THE PAPUA NEW GUINEA

UNIVERSITY OF TECHNOLOGY

RESEARCH REPORT

2017

Compiled and Edited
by

Professor Shamsul Akanda

Department of Agriculture

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CONTENTS

FOREWORD

It gives me much pleasure to write a foreword to Unitech's Research Report for 2017. I am very grateful to the Dean of Postgraduate Studies, Professor Shamsul Akanda, for compiling and editing the research activities of the university.

Research activities at Unitech are promoted by a Research Committee of the Academic Board. It provides research grants to staff and postgraduate students. It funds attendance at conferences and organizes a weekly research seminar. The current Research Committee Seminar Convenor is Professor Subramaniyam Gopalakrishnan of the Applied Sciences Department. I am very grateful to him for his commitment to the seminars. These are very well attended. Some of the departments complement these seminars with their own departmental research seminars.

In 2017, a total of K76,353 was given out by the Research Committee for research projects, and K22,680 was used to support staff attendance at national and international conferences. Nonetheless, many requests for research funding and attendance at international conferences were turned down by the Research Committee, due to a shortage of funds. These funds need to be tripled or quadrupled. That would be a good investment

Unitech has 13 academic departments and 4 research units. It has the largest postgraduate program in the Papua New Guinea. The majority of the students are from Papua New Guinea but there are also some from other Pacific Island countries and one from Africa (Botswana). The presence of research students creates an atmosphere that is conducive to research. Supervision of postgraduate students and doing research go hand in hand.

The Papua New Guinean postgraduate students at Unitech are either sponsored by the university or by themselves. Whereas the government has instituted scholarship programs for undergraduate study (HECAS – Higher Education Cost Assistance Scheme - and AES – Academic Excellence Scholarship) no similar schemes are in place for postgraduate study. We are aware that the government plans to introduce scholarships for postgraduate studies soon, and we look forward to a substantial expansion of our postgraduate programs when that happens.

I would like to take this opportunity to thank all heads of department, leaders of research units and members of the Research Committee for their fruitful work during the year 2017. I also thankful to the Vice Chancellor and his management team for their continued support and commitment of funds even when the university budget is under stress.

Dr Augustine Moshi
Pro Vice Chancellor Academic and
Chairman of the Research Committee

THE RESEARCH COMMITTEE OF THE ACADEMIC BOARD

1. TERMS OF REFERENCE

In order that research activities within the University may be encouraged, coordinated, funded and monitored efficiently, the Academic Board set up a Research Committee under the following terms of references:

(a) To promote and encourage research and development;
(b) To formulate an overall research policy and appropriate guidelines;
(c) To allocate funds for research and development within the University;
(d) To prepare an annual report on the research conducted by the University.

2. CONSTITUTION

Ex-Officio Members

a. Vice Chancellor
b. Pro Vice Chancellor (Academic)
c. Chairman, ATCDI

Appointed Members

d. One person appointed by the Vice Chancellor who shall be the Chairman of the Committee
e. Six persons appointed biennially by the Academic Board

MEMBERSHIP

Ex-Officio Members

Dr Albert Schram
Associate Professor Augustine Moshi

Appointed Members

Associate Professor Augustine Moshi (Chairman)
Professor S. Akanda
Dr. S. Gopalakrishnan
Dr. G. Arpa
Dr Mex Peki

In Attendance

Mr Peter Likius, Deputy Bursar
Mr Gabriel Paul, Executive Officer

Executive Summary

The Annual Research Committee Report is a comprehensive compilation of ongoing and completed research from all the 13 academic departments. The university completed the 2017 Academic year with a high note even though financial challenge was hurting the normal operations of the university. The Research Report 2017 contains the research priorities aligned with "Unitech 2030" and national priority areas, ongoing and completed research, publications, national and overseas conference attendance by the academic staff from the 13 academic departments. During 2017, a total of 68 peer reviewed research articles were published in reputed international and national journals compared to 55 in 2016. This shows the strong commitment and resilience of the faculty members to research and publications despite severe funding shortage in 2017. The number of journal publications is in steady increase over the years. The research conducted by the PG students those who graduated in 21st Aril, 2017 was reported as a part of Research Report 2016.

Research conducted by the final year undergraduate students also constitute a large proportion of research reported by the academic departments. Many of the research outputs are very important and of immense values for tackling the problems the country is facing. Many of those required to fine-tuned further research.

Despite severe financial challenge, university allocated a total of K76,353 to support the postgraduate students' research, and an amount of K22,680 for conference attendance by the academic staff. Allocations of funds both for research and conference were higher than that of 2016. This demonstrates the Unitech's strong commitment to PG studies and research. This funding needs to be substantially increased in the coming years as this is the worthwhile spending. Postgraduate studies are the conduits for the universities to develop research programs to be creative and solve complex problem through innovations leading to sustainable national developments. These are the shared challenges for the whole country and needs shared response.

The report also contains 25 abstracts presented in the "Unitech Research Committee Seminar Series" – a hallmark of Unitech. This weekly seminar series that is running for the last five years brings the academics, staff and students together in a common platform to share and disseminate research findings to wider university community. This seminar series is the best forum not only to disseminate the research outcomes to wider community but also to train the young academics and postgraduate students for their presentation and communication skills.

Number of Peer Reviewed Journal Publications for Different Academic Departments (2013-2017)

Departments	2013	2014	2015	2016	2017	Total
Agriculture	14	06	08	08	12	48
Applied Physics	0	0	0	06	21	27
Applied Sciences	04	07	09	02	0	22
Architecture and Building	01	0	0	0	0	01
Business Studies	01	1	05	07	12	26
Civil Engineering	01	0	01	03	0	05
Communication and Development Studies	03	10	05	02	06	26
Electrical and Communication Engineering	0	03	01	06	05	15
Forestry	02	02	03	0	0	07
Mathematics and Computer Science	04	02	01	0	02	09
Mechanical Engineering	01	03	01	1	01	07
Mining Engineering	03	01	01	0	0	05
Surveying and Land Studies	03	11	12	20	09	55
Total	**37**	**46**	**47**	**55**	**68**	**253**

Departmental Research Reports

Agriculture

Applied Physics

Applied Sciences

Architecture and Building

Business Studies

Civil Engineering

Communication and Development Studies

Electrical and Communication Engineering

Forestry

Mathematics and Computer Science

Mechanical Engineering

Mining Engineering

Surveying and Land Studies

DEPARTMENT OF AGRICULTURE

Head of Department: Dr Rajashekhar Rao BK

The Department of Agriculture is one of the 13 Academic Departments in Papua New Guinea University of Technology. It offers Undergraduate and Postgraduate Degrees in Agriculture, conduct agricultural research and disseminate the relevant information to the community. The undergraduate program consists of a four-year study program- Bachelor of Science in Agriculture (BSc. Ag). The Bachelor of Agriculture and Rural Development (BARD), program is offered in distance mode in collaboration with the Department of Distance Learning. There are three robust postgraduate programs, which include Master of Science in Agriculture (MSc. Ag), Master of Philosophy (MPhil), and Doctor of Philosophy (PhD). The MSc. Ag) program is a combination of course work and research-based degree program, while PhD and MPhil studies are fully research-based degrees.

