OUTREACH

UNIMAS RESEARCH BULLETIN | Vol.6 No.2 | AUGUST 2012 ISSN : 1985-2053

- UNIMAS climbs 30 places in QS Asian University Ranking 2012
- Identifying new Communication Pathways inside Cells
- Sarawak Indigenous Spell Checker (Sarawak INSPECH)
- Emergency Response Plan for Murum HEP Dam

Fast Facts on UNIMAS

Date established (incorporated)	**24 December 1992**	
Campus Site	**Kota Samarahan, Sarawak, Malaysia (about 25 km from the city of Kuching, the capital city of Sarawak)**	
Present Vice Chancellor	**Prof Datuk Dr Khairuddin Ab Hamid**	
Student Enrolment (Academic Session 2011/2012)	Undergraduate	9,504
	Postgraduate	1,053
	Total	**10,557**
Full time staff	Academic	569
	Management	167
	Support	1,163
	Total	**1,899**

Faculties
Faculty of Applied and Creative Arts (FACA)
Faculty of Cognitive Sciences and Human Development (FCSHD)
Faculty of Computer Science and Information Technology (FCSIT)
Faculty of Economics and Business (FEB)
Faculty of Engineering (FE)
Faculty of Medicine and Health Sciences (FMHS)
Faculty of Resource Science and Technology (FRST)
Faculty of Social Sciences (FSS)

Institutes
Institute of Biodiversity and Environmental Conservation (IBEC)
Institute of East Asian Studies (IEAS)
Institute of Health and Community Medicine (IHCM)
Institute of Social Informatics and Technological Innovations (ISITI)
Institute of Design and Innovation (InDI)

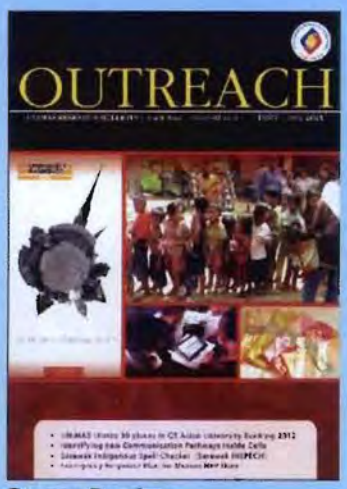
Centres
Centre for Language Studies (CLS)
Centre for Academic Information Services (CAIS)
Centre for Student Development (CSD)
Centre for Technology Transfer and Consultancy (CTTC)
Centre for Information and Communication Technology Services (CICTS)
Centre for Applied Learning and Multimedia (CALM)
Research and Innovation Management Centre (RIMC)
Centre for Graduate Studies (CGS)

Centres of Excellence
Malaria Research Centre
Centre for Water Research
Centre for Rural Informatics
Centre for Image Analysis and Spatial Technologies
Centre for Renewable Energy
Centre for Semantic Technology and Augmented Reality
Centre for Sago Research
Centre for Disability Studies

International Linkages
67 International Partners Worldwide (Active)

Centre for Academic Information Services

Volume of Books	214,258
Sets of Media Materials	10,715
Journal Titles (Print and Electronic)	43,995



Cover Design
Highlighted events of the year.

Introduction to This Issue

It is my great pleasure to welcome you to this issue of Outreach. I am pleased that our timeless effort in the first six months of this year has come to fruition. Our teamwork and continuous commitment in striving to achieve UNIMAS' aspiration as a research university have received due recognition. With that, I am proud and delighted to share the good news that UNIMAS has moved up from 191st to 161st place in the Asian University Rankings 2012 by QS World University Rankings. We are not only recognised for what we have achieved based on the rankings, but also our research endeavours are also acknowledged through the various awards won in the recent Malaysia Technology Expo 2012 (MTE 2012). My congratulations to all.

For this edition of Outreach, I would like to record my sincere gratitude to Professor Justo Amador Diaz, a visiting Professor at the Faculty of Computer Science and Information Technology (FCSIT) who had taken some time off from his busy schedule to write from the perspective of the stakeholders. In serving the society while at the same time progressing to reach our goals, our researchers have embarked on various projects, such as, creating renewable energy sources from waste, crafting an Iban-Melanau word processing spell checker, as well as studying the nesting and roosting behaviour of the white-nest swiftlet. These research projects are part of our university research niche areas, namely, Emerging Tropical Infectious Diseases, Biodiversity and Environmental Management, ICT Development and ICT for Development, Renewable Energy and Green Technology, and Industrial Design. In our arduous but confident steps towards achieving our vision, it is crucial for us to collaborate with our international partners as these exchanges provide both parties valuable opportunities. In the past six months, we have successfully signed Memorandum of Understandings (MoUs) with international institutions and organisations from India, Japan and Iran. On this occasion, I would like to express my sincere appreciation to our researchers as well as the professional and support groups for the work done thus far and may I encourage you to continue with your tireless efforts to propel UNIMAS towards greater heights. Thank you and God Speed.

Prof Dr Peter Songan

TABLE OF CONTENTS

UNIMAS RESEARCH NICHE AREAS

EMERGING TROPICAL INFECTIOUS DISEASES

This area of research is dedicated to investigating the causes and diagnosis of viral diseases of public health importance in the region. Our location in Borneo allows us to study tropical diseases in the areas where they naturally occur. By using both classical and molecular biology tools, we hope to understand the epidemiology and host-patogen interactions to better predict the occurrence of future outbreaks.

BIODIVERSITY AND ENVIRONMENTAL MANAGEMENT

Tropical biodiversity and environment is threatened by activities such as logging, agriculture and pollution while certain species are over-exploited for food, pets and other commercial products. Recognising the need to conserve both the species and their natural habitat, research conducted mainly by staff and students from the Institute of Biodiversity and Environmental Conservation and Faculty of Resource Science and Technology have focused on rare and endangered species (e.g., Hose civets, Rainbow toad) in threatened ecosystems of both terrestrial and aquatic environment. Working in collaboration with local communities, government and non-government agencies, our researchers have studied the entire environment of Sarawak from its coastal waters (e.g., Ecology and conservation of dolphins in Kuching bay) to its mountain top (e.g., Herpetofauna of Gunung Penrissen), from the smallest creatures that threaten human life (harmful algae) to the largest endangered mammal (orangutans). In order to understand more holistically how humans have impacted the environment, we study how land use change in selected river basins have affected community livelihood, aquatic life and water quality. These research activities are funded by internal, national and international grants.

RENEWABLE ENERGY AND GREEN TECHNOLOGY

Research and Development in Renewable Energy and Green Technology aim to strengthen and rationalise efforts in all renewable energy technologies. Research and development of technologies for alternative energy focuses on the reduction of energy consumption as an emergent issue associated with global warming, diminishing fossil fuels, as well as community and environment.

ICT DEVELOPMENT AND ICT FOR DEVELOPMENT

Information and Communications Technology Development (ICTD): Research and development in ICTD encompasses the construction of indigenised ICTs which are socially relevant and appropriate for the communities. The current focus is technologies which work in locations which are extremely remote, locations which neither have power nor telecommunication connectivitiy. For example, the robust, affordable long range WiFi which works over long distances up to 10 km using solar power. ICTD in UNIMAS also includes state-of-the-art research in semantic technologies, image processing, augmented reality, and the development of ICTs in preservation and maintenance of Sarawak's indigenous languages. ICT for Development (ICT4D): Research and Development in ICT4D encompasses areas where ICTs can be used to assist society in attaining a better quality of life and achieving socio-economic goals. Areas in ICT4D include studying the needs of the community, and how ICTs can be used to meet those needs, the impact of technologies from socio-economic or environmental perspectives. For example, the deployment of community radio in a remote location and studying how it can assist in dissemination of information in rural areas, or how lodge owners in remote areas communicate with their international clients using the Internet and Facebook thereby increasing their revenue, and in turn their income. In addition to how the ICTs are being employed, the research also includes the development of new approaches in working with indigenous communities not only in Sarawak and Sabah, but also in West Malaysia.

INDUSTRIAL DESIGN

Industrial design is harmonising art and science whereby aesthetics and usability of products can be improved for marketability and production. Industrial design can add value to a product beyond the manufacturing process through application of innovative and creative design solutions. Researchers execute design solution towards problems of form, ergonomics, product usability, marketing, brand development and sales. Industrial design encompasses a wide range of user and technology driven product such as furniture, household product, toys, transportation, electronic and electrical products, which forms the main research area to enhance the sustainable economic development of the country. Sustainable development in this perspective is about searching indigenous knowledge and experience through the understanding of indigenous design, artifact invention, local material resources, and cultural diversification, specifically in Borneo.

RESEARCH NEWS

UNIMAS CLIMBS 30 PLACES IN QS ASIAN UNIVERSITY RANKING 2012

UNIMAS recently moved up thirty places to 161st among the Top 300 Asian Universities 2012 published by QS Asian University Rankings. This year, nine universities in Malaysia were ranked among the top 300 Asian Universities. Overall the nation's results were more mixed, with nine out of 15 Malaysian universities dropping in the rankings compared to 2011. The QS Asian University rankings include international exchanges and citations of publications. This success is a recognition of the effort made by UNIMAS staff and serves as a motivation to attain greater heights in their respective fields.

UNIMAS AT MTE 2012

Researchers from UNIMAS participated in the Malaysia Technology Expo 2012 (MTE 2012), organised by the Malaysian Association of Research Scientists (MARS) and PROTEM Exhibitions Sdn Bhd on 16-18 February 2012 at Putra World Trade Centre. UNIMAS showcased 18 inventions and won 4 gold medals, 3 silver medals and 10 bronze medals. Assoc Prof Dr Nazlina Shaari from the Faculty of Applied and Creative Arts won the "Very Best Invention and Innovation Award" through her invention called "Eco-Mordant: Utilising Sago Effluent in Natural Dye Process".

