generated for the regions of interest (ROIs) under the standard model (SM). Then tumour ROI and pixel DCE-MRI time-course data were analyzed to extract pixel values of K^{trans} and v_e . For each subject, fractal dimensions of K^{trans} and v_e within the tumour ROI were computed using the blanket method. The mean K^{trans} varied between $\sim 0.02 \text{ min}^{-1}$ and $\sim 0.07 \text{ min}^{-1}$ for benign lesions while mean K^{trans} varied between $\sim 0.01 \text{ min}^{-1}$ and $\sim 0.13 \text{ min}^{-1}$ for malignant lesions. The mean v_e for benign and malignant lesions varied from ~ 0.1 to ~ 0.6 and ~ 0.1 to ~ 0.4 respectively. The fractal dimensions of K^{trans} for benign and malignant lesions varied from 2.96 to 3.49 and from 2.37 to 3.16 respectively whereas fractal dimensions of v_e for benign lesions varied from 3.01 to 5.15 and fractal dimensions for malignant lesions varied from 2.42 to 3.44. Texture heterogeneity changes of breast lesions captured by fractal dimension using quantitative DCE-MRI parameters generated under SM is a potential marker for early prediction of pathological response.

Keywords: breast cancer screening; DCE-MRI technique; fractal dimension analysis

Removal of As(V) and Cd(II) in water by thermally stabilized electrospun nanomagnetite and nanotitania doped polyacrylonitrile nanofibers

I. W. Siriwardane^{1,2}, W. R. M. de Silva¹, K. M. N. de Silva^{1,2}, G. A. J. Amaratunga^{2,3}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Sri Lanka*

³*Department of Engineering, University of Cambridge, UK*

Materials engineering for water purification applications is an area of research which has attracted many researchers over the course of time. In this work, an electrospinning process has been used to fabricate the nanomagnetite and nanotitania doped polyacrylonitrile (MTPAN) composite fibers. The electrospinning conditions: polymer concentration, applied electric voltage, feed rate and the distance between needle tip to the collector, were optimized to produce uniform bead-free fibers. The composite fibers were characterized using scanning electron microscopy (SEM), X-ray diffraction (XRD) and Fourier transformed infrared (FTIR) spectroscopy. The pyrolysis temperature conditions of MTPAN fibers were determined by thermogravimetric analysis (TGA), as a prerequisite to producing metal oxide nanoparticles decorated carbon fibers *via* this route. Thermally stabilized MTPAN fibers were assessed for their As(V) and Cd(II) ion removal capacity. The isotherm studies were carried out in batch experiments. As(V) adsorption data could be best explained by the Freundlich isotherms, whereas for Cd(II) a good agreement was obtained with Langmuir isotherms. The results indicate that the incorporation of nanomagnetite and nanotitania enhance the removal of both As(V) and Cd(II). However, MTPAN fiber shows a greater affinity to Cd(II) than to As(V). Studies on the effects of pH on adsorption capacity showed that the adsorption of both As(V) and Cd(II) on to MTPAN fibers are electrostatically driven. Studies to evaluate the effect of the presence of co-ions demonstrated that the presence of high concentrations of Ca²⁺ and Mg²⁺ suppress the adsorption of As(V) and Cd(II) with the effect from Ca²⁺ being prominent. It can be concluded that MTPAN like nanofiber structures have the potential to be used in microfiltration techniques for the removal of heavy metals from water.

Keywords: *adsorption; electrospinning; nanofibers; polyacrylonitrile*

Assessing yield losses due to iron toxicity in lowland rice under field conditions

K. G. D. I. Siriwardana^{1,2}, W.D.P. Weerasinghe^{1*}, K.K.D.Chandrasekara¹, G.D.A.Priyantha¹,
M.G.N.Rupasinghe¹, M. R. Wijesinghe²

¹*Regional Rice Research and Development Centre, Bomбуwela, Sri Lanka*

²*Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka*

In Sri Lanka, iron toxicity is recognized as one of the most widespread soil constraints for rice production, particularly in the low country wet zone. This paper investigates the effect of iron toxicity on growth, and yield losses, of paddy. A total of seven treatments, which included three rice varieties and two advanced breeding lines of unknown iron tolerance, and a further two varieties with known tolerance/susceptible traits, were used for the trials. The experiments were conducted on naturally iron-rich soils at the Regional Rice Research and Development Centre, Bomбуwala in the 2017/2018 *maha* season. A randomized complete block design with three replicates was used with the seven treatments. The susceptibility/tolerance to iron toxicity was assessed using five endpoints indicating growth and yield production. Significant differences between the seven exposed rice types were noted for all the recorded traits, with some showing superior performances for selected traits. Taking each measured endpoint individually, the lowest leaf bronzing score was recorded in Bw267-3, lowest number of days to 50% heading in Bw272-6b, highest number of tillers in Bw14-820 and maximum grain yield in Bg366. The tallest plants were recorded in Bw267-3, although for paddy, a ‘moderate height’ is more desirable. Considering a combination of the desirable traits i.e. with regard to all five recorded endpoints, the advanced breeding line Bw14-820 and the variety Bg366 could be taken as showing the highest tolerance to iron toxicity, suggesting that they could be recommended to overcome iron toxicity conditions in lowland areas in the wet zone of Sri Lanka. These varieties could also be further used to develop more tolerant strains of rice in future breeding programmes in the country.

Keywords: *advanced breeding lines; iron toxicity; paddy yields; rice varieties*

Strength classification for Sri Lankan wood species

V.R.A. Siriwardana¹, W.N. Wickremasinghe²

¹*Research Development and Training Division, State Timber Corporation, Sri Lanka*

²*Department of Statistics, University of Colombo, Sri Lanka*

Efficient utilization of timber needs better classification procedures. This would optimize the utilization of timber for a specific purpose, taking into account the cost and preference, in addition to making the timber production economical and to cope with the rising demand. At present, Sri Lanka does not have a scientific approach for strength classification of timber species. This study is aimed at producing a strength classification suitable for the Sri Lankan timber species and to identify the relationships of strength properties with other properties of wood. Data pertaining to density, modules of rupture, modules of elasticity, compression parallel to grain, working qualities, and environmental factors of growth were obtained from published data. Anatomical properties were measured by pre-prepared microscopic slides using micrometrics software application for 72 wood species. Strength properties did not show a significant relationship with anatomical properties and environmental factors of growth, but they had a significant relationship with working qualities. Classification was done using cluster analysis and four clusters were found to be sufficient for the analysis by elbow method. Composed strength classes can be identified as light, medium, high and very high. The mean values of density were 382, 600, 769 and 999 kg; modules of rupture were 51, 75, 93 and 118 Nm; modules of elasticity were 6862, 9900, 12243 and 15421 Nm compression parallel to grain were 25, 37, 47 and 60 Nm; for light, medium, high and very high strength groups, respectively. Four strength variable means were significant for all strength classes (p-values < 0.05) and had only 1% misclassification rate by discriminant analysis. The Malaysian classification was found to be satisfactory for the classification of local species but was not the best classification. It was found that the other classifications were not suitable for the strength range of the local species. Local timber species need a unique strength classification and the proposed classification can be recommended.

Keywords: *strength properties; timber classification; wood properties; wood species*

Keratin protein fibers derived from merino wool yarn for efficient removal of rhodamine B dye: Charge induced absorption and desorption behaviour

N. D. Tissera^{1,2}, R. N. Wijesena^{1,2}, K. M. N. de Silva^{1,2}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Sri Lanka*

Merino wool yarn based keratin protein fibers were surface hydrolyzed by treating wool yarn in 0.5 M NaOH solution at 298 K for 15 minutes. During the hydrolysis wool yarn was provided with a higher degree of free amine and other surface functional groups. The morphological change and surface functionalization of the yarn was confirmed by SEM and FTIR. Wool yarn treated with 0.5 M NaOH showed exceptional absorption of Rhodamine dye from an aqueous solution compared to a control wool yarn in the presence of acetic acid. Scatchard analysis of the isotherms of 0.5 M NaOH treated wool confirmed the existence of multiple binding sites in the material. The absorption was due mainly to the free amine and carboxylic groups on the 0.5 M NaOH treated wool sample. It was also observed to have charge induced absorption due to the protonation of amine groups on the surface hydrolyzed keratin protein fibers in acetic acid medium. In the presence of 3.5% acetic acid in the aqueous dye medium, 0.5 M NaOH treated wool showed 95% absorption with a maximum absorption capacity of 294 mg/g (q_m) at 298 K. This value is higher than several previously reported q_m values for the rhodamine dye. The dye removal efficiency of the 0.5 M NaOH treated wool sample remains at 95% even after four adsorption-desorption cycles. Combining the high absorption capacity and recyclability, surface hydrolyzed wool (0.5M wool) can be a promising biomaterial to remove Rhodamine B (C.I 4570) dye from an aqueous medium modulated by acetic acid.

Keywords: *absorption; hydrolysis; protonation; Rhodamine B dye; wool,*

Construction and evaluation of a thermal energy storage system designed for a concentrating solar thermal energy plant

M. P. S. Viraj¹, P. D. C. Kumara^{1,2}, H. H. E. Jayaweera¹, T. R. Ariyaratne¹

¹ *Centre for Instrument Development, Department of Physics, University of Colombo, Sri Lanka.*

² *Institute of Technology, University of Moratuwa, Sri Lanka.*

Design and construct of an efficient, thermal energy storage (TES) system for a medium scale parabolic trough concentrated (PTC) solar thermal energy plant with a harnessing capacity of 9.12 kW is reported. The TES is designed as a direct-active type thermocline system with the use of a pressure vessel. In the TES, thermal energy is stored as sensible heat using Mobil-Therm 605 thermic oil. The thermal capacity of the battery is 17 MJ. The same oil is used as the heat transfer medium in the whole system (PTC, TES and application). The operating temperature of the system is set to 150 °C at 2 bar. The efficiency of this type of a system, mainly depends on the quality of the insulation used. In the initial design of the TES, the pressure vessel was constructed using a steel cylinder (height -1.1 m, diameter – 0.306 m) covered with a 50 mm layer of glass wool. Under normal conditions the time constant of the cooling curve of the TES was found to be 1065 minutes. In the second stage, insulation was further improved by adding a concentric steel chamber (height – 2.3 m, diameter – 0.609 m, thickness -10 mm) to improve the time constant. A set of K-type thermocouples were mounted in both (inner and outer) surfaces of each cylinder to monitor temperature of the TES. A separate thermocouple was used to monitor the ambient temperature. The double walled insulation system was evaluated for vacuum levels from 1 bar to 1 mbar. The time constants of the improved TES were found to be 1088, 1194, 1280, and 1450 in minutes for the vacuum levels of 1000, 100, 10 and 1 in mbar respectively. It was noticed that the time constant of the TES with respect to the vacuum level follows a power series equation $\tau = 1436 p^{-0.04036}$, where τ is the time constant in minutes and p is the vacuum level in mbar.