The Department has 15 qualified academic staff members (11 with PhDs and 3 on PhD studies overseas). In 2017, seven students graduated with postgraduate degrees (2 MPhil and 5 MSc). The Department of Agriculture is committed in delivering quality teaching, research, outreach activities and post-graduate studies. It has well guided activities including research thrust areas stipulated in the Department's Five Year Strategic Development Plans (2005 – 2010 and 2011 – 2015). Strategic Plan for 2016-20 has already been prepared based on the University's Vision 2030 and Mission. The curriculum is enhanced through regular and periodic review in consultation with stakeholders and industries in the public and private sectors. The Department has established strong collaborative research links with international developmental partners and stakeholders, including Australian Centre for International Agricultural Research (ACIAR) and New Zealand AID. Regular publication of the scientific journal '*Niugini Agrisaiens*' and academic staff publishing scientific papers regularly confirm the department's strong commitment in research at Unitech. Strong collaborative research collaborations exist with PNG National Agricultural Research Institute (NARI), University of South Pacific (USP), Fiji, Charles

Sturt University (CSU), Australia, National Research Institute (NRI) of Greenwich University (U.K.), South Australian Research and Development Institute (SARDI), Australia, University of Canberra, Australia, Curtin University, Australia and other NGOs, industries and institutions further cements our strong leadership in agricultural research. Other publications, compilation of abstracts of research done by the post- graduate students, Annual Reports, Farm Report and Strategic Plan on annual basis also strengthens the department's research capacity.

The following research focus areas have been identified and much of the staff and student research are woven around these thematic areas:

RESEARCH FOCUS AREAS

Research Focus Area – 1: Crop Sciences

- Evaluation of promising rice varieties for Papua New Guinea
- Crop improvement and adaptation to stress environments caused by climate change
- Use of *Trichoderma* spp. as a biocontrol agent against some selected soil borne pathogens
- Study of the production technology and practices of selected crops by farmers in different agro-ecological regions of Papua New Guinea
- Study of the production technology and practices of selected vegetables by farmers in different agro-ecological regions of Papua New Guinea
- Soil N and composting in sweet potato-based farming systems
- Symbionts as potential biocontrol agent for cocoa pod borer
- Development of a maize seed system for PNG
- Gene discovery in PNG wild rice: seed and grain characteristics
- Genetic transformations of taro and rice
- Quantification of greenhouse gases (GHG) emissions from soils under major cropping systems of Papua New Guinea
- Development of fungal inoculum for artificial agarwood production in PNG

Research Focus Area – 2: Livestock Sciences

- Conservation of farm animal genetic resources
- Utilization of crop wastes and agro-industrial by-products for feeding livestock and poultry
- Determining digestibility of locally available feed and fodder
- Determination of anti-nutritional factors in the fodder crops of PNG
- Development of suitable weaner piglets diet
- Smallholder Aquaculture development in PNG

Research Focus Area – 3: Agricultural Economics

- Analysis of marketing costs and margins spread of sweet potato sales produced from the highlands of Papua New Guinea
- Economic impact assessment of honey bee
- Coffee integrated farming in Eastern Highlands Province
- Economic impact of climate change on coffee and cocoa production in PNG: A Ricardian Approach
- Handbook on relevant production, trade and price statistics on agricultural, livestock and poultry products of PNG
- Agriculture sectoral growth in Papua New Guinea since political independence

Research Focus Area – 4: Agricultural Extension and Rural Development

- Evaluation of on-going extension approaches in PNG and their effectiveness in rural livelihood improvement
- Problems and prospects of retaining youth in agriculture in PNG
- Identifying the present farming systems in different regions of PNG and scope for improvement
- Examining household food security in peri-urban settlements
- Livelihoods of settlers in peri-urban settlements

- Return from Investment in Higher Education, Extension and Innovations
- Entrepreneurship Development among Rural People
- Women in Agriculture for Food Security
- Diffusion of Agricultural Innovations among Rural Community

Research Focus Area – 5: Post-Harvest Technology

- Survey on current status of mechanization in PNG: impact study of mechanisation on rural livelihood and environment
- Development of post-harvest technology and post-harvest management systems for horticultural crops in PNG

EXTERNALLY FUNDED RESEARCH PROJECTS/ COLLABORATIONS

1. SARDI Project: Enhancing role of small scale feed milling in the development of the monogastric industries in Papua New Guinea (http://aciar.gov.au/project/ASEM/2010/053). A four-year project amounting A$ 798,863.00 with partners: South Australian Research and Development Institute (SARDI), NARI, CLTC Banz, Livestock Dev Corp).

2. Transformative Agriculture and Development in Papua New Guinea (TADEP): The TADEP project comprises of other ACIAR-funded projects which includes Bougainville Cocoa (HORT/2014/099), Canarium (FST/2014/099), Sweetpotato (HORT/2014/099), Women's Business acumen (ASEM/2014/095), and PNG Cocoa (HORT/2014/096).

3. ACIAR (HORT/2015/087): Sweetpotato Crop Protection project: The Sweetpotato crop protection project is a five-year project and is focused on sweetpotato weevils in PNG. It is collaboration between Charles Sturt University, University of Southern Queensland, Unitech, NARI and FPDA.

4. ACIAR (ASEM/2014/095): Improving Opportunities for Economic Development for Women Small Holders in Rural Papua New Guinea. This is a four-year project under ACIAR funding. The collaborating institutions include University of Canberra, Pacific Adventist University, TADEP/ACIAR, NARI, FPDA, and an NGO– Baptist Union of PNG.

5. Early Learning Project, The Early Childhood Education and Learning project is collaboration between University of Canberra and the Pacific Adventist University under the ACIAR funding. Unitech's Agriculture Department is involved in producing smallholder agriculture-based modules for teaching trainee teachers for lower and upper primary school learning. This project is also tied to the TADEP project above.

6. ACIAR (ASEM/2014/054): Identifying opportunities and constraints for rural women's engagement in small-sclae agriculture enterprise in PNG. This is a four-year project under ACIAR funding. The collaborating institutions include Curtin University, Coffee Industry Corporation (CIC), Cocoa and Coconut Industry (CCI) and PNG Oil Palm Research Association (PNGOPRA).

7. Growth, inclusiveness and sustainability of the Cocoa Value Chain (VC) in Papua New Guinea funded by Natural Resources Institute (NRI), University of Greenwich, UK (2017-18)

8. Livelihood restoration-Agricultural Component (Preliminary investigations) funded by Wafi-Golpu Joint Venture, Papua New Guinea (2017)

LIST OF PUBLICATIONS

Peer-reviewed Journal Articles/ Book Chapters

Baiga R. and Rajashekhar Rao B. K. (2017). Effects of Biochar, urea and their co-application on nitrogen mineralization in soil and growth of Chinese cabbage. ***Soil Use and Management*** 33, 54-61. doi: 10.1111/sum.12328

Buyoyu P., Maino M. K. and Okpul T. (2017). First report of *Colletotrichum gloeosporioides* species complex causing anthracnose on leaves of cutnut, *Barringtonia edulis*, in Papua New Guinea. ***New Disease Reports*** 35, 7. doi: 10.5197/j.2044-0588.2017.035.007

Dotaona, R., Wilson B. A. L., Stevens, M. M., Holloway, J. and Ash G. J. (2017). Chronic effects and horizontal transmission of *Metarhizium anisopliae* strain of QS155 infection in the sweetpotato weevil, *Cylas formicarius* (Fab.) (Coleoptera: Brentidae). ***Biological Control*** *114*: 24-29. doi:10.1016/j.biocontrol.2017.07.008.

Dotaona R., Wilson B. A. L., Ash G. J., Holloway J. and Stevens M. M. (2017). Sweetpotato weevil, *Cylasformicarius* (Fab.) (Coleoptera: Brentidae) avoidsits host plant when a virulent *Metarhiziumanisopliae* isolate is present. ***Journal of Invertebrate Pathology***, *148*: 67-72.