UNIMAS researchers with their medals and certificates at the Malaysia Technology Expo 2012.

UNIMAS R&D EXPO 2012

The 5th Annual R&D Exposition was held on 21-22 March 2012. The theme for this year is "Progressing with Research, Innovation and Commercialisation through Academia and Industry Linkages". This is in line with UNIMAS' aspiration to become a research university. The Expo was divided into three different clusters: Pure Sciences, Technology and Engineering, and Social Sciences/Humanities. The exhibits included creative designs utilising recycled materials, environmental engineering, robotic technology, medical tools, ICTs, augmented reality systems as well as the soft sciences. A total of 80 participants from various faculties took part in this exposition. Altogether 10 gold, 14 silver, and 16 bronze medals were awarded.

Visitors and participants at the UNIMAS R&D Exposition.

ASIA-PACIFIC TELECOMMUNITY J3 (APT J3)

The Asia-Pacific Telecommunity (APT) J3 project, "Technology Enhanced Solutions for Remote Rural Communities in Malaysia to Facilitate Development of Learning, Preservation of Local Knowledge and Creation of Health Awareness and Practices for Healthy Living" is a continuation of the successfully implemented APT J2 pilot project which began in early 2010. The findings and also experiences in the APT J2 project were translated into tangible ICT-based educational solutions for the remote rural communities in the identified sites. The USD139,510 grant was awarded by Asia-Pacific Telecommunity to Dr Fitri Suraya Mohamad and her research group. Dr Fitri is a research fellow at the Institute of Social Informatics and Technological Innovations and a senior lecturer at the Faculty of Cognitive Science and Human Development. This project proposes to implement a multifaceted approach to provide efficient technology-enhanced solutions for remote rural communities in Sarawak, Malaysia. Specifically, the objectives of the project are to establish a fibre-optic LAN infrastructure for schools and health clinic in Bario; to develop e-education solution which serves as a digital repository to complement formal teaching and learning experiences of the school community in Bario. Extensions of the project include replications to identified sites and to propose a sustainable health check system for use by community members in the identified remote rural communities in Sabah and Sarawak.

Schoolchildren working on a task using the tablet.

PRIVATE INDUSTRY GRANTS

Researchers from the Faculty of Computer Science and Information Technology (FCSIT) and Institute of Social Informatics and Technological Innovations (ISITI) have recently obtained grants amounting to RM800,000 from a private institution for research work to be conducted from April 2012 to June 2015. The main topic of research is "Multi-Dimensional Responsible Rural tourism Capacity (RRTC) Framework for Sustainable Tourism". The main objective of the research is to provide solutions for stakeholders in implementation of ecologically sustainable practices in a profitable and responsible manner which is in line with the Economic Transformation Programme roadmap for Malaysia. These grants will allow our researchers to enhance their research and provide avenues for the research findings to be shared with the international community through the network of the sponsoring bodies.

Local communities at rural destination stand to benefit from responsible tourism initiatives.

UNIMAS RESEARCHERS RECEIVED RM287,041 KNOWLEDGE TRANSFER PROGRAMME (KTP) GRANT FROM MOHE

From left: Dr Wan Azlan, Dr Harry Entebang, Prof Dr Peter Songan, AP Dr Alvin Yeo & AP Dr Rusli Ahmad.

Two groups of researchers from UNIMAS were awarded the Knowledge Transfer Grant from the Ministry of Higher Education to undertake two selected community related projects in Sarawak. The grant was handed over by the Minister of Higher Education, Y.B. Dato Seri Mohamed Khaled Nordin to Professor Dr Peter Songan, Deputy Vice Chancellor (Research and Innovation). The recipients of the grant are Associate Professor Dr Alvin Yeo Wee who will use the grant to develop the "competency of the Penan through E-Commerce initiative in Long Lamai" and Dr Wan Azlan Bin Wan Zainal Abidin who will carry out the "Micro Hydro System initiative through knowledge transfer programme in Kampung Semulong Ulu" in Sarawak.

RESEARCH HIGHLIGHTS

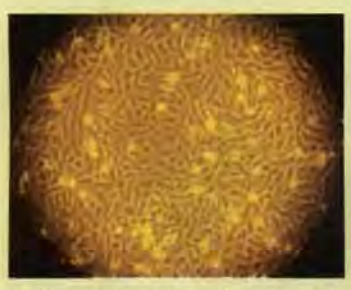
IDENTIFYING NEW COMMUNICATION PATHWAYS INSIDE CELLS

Researcher: William Lim Kiong Seng
Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak

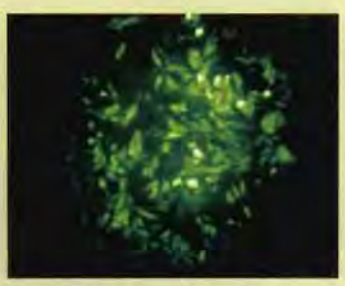
For an organism to survive, every cell in its body must be able to sense changes in the external environment and work together with neighbouring cells. One of the most common cellular communication system is having docking stations (called receptors) on the surface of cells that senses external signals such as light, gases, hormones or drug molecules. Activation of these cell surface receptors sends a signal to cellular proteins that physically associate with the receptors, starting a chain reaction of protein-protein interactions which transmits the signal throughout the cell. Many diseases are due to disruption of these signaling pathways inside cells.

In humans, the largest family of receptors is G-protein coupled receptors (GPCR). They are so named because they associate with proteins in the cell called guanine nucleotide-binding regulatory proteins, or G proteins for short. These receptors are involved in many important bodily processes ranging from the beating of the heart to seeing with the eye. At least one third of current prescription drugs works by binding to this group of receptors. Hence GPCRs are intensively studied by the pharmaceutical industry for new ways to treat or prevent diseases. One of the research approaches is to identify proteins that interact with and regulate the function of these receptors.

The model GPCR used in the laboratory is the α_{2A} adrenergic receptor which plays important roles in many different body tissues. To obtain large amounts of this receptor, cells were transfected, or engineered to manufacture the receptor protein, which they normally do not. Proteins are invisible, but the transfection process can be monitored by transfecting cells with a protein that can be made visual. The microscopic image on the left below shows the cells as they normally appear under normal lighting. When these cells are transfected with Green Fluorescent Protein, irradiating them with blue light will cause the transfected proteins to emit green light, as can be seen in the green-looking cells in the microscopic image on the right. Thus Green Fluorescent Protein allows the effectiveness of the transfection procedure to be monitored.



Cell appearance under normal lighting.



Cells after absorbing blue light which causes Green Fluorescent Protein to emit green light.

GPCRs are embedded in the cell's plasma membrane which surrounds the cell. In recent years there has been a growing interest in the low density microdomains within the plasma membrane where many signaling proteins are concentrated, called lipid raft. The name conveys the idea of a low density protein-lipid raft floating on a dense sea of lipids that make up the plasma membrane.

The first step in studying a subcellular component of cells like lipid rafts is to isolate it from other cellular contents. The method used is called density gradient centrifugation, which separates cellular material into (in this case 12) different fractions of varying densities, with fraction 1 being the lowest density, increasing to a maximum in fraction 12. The figures below show the results of a protein detection technique called Western Blot, where each dark band represents a specific protein as detected by an antibody which binds only to that protein. The numbers represents the different fractions of separated cellular material. Flotillin is a protein known to localise in lipid raft. It can be seen from the blot below that most of the flotillin is found in the first eight fractions, corresponding to the lower density fractions expected for lipid raft.

Our laboratory was set up with an IRPA (Intensification of Research in Priority Areas) grant for studying the interaction between a GPCR and a hypothesised protein partner, the 70 kDa heat shock protein, or hsp70. Currently, our laboratory is funded by MOSTI's e-Science Fund to study the interaction between receptor and hsp70 in lipid raft. This project comes under the Biotechnology Research Cluster and the Field of Research is Molecular Pharmacology. The findings have been submitted for publication.

Detection of flotillin protein among the separated fractions of cellular material.

The blot below shows the distribution of the model GPCR (α_{2A} adrenergic receptor) among the separated fractions. It is predominantly found in fractions 1 to 4, showing that is localised to lipid raft.

Isolation of receptor protein in the lipid raft fractions of cellular material.

These results set the stage for studying the subcellular distribution of hsp70, and thereafter to investigate the interaction between receptor and hsp70 in the cellular fractions where both proteins are present.

NESTING AND ROOSTING BEHAVIOUR OF THE WHITE-NEST SWIFTLET *Aerodramus fuciphagus* (AVES: APODIDAE) IN SARAWAK

Researchers: Mustafa Abdul Rahman[1], Mohamad Fizl Sidq Ramji[1] and Lim Chan Koon[2]
[1]*Faculty of Resource Science and Technology, Universiti Malaysia Sarawak*
[2]*Aquilaria Plantation (Sarawak) Sdn Bhd*

Edible-nest swiftlets have long been recognised as highly-prized economic and pharmaceutical commodities. The overwhelming success of the edible-bird nest industry has precipitated establishments of growing "swiftlet houses" in Borneo. In Sarawak, the conventional management of swiftlet farming activities, particularly the house-farmed colonies, is largely carried out by local entrepreneurs or farm managers with little or no scientific knowledge. As a result, the growing trend prompted many bird nest operators to invest heavily in various farming products without sufficient and credible biological and ecological data.

The long-term success of luring, maintaining and expanding any swiftlet colony within the proximity of many competing swiftlet farms require comprehensive understanding of its socio-behavioural ecology To address this issue, a study of two established populations of white-nest swiftlet (*Aerodramus fuciphagus*) in Miri, Sarawak was conducted in early 2011. Adopting a systematic ethological approach, this study attempts to seek critical information on its nesting and roosting behaviours, reproductive biology adaptive mating system, courtship displays and communal behaviours using non-stop video surveillance system. Furthermore, focal sampling was conducted on a marked breeding pair of the monomorphic swiftlets using advanced motion of pan-tilt-zoom (PTZ) infra-red camera.