Keywords: *cooling curve; solar thermal energy; thermal energy storage; vacuum insulation*

Serum TNF- α , IFN- γ and IL-10 levels in oral and oropharyngeal cancer

A. I. Wathupola¹, K. A. Perera², P. V. Udagama¹

¹*Department of Zoology and Environment Sciences, University of Colombo, Sri Lanka.*

²*National Cancer Institute, Maharagama, Sri Lanka.*

Oral and oropharyngeal cancers (OOPC) grouped together is the fifth most common cancer worldwide and is the second most important cancer in Sri Lankan males. Cytokines are a group of signaling molecules that mediate and regulate host immunity and inflammation with a probable significant role in oncogenesis. This study aimed to compare the serum levels of TNF- α , IFN- γ and IL-10 in patients with OOPC against healthy individuals. These serum cytokine levels were also analyzed in human papilloma virus (HPV) positive OOPC cases. This case-control study used 380 each of OOPC patients and age and gender matched non-cancer healthy control subjects. Serum cytokine levels quantified using Sandwich Enzyme Linked Immunosorbent Assay kits, were evaluated for diagnostic accuracy by Receiver Operating Characteristic (ROC) curve analysis. Polymerase chain reaction (PCR) was used to detect HPV DNA in OOPC tumour tissue. Levels of tested cytokines were significantly higher in OOPC patients than in controls. (TNF- α : 3.6 pg/ml vs 3.1 pg/ml, $p = 0.012$; IFN- γ : 8.8pg/ml vs 8.1 pg/ml, $p = 0.032$ and IL-10: 0.6pg/ml vs 0.4pg/ml, $p = 0.021$). HPV DNA was detected in only 12.6 % of OOPC patients. The levels of TNF- α ($p=0.012$) and IFN- γ ($p=0.029$) were statistically higher in OOPC patients infected with HPV than in HPV negative OOPC. TNF- α recorded 100% accuracy, sensitivity and specificity (cut off ≥ 3.21 pg/ml), while IFN- γ showed 92.4% accuracy (sensitivity=70.0%; specificity=93.3%; cutoff >8.31 pg/ml) and IL -10 showed 98.5% accuracy (sensitivity=90.9%; specificity=100%; cutoff >0.48 pg/ml). The Th1:Th2 cytokine ratio of both TNF- α :IL-10 (1.03 ± 0.17) and IFN- γ :IL-10 (1.01 ± 0.21) showed a significant increase in OOPC patients compared to healthy controls ($p < 0.05$). Increased levels of serum TNF- α , IFN- γ and IL-10 with a concurrent Th1 cytokine-biased, pro-inflammatory immune response detected in OOPC suggest that these cytokines may be useful in diagnosis of OOPC.

Keywords: Human papillomavirus; IFN- γ ; IL-10; oral and oropharyngeal cancer; serum cytokines; TNF- α

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The effect of peculiar motion of galaxies when calculating the gravitational lensing time delay

G. Weerasekara¹, T. Wickramasinghe², K. P. S. C. Jayaratne^{1*}

¹*Astronomy and Space Science Unit, Department of Physics, University of Colombo,
Sri Lanka.*

²*Department of Physics, The College of New Jersey, USA.*

An intervening galaxy acts like a gravitational lens and produces multiple images of a single source such as a more remote galaxy. In such a scenario the source, the lens and the observer all have peculiar motions in any random direction in addition to the overall expansion of the universe due to the dark energy. There is a difference in light arriving times from images of a single source, known as the time delay. In calculating such time delays, the peculiar motions of the source, the lens and the observer are generally neglected. In this study, realistic time delays are calculated considering such peculiar motions. The results show that peculiar motions contribute to measurable differences to the observed time delays. According to theoretical model developed in this study, it was observed that the peculiar motion of the lens gives rise to a significant time delay difference in comparison to the peculiar motion of the source and the observer which gives rise to an insignificant time delay difference.

Keywords: *gravitational lensing; peculiar speeds*

Light independent antimicrobial properties of titanate species against multi-drug resistant bacterial strains

N. Wickramasinghe¹, C. Nanayakkara¹, W. R. M. de Silva^{1*}, K. M. N. de Silva^{1,2}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Homagama, Sri Lanka*

Antibacterial agents are widely used in hospitals to kill or prevent the growth of bacteria. In some cases, these antibiotics are administered for a longer period resulting in antibiotic resistance. Since several antibiotics have become ineffective for many bacterial species, there is a growing demand for seeking more effective and sustainable novel antibiotics. For this purpose, inorganic nanoparticles such as titanium dioxide, zinc oxide, copper oxide and silver have been extensively studied. Of these materials, titanium species have a higher demand due to their excellent photocatalytic activity leading to the formation of reactive oxygen species. There is a greater complexity in applying this in *in-vivo* as the application of TiO₂ requires irradiation. Therefore, in this study we attempted to investigate the light independent antibacterial activity of meta titanate (H₂TiO₃) and potassium titanate (K₂TiO₃) against *Pseudomonas aeruginosa* and *Escherichia coli*. The synthesized H₂TiO₃ was characterized using X-ray diffraction (XRD), Thermo Gravimetric Analysis (TGA), Scanning Electron Microscopy (SEM) and FTIR. Antibacterial studies were carried out using the disc diffusion method with varying concentrations of both K₂TiO₃ and H₂TiO₃. The antibiotic activity of the compounds was compared with that of Gentamycin, the positive control. According to the results, both K₂TiO₃ and H₂TiO₃ showed excellent antibacterial activity under dark conditions unlike nanotitania. In addition, the antibacterial activity shown by K₂TiO₃ was found to be even superior to that of Gentamycin.

Keywords: antibiotic resistance; disc diffusion method; meta-titanic acid; nanotitania; potassium titanate

Facile fabrication of silver based transparent conductive electrodes via electrospinning

R. N. Wijesena^{1,2}, N. D. Tissera^{1,2}, K. M. N. de Silva^{1,2}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Sri Lanka*

Transparent conductive electrodes (TCEs) are a critical component in a number of photoelectronic devices including solar cells, light emitting diodes, transparent screens, etc. A facile fabrication method of electrospinning assisted transparent conductive electrodes (TCEs) is demonstrated to address some of the limiting drawbacks of the conventional processes. These TCEs are conventionally fabricated using solvent casting or screen printing methods through the use of a silver nanowire based ink. However, there are various challenges in these approaches with repeatability and ability to obtain nanomaterials with consistent quality. We report a novel methodology to fabricate a conductive metal network on a glass target *via* electrospinning of a silver salt-polymer solution, followed by thermal assisted sintering. The resultant conductive networks showed a low surface resistance of $12.0 \pm 5.3 \text{ } \Omega/\square$. The transmission of the light varied from ~50% to ~10%, depending on the density of the deposit of the same sample. Investigation using electron microscopy showed that the conductive network comprised fused micro and nanoparticles of silver, resulting from thermal reduction of silver ions inside the nanofiber matrix. It was also observed that the resulting conductivity is significantly affected by the sintering time. X-ray diffraction studies suggested that during the thermal treatment process, silver ions get reduced first followed by the growth and oxidation to silver oxides. The optimum conductivity was reached after 1 min of thermal treatment at 300 °C. This new route to TCEs may open up interesting pathways to prepare conductive thin films and overcome the limitations of traditional methods.

Keywords: *electrospinning; facile; microfibers; transparent conductive electrodes*

Hydroxyapatite–feroxyhyte nanohybrids for effective removal of lead and fluoride

A.K.D.V.K. Wimalasiri¹, M. S. Fernando¹, D. P. Dissanayaka¹,

W. R. M. de Silva¹, K. M. N. de Silva^{1,2}

¹*Department of Chemistry, University of Colombo, Sri Lanka*

²*Sri Lanka Institute of Nanotechnology (SLINTEC), Homagama, Sri Lanka*

Health issues arising from inorganic contaminants (anions and cations) in drinking water have risen to an alarming level in many countries. Therefore, the removal of these toxins from drinking water is important. Even though the adsorption process is generally considered as the most promising and simplest, this requires a very long equilibrium time and specific pH adjustments. The objective of this study was to develop biocompatible super-sorbent materials to remove fluoride and Pb(II) effectively from contaminated drinking water. For this purpose hydroxyapatite-feroxyhyte nanohybrids were successfully synthesized by an *in situ* wet chemical precipitation method using ammonium monohydrogen phosphate, calcium nitrate and ferrous sulphate. The synthesized composite was characterized using SEM and FTIR. SEM shows that the shapes are irregular in nature and there is a continuous interconnection between particles with sizes ranging from 50 nm – 60 nm. Successful synthesis of the composite was evident from FTIR analysis which shows a broad band in the 3000-3500 cm⁻¹ region corresponding to the stretching vibration mode of H bonded OH groups present in both hydroxyapatite and feroxyhyte. The peak at 1045 cm⁻¹ can be assigned to the stretching modes of P-O and Fe-O bonds. In addition, the two IR bands at 875 cm⁻¹ and 775 cm⁻¹ further endorse the presence of Fe-O-OH vibrations. The prepared hydroxyapatite-feroxyhyte composite was used for the removal of Pb (II) and fluoride ions after optimizing time and pH. The composite reached equilibrium in 30 seconds and 5 minutes for Pb (II) and fluoride respectively. At equilibrium, Pb(II) and fluoride uptake capacities by the composite were 303 mg/g and 3.78 mg/g at pH 6.5. The adsorption isothermal profiles of Pb(II) and fluoride were in agreement with the Langmuir model indicating the formation of a saturated monolayer at equilibrium.