Elahi K. and Michael P. S. (2017). Oil palm plantation, smallholders and land settlement scheme in Papua New Guinea. ***DWU Research Journal*** *26:* 15-29.

Fidelis C. and Rajashekhar Rao B. K. (2017). Enriched cocoa pod composts and their fertilizing effects on hybrid cocoa seedlings. ***International Journal of Recycling Waste in Agriculture***, 6: 99-106. Doi: 10.1007/s40093-017-0156-8.

Besari, F., Danbaro, G., Ayalew, W. and Glatz, P. (2017). Egg production performance of village chickens fed a local diet compared with a commercial diet on village farms in Papua New Guinea. In: Phil Glatz (ed). 2017. *Local feed resources for pig, poultry and fish production in Papua New Guinea*. ACIAR Monograph MN195, Australian Centre for International Agricultural Research Canberra, ACT. p170-174. Available at http://aciar.gov.au/publication/mn195

Besari, F., Danbaro, G., Ayalew, W., Pandi, J. and Glatz, P. (2017). Egg production performance of Hyline Brown hens fed on concentrates blended with sweet potato or cassava in the highlands of Papua New Guinea. In: Phil Glatz (ed). 2017. *Local feed resources for pig, poultry and fish production in Papua New Guinea.* ACIAR Monograph MN195, Australian Centre for

International Agricultural Research Canberra, ACT. p182-187. Available at http://aciar.gov.au/publication/mn195

Besari, F., Danbaro, G., Solomon, E., Ayalew, W., Glatz, P., Pandi, P. and Kohun, P. (2017). Egg production performance of village hens fed on concentrates blended with sweet potato or cassava in Papua New Guinea. In: Phil Glatz (ed). 2017. *Local feed resources for pig, poultry and fish production in Papua New Guinea.* ACIAR Monograph MN195, Australian Centre for International Agricultural Research Canberra, ACT. p175-181. Available at http://aciar.gov.au/publication/mn195

Iamba, K., Michael P. S., Dono D. and Hidayat Y. (2017). Possible New Species of Araecerus (Coleoptera: Anthribidae) associated with *Mastixiodendron pachyclados* (Rubiaceae) of Papua New Guinea. ***Environmental and Agriculture Research*** *3:* 59-64.

Keso E., Rajashekhar Rao B. K. and Ramakrishna, A. (2017). Growth and acquisition of Na, K and Ca in some elite sweetpotato [Ipomoea batatas (Lam.) L.] genotypes under salinity stress, ***Journal of Plant Nutrition***, *40(19):* 2737-2744. doi: 10.1080/01904167.2017.1381725.

Maino, M. and Akanda, S. (2016). Occurrence of *Meloidogyne incognita* in sweetpotato gardens in the lowland provinces of Papua New Guinea. ***Niugini Agrisaiens***, 8: 18-25 (published in 2017).

Michael, P. S. (2017). The time course of effects of simple carbon and organic matter on pH and redox potential of acid sulfate soils. ***International Journal of Agricultural and Environmental Research*** 3: 350-359.

Michael P. S., Fitzpatrick W. R. and Reid J. R. (2017). Effects of live wetland plant macrophytes on acidification, redox potential and sulfate content in acid sulphate soils. ***Soil Use and Management*** *33:* 471-481.

Oso V. and Rajashekhar Rao B. K. (2017). Land use conversion in humid tropics influences soil carbon stocks and forms. ***Journal of Soil Science and Plant Nutrition*** *17:* 543-553.

Rova, M. and Manus, P. (2017). Determinants of profitability of smallholder peanut production in the Markham Valley of Papua New Guinea. ***Niugini Agrisaiens*** *9:* (Accepted)

SEMINAR/CONFERENCE PAPERS

Ban, G., Akanda, S. and Maino, M. (2017). Growth of *Trichoderma harzianum* on locally available materials and shelf-life. 8th Huon Seminar, 7th - 8th November, PNG University of Technology, Lae

Maino, M.K. and Akanda, S. (2017). Biological Control of Insect Pests, Weeds and Disease-causing Pathogens of Agricultural Importance: Research, Application and Future Prospects in Papua New Guinea (HS 044-2017), 8th Huon Seminar, 7th - 8th November, PNG University of Technology, Lae

UNITECH RESEARCH SEMINAR PRESENTATION FOR 2017

Gwendolyn Ban (2017). Study the Effect of *Trichoderma* species on Selected soil borne fungi in Papua New Guinea

Ronnie Dotaona (2017). Green gun: *Metarhizium* as a bioinsecticide

WORKSHOP/CONFERENCE/PROFESSIONAL MEETINGS ATTENDANCE

Prof Shamsul Akanda

a. International Staff Week at the University of Valladolid, Spain, 22-26 May 2017 under the ERASMUS-Plus -KA107-ICM
b. Postgraduate Certificate in Student-Centered Teaching (Workshop 3) 20-25 August 2017 held at Cairns, Australia

Dr R Rao

a. The Transformative Agriculture and Enterprises Development Program (TADEP)-ACIAR annual meeting at Cairns, Australia June 20-22, 2017

b. Attended the JCU-Unitech Twinning workshop on blended learning, August 21-25, held at Unitech, Lae PNG

Dr P Manus

a. Attended the JCU-Unitech Twinning workshop on blended learning, August 21-25, held at Unitech, Lae PNG

Dr V Bue

a. Postgraduate Certificate in Student-Centered Teaching (Workshop 3) 20-25 August 2017 held at Cairns, Australia

b. The Transformative Agriculture and Enterprises Development Program (TADEP)-ACIAR annual meeting at Cairns, Australia June 20-22, 2017

Prof. T Okpul

a. Asia-Pacific Coconut Community (APCC) meeting on Coconut Biofactory on 5th June 2017 at Port Moresby

b. 1st meeting of the PNG Science and Technology Council on 31st May, 2017 at Port Moresby

Dr. Jayaprakash

a. Attended the Annual conference of Indian Poultry Science Association IPSACON2017 -- XXXIV held at Bangalore, India from Nov. 28 to 30, 2017.

Dr G. Ban

a. Represented PNG University of Technology at the Vanuatu National Career Day between 2nd -5th July, 2017 held in Port Vila, Vanuatu

b. Attended the JCU-Unitech Twinning workshop on Principles of Contemporary Curriculum Design 21st - 25th August, 2017 held at Cairns, Australia

c. Academic Staff Mobility Program at the University of Valladolid, Spain, 6th - 10th November, 2017 under the ERASMUS-Plus -KA107-ICM

POSTGRADUATE STUDENTS' RESEARCH

Table 1. Research conducted by postgraduate students under the supervision of Departmental staff, 2016

Student	**Research topic**	**Funding source**	**Supervisor**
M.Sc.Ag Program			
Magero NURIE	Effects of indigenous strains of *Metarhizium anisopliae* (Metschinkoff) Sorokin on sweet potato weevil, *Cylas* formicarius (Coleoptera.Brentidae) and West Indian sweet potato weevil, *Euscepes batatae* (Fairmaire [Coleoptera Curculionidae])	GAP	Dr Dotaona
Peninah JACOB	Effect of feeding crushed grain sorghum and grass mixtures on digestibility, growth and feed conversion efficiency of goats in Papua New Guinea	Trukai	Prof. Danbaro
Murphy YOMI	Validation of a Nitrogen (N) dilution curve in sweet potato (*Ipomea batatas*. L) crop	Self	Dr Rao
Naomi BATISARISARI	Economics of taro production in Taveuni Island, Fiji.	BULA	Dr Manus
M. Phil Program in Agriculture			