Detailed information such as how the swiftlets interact with each other at roost, how the colony expands, or what criteria the newly fledged nestlings use to find a new nesting site are all very useful for a swiftlet farmer Is there any critical size before the entire population begins to colonise other areas? What do the sexually immature juvenile swiftlets do, and where do they roost within the colony? Do they have a social role to perform? How do they find their partner in total darkness? What communication cues do they use? Do swiftlets pair for life or are they polygamous? Is there any inbreeding within the colony? The last few questions are important in terms of genetic drift and the health of the entire gene pool of the population. However, little is known of the swiftlets' habit.

At this point, the characterisation of ethological events and general roosting behaviours of the white-nest swiftlet have provided new knowledge on the daily colonial movements, specific roosting behaviours and activity rate of the colony of the species. For instance, the daily colonial movement consists of three basic activity sessions which includes the first flight hours (0600-0700 hr), visiting hours (0700-1100 hr) and returning hours (1800-1900 hr). Along with this, the successful marking on the sampled breeding pair has led to a significant breakthrough for potential sexual segregation in nesting behaviours of the monomorphic swiftlet. In particular, the difficult identification of breeding pairs can be carefully ascertained during courtship displays, nest building and other prescribed roosting behaviours.

At this point, sexual segregation seems very likely in a colonial structure. Hence, this study has the capacity to yield valuable information on the complex behavioural pattern among white-nest swiftlet. Thus, it is anticipated that comprehensive understanding on nest-site preferences will enable farm managers to further improve their swiftlet houses and nest collection yield.

A breeding pair of white-nest swiftlet roosting at their nest.

A schematic layout of a simple video surveillance system with a static IR camera and an adjustable multifocal DN-PTZ camera for best viewing angles and optimum resolution for targeted individuals and nest boxes.

NANOPARTICLES FOR BIOMEDICAL APPLICATIONS

Researchers: Chin Suk Fun, Pang Suh Cem and Siti Nur Akmar Mohd Yazid
Faculty of Resource Science and Technology, Universiti Malaysia Sarawak

In recent years, polysaccharides such as dextran, cellulose, starch and chitosan have been widely studied and explored for biomedical applications. Starch as one of the most abundant polysaccharides on earth has been widely studied as precursor materials for preparing starch nanoparticles as it is renewable, biodegradable, cheap and non-toxic in nature. Starch nanoparticles have shown great promises as drug delivery carriers due to their high surface area to volume ratio, bio-adhesiveness, with mean sizes within the range of many bio-molecules.

In our research group, we have successfully utilised locally available native sago starch (*Metroxylon sagu*) as the precursor material for fabrication of starch nanoparticles. A facile and green nanoprecipitation method has been developed for the fabrication of starch nanoparticles with controllable size and morphology. Starch nanoparticles were obtained by addition of starch solution into excess absolute ethanol solution. Both solvent and non-solvent systems used in the synthesis were aqueous-based and the synthesis method was simple and easy to perform as compared to other synthesis approaches previously reported. The mean sizes and shapes of the starch nanoparticles can be changed by varying the synthesis conditions such as the use of an appropriate surfactant and adjusting the ratio of solvent-nonsolvent during precipitation. Under optimum conditions, spherical starch nanoparticles with mean particle size ranging from 100-150 nm can be obtained (Figure 1).

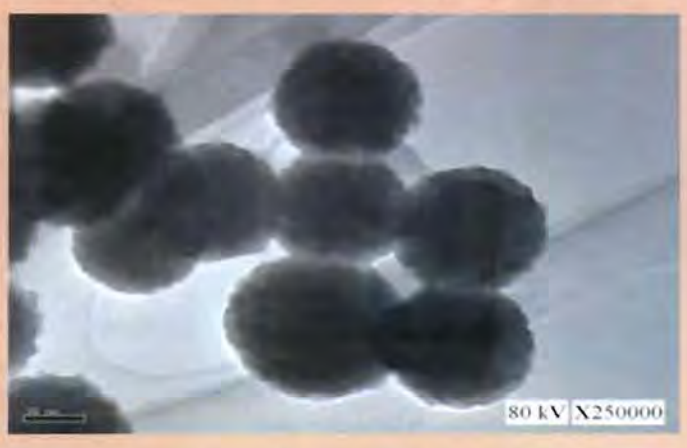


Figure 1: Transmission electron micrograph of starch nanoparticles fabricated by the nanoprecipitation method.

Controlled release agents have received much attention due to their ability to release nuetraceutical or drugs in a sustained and slow way. Curcumin is a yellow polyphenol and it is one of the bioactive components of turmeric. This compound has been reported to show anti-oxidant, anti-inflammatory, anti-tumor and anti-microbial properties. However, the above mentioned properties of curcumin are yet to be fully realised in clinical applications due to their low water solubility, poor bioavailability and photostability. These drawbacks need to be overcome in order to fully harness the goodness of curcumin in such a way that it can be absorbed by the body in a controlled way.

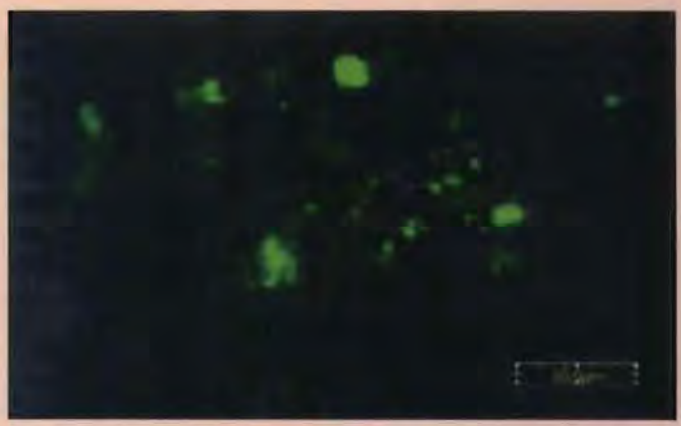


Figure 2: Fluorescent image of starch nanoparticles loaded with curcumin.

The potential application of starch nanoparticles as neutraceutical carriers and controlled release agent have been evaluated by the loading of curcumin onto starch nanoparticles. Curcumin, a potent neutraceutical has been successfully loaded onto starch nanoparticles by an in situ nanoprecipitation method. As can be seen in Figure 2, the starch nanoparticles appeared to be fluorescent under the confocal microscope as curcumin is naturally fluorescent in the visible green spectrum.

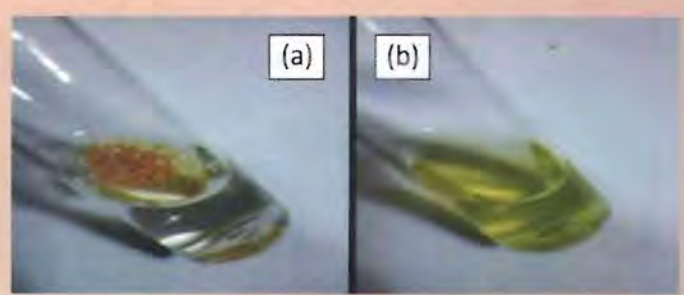


Figure 3: Photos of (a) curcumin flakes floating on the surface of water (b) curcumin loaded starch nanoparticles that are well dispersed in water.

Loading of curcumin onto starch nanoparticles has resulted in enhanced water solubility and dispersibility of curcumin in water, as shown in Figure 3. The loading of curcumin onto starch nanoparticles also improves the photostability of curcumin. The loading efficiency can be changed by the use of the microemulsion system during the loading process and the loading duration. Under optimised synthesis condition, a maximum loading efficiency of 70% was achieved. Our preliminary studies showed that curcumin could be released from starch nanoparticles in a controlled and sustained way over 72 hours under physiological conditions. As such, the potential utility of starch nanoparticles as carriers and controlled release agents for curcumin and other neutraceuticals is highly anticipated.

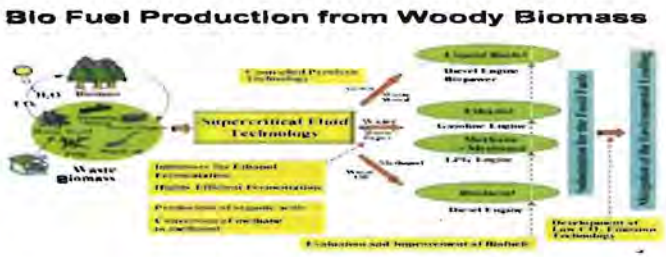
BIODIESEL PRODUCTION FROM WASTE OIL AND FAT AS A RENEWABLE ENERGY SOURCE

Researchers: Abu Saleh Ahmed, Sinin Hamdan and Rezaur Rahman
Faculty of Engineering, Universiti Malaysia Sarawak

As fossil fuel is being rapidly exhausted nowadays, there is a need to find an alternative fuel to fulfill global demands. One of such alternatives is biodiesel, a nonpetroleum-based fuel defined as mono-alkyl esters of long chain fatty acid derived from vegetable oils and animal fats, alcohols of lower molecular weights (primarily methanol) in the presence of catalyst. Biodiesel as an alternative diesel fuel has recently attracted huge attention worldwide for its good exhaust emission, sustainability and biodegradability