Keywords: *adsorption; adsorption isotherm; feroxyhyte; hydroxyapatite*

Acknowledgement: National Research Council (Grant: NRC-TO 16-18)

FACULTY OF TECHNOLOGY



Technology for Crossing Borders in Higher Education

19 November 2018

**MESSAGE FROM THE DEAN
FACULTY OF TECHNOLOGY**

Senior Professor J. K. D. S. Jayanetti



It is with great pleasure that I send this message on the occasion of the Annual Research Symposium 2018 of the University of Colombo, conducted under the theme “Engaging with the digital world in higher education”.

The Faculty of Technology recognizes the importance of the active participation in the Annual Research Symposium as it enables the university to sustain its academic excellence at the highest level. The Faculty which is dedicated to providing its students with a strong foundation in research and skills has selected “Technology for crossing borders in higher education” as the theme of its research symposium this year. It is noteworthy, that the number of presentations at this year’s symposium has doubled compared to that in 2017. We are happy that a few researchers from China will also present work that has resulted through collaborations with our Faculty. I am confident that the outcome of the symposium will greatly contribute to fostering a research and innovation culture of high quality while paving the way for technological advancement of the country.

I would like to extend my sincere appreciation to the organizing committee for their commitment and dedication in organizing the research symposium. On behalf of the Faculty of Technology, I wish to express my best wishes for a meaningful and productive event. I congratulate the researchers who are presenting their work and wish them all the best in their future endeavors.

FACULTY OF TECHNOLOGY

PROGRAMME

19 November 2018

- 10.30 a.m. Arrival of the Guests and Registration of the Participants
- 11.00 a.m. Lighting of the Oil Lamp and National Anthem
- 11.15 a.m. Welcome Address by Senior Professor J. K. D. S. Jayanetti
The Dean, Faculty of Technology, University of Colombo
- 11.25 a.m. Address by the Chief Guest, Senior Professor Lakshman Dissanayake
The Vice Chancellor, University of Colombo
- 11.35 a.m. Keynote Address by Senior Professor Ajith de Alwis
Senior Professor of Chemical and Process Engineering, University of Moratuwa
Project Director, Coordinating Secretariat for Science, Technology and Innovation
- 12.05 p.m. Plenary Speech by Jari Olli
Head, Department of Clean Technology and Electric and Automation Technology, Metropolia University of Applied Sciences, Finland
- 12.35 p.m. Address by Dr. Liu Jianhui
Assistant Director, Island Research Center, State Oceanic Administration, China
- 12.40 p.m. Vote of Thanks by Dr. G. D. N. Perera
Head, Department of Instrumentation and Automation Technology, Faculty of Technology, University of Colombo
- 12.45 p.m. Lunch
- 1.30 p.m. Technical Sessions

INTRODUCTION TO THE KEYNOTE SPEAKER

Ajith de Alwis, PhD.

Senior Professor, Department of Chemical and Process Engineering, University of Moratuwa



Ajith de Alwis is Senior Professor of Chemical and Process Engineering at the University of Moratuwa. He obtained his PhD from the University of Cambridge and has worked at the University of Reading, UK and the Indian Institute of Science, Bangalore, India. His experience includes serving as a Science Team Leader at the Sri Lanka Institute of Nanotechnology and as the Project Director at the Coordinating Secretariat for Science Technology and Innovation (COSTI), Ministry of Science Technology and Research. He is a member of the Intellectual Property Advisory Commission of Sri Lanka and a member of the Governing Council of National Occupational Health and Safety Institute, Ministry of Labour and also a Founder Director of the Sri Lanka Green Building Council. His interests are in Eco-innovations, Food Process Engineering, Environmental Engineering, Nano biotechnologies, and Bioenergy systems. He is the Founder President of the Lanka Biogas Association and a Fellow of the National Academy of Sciences, Sri Lanka.

KEYNOTE ABSTRACT

Be a Learner of Excellence with new Technology!

A. de Alwis

Department of Chemical and Process Engineering, University of Moratuwa

Technology today is changing and developing at a rate today. While some time back we were only looking at networking among ourselves only. However, today we have the ability to have networks among devices thus giving rise to Internet of Things, with time perhaps leading to Internet of Everything! There is a need for different dynamics to be embraced by both the student and the teaching communities. With tuition dictating what you study and how you study and finally how you end up facing examinations our students do not understand the gravity of the situation facing them in time to come. At times you even hear that there are classes to prepare students to enter into preferred streams of graduate study in universities. Unfortunately, these efforts are completely counterproductive to the individual as well as to the country. First and foremost, the concept that I would like to stress is that a student must have an understanding of what he or she likes to do – the subject of interest and more so the area of interest.

Whatever the current situation in our country, there are tremendous changes taking place in global scale. We called what is happening today as the fourth industrial revolution. The new technology revolution is considered to be nothing less than a transformation of humankind. It is that serious! As we are taking a decision today there is a need to understand what awaits us in the future as the choice that you make today has to prepare them to that emerging future. Today with the internet one can learn any subject area and at your convenience. Hence there is nothing to worry if, for some reason, you are unable to secure the placement or the subject stream that you actually prefer. What is happening with most of our students is that when their choice is not realized, there is overall depression and a serious lack of drive. The process is then on a downhill course. There are many pathways opening up today and the technologies are really transforming the workplace and hence some of the actual courses that we teach may actually be irrelevant as time moves on. Formal education systems are not that

flexible and one cannot change curricula as per the rate the technology is changing! Hence my second recommendation – ensure that one understands the basics well, really well. Ask questions all the time – Why? You will definitely benefit from that process. Forget what the tuition master told you – this is the type of question and this is the way to answer. That way you learn nothing except perhaps getting through an examination.

Now how can one self-learn? One must make an effort to learn English of course as knowing more than one language is always beneficial and open up new worlds. Today there are mechanisms coming up even in the mobile phone to listen to someone else with a different language but get instantaneous translation to your own language. Listen to News and not to idle chatter. In the internet listen to few TED Talks everyday and you will really benefit from those 18 minutes of listening. It is said that a successful person actually reads about 30 books per year. The world of work is indeed becoming quite different as technology is changing so fast and that is why science is interesting and more are needed to science. As you know vehicles may not need drivers anymore. Surgeries will be done by robots thus replacing surgeons and radiologists by computers as pattern recognition is quite easy with the use of computers.

I hope that, after listening to the presentation you will check out a book, listen to a few speeches and speak to a few scientists. Dive into new technologies as new tools for learning. Enjoy learning and be a productive citizen to Sri Lanka.

FACULTY OF TECHNOLOGY

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A study of the municipality solid waste open dumping sites management in Sri Lanka

S. J. S. Bandara¹, R. U. K. Piyadasa², H. A. S. C. Hatharasinghe³

¹*Central Environmental Authority, Battaramulla, Sri Lanka*

²*Department of Environmental Technology, University of Colombo, Sri Lanka*

³*Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka*

The disposal of Municipal Solid Waste (MSW) has become one of the major environmental issues in Sri Lanka with the rising population and urbanization. The dumping of garbage on roadsides and environmentally sensitive areas such as natural wetlands, river banks, and reservations is being a common practice. According to the legislation Local Governing Authorities (LGA) are the responsible institute for the Municipal Solid Waste management in the country. Main objective of this study is identifying open dump sites around the country and quantifying and categorizing them into small, medium and large scale by using selected measurements as waste intake per day, height of heap and assessing nearby water bodies. According to this study, Sri Lanka has 207 open dumpsites and 90.3% are illegal dumpsites located near water courses. Moreover, 90.3% of LGA have been dumped their MSW without treatment or segregation to bare land own by them 14% of them are large scale dumpsites which have more than 15 m heap and 20.8% from total dumpsites are medium scale which are not exceeded 15m of height and more than 10 m. Most common dumpsites are small scale which are less than 10 m heap and 60% from total dumpsites and only 9.7 percent from the total dumpsites are obtained Central Environmental Authority (CEA) recommendations or approvals. MSW is becoming a huge problem to all LGA due to difficulties of finding suitable land for waste disposal, lack of technical knowledge in waste management, public objections to the development of sanitary land fill sites and financial restrictions. Furthermore, those open dump sites are recommended to rehabilitate through long technical procedure known as landfill mining (Joseph, 2015) and convert the same land to sanitary landfill by introducing proper lining system with strict supervision of CEA and foreign specialists.

Keywords: *landfill; local governing authorities; municipal solid waste; open dumpsite; solid waste management*

Copper foam based 1-D nanostructured Cu₂O for non-enzymatic glucose sensing

J. L. K. Jayasingha¹, M. N. Kaumal², K. M. D. C. Jayathilaka³, M. S. Gunewardene¹, D. P.

Dissanayake², J. K. D. S. Jayanetti^{1,4}

¹*Department of Physics, University of Colombo, Sri Lanka*

²*Department of Chemistry, University of Colombo, Sri Lanka*

³*Department of Physics, University of Kelaniya, Sri Lanka*

⁴*Department of Instrumentation & Automation Technology, University of Colombo, Sri Lanka*

One dimensional nanostructures of nanowires, nanorods and nanotubes etc. are potential candidates for applications in the field of biosensing. This work reports ultra-high sensitive electrochemical non-enzymatic glucose sensor with ultra-lower detection limit prepared by *in-situ* electrochemical anodization process in an alkaline medium. Initially, copper foam supported Cu(OH)₂ 1-D nanostructures were grown in a 3M NaOH solution for 30 min. Then, Cu(OH)₂ films were converted into cuprous oxide (Cu₂O) structures after subsequently annealing in a N₂ gas atmosphere at 500°C. Materials characterization was performed with scanning electron microscopy (SEM) and X-ray diffractometry (XRD). Electrochemical characterization was achieved by cyclic voltammetry (CV) and chronoamperometry (CA). XRD measurements revealed that films are polycrystalline Cu₂O structures without impurities. SEMs showed 1-D mixed Cu₂O nanostructures having nanorods, nanotubes and nanobelt-like structures with cross sectional dimensions of ~200 nm and length exceeding 10 µm. Also, the outer surface of Cu₂O structures were rough having ~20 nm pores. CV measurements were obtained to study the kinetics of the electrochemical reactions during oxidation and glucose oxidation potential was found to be +0.4 V vs. Ag/AgCl. Chronoamperometric measurements were performed at +0.4 V in a 0.1 M NaOH solution with successive addition of 0.02 mM, 0.5 mM and 5.0 mM glucose solutions. The amperometric current responses were significantly high and exhibited multiple linear detection ranges. An ultra-high sensitivity of 5,792.69 µA mM⁻¹ cm⁻², ultra-lower detection limit of 15 nM and linear detection ranges of 15 nM to 0.1 mM and 575 µM to 4,098.9 µM were found. Electrodes showed insignificant response for ascorbic acid, citric acid, uric acid, sucrose, fructose and NaCl. It also revealed that the current response of the Cu₂O/CF electrodes was around 96% after 10 days suggesting that these electrodes exhibit good stability for oxidation of glucose making them good platform for non-enzymatic glucose sensing applications.