Rokotamana VITINAQAILEVU	Cocoa pod husk composting – Quantification of N loss and effect of amendments	BULA	Dr. R. Rao
Obert LOU	Assessment of feed digestibility, feed intake, and body weight gain of goats fed *Leuceanae leucocephala* forage mixed with three common pasture species in Papua New Guinea	Unitech (LNSDC)	Prof. G Danbaro
John RIWASINO	Monitoring and evaluating the effects of agri-business entrepreneurship in Papua New Guinea: *Farmer's opinion and decision about tree farming on their customary land in Markham Valley, Morobhe Province*	Self	Dr Kerua & Dr Manus
Elizabeth OWA	Agricultural innovations adopted by women and its impact on household food security in selected villages in Jiwaka Province, Papua New Guinea	ACIAR	Dr Bue
William NANO	Performance and evaluation of peer education learning in animal feed production for women in selected rural areas in the Jiwaka Province of PNG	ACIAR	Dr Kerua

FINAL YEAR UNDERGRADUATE STUDENTS' RESEARCH PROJECTS

Table 2. Research work undertaken by fourth-year BSAG students as a partial fulfilment of the Bachelor's degree program

#	**Name**	**Supervisor**	**Title of the research project**
1	Leban Leban	Prof. S. Akanda	Screening of rice varieties against sheath blight caused by *Rhizoctonia solani*
2	Malina Ninjipa	Dr. P. Michael	Micropropagation of *Moringa oleifera* planting materials using callus culture *in vitro*
3	Juliejoy Reme	Dr. P. Michael	Tissue sampling and elemental analysis of crop plants grown at the Tenth City Dump
4	Nandros Molean	Dr. P. Michael	Root induction on stem cuttings of various legume plants using rooting hormones in vitro
5	John Banian	Dr Rao	Determination of total carbon content in selected soils of PNG by Dry Combustion and Gravimetric Methods
6	Allington Kenny	Dr Rao	Effect of N fertilization on some phenological parameters, chlorophyll content and tuber yield of sweet potato
7	Anthony Bok	Dr. Rao	Effect of cattle manure on the growth rate and yield of single grass at the Unitech farm
8	Ario Penuel	Dr Rao	Effects of co-compositing cocoa pods with chemical amendments on phosphorus and sulphur nutritional status of compost
9	Gledish Koki	Prof. G. Danbaro	Comparison of weight gains of broiler chickens fed with sorghum and commercial feed
10	Raymond Manus	Prof. T. Okpul/Mr P. Buyoyu	Standardisation of rice callus induction and plantlet regeneration protocol at the Unitech Biotechnology Centre
11	Samson Walua	Prof. T. Okpul	Investigation of inter-specific hybridization between theobroma block and theobroma cocoa
12	Jerryanne Kevan	Prof. T. Okpul	*In vitro* embryo rescue of Cocoa (*Theobroma cacoa*)
15	Elisha Napu	Dr. R. Dotaona	Isolation and Identification of *Metarhizium* spp.

16	Levy Kasa	Dr R. Dotaona	Evolved herbicide resistance effects of glyphosate on Milk Weed (*Euphorbia heterophylla*) and Wandering Jew (*Commelina benghalensis*)
17	Olivia Geno	Dr Jayaprakash	Quality assessment of poultry and duck eggs
18	Alex Galus	Dr Jayaprakash	Quality assessment of table eggs
19	Ralph Alu	Dr. P. Manus	Factors affecting income of smallholder cocoa farming in Situm, Morobe Province
20	Sam Kumao	Dr. P. Manus	An economic study of smallholder broiler production and marketing in some selected areas of Kainantu
21	Judah Boska	Dr P. Manus	An economic study of smallholder broiler production and marketing in some selected areas of Morobe Province
22	Tumu Tumu (Jr)	Dr P. Manus	An economic study of smallholder poultry production and marketing in some selected areas of ENGA province
23	Samaria Mambere	Dr V. Bue	Investigating household involvement in cocoa production and its benefit to family livelihood improvement in Situm, Morobe Province
24	Julie Petrus	Dr V. Bue	Women's involvement in the cultivation and selling of garden produce to sustain household income in Situm villages
25	David Walimu	Dr W. Kerua	Effect of Population Density on the Gardening Activity of Villagers in Butibum, Morobe Province.
26	Pupe Kirime	Dr G. Ban	Effective concentration of *Lecanicillium lecanii* against coffee leaf rust
27	Leonie Tano	Mr. Nano	Evaluation of SPISARD training in Munix village
28	Eddie Gamo	Mr. Nano	Effects of cocoa pod meal on the performance of Tilapia
29	Karo Kazu	Mr. Nano	Effects of cocoa pod meal on the performance of tilapia grow-out
30	Brendon Saimbolow	Mr. Nano	Effects of duckweed meal on tilapia outgrowth at the Unitech Agriculture Departmental Laboratory
31	Wandibe Haralu	Mr. Kei	Determining the importance of *Tephrosia* plant relates to soil pH improvement and their parts use as medical treatment
32	Patricia Nimiago	Mr. Kei	Assessing composition, density and dominance of

			common agricultural weeds at the Unitech Farm
33	Amelia Jelsiwi	Mr Kei	Screening and evaluating the infestation rate of scab on selected commercial sweet potato varieties

DEPARTMENT OF APPLIED PHYSICS

Head of the Department: Dr. Gabriel Anduwan

The Department of Applied Physics is relatively small in terms of building but the department served a lot of students just like other service departments. We have two undergraduate courses: Bachelor of Science in Applied Physics with Electronics and Instrumentation and Bachelor of Science in Radiation Therapy. These two courses are completely different in terms of their course structures. On top of these, we conduct service courses 10 departments out of 13 departments in this University.

The Applied Physics course with electronics and Instrumentation with more emphasis on the principles of application to Physics are imparted to students. The students are grounded with analytical skills and all the application to Physics principles. The graduates of Applied Physics students are working all over the country and a few overseas. They work in any work related to Physics. Some are working in the Airline industry; education, mining industry, PNG Power and even some are doing private consultancy work. However, Radiation Therapy is a specialized field that deals with cancer treatment which is run by our department in collaboration with Angau Hospital. At the completion of the course, the students are expected to work with the Health Department. At the moment, the BSRT course is slowly winding down as all our graduates are yet to be given position within the health department although they are working.

The department also conducts program at Master's Level leading to M.Sc. degree in Applied Physics. The program has been designed to provide the students with scope of advanced training in fundamental areas of Applied Physics through formal course-work and participation in original research work in one of a variety of projects directed by the faculty members.

A. Unitech Research Seminar Presentations

1. Felix B. P. Space weather predictions related to geomagnetic storms. 5 September, 2017

2. Jojo P. J. Biological effects of natural background radiation, UNITECH Seminar Series, Lae, PNG, March 21, 2017

3. Jojo P. J. Certain congenital anomalies in high background radiation areas- a case control study, September 26, 2017

4. Mukhopadhyay, M. "Volcanism & Geothermal Fields in Papua New Guinea - Scope for Renewable Energy Search by Geophysical Exploration", UNITECH Seminar Series, Lae, PNG, May 9, 2017

5. Thakur, Ravindra Thakur, "Scalar Bound States Using Worldline Monte Carlo", 1st Aug., 2017.

B. Research Publications

1. Abdelfattah, A., Mogren, S. and Mukhopadhyay, M. (2017). Mapping b-value for 2009 Harrat Lunayyir earthquake swarm, Western Saudi Arabia and Coulomb stress for its mainshock. J. Volcanologic, Geothermal Research, 329, 1.