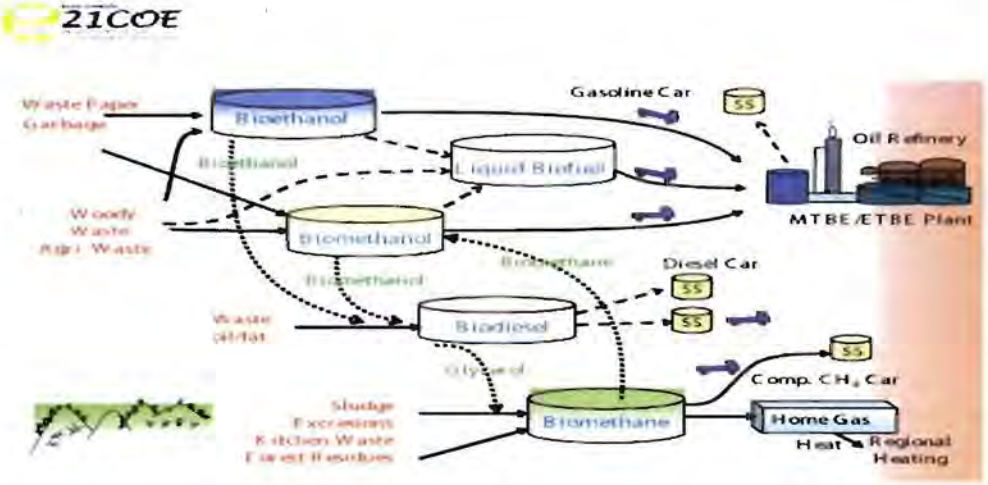
Air-pollution is a serious problem all over the world. Vehicles in big cities and towns contribute the most to gaseous emissions as greenhouse gases (GHG) such as carbon-dioxide (CO_2), carbon monoxide (CO), nitrogen oxide (NO_x) and sulphur oxide (SO_x) cause climate change and environmental damage to flora and fauna. Exhaust emission of diesel engines operating on biodiesel and its blends with diesel fuel have been reported in numerous studies. Many studies have shown that the increase of biodiesel percentage in the blend reduces CO, SO_x hydrocarbons (HC) and particulate matter (PM) emission and smoke. However the emission of NO_x depends on the biodiesel sources.

In this study waste fat and oils were used to produce biodiesel through transesterification, and this converted biodiesel was then used to prepare biodiesel/diesel blends. The objective of this study was to investigate the conversion of waste to biodiesel as well as to compare the engine performance and trace formation from the exhaust tail gas of a four-cylinder, four-stroke indirect injection (IDI) diesel engine. The biodiesel conversion yield from different sources are compared. The engine performance at different engine speeds are compared with biodiesel blends and ordinary diesel fuel. The formation of CO, NO_x and HC are also investigated and discussed.



Biomass conversion process.

Transesterification process for biodiesel.



CO_2-zero emission type bioenergy production and utilisation system.

PRODUCT & TECHNOLOGY TRANSFER

SARAWAK INDIGENOUS SPELL CHECKER (SARAWAK INSPECH)

Researchers: Alvin Yeo Wee, Bali Ranaivo-Malançon, Suhaila Saee and Suriati Khartini
Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak

A screenshot of the Spell Checker INSPECH.

One of the key productivity (and learning) tools in writing is the spell-checker. Given the fact that Sarawak languages do not have a large number of speakers, major software companies have not implemented such spell-checkers. In this research, we investigated the linguistic nature of Sarawak languages, leveraged on the findings and implemented the Iban and Melanau Spell Checker In addition to the common features, the spell checker of the Iban language also replaced the old spelling of Iban words with new spellings. The accuracy of the spell checker is high as it performs the dictionary lookup together with Morphological Analyser. The POS (part-of-speech) tagger which is embedded inside the spell checker for Iban language has increased the accuracy of pin-pointing misspelled words, from the most likely to the least likely

Benefits:
- Fast and accurate spell checking of documents in Iban and Melanau.
- Appeal to younger generation in that local indigenous languages are keeping with the times.

Potential Application & Uses:
- Important component for word processing tool, like AbiWord.
- Useful for autocorrect of any applications which require correct spelling.
- Assistance in generating more materials in local languages.

Target users: writers, translators, teachers and students of the Iban and Melanau language.

ENAI COUNSELING MANAGEMENT SYSTEM (ENAI-CMS): THE COMPREHENSIVE APPROACH

Researchers: Mohd. Razali Othman, Safi'ee Madian, Sheilla Lim Omar Lim and Siti Norazilah Mohd Said
Faculty of Cognitive Sciences and Human Development, Universiti Malaysia Sarawak

enaiCMS
CounselingManagementSystem

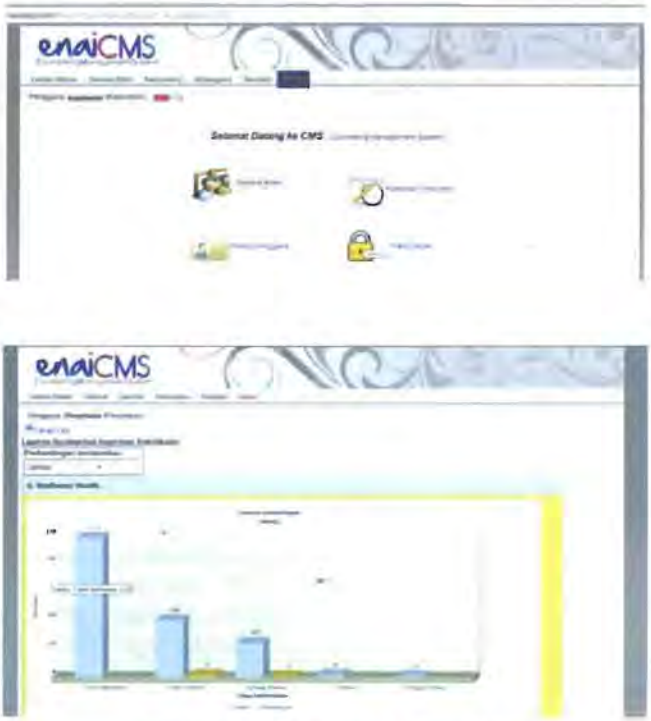
ENAI Counseling Management System (ENAI-CMS) offers an innovative three-tiered program to give employers and employees access to an array of services that address personal life challenges and improves workplace productivity and performance. It provides a one-stop solution for government agencies and organisations in Malaysia. The software supports a wide range of Windows platform with all components running purely on Open Source solution. With its installation on dedicated or shared hosted server, ENAI-CMS gives users complete control. The software includes the entire source-code for greater flexibility and integration for users project requirements. In addition, with simple installation, users can run the software instantly without much difficulty ENAI-CMS offers extensive user friendly functionality that makes using the application enjoyable and effective. Its features are categorised into three areas, namely, general features, security features, and the technology architecture. The following are some of the features of ENAI-CMS:

General Features
- Fully web-based
- Full-text search
- Personalised dashboard

Security Features
- Access right for counseling protection on a per group or role basis
- SSL for encrypted and secure connections
- Audit trails of user interaction with system Technology

Architecture
- The ENAI-CMS system is a PHP application and hosted in any web server which supports the PHP runtime. The use of a SSL-capable web server is highly recommended.
- The application currently requires MySQL database engine.
- Supported operating systems include Linux, FreeBSD, Microsoft Windows 2000/2003 and Sun Solaris

ENAI-CMS is an effective system to reach targeted employees who are facing life-related problems which can hamper productivity and performance. ENAI-CMS can dramatically increase productivity for employees working in government agencies and other organisations in Malaysia.



Analysis by ENAI CMS viewable by management.

*fas*TiP-X KIT: AMPLIFY DNA VIA PCR WITHOUT PRIOR DNA PURIFICATION

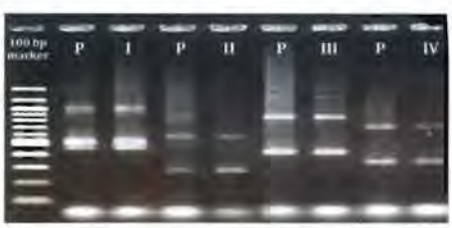
Researchers: Ho Wei Seng[1], Lai Pei Sing[1], Ismail Jusoh[1] and Pang Shek Ling[2]
[1]*Faculty of Resource Science and Technology, Universiti Malaysia Sarawak*
[2]*Sarawak Forestry Corporation*

DNA extraction is a prerequisite to any genomic analyses. The conventional DNA extraction (e.g., CTAB/SDS extraction) method for plant samples are time consuming, tedious and labour intensive as it involves the use of liquid nitrogen (-196°C/-321°F) and hazardous chemicals, such as β-mercaptoethanol, chloroform: isoamyl alcohol (96:4) and phenol: chloroform:isoamyl alcohol (48:48:4), and therefore not suitable for high-throughput genomic analyses. In fact, more than 50% of the extracted DNA would be lost along the extraction steps. Hence, there is a pressing need to develop a rapid, simple and efficient DNA extraction method aimed at saving time and cost for high-throughput genomic analyses, especially in genomic selection or marker-assisted selection (MAS) study.

This new method involves only three simple steps prior to PCR amplification: (i) transfer plant samples into the fasTip-X Extract Buffer (EB) by touching the samples using pipette tip or Harris Uni-CoreTM puncher; (ii) incubate to lyse plant cells; and (iii) directly use incubated solution for Polymerase Chain Reaction (PCR) amplification. The fasTip-X Extract Buffer (EB) eliminates the need for freezing of cells and tissues with liquid nitrogen, mechanical disruption, organic extraction, column DNA purification or alcohol precipitation. Furthermore, it amplifies DNA directly via PCR from plant samples without any DNA purification steps, thus allowing significant savings in both time and cost compared to the conventional method.

*fas*TiP-X kit.

Protocol and advantages of *fas*TiP-X kit.



PCR amplification using 5S rRNA primers with template obtained from fasTIP-X. M:100bp marker; P: positive control; I: Neolamarckia cadamba; II: Duabanga moluccana; III: Durio zibelthinus, and IV: Dimocarpus longan.