Keywords: cuprous oxide; electrochemical anodization; glucose sensing; lower detection limit; sensitivity

The DNA marker assisted introgression of blast resistant genes (*Pita*, *Pikh*, *Pitp(t)*) of *Tetep* variety into local rice blast susceptible cultivar *Bg94/1*

W. A. D. Jayawardana¹, G. A. U. Jayasekera¹, K. L. N. S. Perera², S. Mohotti²

¹*Department of Plant Sciences, University of Colombo, Sri Lanka*

²*Genetech Molecular Diagnostic Lab, Sri Lanka*

Rice blast, caused by the fungal pathogen *Magnaporthe grisea* (*Pyricularia grisea*) is the major rice disease among 85 countries across the world. This research study made progress in introgression of blast resistant genes of resistant variety *Tetep* (*Pita*, *Pikh* and *Pitp(t)* genes) into local susceptible cultivar *Bg94/1* with the aim of developing a durable blast resistant cultivar. Vietnamese rice variety *Tetep* and local cultivar *Bg94/1* were selected as the donor and recurrent parents, respectively. Plants were grown in the field of RRDI, Batalagoda. Initially, *Tetep* x *Bg94/1* plants were crossed at the time of flowering to obtain F1 population. Subsequently, F1 plants were crossed with recurrent parent (*Bg94/1*) to produce first backcross population (BC1F2). Following the same above mentioned procedure the back cross two generation (BC2F3) and backcross three generation (BC3F4) were established by crossing BC1F2 plants and BC2F3 plants with recurrent parent plants (*Bg94/1*). Phenotypic screening was performed at the established field in RRDI, Batalagoda with dry leaves spore suspension of blast pathogen. All plants were scored by using standard blast scoring system. Phenotypic screening for blast disease resistance clearly showed that all three backcross generations are highly resistant to blast disease. In addition all three back cross generations were tested with three linked markers namely (*YL155/87*, *RM206* and *RM246*) and PCR products were observed in 2% agarose gels. Molecular genotyping confirmed the presence of above three blast resistant genes (*Pita*, *Pikh* and *Pitp(t)*) in the backcross generation three (BC3F4). Findings of the present study confirm successful transfer of blast resistant genes from *Tetep* variety into backcross generations and development of resistance against blast pathogen.

Keywords: *backcrossing; Bg94/1; blast disease; marker genotyping; tetep*

Valorization of Blue Pea flower (*Clitoria ternatea*) through developing a functional beverage

S. A. T. Lakshan¹, N.Y. Jayanath¹, W. P. K. M. Abeysekera², W. K. S. M.

Abeysekera³

¹*Department of Food Science & Technology, University of Peradeniya, Sri Lanka*

²*Herbal Technology Section, Industrial Technology Institute, Sri Lanka*

³*Department of Agricultural Technology, University of Colombo, Sri Lanka*

In Sri Lanka, a food product developed using blue flower (BF) of *Clitoria ternatea* is not available even though it has been reported with many health benefits worldwide. Hence, this study was carried out to develop a functional beverage using the BF which is having an antioxidant potential. Initially, 3 g of sieved dried powder of BF was extracted with 1 L of distilled water at 59.6 °C for 37 min. Selected 3 out of 9 formulations which were generated by combining different ratios of BF extract, a natural sweetener and a natural flavour were subjected to ranking tests for the preference of sensory attributes such as colour, flavour, sweetness, aroma and overall acceptability. Selected formulation from the ranking test was evaluated using a 9 point hedonic test for the preference of above mentioned attributes. Storage studies were conducted for 28 days with and without added preservatives. Antioxidant potential of the beverage was evaluated in terms of total phenolic content (TPC), total flavonoid content (TFC), ferric reducing antioxidant power (FRAP), oxygen radical absorbance capacity (ORAC), ABTS⁺ and DPPH radical scavenging activity. Selected formulation showed a significantly higher consumer preference ($p < 0.05$) for color and overall acceptability. Hedonic test indicated a moderate likeness for the product. The beverage found to be self-stable without added preservatives for 28 days and all the physicochemical and microbial parameters tested were not significantly different ($p > 0.05$) to those of the fresh beverage. TPC, TFC, FRAP, and ORAC of the beverage were 85.57 ± 4.18 mg gallic acid equivalents/L, 43.67 ± 2.30 mg quercetin equivalents/L, 14.99 ± 3.43 mg trolox equivalents (trolox)/L, and 122.28 ± 7.26 mg trolox/L. ABTS⁺ and DPPH radical scavenging activity (IC₅₀) of the beverage were 35.83 ± 0.52 µL/mL and 247.61 ± 4.54 µL/mL respectively. It is concluded that BF extract has the potential to be used in developing a functional beverage.

Keywords: antioxidants, blue flower, *Clitoria ternatea*, functional beverage, storage studies

A review of Static Headland-Bay Beach (SHBB) concept and its application on the sandy coast in Sri Lanka

B. Li¹, J. K. D. S. Jayanetti²

¹*Island Research Center, State Oceanic Administration, Pingtan, Fujian, China*

²*Department of Instrumentation & Automation Technology, University of Colombo, Sri Lanka*

The headland-bay beach is one of the most common coastal forms in the world. Its morphology reflects changes that occurred during long-term evolution of the sandy coast. Several headland-bay beach models have been proposed to simulate coastline's configuration in equilibrium. Sri Lanka is a country with abundant resources of sandy beaches, and many of them now are in serious erosion because of different causes, such as sea level rise, coastal construction and sand mining. SHBB concept provides a method to simulate the flat form of a headland bay beach without any sand supply, and predict the trend of evolution. The present study was aimed at initiating a novel elliptical model in Sri Lanka to simulate coastline's configuration in equilibrium. The SHBB model was applied on the headland-bay sandy coast in Sri Lanka to find out the feasibility and suggestions were given to protect the Sri Lankan coast.

Keywords: *coastal protection; elliptical model; SHBB concept; sandy beach*

A study on beach management experience and deficiency based on beach user behaviour constraints in China

J. Liu¹, F. Yu¹, B. Huang¹, R. U. K. Piyadasa²

¹*Island Research Center, State Oceanic Administration, Pingtan, Fujian, China*

²*Department of Environmental Technology, University of Colombo, Sri Lanka*

With the development of coastal tourism economy and the promotion of ecological civilization construction, China has carried out a series of beach management practices and efforts. Although there is no national beach management regulation in China, coastal cities have introduced beach management approaches based on the regional conditions. In this study, the beach management regulations of five coastal cities, Weihai, Xiapu, Pingtan, Shenzhen and Beihai were selected as study sites for different beach tourism development levels. Commonality and differences of beach management systems, human activity constraints, beach classification and beach function zoning of these areas were investigated and factors affecting beach management regulations viz. natural characteristics of beaches, marine functional zoning, local policies, tourism economy and locations were analyzed. Further, the characters of natural beach, the modes of beach utilization, main management behaviors and effects achieved among 5 different study sites were compared. The findings of the present study revealed that the beach management regulations in China always focuses on the management operator, management framework, bathing beach and human activities, as well as focus on beach nourishment. Further, it was revealed that the tourism development and ecological environmental protection are driving forces when stipulating the beach management regulations and natural coastal environment, development orientation and local policies are main factors considered in various beach management practices. The findings of the present study concluded that the China's beach management system needs to incorporate comprehensive management elements and behavior mechanisms and it should be operated in a sustainable manner. Further, it is recommended that the beach management systems should be based on beach resources investigation and monitoring and further research should be warranted in ecological protection, beach valuation and management efficiency evaluation.

Keywords: *beach management; beach tourism; beach user behavior; management regulations*

Isolation and identification of potential crude oil utilizing bacterial species from chronically contaminated sites with petroleum hydrocarbons located in the Gampaha District, Sri Lanka

M. A. S. H. Mirihana¹, C. K. Hemachandra², J.J. Wewalwela³, T.N. Kapuruge¹, W.W.P. Rodrigo¹, W.R.K. Fonseka⁴

¹*Biotechnology Unit, Industrial Technology Institute, Sri Lanka*

²*Department of Environmental Technology, University of Colombo, Sri Lanka*

³*Department of Agricultural Technology, University of Colombo, Sri Lanka*

⁴*Environmental Technology Section, Industrial Technology Institute, Sri Lanka*

The present study was aimed at isolating and identifying novel potential crude oil utilizing bacterial species from chronically contaminated sites with petroleum hydrocarbons, located at Gampaha district. The sludge samples collected from the selected sites were inoculated separately into Bushnell Hass Minimal Salt medium (BHMS) amended with 2% filter sterilized crude oil under aseptic conditions to prepare the respective primary enrichments and were incubated under 28°C for 7 days at 130 rpm. A parallel control was also conducted. Crude oil was used as the sole source of carbon and energy. Five successive enrichments were carried out and bacterial colonies obtained from fifth enrichment were sub cultured and pure bacterial colonies were obtained. The species were identified as *Bacillus licheniformis*, *Bacillus infantis* and *Pseudomonas aeruginosa* through molecular characterization after isolating DNA from pure bacterial cultures. The crude oil utilization capacities of the three isolates were assessed using their respective growth kinetics under individual basis. Each isolate was inoculated separately into BHMS amended with 2% crude oil in duplicate and incubated for 7 days along with the controls. OD₆₂₀ was measured in every 24 hours and was used as an indirect measurement of their growth kinetics. The results revealed that, all of the above isolates showed significant growth. Therefore, it is evident that, all three isolates were efficiently utilizing crude oil as their sole source of carbon and energy. Further studies are necessary to assess their potential crude oil degradation capacities at an individual/ consortium basis.