2. Arunima, S. and Jojo, P.J. (2017). Assessment of ingestion dose through staple food to the populace in the placer deposits region of west coast India, International Journal of Scientific Research 6(5),305 (*Index Copernicus*)

3. Arunima, S, Lekshmi, R. and Jojo. P J. (2018). Estimation of Carcinogenic Risk Through Ingestion of Locally Available Food Materials of South West Coast of India, Journal of Ultra Scientist of Physical Scientists –A, 30(1), 92 (*Science Direct*).

4. Aswathy, V.V., Sabiha, A.H., Gözde, Y., Sheena, M.Y., Yohannan, P. C., Jojo P.J., Fatma, K. O., Stevan, A., Sanja, J. Armaković, I., Yildiz, C. and Van Alsenoy (2017). Modification of benzoxazole derivative by bromine-spectroscopic, antibacterial and reactivity study using experimental and theoretical procedures Journal of Molecular Structure 1141, 495. *SCI Journal*

5. Aswathy, V.V., Sheena, M. Y., Jojo, P.J., Yohannan, P.C., Anna, B., Stevan, A., Sanja, J. Armaković I., Paulina, B., Sylwester, K. C. and Van Alsenoy (2017). Investigation of spectroscopic, reactive, transport and docking properties of 1-(3,4-dichlorophenyl)-3-[3-(trifluoromethyl)phenyl]thiourea (ANF-6): Combined experimental and computational study Journal of Molecular Structure 1134, 668. *SCI Journal*

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8. Dhanya, B., Jojo P.J. and Jose. P.A. (2017). An assessment of ingestion dose to public from polonium -210 and lead- 210 via dietary sources in an industrial area Eloor, Kerala, India, Pollution Research. 36 (4)163. (*SCOPUS*)

9. Khan, D., Sarfraz, Thakur R., and Angriawan, A. (2017). Gifted Innovation: An Examination Using Different Business Theories, The Journal of Business Inquiry, 17, Issue (Special Issue), XX-XX, http:www.uvu.edu/woodbury/jbi/volume17, ISSN 2155-4072.

10. Le, C . T . , Clark, D. J. , Ullah, F. , Senthilkumar, V., . Cho H.Y, . Sim Y, . Seong, M.J., Chung, K.H. , Kim, Y. S. and Jang, J.I. (2017). Impact of selenium doping on resonant second harmonic generation in monolayer MoS2, ACS photonics**,** 4, 38.

11. Lekshmi, R. and Jojo, P. J. (2017). Radioactive pockets in the southern seashore of Kerala, India, International Journal of Scientific Research 6(5), 257 (*Index Copernicus)*

12. Lekshmi, R., Arunima, S. and P. J. Jojo. (2018). Determination of radon exhalation rates and emanation factor of some soil samples collected from southern seashore of Kerala, India. Journal of Ultra Scientist of Physical Scientists –A, 30(1), 80. ISSN 2231-346X (Print) ISSN 2319-8044 (Online) (*Science Direct*)

13. Midhun, M., Rejith, R.S., Samuel, M., Jojo, P.J. and Sahoo, B.K. (2017). The in situ measurement and calculation of Exhalation rates of Radon and Thoron in Alappad region of Kollam district, Kerala, India, International Journal of Pure and Applied Physics, 13(1), 172. (*Index Copernicus*)

14. Midhun, M., Samuel, M., Rejith. R.S., Jojo, P.J. and Sahoo, B. K. (2017). Comparison of thoron (^{220}Rn) content and gamma radiation level in high background radiation area of Kollam, India, Journal of Radioanalytical and Nuclear Chemistry, 314(1) 177. *SCI Journal*

15. Midhun, M., Samuel, M., Rejith, R.S, Jojo, P.J. and Sahoo, B.K. (2017). A comparative study between thoron (220Rn) and gamma radiation level in High Back Ground Radiation Areas of Kollam district of Kerala, India, Journal of radioanalytical and Nuclear Chemistry.314(8), 1, *(SCI Journal)*

16. Mogren, S., Saibi, H., Mukhopadhyay, M., Gottsmann, J. and Ibrahim, E-H. (2017). Analyze the spatial distribution of lava flows in Al-Ays Volcanic area, Saudi Arabia, using remote sensing. Arabian Journal of Geosciences, 10,133. *(Springer publication)*.

17. Monica, S., Bijini, B.R. and Jojo, P.J. (2017). Distribution of Uranium in Drinking water and Associated Age-Dependent Radiation Dose in Porakad, Allapuzha District, Journal of Ultra Scientist of Physical Scientists –B, 29(11), 337 (*Science Direct*)

18. Monica, S., Soniya, S.R., Visnu Prasad, A.K. and Jojo, P.J. (2017). Measurement of radium content and radon exhalation rates in soil samples along the coastal regions of Karunagapally, Kollam district, Kerala, Indian Journal of Scientific Research., 8(1), 31 *CrossRef*

19. Monica S., Visnu Prasad, A.K., Soniya, S.R. and Jojo, P.J. (2017). Ambient gamma levels in the in seaside regions of Alapuzha district, Kerala, International Journal of Pure and Applied Physics. 13(1) 179. (*Index Copernicus*)

20. Ramsiya M, Antony, J., and Jojo, P.J. (2017). Estimation of indoor radon and thoron in Palakkad, Kerala, India using Solid State Nuclear Track Detectors, Journal of Radiation Research and Applied Sciences.10(3), 269. *(Science Direct)*

21. Reeba, M. J.and Jojo, P. J. (2017). Radiation dose to the populace in southern peninsular India through foodstuff, Nature, Environment and Pollution Technology, 16(4) 1229. (*SCOPUS*)

22. Reshma, B., Ravikumar, C. D., Vishnu Prasad, A. K., Jojo, P. J., Dhanalakshmi, B., Chitra N., Bala Sundar, S., Jose, M. T. and Rosaline, M. (2017). Inhalation dose and source term studies in a tribal area of wayanad, Kerala, India, Journal of Environmental and Public Health 217, 10 (*SCOPUS Indexed*)

23. Soniya, S.R., Monica, S., Visnu Prasad, A.K., and Jojo, P.J. (2017). Heterogeneity of radioactivity in soil from Varkala, Kerala, International Journal of Pure and Applied Physics. 13(1), 209 *(SCI Journal)*

24. Visnuprasad, A. K., Jaikrishnan, G., Sahoo, B. K., Pereira, C. E. and Jojo, P.J. (2018). Contribution of thoron and progeny towards inhalation dose in a thorium abundant beach environment, Radiation Protection Dosimetry,178 (4), 405. *(SCI Journal)*

3. Conference Papers

1. Gaoma G. and Soto R., Generation of Wireless Power, Huon Seminar, 2017.

2. Jojo P. J., Biological effects of natural background radiation, UNITECH Seminar Series, Lae, PNG, March 21, 2017

3. Monica S. and Jojo P. J. Distribution of Uranium in Drinking Water, National conference on Conservation of Fresh water Biodiversity held on Department of Zoology, Kariavattom, India, January 2017.

4. Monica S. and Jojo P. J. Natural Radioactivity Distribution of soil samples from Neendakara, 29th Kerala Science Congress held on Marthoma college ,Thiruvalla, India, January 2017.

5. Monica S. and Jojo P. J. Radon Exhalation rates in soil samples, National seminar on Research in Present Scenario held on Nesamony Memorial Christian College, Marthandam, India, January 2017.