NETWORKING

MoU between UNIMAS and Institute for Cognitive Science Studies Tehran, Iran

An MoU was signed between UNIMAS and Institute for Cognitive Science Studies (ICSS), Tehran, Iran on 29 November 2011 to seal the partnership between the two institutions in research and academic endeavours. This MoU is anchored by the Faculty of Cognitive Sciences & Human Development, UNIMAS. The two universities will embark on staff and student exchange activities, collaboration in research and joint academic pursuit.

MoU between UNIMAS and B.S Abdur Rahman University, Chennai, India

An MoU was signed between UNIMAS and B.S Abdur Rahman University (BSAU) Chennai, India on 10 February 2012. Based on the MoU, both parties agreed to promote international academic cooperation in the following areas (a) institutional exchanges of staff and students from each partner institution; (b) organisation of symposiums, conferences, workshops, short term courses and research meetings; and (c) exchange of information pertaining to development in teaching, student development and research.

MoU between UNIMAS and Tokuyama Corporation

An MoU was signed by Professor Datuk Dr Khairuddin Ab Hamid on behalf of UNIMAS and Mr Seiichi Shiraga on behalf of Tokuyama Corporation on 29 March 2012. Besides joint consultancies and R&D collaboration, the MoU paves the way for UNIMAS researchers and students to have their research or study attachment in Tokuyama Corporation, Japan or in its subsidiary company in Sarawak. UNIMAS will also benefit from sharing of technical expertise, particularly in chemical, cement and electronic industries, because of the good relationship Tokuyama Corporation has with Yamaguchi University.

MoA between UNIMAS and Grant Assistance for Grassroots Human Security Projects, Japan Government

The Institute of Social Informatics and Technological Innovations (ISITI-CoERI), UNIMAS on 8 March 2012 secured a grant of RM350,000 from the Government of Japan. The grant is earmarked for the construction of a micro-hydro system in Long Lamai, Ulu Baram, Sarawak, which will be wholly-owned and managed by the Penan community living there The multi disciplinary research team from ISITI-CoERI will adopt a participatory approach involving the community private industries and the Ngerabit eLamai telecentre committee in Long Lamai.

Since 2009, the Penan community in Long Lamai has been enjoying the use of a Solar PV system which is used to power its telecentre with 6 computers and a VSAT satellite. This was made possible with the RM155,920 Grassroots Grant Assistance for Human Security Project by the Government of Japan.

MoU between UNIMAS and Jabatan Perhilitan, Malaysia

In conjunction with the national Biodiversity Day and the Green Wave Programme 2012, an MoU was signed between *Jabatan Perhilitan* (*Perlindungan Hidupan Liar dan Taman Negara*) and a number of Malaysian universities: UM, UKM, UPM, UTM, UNIMAS, The University of Nottingham (Malaysia Campus), and Cyberjaya University College of Medical Sciences. YB Tan Sri Datuk Seri Panglima Joseph Kurup, the Assistant Minister of Natural Resources and Environment, Malaysia officiated at the event which took place at Paya Indah Wetlands on 22 May 2012. The MoU seeks to increase expertise in wildlife research as well as the collection of biodiversity information in protected areas for wildlife conservation. Another expected outcome of the MoU is the coordination of research on wildlife to ensure that it is in line with current needs and to reduce duplication of research efforts.

STAKEHOLDER SPEAKS

Professor Justo A Diaz

ICT Research, Development and Commercialisation in UNIMAS: An international Academics' Perspective

Firstly, I would like to thank the Outreach Editorial Board for inviting me to contribute to this issue of Outreach. Although I live in New Zealand (and a Professor and Head of Department at the University of Auckland for 11 plus years), after retirement I have been returning to Kuching since my first visit in 1998. I was then a Visiting Professor to the then Faculty of Information Technology, and have returned for extended periods to Swinburne University of Technology in Kuching ever since. What drew me back to Sarawak, besides the hospitable people and the warm climate, was the opportunity to work with the young ICT researchers.

I am pleased to note that at UNIMAS, researchers in the Information and Communication Technology (ICT) field are playing their part in nation building besides developing the human capital (ICT graduates), research, and development. For example, at the Faculty of Computer Science and Information Technology (FCSIT), the faculty's theme of "Technology Impacting Life" and the play on the Faculty initials "FoCuS IT on transforming individuals" reflects the concerns of the Faculty on how technology, specifically, pervasive computing and ubiquitous access, is affecting the lives of communities and individuals. Ubiquitous access is reflected in the use of smart devices connected to broadband and telephone services providers. In the urban centers one can see that the first reaction of young people is to reach for their smart device and connect with someone. All these people connecting to wireless networks cause what we call traffic jams on the road and in networks, degradation of service. The response of the FCSIT has been to initiate research on IPv6 based networks and how to improve the quality of service in networks. The FCSIT computational modeling research group has strong fundamental background in prediction of dynamical systems, statistical modeling and operational research. The work they do has impact on society, for example, malaria disease modeling, wind behaviour prediction, paddy yield prediction, and scheduling manpower.

While we speak of ubiquitous access we also know that there are large numbers of people that do not have access especially in rural areas or those that cannot afford these services. UNIMAS, since 1999, has been concerned with the potential of digital technologies and communications to enhance and enrich the lives of isolated communities in Sarawak – the eBario projects have earned worldwide acclaim through the research and activities in Bario. The project has been extended to 4 other sites in Sabah and Sarawak, and now to other groups in West Malaysia. The Institute of Social Informatics and Technological Innovations (ISITI) and Centre of Excellence for Rural Informatics (CoERI) were founded to focus on research and development addressing the needs of the underserved rural communities, from providing Internet access to assisting in the preservation of cultural values and languages and improving the social-economic welfare of these communities through the use of digital technologies. The multi-disciplinary work conducted by ISITI-CoERI involve faculties such as Computer Science and IT, Social Sciences, Cognitive Science and Human Development, Medical, Engineering, Economics and Business. The work covering with five remote communities in East Malaysia, and now four sites with the Orang Asli, has to be commended for reaching the unreached. Research such as wireless solar-powered long-range WiFi system and the community radio in Bario augurs well not only for UNIMAS but for the indigenous communities which are benefitting from these technologies. In addition, stakeholders such as the Government also benefit from insights and findings from the research conducted.

Another Centre of Excellence, "Center of Excellence for Image Analysis and Spatial Technologies" (IMAST), is well known for its image processing research. This research gains its impact from the increasing computing power available when combined with networking capabilities. This is best illustrated with its efforts to develop an intelligent video surveillance system. This system coupled with face recognition technologies would also be in high demand by the security industry and governments. In addition, IMAST has conducted research, development and commercialisation in the oil palm industry, employing image processing techniques on satellite images to calculate the number of oil palm trees. Working with Sarawak Forestry Corporation, they have also developed and commercialised software for recognising tree species.

In sum, it is now generally acknowledged that ICTs are quintessential in our lives, be it for work or play. UNIMAS' choice of ICTs as one of the niche areas is not only strategic but has already garnered attention from industry and government. In addition, targeting the local markets and working collaboratively with industries augur well for UNIMAS.

RESEARCH & CONSULTANCY

Sarawak Dolphin Project work in Similajau

Sarawak Dolphin Project (SDP) was launched in Kuching as a joint conservation-based research project funded by Shell implemented by UNIMAS and the Sarawak Forestry Corporation (SFC). The first field survey of the project took place in Similajau from June 11-14, 2008. The survey team, comprised UNIMAS and SFC staff, logged 14 sightings of three different cetacean species; the Irrawaddy dolphin, finless porpoise, and the humpback dolphin. Over the next four years, 13 surveys were conducted, which comprise nearly 4,000 km of survey track and 116 cetacean sightings at the Similajau National Park headquarters or fishing village of Kuala Nyalau to the North The majority of the surveys were funded by SALCO, a joint venture company of CMS and Rio Tinto (Australian mining company). The results of surveys conducted in the first two years of the project was published in the Raffles Bulletin of Zoology in February 2011. The funding from SALCO and other grants provides the SDP with a unique opportunity to monitor the potential effects of these coastal developments on dolphin populations over time.

SDP surveys in the Similajau area include line transect boat surveys which can detect shifts in distribution and population numbers over time The research methods also include water parameter sampling to detect possible changes in water temperature, salinity, turbidity and acidity The use of photo-identification allows recognition of individual Irrawaddy and humpback dolphins over time, making it possible for the team to track their movements within the survey area, and also providing another means for calculating population numbers. By returning to the area on a regular basis, and using these same survey methods each time, the SDP team was able to detect any potential impacts of the coastal developments on the dolphins and their habitat.

Although Rio Tinto/SALCO is no longer in a position to fund the SDP's dolphin research in the area, surveys are still continuing from 2012 to 2013 with funding from the International Whaling Commission s (IWC) Small Cetacean Conservation Fund.

Irrawaddy Dolphin surfacing off the coast of Similajau.

Emergency Response Plan for Murum HEP Dam

Sarawak Energy Berhad (SEB) has commissioned UNIMAS Holdings Sdn Bhd and CTTC to conduct a study for the preparation of Emergency Response Plan for Murum Hydro-Electric Power Dam. The study commenced in January 2012 and is expected to be completed by August 2012. The scope of work includes site visit to the Murum Dam site, consultations with Bakun Dam operator, Sarawak Hydro Sdn Bhd, and the Resident and District offices at Belaga and Bintulu. The research team has predicted various emergency scenarios through dam-break simulations. A comprehensive monitoring network has been recommended to provide a continuous monitoring of the dam structure, slope stability and geotechnical movements at the vicinity of the Murum Dam site. Subsequently, SEB and the Ministry of Public Utility Sarawak have extended the study to cover the potential cascading effect on Bakun Dam. UNIMAS is committed to provide high quality consultancy services and with this experience, we are one of the experienced Emergency Response Plan (ERP) consultants in Sarawak.