Keywords: *Bacillus sp.*; BHMS medium; bioremediation; crude oil; enrichments

Geochemical assessment of three major lakes in Anuradhapura, North Central Province of Sri Lanka

E. A. I. A. Perera¹, N. I. Vendandalan¹, H. Ishiga², S. M. Young³

¹*Department of Physical Sciences, Rajarata University of Sri Lanka, Sri Lanka*

²*Department of Geosciences, Shimane University, Japan*

³*Department of Environmental Technology, University of Colombo, Sri Lanka*

Monitoring water quality and geochemical aspects in Anuradhapura tanks are important since, water from few tanks are used for drinking purposes. Suspended solids are also important to monitor absorbed elements, thus water samples as well as suspended solids were collected from sampling locations at the surface and 1.5m depth in March 2015 and August 2015, from Tissa lake n=11, 6, Thuruwila lake n=11, 8 and Nuwara wewa n=14, 13 respectively. The temperature, pH, oxidation reduction potential, electrical conductivity of water samples were measured on site. Cations of Na, K, Ca, Fe, Mg and anions, F^- , PO_4^{3-} , NO_3^- , SO_4^{2-} were analyzed using standard methods. Suspended solids were analyzed for 21 elements using X-ray diffraction. The pH lies between World Health Organization standards and NO_3^- , SO_4^{2-} , Ca, Mg lies below the range, Total Hardness of all samples lies within or below the range and Fe level of all the samples of Nuwera wewa shows higher values while Tissa and Thuruwila tank water lies within the range. Sodium Absorption Ratio showed “medium” sodium level for most of the samples and few showed “high and very high” values. A variation was seen in the surface and 1.5m depth water. Total Sulphur, Pb, Zn, Cu, Ni, F^- , shows high enrichment and As, MnO, CaO, P_2O_5 shows depletion in all suspended solid samples of all three tanks. These recorded high values of Pb, Zn, Cu, Ni and F^- in these three tanks may be related to the intense agricultural practices in the surrounding agricultural lands and also by the natural weathering. Overall, the chemical composition of Tissa and Thuruwila water is suitable for drinking as well as irrigation purposes. Nuwera wewa water is suitable for irrigation purposes and due to the exception of high Fe the water is not relatively suitable for drinking purposes.

Keywords: *drinking water; lakes; suspended solids; water quality*

Developing cryogenic and microwave control systems for the solid polarized target for Fermilab E1039 experiment

G. D. N. Perera¹, D. Keller², I. Johnson², D. V. P. Dasanayake¹

¹*Department of Instrumentation & Automation Technology, University of Colombo, Sri Lanka*

²*Department of Physics, University of Virginia, USA*

Measurement of single spin asymmetry of the Drell-Yan process on a transversely polarized target will be used to determine the sign and magnitude of the Sivers Asymmetry at the Fermilab E1039 experiment. The solid polarized target for this experiment is being built at the University of Virginia (UVA) in cooperation with Los Alamos National Laboratory. The nuclear instrumentation group at the Faculty of Technology, University of Colombo is collaborating with the E1039 experiment and contributing in building the cryogenic controller system and microwave controller system for the solid polarized target. These systems require remote control due to the high radiation level in the experimental hall. Automation of these systems results in greater efficiency and functionality for running these types of polarized target experiments. The objective of this presentation is to report the current status of the development of these systems.

Keywords: *Drell-Yan; E1039; microwave control; solid polarized target*

A GIS based spatial analysis on the soil quality variations of the Kalu Oya and Mudun Ela basins related to the anthropogenic wetland alterations

R. U. K. Piyadasa¹, H. M. M. S. D. Herath¹, W. A. I. Uthpalani²

¹*Department of Environmental Technology, University of Colombo, Sri Lanka*

²*Department of Geography, University of Colombo, Sri Lanka*

The proportionate availability of wetlands in and around the commercial capital Colombo, Sri Lanka has become a newer income generator in terms of green urban development in contemporary context. Yet these wetlands have been facing rapid and continuous urbanization for an extensive period which has been severely altering the essential soil properties. Utilizing the Kalu oya & Mudun Ela basins which are sited in the highly inhabited suburban areas of Northern Colombo, this study attempts to identify the range of main wetland soil characteristics of the wetlands in the region. It mainly focuses on the functioning and importance of soil properties to the wetland ecology, hydrology and ecosystem services of the region. Following a rapid field observation survey on identifying ‘biodiversity hot spots’, 52 soil sampling locations were selected using GPS technology. 11 Physio-Chemical characteristics of each soil sample were analyzed using in-situ and laboratory measurement methods. The results were subjected to overlay analysis of spatial distribution using Arc GIS 10.2 software. The spatial distribution of soil quality parameters indicates that the highest pH and EC values recorded in the area where Kalu oya connects with Kelani River indicating signs of salt water intrusion. The location of water bodies also causes for nutrient contamination pattern in the region. Tragically the cultivating paddy land areas display the highest chemical contents. The analysis indicates rapid conversion of the soils from wetland characteristics to infertile polluted wastelands characteristics spreading from the Kalu Oya mouth to upper catchments. It is very important to improve the soil quality of the catchment area in order to enhance the wetland functions of the region. Otherwise, it will lead to increasing flash floods, contaminating the ground water and also degrading the green ecosystem based urban-value of the region.

Keywords: *soil characteristics; spatial analysis; wetlands*

Morphodynamic response of beaches to tropical storms: Difference and its mechanism

H. Qi¹, F. Cai^{1,2}, L. Jinhui³, L. Gen^{1,2}, S. Fangfang^{1,2}, G. Lei¹, Z. Jun¹, R. U. K. Piyadasa⁴

¹*Third Institute of Oceanography, SOA, Xiamen 361005, China*

²*College of Marine Geosciences, Ocean University of China, Qingdao, 266100, China*

³*Island Research Center, State Oceanic Administration Pingtan, 350400, PR China*

⁴*Department of Environmental Technology, University of Colombo, Sri Lanka*

South China is considered as a main active area for northwestern pacific tropical cyclones where this area experience storms more than ten times in an annual basis. Despite of the short period of existence, the rough waves and storm surge caused by tropical storm induce significant changes in beaches. Therefore, tropical storms are considered as main driving force affecting the development and evolution of beaches in South China. In the present study, case studies published during the last two decades relevant to the field investigations of the alterations of beach morphology due to storm action was comprehensively reviewed concentrating on the characteristics, patterns and factors affecting the beach responses to storms. The review revealed that, the factors affecting the beach storm-effect are classified as active factors, passive factors and immovable factors. The active factors dominate the driving forces of the storm, including the features of tropical cyclone and storm dynamics where the passive factors are the inherent characteristics of beach, which can passively adjust during storms and the immovable factors can significantly influence the storm-effect intensity and beach behavior during storm, but they are not changed by storm and can't dominate storm process of beach. Further it was revealed that the morphodynamic process of the beach could be significantly affected by the anthropogenic activities by causing unbalanced and asymmetric beach storm process leading to reduction in the capacity of the beach for shore protection and storm resistance. Additionally, storms can further aggravate the adverse impacts on the morphodynamic process of the beach. The basic understanding relevant to beach morphodynamic response anthropogenic activities and storms generated through this study could be effectively used in designing and conducting research on beach storm-effect and support the restoration, protection and management of beach resources.

Keywords: *beach morphodynamic process; shore protection; storm effect; storm resistance*

SRI PALEE CAMPUS



Empowering Communities through Media and Arts

8 - 9 November 2018

**MESSAGE FROM THE RECTOR
SRI PALEE CAMPUS**



Professor R. C. K. Hettiarachchi

It is my great pleasure to issue this message on the occasion of the Annual Research Symposium 2018 of the University of Colombo. A theory is a proposed explanation for how a set of natural phenomena will occur, capable of making predictions about the phenomena for the future, and capable of being falsified through empirical observation (West and Turner, 2006). Inventions were the results of careful investigations of the observable and non-observable facts originated with curiosity. Human beings have travelled through several phases of their development till they achieved today's success. Modern man is equipped with all sorts of techniques to build new theories based on the data available around him. Modern technology which is also a product of human beings immensely contributes to new inventions and theories as well as the advancement of modern life. Thus, new discoveries with new technology seem inevitable if we apply existing theories to create new knowledge. Similarly, formulating new theories based on observable patterns will create many opportunities in the future to go for new inventions. It is our enthusiasm, motivation, vision, and the dedication that we have to keep in high esteem to achieve anything and everything. Therefore, giving priority to research work will boost our effort to upgrade the living standard of living beings in the universe.

The attributes of the Colombo University as the leading university of the country very clearly indicate the priority given to research. The Annual Research Symposium of the university is remarkable in a sense that it provides all academics an equal opportunity to engage in high quality research and disseminate the findings of their research. With the research publications coming out of this conference, the university will be able to keep its position as the number one in Sri Lanka and secure a good position among world universities. As all activities of the university comply with its mission, this research conference can also be considered as one of the key performance indicators to realize its mission. On behalf of Sri Palee Campus, I would like to extend my sincere wishes for a very productive and successful symposium!

SRI PALEE CAMPUS

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Challenges of dance education in secondary schools in Sri Lanka

R.I. Batuwangala

Department of Performing Arts, Sri Palee Campus, University of Colombo, Sri Lanka

Dance has always been an effective language and a powerful medium of communication, although its beginnings, forms and purposes could be manifold. Since Sri Lanka introduced the teaching of dance in public schools as a subject in 1972, the influence it has on the society has been tremendous. However, its effectiveness has also been hindered by several problems in the school system. Thus, the main purpose of this study was to investigate challenges of dance education in secondary schools in Sri Lanka. Both primary and secondary data were used in this research: The data was collected through reviewing the existing documents on dance education as well as semi-structured interviews with selected stakeholders who have been decisive in the development of dance education in Sri Lanka. According to preliminary data analysis, the implementation of dance education in the secondary school curriculum in Sri Lanka continues encountering challenges from various perspectives despite its progress, mostly economic, administrative, and cultural. Results also revealed varying perspectives of the stakeholders towards the existence of the subject as part of the school curriculum, with conservative views from traditionalists demonstrating dissatisfaction with the pedagogy of dance education while there was optimism on the part of educational authorities. As this is an ongoing research, further analysis will be done and implications will be given accordingly.