6. Monica S. and Jojo P. J. Distribution of Uranium in Drinking Water and Associated age dependent dose in water samples, International Conference on Science, Engineering and Management held at Kuriakose Elias College, Kottayam, March 2017.

7. Monica S. and Jojo P. J. Distribution of Uranium in Drinking Water, National Symposium ITCER, S.N. College, Kollam, India, March 2017.

8. Mukhopadhyay, M. and Anduwan, G. Integrating sustainability in Physics Education at the University of Technology, Papua New Guinea - Experience of last 40 years by a developing nation. The International Conference on Sustainability, Technology & Education (STE 2017), Sydney, 11-13 Dec. 2017.

9. Mukhopadhyay, M**.**, (Invited Lecture & Session Chairman) Geophysical modeling for giant anticlines in Eastern Saudi Arabia - Progressive deformation of crust' by at 54th Indian Geophysical Union, National Geophysical Research Institute, Hyderabad, India. Council of Scientific & Industrial Research, Govt. of India, 3rd - 7th December 2017.

10. Mukhopadhyay, M**.**, Session Chairman for Marine Geosciences, Session 7B, 54th IGU Hyderabad, 5th Dec 2017.

11. Soniya S. R. and Jojo P. J. Measurement of Activity concentrations of Soil samples collected from Thangasherry, Kollam District, National seminar on Trends in Theoretical Physics held on Department of Physics, University College ,Thiruvananthapuram (January 2017)

12. Soto, R. “Excellence in Education”, ATEM Conference at UNITECH, November 2017.

13. Soto, R. TQM in Education in the 21st Century, ATEM Conference at UNITECH, November 2017.

14. Vivek Kumar P. R., Anila G., Jaikrishan G., Jojo P.J. and Birajalaxmi D. Influence of dose, age and smoking habit on somatic mutations in lymphocytes of individuals exposed to chronic low level natural radiation, Annual Conference of Environmental Mutagen Society of India (EMSI) and National Conference on Environmental Mutagenesis: Integration of Basic Biology & Omics to improve Human Health, January 25-27, 2018.

4. Final Year Student Projects

1. A nutritional guideline for cancer patients in PNG who undergo treatment to address swift recovery by Serah Jane. Supervised by David Kolkoma

2. Cell Tower and its electromagnetic field radiation effect on Human health and environment by Jason Gundu. Supervised by David Kolkoma.

3. "The generation of Wireless Power Transmission": The objective of designing a wireless power transmission with an induction range of over 90% ac which can be converted to both dc and ac wireless power transmission with efficiency. The transmission of power ranges from 1.5 kw-2.5 kw. A frequency of 20 KHz was used to resonate between transmission coil and receiver coil. A paper was presented by Mr Gaile Gaoma during the Huon Seminar 2017. Supervised by Roberto Soto

4. A Research was done on how much bio-gas could be generated from a Pig's farm with at least 50 pigs to determine if it was enough to generate or produce energy to sustain the Farm's needs in both gas and electricity by Jacob Wape. Supervised by Roberto Soto

5. Some research in techniques to produce Electricity from Bio-mass was performed by David Joe, Douglas Pilato and Eric Ken. The research was performed on how to produce Electricity using Bio-mass. Identify and understand the process in which the energy in Bio-mass can be converted into electrical energy. Supervised by Roberto Soto

6. The designing of a wireless control system to see the water level and the commissioning of a wireless camera to monitor the level of water was by Douglas Pilato. It was a basic design for understanding wireless instrumentation concepts and the systems that could be used and implemented in an industrial set up which is controlled by wireless instruments with the processes involved. Supervised by Roberto Soto

7. A research was performed and calculation done in relation to waste generated at Main Market in Lae. The waste from market has the potential for generating electricity from the Bio-mass (generated as waste from the Market in a daily basis) by David Joe, Jacob Wape and Frank Jack. Supervised by Roberto Soto.

5. Post graduate Project (Ongoing)

Masters Program

Mr Philip Epemu Victor (M Sc) (Supervisors: Prof Jojo Panakal John & Dr Felix Pereira)

Topic: Indoor radiation levels and dose assessment to the populace in the city of Lae in Papua New Guinea

6. Ph D (Recently registered)

Mr. David Kolkoma (Supervisors: Prof Jojo Panakal John & Dr Felix Pereira)

Topic: Radiation dose Profiling of mineral rich regions of Papua New Guinea

DEPARTMENT OF APPLIED SCIENCES

Acting Head of Department: Reilly Nigo

Introduction

The Department functions with two sections: Applied Chemistry and Food Technology. Food Technology courses are only offered in PNG University of Technology in the whole of the South Pacific (except Australia and New Zealand). Our Department, based on the current market scenario and other developments, keeps track on the curriculum, and suitable changes and revisions to the curriculum were done in the past. The Department also embarked into balancing the total credits, as much as possible, so that the students undergo a smooth teaching-learning process. The Department has actively engaged with industries through Industrial Advisory Board (IAB) for their input on curriculum review on the two course it offers and also few industry-based research work through its final year and MPhil projects. The research activities of the two sections are provided below.

Research interests: Applied Chemistry Section

No.	Name	Research interests
1	Prof. Subramaniyam Gopalakrishnan	Organic chemistry, medicinal chemistry, nanotechnology, Spectroscopy
2	Dr. Srikanth Bathula	Chemical Speciation and bioavailability, engineering materials and water chemistry.
3	Dr. Sivakumar Balakrishnan	Material chemistry: Metal- Organic Frameworks (MOFs), development of materials for water purification and sensor based materials on MOFs, porous silicon functionalisation and sol-gel ceramic materials.
4	Mr. David Timi	Organic chemistry, phytochemistry
5	Mr. Justin Narimbi	Analytical chemistry, environmental chemistry, instrumental methods for analysis, Water quality assessment and monitoring, Laboratory quality management.
6	Mr. Jayson Wau	Organic chemistry, phytochemistry
7	Mrs. Sandy Puy	Analytical chemistry, environmental chemistry

Research interests: Food Technology Section

No.	Name	Research interests
1	Mr. Reilly Nigo	Renewable and Clean Energy, Animal Feed Development, Thermal Processing, Food Drying Studies
2	Dr. Lydia Yalambing	Nutrition intervention studies, compliance studies in terms of food fortification and food nutrition labels; Complementary/supplementary food development and Food Composition studies.
3	Ms. Elizabeth Nasing	Antimicrobial Studies in Foods – Food Safety & Therapeutic Uses, Food microbiology – Water Safety, food safety, Antioxidants – Public Health/Food Safety, Product Development
4	Mrs. Sogoing Denano	Food safety and food security; compliance studies.
5	Mr. Zeipi Toksy	The general interest areas are enzymology, Fats, oil and protein chemistry.
6	Mr. Nigel Kiaka	Industrial solid and liquid waste management
7	Mrs. Rag Gubag-Sipou	Food microbiology, microbial quality of food and water, medicinal studies of indigenous plants.

Research Output: Peer Reviewed Journals

1. **Narimbi, J**., Mazumda, D., & Sammut. J. (in press). Stable isotope analysis to quantify contributions of supplementary feed in Nile Tilapia *Oreochromis niloticus* (GIFT strain) aquaculture. *Aquaculture Research*. DOI:10.1111/are.13642 (2017)

Research Projects

1. **Studies on Health and Medical Conditions Related to Environmental Effects of Volcano Affected Areas of East New Britain Province of Papua New Guinea** – undertaken by Ms. Kundo Hundang for Ph.D. degree under self-sponsorship (since Feb ’15). Principal supervisor: Dr. L. Yalambing. Study is underway and few samples were collected from various identified zones in ENB Province and Cd analysis on progress. General survey was also carried out in various places around the volcano (Mt. Tavurvur). Towards end of 2017, Ms Hundang left for studies in West Indies for around 10 months to of collaboration studies in her Ph.D studies.