Dam construction sites.

SEMINARS & CONFERENCES

Symposium on Borneo Heritage 2012

The Faculty of Computer Science and Information Technology (FCSIT), UNIMAS hosted the Symposium on Borneo Heritage 2012 on 16 February 2012 at DeTAR Putra, UNIMAS. This one-day symposium comprised presentations and lectures from international and local scholars to share their knowledge and experiences in Digital Heritage Collection. The symposium highlighted the importance of digital repositories for the preservation of the Borneo Heritage. Amongst the speakers were Professor Dr Hermann Maurer from University of Graz, Austria; Professor Dr Wolf-Tilo Balke from Technische Universität Braunschweig, Germany; Associate Professor Dr Alvin Yeo Wee from the Institute of Social Informatics and Technological Innovations, UNIMAS; Associate Professor Dr Balisoamanandray Ranaivo-Malançon from the FCSIT, UNIMAS and Associate Professor Datu Hj. Sanib bin Hj. Said from the Institute of East Asian Studies, UNIMAS.

The Borneo Frog Race 2012 (IBEC)

The Borneo Frog Race, the first of its kind, was held in Sarawak to create greater awareness on amphibian conservation in Borneo. This event was organised by Institute of Biodiversity and Environmental Conservation (IBEC) in association with the Permai Rainforest Resort on 28 April 2012. The purpose of this event was to celebrate the 4th Annual Save the Frogs Day 2012. The frog race also included talks and a race to document amphibians on Gunung Santubong and their conservation. The race was opened to the general public and based at the Permai Rainforest Resort, Santubong. The event was attended by 41 participants, many of whom were students from UNIMAS, in addition to members of the Malaysian Nature Society and staff of the Sarawak Forest Department and Sarawak Forestry Corporation. Participants had about 120 minutes to go up Gunung Santubong and photographically document amphibians.

3rd Conference in Advancing Social Work Series

The 3rd Conference in Advancing Social Work Series was organised by the Faculty of Social Sciences (FSS), UNIMAS on 17-18 July 2012. The conference aimed to strengthen the working relationship between those in the field and the trainers, so as the next generations of social workers will be well equipped to deal with contemporary practical issues. The conference also aimed to encourage a strong mentoring culture within the work setting – a traditional core area of professional practice that is timely to be revived.

Postgraduate Conference on Social Sciences & Humanities

July 9 & 10 2012 witnessed the commencement of the very first Postgraduate Conference on Social Sciences and Humanities 2012 (PCSSH 2012) organised by Faculty of Economics and Business, Universiti Malaysia Sarawak. Yang Berbahagia Professor Datuk Dr Khairuddin Ab Hamid officiated at the conference which provides exciting discussions and arguments related to postgraduate journey for all participants. The conference was initiated to help provide an environment for strong and healthy postgraduate education in UNIMAS. Concomitant with the 20 years resolution, the conference focuses on "Educating and Sharing of Knowledge towards Successful Contemporary Research Development".

ENCON 2012

Engineering Conference (ENCON) is the flagship conference for the Faculty of Engineering, UNIMAS. It was held on 10-12 July 2012 with the theme "Engineering Towards Change - Empowering Green Solutions". The conference focused on the issues of green technologies and sustainable development in the engineering field. The main objective of this conference was to provide a platform for researchers, academicians, engineers, industrial professionals and also postgraduate students to promote cooperation and technological research progress in green engineering. The conference featured three prominent keynote speakers. A post-conference workshop on "Geoenvironmental Engineering for Sustainable Development" was also held.

The Regional Conference on Natural Resources in the Tropics (NRTrop4)

The Regional Conference on Natural Resources in the Tropics (NRTrop4) will be held on 19-21 September 2012 organised by the Faculty of Resource Science and Technology, UNIMAS. The NRTrop4 will encompass broad issues on sustainable utilisation and management of existing natural resources to support and enhance the national and regional economic developments. Issues of alternative resources such as new potential commercial crops, suitable tree species for forest plantation, alternative sources of energy, such as, biofuel agriculture technologies, sustainable fisheries and aquaculture, and commercialisation of timber and non-timber forest products will be the major topics of this conference. The conference will also highlight other important issues in the tropics, such as, conservation of tropical biodiversity, environmental management legislative issues, socio-economic and marketing strategies.

PUBLICATIONS

Abdul Karim, B., Jais, M., & Abdul Karim. S. A. (2011). The subprime crisis and stock index futures markets integration. *Journal of Risk Finance, 12*(5).

Bariyah, N., Lau, E., & Abu Mansor, S. (2012). Long run sustainability of Sarawak – West Kalimantan cross-border trade flows. *Journal of Developing Areas, 46*(1), 165 – 181.

Brown, R. M., Siler, C. D., Das, I., & Pui, Y. M. (2012). Testing the phylogenetic affinities of Southeast Asia's flying geckos: flap-legged geckos (*Luperosaurus*), parachute geckos (*Ptychozoon*) and their relationship to the pan-Asian genus *Gekko*. *Molecular Phylogenetics and Evolution, 63*(3), 915–921.

Butt, M. M. & de Run, E. C. (2012). Can ethnically targeted advertisement work for Malay adolescents. The moderating role of ethnic Identity strength. *Asian Academy of Management Journal, 17*(1).

Cho, H. Y., Aeria, A., & Hur, S. W. (2012). *From unity to multiplicities. Social movement transformation and democratization in Asia*, Petaling Jaya: SIRD. (ISBN: 978-967-5832-45-1).

Das, I. (2012). Arboreal reptiles (tree trunk and canopy-dwelling species). In R. W. McDiarmid, M. S. Foster, C. Guyer, J. W. Gibbons & N. Chernoff. (Eds.), *Reptile biodiversity. Standard methods for inventory and monitoring* (pp. 275–279). Berkeley, California: University of California Press.

Dayang-Affizah, A. M., Rossazana, A. R., & Dayang-Hummida, A. A. R. (2012). ASEAN 5+3 economies: Convergence or divergence?. *International Journal of Economics and Research, 5*(1).

de Run, E. C., Chan, A. W. S., & Khalique, M. (2012). Attitudinal and behavioral response to COO cues for low involvement products. *International Journal of Research Studies in Management, 1*(2), 3-14.

de Run, E. C., Yee, T. C., & Khalique, M. (2012). It's not just a brand name: The impact of language on consumer attitude and behavior. *International Journal of Research Studies in Management, 1*(2), 47 - 56.

Fatih, F. A., Siner, A., Ahmed, A., Woon, L.C., Craig, A., Singh, B., Krishna, S., & Cox-Singh, J. (2012). Cytoadherence and virulence – the case of *Plasmodium knowlesi* malaria. *Malaria Journal, 11*(33).

Goldberg, S. R., Das, I., de Silva, A., & Austin, C. C. (2012). *Lankascincus fallax* (Peters' Litter Skink). Reproduction. *Herpetological Review, 43*(1), 134–135.

Haas, A., Hertwig, S. T., Krings, W., Braskamp, E., Dehling, J. M., Pui, Y. M., Jankowski, A., Schweizer, M., & Das, I. (2012). Description of three *Rhacophorus* tadpoles (Lissamphibia: Anura: Rhacophoridae) from Sarawak, Malaysia (Borneo). *Zootaxa, 3328*, 1–19.

Jakhrani, A. Q., Othman, A. K., Rigit, A. R. H., & Samo, S. R. (2011). Model for estimation of global solar radiation in Sarawak, Malaysia. *World Applied Sciences Journal 14 (Special Issue of Food & Environment)*, 83-90.

Jakhrani, A. Q., Othman, A. K., Rigit, A. R. H., & Samo, S. R. (2011). Comparison of solar photovoltaic module temperature models. *World Applied Sciences Journal 14 (Special Issue of Food & Environment)*, 1-8.

Jakhrani, A. Q., Othman, A. K., Rigit, A. R. H., & Samo, S. R. (2012). Assessment of solar and wind energy resources at five typical locations in Sarawak. *Journal of Energy & Environment, 3*, 8-13.

Jakhrani, A. Q., Othman, A. K., Rigit, A. R. H., Baini, R., Samo, S. R., & Ling, L. P. (2012). Investigation of solar photovoltaic module power output by various Models. *NED University Journal of Research, Thematic Issue on Energy*, 25-34.

Jakhrani, A. Q., Othman, A. K., Rigit, A. R. H., Samo, S. R., Ling, L. P., & Baini, R. (2012). Cost estimation of a standalone photovoltaic power system in remote areas of Sarawak, Malaysia. *NED University Journal of Research, Thematic Issue on Energy*, 15-24.

Keong, M. L., Ramayah, T. Kurnia, S., & Lo, M. C. (2012). Explaining intention to use an Entreprise Resource Planning (ERP) System: An extension of the UTAUT model. *Business Strategy* Series, *13*(4), 173-180.

Khalique, M., Isa, A. H. M. B., & Shaari, J. A. N. (2012). Challenges faced by Pakistani pharmaceutical companies: An intellectual capital perspective. *International Journal of Research Studies in Management, 1*(1), 39-45.

Khalique, M., Shaari, J. A. N. B., & Isa, A. H. M. (2012). Intellectual capital and banking sector of Pakistan. *International Journal of Research in Commerce, Economics & Management, 2*(6). 1-5.

Kongkerd, N., Singh, B., Nishibuchi, M., Swangjaroen, N., & Vuddhakul, V. (2012). Human *Plasmodium knowlesi* infection in Ranong province, south-western border of Thailand. *Malaria Journal, 11*(36).

Lam, K. C., & Ghazali, K. (2012). Saya suka tapi tak bangga– Satu kajian sikap bahasa. *GEMA Online Journal of Language Studies, 12*(1), 275-293.