Keywords: *aesthetic purpose; challenges; dance education; folk skills; reconceptualization*

On-line reading behavior of university students in China
(with reference to WeChat app)

K. P. Gamage

Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

Reading can be intensely a personal and private experience as well as a tool enabling readers to connect with others, share ideas, and form social bonds. While the information and communication technologies are developed, social media facilitate the digital social reading practice. As a result, during the past few years, huge numbers of social reading apps such as Kindle, IBook, WeChat, Baidu, and Jd x Reader have been launched. These apps allow readers to participate in discussion groups and make comments, sharing their thoughts and opinions on what have been read. WeChat is a mobile text and voice messaging communication service launched in January, 2011 by one of the biggest Internet Companies namely “Tencent” in China. By 2017, WeChat monthly active users were 889 million in the world but the majority were based in China. Moreover, this emerging public platform has 10 million monthly active users and it is estimated that 5.86% articles are read by each active WeChat user per day. Therefore, the aim of this study is to investigate the reading behavior of Chinese university students using this social media app, WeChat. A questionnaire was employed to collect 100 valid responses of undergraduate and postgraduate university students from different faculties in a Chinese university and data were analyzed quantitatively. While results revealed interesting findings, social interaction, self-development, peer recognition, information acquisition, personal interest, and time killing were identified as main reasons for reading through the WeChat app.

Keywords: *digital reading; reading behaviour; reading motivation; social reading*

Gender ideologies and practices in contemporary advertising in Sri Lanka

S.L. Hewapathirana

Department of Mass Media, Sri Palee Campus, University of Colombo, Sri Lanka

Although there are some significant studies done on gender, nationalism, and cultural ideologies, the ideological function of advertising has not sufficiently been examined and analyzed within the conventional social science research in Sri Lanka. On one hand, traditional gender ideologies and images have severely been used within the advertising industry in the country, celebrating Sri Lanka's traditional history and culture. On the other hand, libertarian life styles and values also seem to have used to address the needs of contemporary consumer culture. In this sense, the advertising industry symbolizes Sri Lanka's deep anxiety and ambivalence toward its own cultural ideologies and materialist culture of global capitalism. Therefore, the aim of this study was to explore the way in which advertising industry functions as an ideological apparatus of sexual conservatism. The study focused on advertising viewers in Sri Lanka utilizing focus group discussions and in-depth interviews. According to the preliminary data analysis, it was found that the advertising industry is basically led by the purpose of widening markets for selected products and services; it makes use of cultural and traditional ideologies not to change the *status quo* but to manipulate consumers' demand in a strategic manner. It is this inherent pragmatic characteristic within the advertising industry that transforms it into an ideological apparatus of gender conservatism.

Keywords: *advertising; capitalism; gender; ideology*

Issues and challenges of Hindustani classical music pedagogy in Sri Lanka

I.D. Kondasinghe

Department of Performing Arts, Sri Palee Campus, University of Colombo, Sri Lanka

The Hindustani classical music pedagogy, which has played a substantial role in both school and higher education sectors, has been practiced for 70 years in the national education system in Sri Lanka. Although different educational institutions in Sri Lanka have given excessive weight to the curriculum of Hindustani classical music, Hindustani music has currently decreased its demand and confined to simply passing exams. It is recognized only as an educational qualification and a title. It is also evident that Hindustani classical music has lost its quality value as a subject even though it has increased the percentage of the number of students who learn the subject. Therefore the objective of this research was to investigate the issues and challenges in the pedagogy of Hindustani classical music in Sri Lanka. This research was based on a qualitative data analysis of which the primary sources of data collecting methods were interviews, observations, and questionnaires whereas the secondary resources were books, journals, magazines, and audio recordings. Results revealed many negative aspects of pedagogy of the subject: 1) learning the subject is limited to obtaining a certificate 2). Hindustani classical music exams have become a profitable commodity in the stream of music education, 3) Music graduates have been given teaching appointments in the educational field without proper music teacher training 4) lack of practical knowledge in music graduates even though they gain better results in exams, and 5) different social opinion on classical music and its artistic values. Results showed few areas to be addressed where changes are needed in the field, such as, 1) improving collaboration between the National Institute of Education and other higher educational institutes of music to improve the pedagogy of Hindustani classical music, 2) offering a substantial air time to promote Hindustani classical music in video and audio media, 3) updating the teacher training process, 4) uplifting the professionals in Hindustani classical music, 5) organizing workshops, campaigns, and seminars island wide to promote Hindustani classical music, 6) introducing Hindustani classical music as a subject in other higher educational institutes and 7) encouraging young talents in Hindustani classical music.

Keywords: *Hindustani classical music; music education; music pedagogy*

LIBRARY NETWORK



Paradigm Shift of University Libraries in the Digital World

27 November 2018

MESSAGE FROM THE ACTING LIBRARIAN

Dr. Chandrani Kuruppu



It is a great pleasure that I have this opportunity to send a message as the Acting Librarian for the Annual Research sessions of the Library Network, which will be held on 27th November 2018. It will be a remarkable milestone for the Library Network and will be an annual event in the calendar henceforth. The theme of the sessions is “Paradigm shift of university libraries in the digital world” and 12 related research papers will be presented by the librarians covering the areas like information seeking behavior of undergraduates, provision of biomedical literature on digital platform, millennials’ expectations of service quality, evaluating the library website, developing a digital tool avoid research duplication in Humanities and Social Sciences, reflecting the diverse research interests of our librarians.

Librarians in the digital age have a vital role of facilitating the patrons to fulfill their information needs through massive volumes of information of a multitude of formats as well as of quality. I am assured that this research session will provide diversified aspects of the role of future university librarians, in fulfilling this responsibility.

I am very much thankful to Senior Professor Lakshman Dissanyake, Vice Chancellor, University of Colombo for accepting our invitation to grace the occasion as the Chief Guest and to Dr. Ruvaize Haniffa, Member of the UGC and Chairperson of the Standing Committee of Library and Information Science (SCOLIS) of the UGC, for gracing this occasion as the Guest of Honour. I am indeed thankful to Prof. Inder Vir Malhan for joining us today to deliver the Keynote Address. I would like to express my sincere gratitude to all my colleagues in the Library Network for their tireless efforts to make this event a success. Finally I would like to convey my best wishes to all the distinguished invitees, panelists, session chairpersons and researchers for a very productive event.

THE LIBRARY NETWORK

PROGRAMME

27 November 2018

8.30 am	Registration
9.00 am	National Anthem & Traditional Lighting of the Oil Lamp
9.10 am	Welcome Address Dr. Pradeepa Wijetunge Librarian & Conference Co-Chair
9.20 am	Address by the Chief Guest Senior Professor Lakshman Dissanayake Vice-Chancellor, University of Colombo
9.30 am	Keynote Address Professor Inder Vir Malhan Dean, School of Mathematics, Computers and Information Science Central University of Himachal Pradesh
10.05 am	Vote of Thanks Dr. Chandrani Kuruppu Symposium Co-Chair
10.10 am	Refreshments
10.45 am	Technical Session 1
12.00 pm	Technical Session 2 & 3 (parallel)
01.15 pm	Lunch
02.00 pm	Panel Discussion
03.15 pm	Valedictory Session
03.30 pm	Refreshments

INTRODUCTION TO THE KEYNOTE SPEAKER

Inder Vir Malhan, PhD.

*Head, Department of Library and Information Science
Dean, School of Mathematics, Computers and Information
Science
Central University of Himachal Pradesh*



Born in a rural village in the Ludhiana District of Punjab, Professor Malhan had his schooling in the village and graduated in Science with a First Class. Later he obtained M.Lib.Sc. and Ph.D. from Punjab University, Chandigarh and started his teaching career at the same university. He has over 37 years of teaching and research experience at Punjab, Jammu and Central University of Himachal Pradesh, Dharamshala. Professor Malhan is currently the Dean, Academic and Dean of the School of Mathematics, Computers and Information Science and also the Head, Department of Library and Information Science and is in-charge of the Library system of the Central University of Himachal Pradesh. Before joining the Central University of Himachal Pradesh, he served as the Head of the Department of LIS of the University of Jammu and also headed the Library System of the same university.

At the national level, he is a member of many significant committees including the UGC expert committee for developing model curricula for undergraduate studies in LIS, the Research Advisory Board of DELNET, the UGC National Committee on Electronic Theses and Dissertations, the National Advisory Committee of e-Shodh Sindhu, the e-PG-Pathshala project and a topical coordinator for conversion of e-PG-Pathshala content into MOOCS. He also serves on the expert panel for Scientific and Technical Terminology in India. Professor Malhan has published over 100 journal articles and conference papers and authored/edited 12 books nationally and internationally. He has also supervised a wide range of successful Ph.D. and M.Phil theses. He is a recipient of many awards throughout his career, including the IASL Leadership Award, Kaula-Ranganathan Gold Medal, ILA-Gidwani Deshpandey Award, SATKAL National Award, Harish Chandra-Sushila Chandra National Award and the PLA-Satija Award for professional excellence. Professor Malhan is currently the President of the Indian Association of Teachers of Library and Information Science (IATLIS) and a member of the P.N. Kaula Trust, ASIS - USA, ISKO - GERMANY, IAALD - USA and the Asian Chapter of SLA-USA. He is a life member of ILA, IATLIS and a Fellow of SIS.

Paradigm Shift of University Libraries in the Digital World

I. V. Malhan

Department of Library and Information Science, Central University of Himachal Pradesh

University libraries have always remained an important component of knowledge infrastructure of universities and immensely contributed to their learning and knowledge creation activities. They now require undergoing enormous transformation in view of growing digital landscape, networked and distributed information environment, convenience of accessibility of information from any place, and enormous changes in ways and choices of users for searching, accessing and communicating information. Libraries are no more rendering their services merely with the support of select books and other in-house documents, but also with the practice of exploring an ocean of external digital information resources. Emergence of new knowledge management tools, proliferation of content management software, advent of mobile apps and growth of social media, big data analytics software and unbundling of content are offering enormous opportunities for university libraries to expand their services and enhance their roles. On the other hand, information users are facing a hyper competitive environment, information overload and time constraints to use information resources, but require to do quality work and innovate to survive and thrive in their chosen fields. University libraries therefore need to develop work processes and operations involving all-encompassing work of document management, content management, data analytics, information analysis, and strategic knowledge management. Digital landscape also demands any time instant access to quality filtered, value added, and need based impact making information. On time knowledge consultancy, resources for self-learning, knowledge alignment for imbedding knowledge in work processes and empowering users with media and information literacy are other evolving service needs. The value of a university library will not be evaluated based on potential resources accumulated but on the premise of services rendered in enhancing the desired activities and goals of the university. In the ever-changing information scenario,

the metamorphosis and relevance of a university library will depend upon its promptness to change for the better and ability to create a service image. Massive reskilling of university library professionals, change in mindsets, existing values and assumptions will be required to conform university libraries to the service needs of the digital information environment. This paper portrays an array of real issues such as what structural changes are required in the university libraries to transform them for their enhanced role in the digital landscape to boost learning and accelerate access to high quality useful information. What way the digital environment empowers and offer more opportunities to library professionals to do better and enhance value of library services and how the university library can offer more personalization and service convenience to user communities.