2. **Biological assessment of phytosynthesized silver nanoparticles** [funded by PNGUoT Research Committee, LNSDC and the Department of Applied Sciences] – Undertaken by Mr. David Timi for Ph.D. degree supervised by Professor Gopalakrishnan. All the experimental work on the malaria component and nematode control studies were completed. The rest of the components are in progress and about to complete. The characterization of silver nanoparticles will be sent to India during first week of July 2017. The thesis is expected to be submitted mid/end of 2018.

3. **Extracting and assessment of coconut oil using mannan degrading enzymes from the crop of *Achantina fulcia*** [funded by LNSDC] – Undertaken by Mr. Zeipi Toksy for M.Phil. degree supervised by Professor Gopalakrishnan. The research funding was allotted in semester 1- 2017. The extraction of enzymes from snails is completed. The rest of the work is in progress and expecting to complete the laboratory work by June 2018.

4. **Designing a Suitable Drying System for Higher Altitude Conditions: Using Gembolg District, Simbu Province as a Model** [funded by LNSDC] – Undertaken by Mr Nigel Kiaka for M.Phil. degree supervised by Mr Reilly Nigo. The research funding was allotted in semester 2- 2017. The work is in progress and is expected to be completed November 2019.

5. **Physicochemical and Microbiological Assessment of Drinking Water Sources in Peri-Urban Settlements, Lae Morobe Province.** [funded by LNSDC] – Undertaken by Mrs Sandy Puy for M.Phil. degree supervised by Mr Justin Narimbi. The research funding was allotted in semester 2- 2017. The work is in progress and is expected to be completed November 2019.

6. Ongoing project is "**Towards National Drinking Water Standards in Vanuatu**: Applied Research and Capacity Building" – a collaborative research with reputed Universities of Australia and New Zealand funding by The Pacific Islands Universities Research Network (**PIURN**), Funded by PIURN – Under Taken by Dr Srikanth Bathula. The research is an ongoing study.

7. **Renewable and Clean Energy: Biogas Development from Household and Market wastes** - Funded by the Department of Applied Sciences. Principal investigator: Mr. R. Nigo. A prototype design has been completed with safety features and gas burners have been modified and tested with promising performance. Currently gas production profiles of different animal and food wastes are being worked out. The project has some promising impacts of livelihoods of both rural and urban communities on clean energy, reduction of population and boost of agricultural activities through high grade liquid organic fertilizers through the digested slude from the biogas. Concluding studies are underway and should end by 2018.

8. **Renewable and Clean Energy: Bioethanol production from cocoa pod wastes-** The project is funded by the Department of Applied Science. Principal investigator: Mr. R. Nigo. Cocoa is the third largest agricultural export commodity in PNG which generates a lot of cocoa wastes through the pods after the bean has been removed for fermentation and drying. Preliminary research has shown that the cocoa wastes can yield up to around 20% alcohol from the mucilage which can be used as fuel for both power generation and cooking. Load test using different alcohol-gasoline ratios to run petrol engine generators has been tried out with good performance.

9. **NFA–Unitech – Laboratory Accreditation** – Project leader: Mr. R. Nigo. Around K3.5 million has been allocated to this project. Through the NFA funded the Department of Applied Sciences Building has been fully renovated. Several equipment worth more than K2 million has been purchased. Preliminary accreditation work is in good progress and few industry based tests have been done using HPLC and now two new equipment; namely Gas Chromatography and ICPMS both of the latest models have been commissions and trials runs are in progress. Full launching of National Food Testing and monitoring Centre (NFTMC) is expected in March, 2018.

10. **Food Safety Courses / Training for Industries** – Coordinator: Mr. R. Nigo. This is a program running in three stages annually. Conducted by the senior Food Technology staff of the department (Mr. R. Nigo, Mrs. R.G. Sipou, Mrs. S. Denano, Ms. E. Nasing, Mr. Z. Toksy and Dr. L. Yalambing). The team has written modules and delivered training to

various food Industries. The training is becoming popular in food and allied industries and government / semi-government organizations like NAQIA and Department of Health.

11. **Development of supplementary food for malnourished children.** This is a National Health funded project currently undertaken by Carlton Guwada under self-sponsorship for M.Phil degree (July 2018). Principle supervisor: Dr. L.R-Yalambing. Food formulations and product development will commence this semester with chemical and microbiological assays to follow.

12. **Efficacy of multi-micronutrient fortified wheat-based food on the nutrition status of primary school children aged 6-12 years in Lae, Papua New Guinea.** The study is in collaboration with Applied Science, Unitech, UNSW, National Health Department and funded by Goodman Fielder. Dr. L. Yalambing is a co-investigator in this collaborative nutrition project.

Completed Student Projects (2017)

Applied Chemistry Section – research projects with final year students

No.	Student	Supervisor	Topic
1	ANDREWS Doel	Mr.Narimbi	Investigating the potential of potato seed production using aeroponics (nutrient solution)
2	ERSIUT Hosea	Mr.Wau	Analysis of volcanic ashes obtained from Mount Tavurvur of East New Britain Province.
3	GEYASA Darrel	Mr.Philip Kaupa	Preparation and analysis of vegetal salts from the garden foliage of Unitech campus
4	HASSOR Christine	Dr.Bathula	Qualitative assessment of soft drinks and fruit juices in Lae, Papua New Guinea
5	IKILIK Daniel	Dr.Bathula	Oxalate content in common vegetables
6	JAMES Priscilla	Mr.Timi	Determination of some selected micronutrients of the young edible leaves of *Gnetum gnemon*
7	JIMBANAU Emmanuel	Mr.Wau	Assessment of *Areca* nut mastication sputum stain
8	KATA Flora	Dr.Bathula	A qualitative assessment of harvested rainwater and other sources for drinking in Lae, Papua New Guinea

9	KUBU Andrew	Mr.Wau	*Aroma therapeutic assessment of Areca* nut mastication
10	MARGU Gantha	Mr.Wau	Assessment of the emulsifying properties of *Ficus* (MORACEAE) latex gum
11	MIRINO Larisha	Prof. Gopal	Biosynthesis of silvernanoparticles, studies on antimicrobial activities against human phathogens and phytochemical screeing of active compounds from Catharanthus roseus
12	NANTOP Nhimen	Mr.Timi	Antimicrobial assessment of silver nanoparticles synthesized from aqueous leaf extract of *Gnetum gnemon*
13	PERO Isaac	Mr.Narimbi	Water quality assessment of the raun wara (lake) for the introduction of recreational fishing for Lae city residents.
14	PETER Stephanie	Mr.Timi	Chemical screening and antibacterial assessment of extract of *Gnetum gnemon*
15	KAUPA Elijah	Dr.Bathula	Quality assessment of Chemical analysis of Portland cement
16	SAMBAO Tonny	Mr.Narimbi	Conversion of sulphur dioxide emitted from mining industries into gypsum
17	SUGOGO Tonny Maume	Mr.Narimbi	Determination of heavy metal concentrations in fish and shell fish sold at the Lae city main market
18	TOM Rose	Prof.Gopal	Green synthesis of silver-nano particles from *Codiaeum variegatum* and comparison of antifungal activities between extract and silver-nano particles
19	WALE Napoleon	Mr.Wau	Assessment of several MORACEA species sap photo activity
20	WANO Richard	Prof.Gopal	Comparison of antimicrobial activities between extract and silver-nano particles from *Artocarpus altillis*