Lim, H. C., Leaw, C. P., & Lim, P. T. (2012). Morphological observation of two species of Pseudo-nitzschia (Bacillariophyceae). *Coastal Marine Science, 35*, 52-57.

Lim, H. C., Lim, P. T., & Leaw, C. P. (2012). Genetic diversity of Pseudo-nitzschia pungens (Bacillariophyceae) from Borneo, Malaysia. *Coastal Marine Science, 35*, 58-63.

Ling, T. Y., Azzyati, Z. I. M., & Bilong, L. M. (2012). Temporal and spatial variations and decay rates of *E. coli* in river sediment. *Journal of Sustainability Science and Management, 7*(1), 1-7.

Ling, T. Y., Kho, C. P., & Nyanti, L. (2012). Spatial and temporal variations of heavy metals in a tropical river. *World Applied Sciences Journal, 16*(4), 550-559.

Lo, M. C., Mohamad, A. A., Songan, P., & Yeo, A. W. (2012). Positioning rural tourism: Perspectives from the local communities. *International Journal of Trade, Economics and Finance, 3*(1), 59-65.

Lo, M. C., Mohamad, A. A., Songan, P., & Yeo, A. W. (2012). Repositioning strategy in ecotourism industry: A case of Bario. *Emerald Business Strategies Series, 13*(1), 41-46.

Lo, M. C., Mohamad, A. A., Songan, P., & Yeo, A. W. (2012). Rural destinations and tourists' satisfaction. *Journal of Services Research, 11*(2), 59-74.

Lo, M. C., Mohamad, A.A., Songan, P., & Yeo, A. W. (2012). Rural tourism positioning strategy: A community perspective. *IPEDR, 28*, 22-26.

McWilliam Leitch, E. C., Cabrerizo, M., Cardosa, J., Harvala, H., Ivanova, O. E., Koike, S., Kroes, A. C., Lukashev, A., Perera, D., Roivainen, M., Susi, P., Trallero, G., Evans, D. J., & Simmonds, P. (2012). The association of recombination events in the founding and emergence of subgenogroup evolutionary lineages of human enterovirus 71. *Journal of Virology, 86*(5), 2676-85.

Minton, G., & Das, I. (2012). *Chrysopelea paradisi* (Garden Flying Snake). Diet. *Herpetological Review, 43*(1), 144.

Mohamad, A. A., Lo, M. C., Songan, P., & Yeo, A. W. (2012). Dimensionality of communities' belief attitude toward rural tourism development: The case of Bario. *British Journal of Arts and Social Sciences, 6*(2), 245-254.

Mohamad, F. S., Yeo, A. W., & Abdul Aziz, N. (2012). Technology touching lives. *UNIMAS Publishers, Kota Samarahan, Sarawak.* (ISBN: 978-967-5527-35-7).

Musa, N., Othman, R. M., Abang Ibrahim, D. H., & Din, I. (2012). E-Government services: The formal, technical and informal components of e-fraud prevention for government agency. *International Journal of Research in Management & Technology (IJRMT), 2*(2), 214-219.

Ngaini, Z., Haris-Fadzillah, S. M., & Hussain, H. (2012). Synthesis and Antimicrobial studies of Hydroxylated Chalcone derivatives with variable chain length. *Natural Product Research, 26,* 892–902

Ngaini, Z., Mohd Arif, M .A., Hussain, H., Er, S. M., Tang, D., & Abang Kamaluddin, D. H. (2012). Synthesis and antibacterial activity of Acetoxybenzoyl Thioureas with Aryl and Amino Acid Side Chains. *Phosphorus, Sulfur, and Silicon and the Related Elements, 187,* 1-7.

Nyanti, L., Ling, T. Y., & Jongkar, G. (2012). Fish and crustacean communities and fish length-weight relationships of Lutong River, Miri, Sarawak, Malaysia. *World Journal of Fish and Marine Sciences, 4*(1), 102-110.

Pan, K. L., Chan, W. H., Ong, G. B., Zulkarnaen, M., & Norlida, D. K. (2012). Non-bacterial chronic recurrent osteomyelitis of the clavicle. *Asean Edition of Malaysian Orthopaedic Journal, 6*(1), 56-60.

Pui, Y. M., & Das, I. (2012). A significant range extension for the Kinabalu Parachute Gecko, *Ptychozoon rhacophorus* (Boulenger, 1899) (Squamata: Gekkonidae) and a new state record from Sarawak, northwestern Borneo. *Herpetology Notes, 5,* 20–22.

Ramji, M. F. S., Rahman, M. A., & Tuen, A. A. (2012). Morphological variation of mountain blackeye (Chlorocharis emiliae) populations in Malaysian Borneo. *Malays. Appl. Biol, 41*(1), 1-10.

Rethinasamy, S., Chuah, K. M., & Hafizan Hashim, M. (2012). ESL students learning content subject in English: What do the Malaysian first cohort students say?, *The International Journal of Learning, 18*(7), 353-366.

Salam, M. A., Affan, M. A., Saha, R., Ahmad, F. B., & Sam, N. (2012). Synthesis, characterization and in vitro antibacterial studies of Organotin(IV) Complexes with 2-Hydroxyacetophenone-2-Methylphenylthiosemicarbazone (H2dampt). *Bioinorganic Chemistry and Applications*, 1-9.

Sam, N., Abu Affan, M., Abdus Salam, M., Ahmad, F. B., & Razip Asaruddin, M. (2012). Synthesis, spectral characterization and biological activities of Organotin(IV) complexes with *ortho*-vanillin-2-hydrazinopyridine (VHP). *Open Journal of Inorganic Chemistry, 2,* 22-27.

Sazali, S. N., & Akmar Aziz, N. S. (2012). Morphometric analysis of cantor's roundleaf bat, Hipposideros galeritus Cantor 1846 from several localities in Sarawak, Malaysia. *Journal of Tropical Biology and Conservation, 9*(1), 97-104.

Sazali, S. N., & Juary, J. (2012). Morphometric analysis of the fawn roundleaf bat, *Hipposideros cervinus* (Gould, 1854) (Chiroptera: Hipposideridae), from Several Populations in Sarawak. *Tropical Natural History, 12*(1), 89-95.

Sazali, S. N., Laman, C. J., & Abdullah, M. T. (2012). Morphometrical variations of Malaysian *Hipposideros* Species. *Malaysian Journal of Mathematical Sciences, 6*(1), 47-57.

Sheldon, F. H., Oliveros, C. H., Taylor, S. S., McKay, B., Lim, H. C., Rahman, M. A., Mays, H., & Moyle, R. G. (2012). Molecular phylogeny and insular biogeography of the lowland tailorbirds of Southeast Asia (Cisticolidae: Orthotomus). *Molecular Phylogenetics and Evolution, 65,* 54-63.

Tahira, R., Butt, M. M., de Run, E. C., & Ramay, I. A. (2012). Measuring the e-service quality of Pakistani banks. *International Journal of Economics and Business Research.*

Tay, S. H., Shapiee, A. R., & Labadin, J. (2012). Statistical modelling of CO2 emissions in Malaysia and Thailand. *International Journal on Advanced Science, Engineering and Information Technology, 2*(5), 10-15.

Ting, S. H., & Ling, T. Y. (2011). Ethnic identity of young Malaysians in Sarawak. *Malaysian Journal of Youth Studies, 5,* 165-176.

Ting, S. H., & Ling, T. Y. (2012). Language use and sustainability status of indigenous languages in Sarawak. *Journal of Multilingual and Multicultural Development, 33*(6). DOI: 10.1080/01434632.2012.706301 (Impact Factor: 0.60)

Ulrich, S., Hesse, M., Bröderbauer, D., Wong, S. Y., & Boyce, P. C. *Schismatoglottis* and *Apoballis* (Araceae: Schismatoglottideae): A new example for the significance of pollen morphology in Araceae systematic. *Taxon, 61*(2), 281-292.

Usup, G., Ahmad, A., Matsuoka, K., Lim, P. T., & Leaw, C. P. (2012). Biology, ecology and bloom dynamics of the toxic marine dinoflagellate Pyrodinium bahamense. *Harmful Algae, 14,* 301-312.

Wong, K. T., Ng, K. Y., Ong, K. C., Ng, W. F., Shankar, S. K., Mahadevan, A., Radotra, B., Su, I. J., Lau, G., Ling, A. E., Chan, K. P., Macorelles, P., Vallet, S., Cardosa, M. J., Desai, A., Ravi, V., Nagata, N., Shimizu, H., & Nagata, N. (2012). Enterovirus 71 encephalomyelitis and Japanese encephalitis can be distinguished by topographic distribution of inflammation and specific intraneuronal detection of viral antigen and RNA. *Neuropathol Appl Neurobiol.*

Yeo, A. W., Faisal, S., Zaman, T., Songan, P., & Khairuddin, A. H. (2012). The telecentre replication initiative in Borneo Malaysia: CoERI Experience. *Electronic Journal of Information Systems in Developing Countries, 50*(3), 1-15.

Yeo, J. Y., & Ting, S. H. (2012). Lecture introduction: Bridging students' background knowledge with new lecture content. *ASEAN Journal of Teaching and Learning in Higher Education, 4*(1), 106-120.

Yeo, J. Y., & Ting, S. H. (2012). Questions and interactivity in Arts and Science lecture introductions. *International Journal of Language Studies, 6*(2), 87-106.

Yusoff, H. B., Assim, Z. B., & Mohamad, S. B. (2012). Aliphatic hydrocarbons in surface sediments from South China Sea off Kuching Division, Sarawak. *The Malaysian Journal of Analytical Sciences, 16*(1), 1-11.

Yusup, N., Zain, A. M., & Hashim, S. Z. M. (2012). Evolutionary techniques in optimizing machining parameters: Review and recent applications (2007-2011). *Expert Systems with Applications, 39*(10), 9909-9927.