LIBRARY NETWORK

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Provision of biomedical literature on digital platforms: Assessment of the Information Dissemination Service

D.C. Kuruppu

The Library, Faculty of Medicine, University of Colombo, Sri Lanka

Health Literature Library Information Service (HELLIS) network is a consortium of health libraries in the South-East Asian region. In 1980, it was established in Sri Lanka with the main objective of providing better Information Dissemination Service (IDS). IDS which was established on digital platform in 2011 by the medical library, University of Colombo is popular among health care professionals and bio-medical scientists in the country. The study was focused to determine the efficacy of IDS on digital platform; to find the nature of Inter Library Loan (ILL) requests; to analyze the sources of reference and to provide comparative analysis among information requested groups. Statistics of IDS from 2013 to 2017 was used as data for this study. All ILL requests in the period (n=1809) were analyzed. The ILL requests fulfilled by World Health Organization (WHO) country office library and South East Asian Region (SEARO) library were named as sample A and remaining ILL requests fulfilled by other regions were taken as sample B. Only National Focal Point Library working days were considered as time required for processing. Fulfillment of ILL requests by sample A and B was 75.62% (n=1368). 89.6% (n=1151) was filled by sample A, whilst 41.3% (n=217) was by sample B. The highest percentage of requests fulfilled was recently published material between one to five years. After 30 years published materials were the lowest fulfillments. Time taken for the fulfillment of requests was one – two weeks. Most of reference sources were from well-established publishers and cited in Science Citation Index (55.3%) and Index Medicus searches (38.8%). 73% requests were received from academics and the service was gradually increasing among postgraduate students, but requests from clinicians were poor. According to the international standards, the IDS service was efficient since majority of the requests were fulfilled within a week. Efficiency was due to the digital portal launched in WHO-SEARO library and well-efficient staff members in both ends. Publications within current year to five years back were heavily used by Health Science professionals. Almost all requested reference sources cited in well-popular indexed databases. The service was well familiar among academics and postgraduate students, however awareness programmes should be conducted for clinicians.

Keywords: *biomedical literature use; effectiveness of the service; Information Dissemination Service; Sri Lanka*

Assistive technologies for the visually impaired undergraduates of the University of Colombo

M.A. Lankathilake

Library, University of Colombo, Sri Lanka

Visually impaired undergraduates encounter difficulties in accessing information when compared to their peers. With the development of information technology number of assistive technologies and devices have become popular among the visually impaired than traditional methods. This study is planned with the objective of identifying assistive technologies for the resource center for visually impaired. A literature review and focus group discussions were conducted to identify the suitability of assistive technologies. Focus groups consisted of visually impaired academics, library and information professionals and visually impaired undergraduates. Closed-Circuit Television (CCTV) (83%), audio books (75%), screen magnifier (58%) and screen readers (50%) were identified as highly used assistive devices. Although the braille books are recognised as traditional resources they were also identified as important. In addition to the above devices, braille keyboards, braille note-takers, braille displays and speech synthesizers were identified as assistive devices through the literature survey. According to the discussions with focus group audio books, screen magnifiers, braille displays, braille books and screen readers were identified as extensively used devices. The resource center for the visually impaired at the main library is equipped with braille reader, DAISY digital talking book players and portable digital video magnifiers. According to findings it could be stated that resources and services available in the resource center for visually impaired in University of Colombo are not sufficient to fulfil the needs of the visually impaired undergraduates. Therefore it is recommended to acquire audio book collections covering diverse subject areas, computers with screen reading facility, braille keyboards, screen magnifiers and important braille books to minimize the difficulties in accessing information by visually impaired undergraduates.

Keywords: *assistive technologies; University of Colombo; visually impaired undergraduates*

Epistemological belief structure of Law undergraduates in using electronic information resources: A case study of the University of Colombo

P.K.S. Manatunga
Library, University of Colombo, Sri Lanka

Epistemology from a psychological and educational aspect is how an individual develops conceptions of knowledge and utilize in developing and understanding of the world. Even though personal epistemology is typically held at an intangible state of students, these beliefs have influences on their study strategies, comprehension and are significant predictors of grades. The objective of the present research is to configure epistemological beliefs of the law undergraduates at the University of Colombo, in using electronic information resources. The target user population was law undergraduates from first to fourth academic year in 2018 (999 students) and a sample of 608 was selected randomly according to the Morgan table. The data was gathered by a survey instrument developed referring Schommer's Epistemological beliefs model (1990) with integration of five different values of electronic information resources in academic activities; information need, motivation, searching process, searching speed and searching outcome. Five epistemological belief measures; time, amount, speed, integration and simplicity were used as the basis of the coding schema. Results were subjected to quantitative multivariate factor analysis utilising generalized least squares extraction and cluster analysis was applied to obtain groups with different epistemological belief patterns. The study confirms the multidimensional character of epistemological beliefs in using electronic information resources with a 6-dimension model; speed of knowledge acquisition, knowledge product, autonomy of knowledge, dynamic knowledge, procedural knowledge and comprehensive knowledge. Cluster analysis resulted in three clusters and each cluster indicates a unique six dimensional pattern of epistemological beliefs. Three clusters were pessimistic, optimistic and comprehensive knowledge believers. Epistemological belief patterns of these three groups show a distinct difference. The present research has proved evidence towards contextually unique, quantifiable structure of personal epistemological beliefs in using electronic information resources and enable to understand the factors influential to these learners in both positive and negative ways. This understanding could be used in order to positively enhance the experience of the learner, increasing their capability and desire towards constructive life-long learning practices in digital era.

Keywords: *electronic information resources; epistemological beliefs; epistemological belief structure; university libraries*

Developing a digital tool to support avoidance of research repetition in the Humanities and Social Sciences

M. A. Milton¹, M. A. Lankathilake¹, D.C. Kuruppu¹

¹*Library, University of Colombo, Sri Lanka*

Research in Humanities and Social Sciences (HSS) in Sri Lanka are increasing but most related articles are published in local journals in English, Sinhala and Tamil languages in print mode. Therefore researchers do not have an opportunity to be included in reputed indexing/abstracting services and they do not have an opportunity to conduct comprehensive analysis of literature on what has been conducted in their disciplines. As a result many HSS research may encounter problems of getting duplicated. Development of a database is proposed as the most suitable solution. Accordingly, the objective of this study was to develop a database of all English, Sinhala and Tamil journals and conference proceedings published in Sri Lanka. As the first step a model was developed to construct a database. D-space open source software was used to develop the repository for long-term storage, access and preservation of digital content. Consequently, a prototype was developed. In the database subject headings under HSS considered as communities and the sub divisions of main subject areas as sub communities. An item menu was created which contains meta data. The metadata for the database were identified as bibliographic information such as author name, authorship, title, citations, year, publisher details, journal name, volume, page numbers or conference name place and pages numbers. The created database consists of different authentication levels for uploading and online editorial process. The second phase of the study will consider uploading of documents by providing key words and subject titles using standard subject thesaurus.

Keywords: *database; Humanities; research duplication; Social Sciences; Sri Lanka*

A scientometric analysis of asthma research in Sri Lanka using Scopus and PubMed databases

K. K. N. L. Perera

The Library, Faculty of Medicine, University of Colombo, Sri Lanka

Asthma is a disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. In the digital age, scientometric analysis is used to track emerging developments in research areas which need special attention and funding. Objectives of this study were to analyse the publication rank, papers per 1000 population (PPTP), relative growth rate (R) and doubling time (Dt) of asthma research in Sri Lanka, using both Scopus and PubMed databases, during the period from 2000 to 2017. R is the increase in the number of publications per unit of time whereas Dt is the time required for the articles to double in number. Publication rank, PPTP, R and Dt are parameters frequently used in scientometric studies. According to Scopus, Sri Lanka is globally ranked 91st in asthma research. PPTP on asthma research in Sri Lanka is 0.0021, whereas India shows a value of 3.43. There is an inverse relationship between R and Dt. During 2000 -2006, R values of asthma research in Sri Lanka are lower than that of the world. However, during 2007-2017, asthma research in Sri Lanka shows higher R values compared to that of the world. When compared to Dt values of world during 2000 -2006, the Sri Lankan Dt values are higher. During 2007-2017, Sri Lankan Dt values are lower, compared to the world, indicating a potential for an advancement in the research area.

Keywords: *asthma; doubling time (Dt); electronic information resources; publication rank; relative growth rate (R); Sri Lanka*

An analytical study of open source library software

W.P.G.L. Perera¹, S. Premarathne²

¹*Library, University of Colombo, Sri Lanka*

²*Faculty of Information Technology, University of Moratuwa, Sri Lanka*

The paradigm shift emerges with the advancement of technologies in all sectors and this has shed light on libraries to improve their services for users. In the new millennium, academic libraries tend to use open source library management software than proprietary software due to the advantages of managing, customizing, distributing and sharing the source code for any purpose. As there are numerous open source library management software available, librarians are facing the challenge of selecting the most appropriate one for their library. The objective of the study was to analyse the selected open-source Integrated Library Software (ILS). NewGENLib, Koha, Evergreen and PhpMyBibli (PMB) were selected based on the usage and popularity. Through an extensive review of literature, evaluation criteria were identified and divided into three categories; documentation, general features and services. Under each category and each module, many sub-functions were considered. The system designs are deferred from their development purposes, expect services and target libraries. All have enriched variety of features and functions and they have covered elementary library modules such as acquisition, circulation and open public access catalogue. They also have different sub options. The capacity of the database, interfaces, licensing, user manuals, discussion forums, versions vary from system to system. Among the studied software, Koha open source ILS has covered more features, modules with many options and other criteria. Furthermore, it can be used easily with or without any modifications. By conducting this evaluation process, the study recommended that library professionals should conduct software evaluation before implementing library automation process by considering existing library services, future requirement and capacity of the library, users and the staff.

Keywords: *library automation; library software; open source integrated library software; software evaluation*

Importance and challenges in implementing a digitized historical map collection in academic libraries of Sri Lanka

M.N.F. Sakeena¹, S. S. Johoran¹

¹*Library, University of Colombo, Sri Lanka*

Historical maps are very useful resources as they help us to learn about past spatial background of a particular location. In Sri Lankan context, the bulk of invaluable historical maps were available only in paper format which provides limited access to university students and are in danger of undergoing aging and bleaching effects. Digitization is one of the most effective method which can be used to preserve these paper-based artifacts. Objectives of the study were to identify the importance and challenges in implementing a digitized historical map collection in academic libraries. Online and internal desk research methodologies were used to collect data. The study revealed that digitizing historical maps is a contemporary need of academic context. Academic libraries should pay immediate attention to select paper-based historical maps for digitization, as they are in danger of being lost in the future. The importance of digitizing rare and limited library material will be to satisfy the increasing demand of library users and to provide wide access. Rather than stored in a room in paper format, digitized format makes it more convenient for users to access the material without time and space limitations. However there are several constraints in the process of digitization, such as selecting an appropriate storage medium for the digitized maps. Also, libraries will need to enrich their technical architecture by including a variety of servers, high-speed local networks and fast connections to the Internet. Digitized images are more likely to cause copyright infringements than traditional collections. In order to prevent copyright violations libraries can include reference under each digitized map. This study concludes that the university librarians should take necessary attention to transform historical paper maps into digitized format, which will serve the user community in the digital era in an effective and efficient manner.

Keywords: *conversion of paper-based artifacts; digitized maps; historical maps; preservation of maps*

Web presence of the Library of the University of Colombo: 2013-2018

M.A.L. Silva

Library, University of Colombo, Sri Lanka

Librarians in the new millennium find it difficult to fulfil user expectations through the physical library alone and as an augmentation, the website is used as the virtual public face of the library to facilitate time and place independent services to the clientele. University of Colombo (UoC) library built its website in 2001 and the usability was evaluated in 2013. Periodic evaluation, monitoring and regular updating are essential prerequisites of websites. Thus, the aim of the present study was to evaluate the library website of UoC based on content richness and design accuracy and to identify the changes in the web presence over the period of 2013 to 2018. An evaluative instrument consisted of 67 criteria was created by extensive review of literature and expert validation. The instrument consisted of 32 criteria related to content and 35 on design of the website. A systematic structured observation of the library website was conducted during January, 2018. Content richness of the library website in 2018 was 72.38% where as it was 51.88% in 2013. Among sub categories pertaining to content richness, services showed least web presence in both years which was 28.57% in 2018 and 14.28% in 2013. Items relating to general information and resources indicated 100% web presence in 2018 where as 81.81% and 80% respectively in 2013. Design accuracy of the library website was 84.62% in 2018 and 60.06% in 2013. Accessibility which is a design feature showed least web presence in both years which was 50% in 2018 and 0% in 2013 making library website inaccessible for differently abled users. Among items relating to navigation in both years library website is dearth of features as; up and down navigation within long pages, navigation back to homepage in second level pages, breadcrumb navigation and multiple links. Study concludes that content richness of the library website of UoC was developed over the five year period from 51.88% to 72.38% whereas accuracy of the design was improved from 60.06% to 84.62%. The library UoC has undergone a paradigm shift from its physical library to the virtual public interface in the new millennium and over the five year period from 2013-2018 the website of the library was developed to serve users in the digital world in a much satisfactory manner.

Keywords: *content of library websites; design of library websites; library website evaluation*

Millennials' expectations of service quality from academic libraries

S. D. Somaratna

The Library, Faculty of Science, University of Colombo, Sri Lanka

Today academic libraries are used by millennials who are socially and culturally more diverse than previous generations, Internet savvy, always connected to social media and leaning to multitasking. The purpose of this study was to explore the millennials' expectations of service quality of academic libraries and specific objectives were set; to assess millennials' expectations of service quality, to identify the most important service quality attributes and to identify millennials' anticipation of managing the limited library allocation. A user survey was conducted among the first year students of the Faculty of Science in February 2018. 250 questionnaires were distributed among the students and the response rate was 100%. All the students were aged between 20 to 22 years with birth years ranging from 1995 to 1997. The survey questionnaire was designed taking inputs from SERVQUAL and LibQUAL models and included questions on user expectations of the service quality (physical facilities, library resource, library services and staff), the most important service quality attributes and user anticipation of spending of library allocation. In addition, open questions were included on the additional expectations of library service quality. Students rated their expectations in a five point Likert scale ranging from strongly disagree (lowest) to strongly agree (highest). All the service quality attributes were selected by millennials with more than 80% expectation level except three attributes "electronic security system in the library" (41%), "coffee shop in the library" (45%) and "networking with other libraries for interlibrary lending" (68%). "Internet connectivity and Wi-Fi facilities in the library" (80%) was ranked number one among the three most important attributes for each student followed by "comprehensive printed resources" (78.2%) , "convenient library opening hours"(76.9%), "self-study areas" (76.5%), "group study areas" (76.3%) and "subscription to e-journals and e-books" (75.2%). When considering the millennials' anticipation of limited library allocation, 87% of the students selected the library collection development as the most important factor over the improvement of physical facilities (13%). Further 52% of students selected the development of the printed collection over the electronic collection (48%) and 84% of the students selected library learning space expansion over the improvement of library equipment (14%). Library administration needs to discuss these specific needs of "always connected" generation and address them very carefully to build up a strong relationship between the millennials and the academic library.

Keywords: *academic libraries; Millennials; user expectations*

Accessing electronic resources by medical trainees of the Postgraduate Institute of Medicine, University of Colombo: Issues and concerns

T. Sritharan

Library, University of Colombo, Sri Lanka

University libraries which attached to the higher educational institutions are facing challenges to provide innovative digital services due to the paradigm shift from printed to electronic environment. As the library, Postgraduate Institute of Medicine (PGIM) has initiated the provision of electronic services, it is essential to analyze the issues and concerns in accessing electronic services by diversified users. The aim of this study was to analyze the issues and concerns in relation to accessing electronic resources by post-graduate trainees. A questionnaire was distributed among 427 whilst 380 (89%) responded. The majority were female (65.5%) and 60.4% were in 28-38 years age group. Findings established that e-journals subscribed by the PGIM are used by 72%, open sources by 70.2% and Health Inter Network Access to Research Initiative (HINARI) by 67.7%. 87.4 % of the trainees accepted that the training would improve the skills in accessing electronic resources. The major issues identified by the respondents are absence of remote access to subscribed journals (79.7%); lack of training (69%); internet speed (64%), lack of computers in the library (63.4%), lack of time to search for information (55%) and lack of searching skills (49.5%). Increasing the access points with fast access, more orientations, short courses, developing an information technology module in the post-graduate curriculum and remote access for subscribed resources were the main concerns of the respondents. It is recommended to make arrangements to provide remote access for subscribed e-resources; arrange more training programs on database searching skills; expand the computer access points with fast internet connection; arrangements to include information technology module into the post-graduate curriculum and to extend the opening hours of the library, PGIM.

Keywords: *electronic environment; electronic information resources; postgraduate medical education; PGIM*

Bridging cultural heritage information on the web: A metadata model-based approach for information aggregation in South and Southeast Asian cultural heritage

C. Wijesundara¹, S. Sugimoto²

¹*Library, University of Colombo, Sri Lanka*

²*Graduate School of Library, Information and Media Studies, University of Tsukuba, Japan*

The web has brought the whole world to our fingertips and it has made distant cultural heritage more accessible than ever. The Cultural Heritage Information (CHI) on the web is primarily created and organised by memory institutions as digital archives and is provided to the public. In addition, there are many third-party institutions and individuals who create CHI and/or add value to existing CHI on the web. Thus, there is numerous CHI on the web, but in the reality, they exist in unconnected silos. This situation is common in the South and Southeast Asia, and in addition, the region has its own problems associated with organisation and dissemination of CHI. The authors have investigated these factors and developed a novel metadata model which enables the organisation of both, tangible and intangible cultural heritage separately. The model enables users to distinguish between physical and digital environments of cultural heritage resources and its goal is to aggregate related digital cultural heritage resources to a single platform. It is essential to properly identify the objects which convey information of Cultural Heritage Objects and describe them in accordance with their features, e.g., online digital archives and third-party websites. As a result, the authors have introduced a concept called Modular Metadata which enables the identification of original cultural heritage objects and their digital surrogates separately. Proposed models were evaluated using few use cases and schema mapping was done to examine the feasibility in real-world situations.

Keywords: *cultural heritage information; information organisation; metadata aggregation; modular metadata; South and Southeast Asia*

Information seeking behaviour of the Social Sciences and Humanities undergraduates of the University of Colombo

P. Wijetunge

Library, University of Colombo, Sri Lanka

This study deals with the Information Seeking Behavior (ISB) of the Humanities and Social Science (HSS) undergraduates of University of Colombo with four objectives; to study the information resource usage, information seeking process, and the barriers encountered by them in seeking information, and to make recommendations to alleviate the issues. A questionnaire and Focus Group Meetings (FGMs) were used to gather quantitative and qualitative data respectively. Convenient Sampling method was used and the response rate was 82% out of 550 questionnaires and 95 attended the FGMs. SPSS (ver. 22) and manual analyses were used to analyse quantitative and qualitative data. The majority use Internet instead of trusted resources provided by the library, and use self-taught criteria to evaluate information instead of standard methods, majority consult peers for help with information resource usage and, the majority has not had any training in using the library resources or Internet. They encounter several barriers related to the resources, facilities, services and training which discourage them from approaching the library primarily, to satisfy their information needs. The process they adopt to seek and use information conforms to some other information seeking models; however their information seeking behavior does not mature across the academic years as it should be, and an uncertainty with information seeking prevails throughout their undergraduate life. While more research is required to substantiate the gravity of this issue, librarians must collaborate with the faculty to reduce the stress and uncertainty levels encountered by the undergraduates moving from print-paradigm to digital-paradigm, and to transform the students in to digitally literate who can step in to the world of work with confidence.

Keywords: *Humanities; information seeking behaviour; Social Sciences*

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