Zaman, T., Kulathuramaiyer, N., & Yeo, A. W. (2012). Balanced scorecard for performance measurement and strategic planning of indigenous knowledge management. *Knowledge Management for Development Journal, 7*(3), 317-326.

Zulkarnaen, M., Pan, K. L., Shanmugam, P. S., Ibrahim, Z. A., & Chan, W. H. (2012). Intraosseous synovial sarcoma of the proximal femur: Case report. *Asean Edition of Malaysian Orthopaedic Journal, 6*(1), 49-50.

RESEARCH CONTACTS

The following are contact emails and telephone extensions (082-581000 through operator; or 082-58 followed by the extension number for direct dialing) of officials/researchers in-charge of various research disciplines at UNIMAS.

Vice Chancellor
Prof Datuk Dr Khairuddin Ab Hamid
khair@cans.unimas.my (ext: 1111)

Deputy VC (Research & Innovation)
Prof Dr Peter Songan
songan@cans.unimas.my (ext: 1122)

Faculty of Resource Science & Tecnology
Prof Dr Shabdin Mohd Long
lshabdin@frst.unimas.my (ext: 3180)

1. Molecular Biology
   Assoc Prof Dr Awang Ahmad Sallehin Awg Husaini
   haahmad@frst.unimas.my (ext: 3013)
2. Plant Science and Environmental Ecology
   Prof Dr Cheksum bt Tawan
   cheksum@frst.unimas.my (ext: 2946)
3. Zoology
   Dr Yuzine b Esa
   eyuzine@frst.unimas.my (ext: 2988)
4. Chemistry
   Assoc Prof Dr Zaini @ Zani Assim
   zaini@frst.unimas.my (ext: 3026)
5. Aquatic Science
   Dr Samsur Mohamad
   msamsur@frst.unimas.my (ext: 2941)

Faculty of Computer Science & Information Technology
Prof Dr Narayanan Kulathuramaiyer
nara@fit.unimas.my (ext: 3767)

1. Computational Science and Mathematics
   Dr Sze San Nah
   snsze@fit.unimas.my (ext: 3664)
2. Computing and Software Enginering
   Dr Edwin Mit
   edwin@fit.unimas.my (ext: 3636)
3. Computer Systems & Communication Technology
   Assoc Prof Dr Tan Chong Eng
   cetan@fit.unimas.my (ext: 3776)
4. Information Systems
   Mohamad Nazri Khairuddin Yap
   kmnazri@fit.unimas.my (ext: 3772)

Faculty of Engineering
Prof Dr Wan Hashim Wan Ibrahim
wiwhashim@feng.unimas.my (ext: 3325)

1. Mechanical &Manufacturing Engineering
   Dr Abdullah b Yassin
   yabdulla@feng.unimas.my (ext: 3340)
2. Civil Enginering
   Rosmina bt Ahmad Bustami
   abrosmina@feng.unimas.my (ext: 3337)
3. Electronics Engineering
   Dr Wan Azlan Wan Zainal Abidin
   wzaazlan@feng.unimas.my (ext: 3339)
4. Chemical Engineering & Energy Sustainability
   Dr Rubiyah Hj Baini
   rubiy@feng.unimas.my (ext: 3338)

Faculty of Medicine & Health Sciences
Prof Dr Haji Ahmad Hata Rasit
rahata@fmhs.unimas.my (082 292111)

1. Surgery
   Prof Dr Khin Tun
   tkhin@fmhs.unimas.my (082 292247)
2. Medicine
   Dr Asri Said
   sasri@fmhs.unimas.my (082 292234)
3. Paraclinical Science
   Assoc Prof Dr Nor Aliza Abd Rahim
   arnaliza@fmhs.unimas.my (082 292183)
4. Basic Medical Science
   Dr Zunika Amit
   zunika@fmhs.unimas.my (082 292241)
5. Orthopedics
   Prof Dr Pan Kok Long
   klpan@fmhs.unimas.my (082 292202)
6. Peadiatrics & Child Health
   Dr Mohamaed Ameenudeen B.A Sultan Abdul Kader
   akmameenudeen@fmhs.unimas.my (082 292259)
7. Obstetric & Gynaecology
   Assoc Prof Dr Awi ak Idi
   iawi@fhmhs.unimas.my (082 292263)
8. Community Medicine and Public Health
   Assoc Prof Dr Kamaluddin Bakar
   bkamaludding@fmhs.unimas.my (082 292238)
9. Nursing
   Dr Zabidah Putit
   pzabidah@fmhs.unimas.my (082 292399)
10. Ophthalmology
    Prof Dr Chua Chung Nen
    cnchu@fmhs.unimas.my (082 292221)
11. Psychological Medicine
    Prof Dr Mohd Fadzillah Abd Razak
    armfadzillah@fmhs.unimas.my (082 292281)
12. Family Medicine
    Dr Syed Alwi Syed Abd Rahman
    sarsalwi@fmhs.unimas.my (082 292214)
13. Radiology
    Dr Ahmad Faizal Mohamad Ali
    maafaizal@fmhs.unimas.my (082 292137)
14. Pathology
    Prof Dr Henry Gudum
    gudum@fmhs.unimas.my (082 292272)

Faculty of Applied & Creative Arts
Assoc Prof Dr Hasnizam bin Abdul Wahid
awnizam@faca.unimas.my (ext:1436)

1. Design Technology
   Dr Saiful Bahari Mohd Yusoff
   mysaiful@faca.unimas.my (ext: 1437)
2. Visual Art and Technology
   En Anuar Ayob
   aanuar@faca.unimas.my (ext: 1344)
3. Performing Arts and Production Technology
   Dr Nur Afifah Vanitha Abdullah
   anafifah@faca.unimas.my (ext: 1342)
4. Liberal Arts
   Dr Noria ak Tugang
   tnoria@faca.unimas.my (ext:1343)

Faculty of Cognitive Sciences & Human Development
Assoc Prof Dr Shahren Ahmad Zaidi Adruce
azshahren@fcs.unimas.my (ext: 1569)

1. Cognitive Science
   Dr Zaimuariffudin Shukri b Nordin
   nzaim@fcs.unimas.my (ext: 1537)
2. Human Resource Development
   Dyg Kartini Abg Ibrahim
   aidkartini@fcs.unimas.my (ext: 1552)
3. Counselling
   Edris Aden
   aedris@fcs.unimas.my (ext: 1545)

Faculty of Economics & Business
Prof Dr Shazali Abu Mansur
mshazali@feb.unimas.my (ext: 2280)

1. Economics
   Assoc Prof Dr Puah Chin Hong
   chpuah@feb.unimas.my (ext: 2428)
2. Finance & Accounting
   Prof Dr Abu Hassan bin Md Isa
   miahassan@feb.unimas.my (ext: 2356)
3. Business Management
   Dr Rohaya Mohd Nor
   mnrohaya@feb.unimas.my (ext: 4390)

Faculty of Social Sciences
Prof Dr Spencer Empading Sanggin
spencer@fss.unimas.my (ext: 2255)

1. Sociology and Anthropology
   Dr Poline Bala
   bpoline@fss.unimas.my (ext: 2229)
2. Politics and International Relation
   Dr Mohd Faisal Syam Abdol Hazis
   ahfaisal@fss.unimas.my (ext: 1967)
3. Development Studies
   Dr John Phoa Chui Leong
   jphoa@fss.unimas.my (ext: 2749)
4. Communication Studies
   Assoc Prof Dr Mus Chairil Samani
   smchairil@fss.unimas.my (ext: 2365)

Research & Innovation Management Centre
Prof Dr Haji Mustafa Abdul Rahman
rmustafa@rimc.unimas.my (ext: 1037)

Institute of Biodiversity & Environmental Conservation
Prof Dr Andrew Alex Tuen
aatuen@ibec.unimas.my (ext: 2295)

Institute of Social Informatics & Technological Innovations
Assoc Prof Dr Alvin Yeo Wee
alvin@isiti.unimas.my (ext: 3660)

Institute of Community Health & Medicine
Assoc Prof Dr David Perera
dperera@ihcm.unimas.my (ext: 2347)

Institute of East Asian Studies
Assoc Prof Datu Haji Sanib Haji Said
ssanib@ieas.unimas.my (ext: 2464)

Institute of Design & Innovation
Assoc Prof Dr Khairul Aidil Azlin Abdul Rahman
azlin@faca.unimas.my (ext: 1405)

Centre for Language Studies
Dr Norazuna Norahim
nazuna@cls.unimas.my (ext: 1749)

Centre for Water Research
Prof Dr Lau Seng
lauseng@frst.unimas.my (ext: 3191)

Malaria Research Centre
Prof Dr Balbir Singh
bsingh@fmhs.unimas.my (082 292256)

Centre for Rural Informatics
Assoc Prof Dr Alvin Yeo
alvin@isiti.unimas.my (ext: 3660)

Centre for Image Analysis & Spatial Technologies
Prof Dr Wang Yin Chai
ycwang@fit.unimas.my (ext: 3796)

Centre for Renewable Energy
Assoc Prof Dr Azhaili b Baharun
bazhaili@feng.unimas.my (ext: 3267)

Centre for Semantic Technology & Augmented Reality
Dr Edmund Ng Giap Weng
gwng@fcs.unimas.my (ext: 1491)

Centre for Saga Research
Assoc Prof Dr Hairul Azman@Amir Hamzah Roslan
bkopli@pps.unimas.my (ext: 2280)

Centre for Disability Studies
Assoc Prof Dr Ling How Kee
lhkee@fss.unimas.my (ext: 2225)

Publication Division, Universiti Malaysia Sarawak, 94300 Kota Samarahan
Tel : + 6082 581158 Fax : + 6082 1919