Food Technology Section – Research Projects with final year Students

No.	Student	Supervisor	Project Tile
1	NOMBRI Steven	Rag Gubag Sipou	Microbiological quality of street vended foods sold at selected schools in Lae

2	MESKEREA Alex	Reilly Nigo	Concluding Studies on Second Generation Biofuel Development from cocoa pod wastes and simple ending load tests.
3	TIKIL Sam	Reilly Nigo	Concluding Studies on operation of mini Digestor for BIOGAS PRODUCTION household and farm wastes as an alternative for clean energy source in food processing.
4	ALBERT Judith	Lydia Yalambing	Assessment of the Nutritional Quality and Adequacy of Meals provided in Schools in Lae (Further studies).
5	INJUWA Cornelius	Sogoing Denano	Compliance studies with LAE biscuit - Document Control and Tractability.
6	MAMBA Larisha	Elizabeth Nasing	Investigation of Food Safety in selective cooking methods of Sago Starch.
7	HEMBENNGUA Wangi	Nigel Kiaka	Preliminary studies of Conversion of Canned Meat wastes

Conference Presentations

1. **Wale, N. and J. S. Wau**. Psoralen induced Phytodermatosis by MORACEA on common skin pigments in Papua New Guinea, PNG IMPACT RESEARCH INNOVATION SOCIETY, UPNG, Port Moresby, (December 2017)

2. **Jimbanau, E and J. S. Wau**. Assesment of betel (*Areca catechu L*) nut mastication spittle-stain in PNG, PNG IMPACT RESEARCH INNOVATION SOCIETY, UPNG, Port Moresby, (December 2017)

Unitech Research Seminar Series

Zeipy Toksy. Coconut oil extraction and assessment using enzymes from Giant African Snail *Achatina* (12 Sept, 2017)

DEPARTMENT OF ARCHITECTURE AND BUILDING

Acting Head of Department: Mr. Daniel Wasi

Research interest for the staff members from the Architecture and Building Department are as follows;

Academic Staff	Research Interest
Daniel Wasi *Principal Technical Instructor & Acting HOD*	1. Building Construction Waste in Papua New Guinea 2. Motivation and Performance of Indigenous Contractors. 3. Small National Contractors Management skill development 4. Safety and Cultural obligation of Small National Contractors 5. Motivation and Productivity of Small National Contractors
Professor C Gonduan *Architecture Course Director*	1. User Behavior in Institution Housing: a periodic observation and assessment of indigenous user behavior in PNGUOT housing. 2. Environmental Stress: An assessment of the built environment wear and tear in response to user overload. 3. Shifting Cultural Influence in Domestic Architecture Design in Indigenous Environments and Societies 4. Bamboo Ply as alternative Building Material in Rural PNG.
Dr. Andrew Sariman *Senior Lecturer*	1. Thermal Performance of UNITECH Housing 2. Design Faults in Existing Housing 3. Climatic Data for Architects in Papua New Guinea 4. Effectiveness of Shading Devices 5. Design Studio Learning 6. Thermal Performance Comparison Between Steel Metal and Traditional Thatched Roofs 7. Quality of Concrete Masonry Block Manufactured form Sand Obtained from Sea Shore around Papua New Guinea 8. Building Energy Studies
Ali Bou *Principal Technical Instructor*	1. Natural Preservation of Wooden Marine House Pile for Coastal PNG 2. Convenient Roofing for Rural PNG 3. Mangrove Farming: Future Sustenance for Coastal Rural PNG 4. Convenient Flush Toilet for Coastal Rural PNG

Mathew Pomoso *Senior Technical Instructor*	Lecturer still currently undertaking his Masters in Management on distant mode with the University of Natural resources and and Environment
Magdelyne Kuluwah *Technical Instructor*	With no teaching experience (Have been in the industry for more than 10 years), staff needed time to improve her delivery of lecturers and assessment of student work, before she can undertake any research
Austin Polin Lecturer	Melanesian Building Vernacular Tradition CAD and Programming (Digital Design)

Conference Attendance 2017

No staff attended a conference in 2017, with academic staff shortage; lecturers were busy in the preparation and delivery of lectures.

List of Publication

There are no staff publications in 2017, due to heavy teaching load. This had an effect on staff ability in undertaking research and publications.

Students Research

Below are list of research undertaken by students of the Department of Architecture and Building in 2017.

Student Name:	**Research Topic:**
Wilkinson Apio	The Importance of Green Innovative Public Spaces at the Papua New Guinea University of Technology.
Emmanuel Balip	Green Walls
Elaine Benson	Vernacular Roofing Techniques in the Hot Humid Tropical Region.
Vincent Guniniei	The Potential Effects of Using Local Building Materials on the Well-being of Indoor Environment.
Vanellie Igag	Permaculture: Green Architecture: Regenerative Design
Delma Kalo	The Renewable Alternative Power Sources Tested and Used in Papua New Guinea.
Jason Kanawa	Effective Openings in Tropical Buildings

Obed Mandani	ESD: Building Materials (how materials could be used to minimise gas emissions)
John Samane	Building Maintenance: The Main Influencing Factor Causing Building Maintenance at the Papua New Guinea University of Technology.
Bluey Sevua	Green Architecture: A Study of Green Covering Systems and Related Issues
Margaret Siwisika	Sustainable Landscaping in Learning Institutions
Apisai Songake	Tropical Building Design: Sun Control or Shading Devices
Camilus Tanis	Tropical Building Design: Natural Ventilation in Residential Buildings in the Warm Humid Climate at Unitech Campus.

DEPARTMENT OF BUSINESS STUDIES

Head of Department: Professor Zhaohao Sun

1 Introduction to DBS

Department of Business Studies (DBS) is the largest Department of the thirteen academic departments at the UNITECH with approximately 600 undergraduate and postgraduate enrolments every year. It is a multidisciplinary Department with proven track records for producing national and Pacific regional leaders and beyond. Our alumni have led PNG's industrial and governmental sectors for decades.

The programs within the DBS make our students easier to build bridges between knowledge, skill, value and practice. The DBS offers undergraduate degree programs in Accounting, Applied Economics, Information Technology, and Management. It also offers postgraduate degree programs such as Master of Philosophy in Information Technology, Masters in Business Administration (MBA) and an Executive Masters in Business Administration (EMBA) program. DBS is developing the comprehensive postgraduate programs including postgraduate diploma, masters and PhD studies in Accounting, Applied Economics, Information Technology, and Management.

The DBS has a research center of big data analytics and intelligent systems with active international cooperation and a significant number of publications with international visibility. It is building a PNG –China Centre of Business Studies and a PNG-Australia Centre of Governance and Policy Development as well as a Centre of Innovation and Entrepreneurship.

Research across the four main disciplines represented in the DBS is encouraged: Economies, Management, Information Technology, and Accounting. The following research activities were undertaken by academic staff members in the DBS during 2017 Academic year: The report shows that 1. Comparing with 2015 (5), 2016 (14), the number of journal publications of 2017 is 11, another 10 working papers (Preprints) have not been included. The quality has also been increased dramatically. At least 5 of them have been indexed by SCOPUS and/or ERA and/or ISI (SCI). The main contributors for research outcome of DBS are four academic staff members. However, the

majority of academic staff of DBS have no record of peer-reviewed publications, nor attending national and international academic conferences, nor delivering any research seminar presentations in the past three years (2015-2017). Therefore, how to activate the research passion of academic staff and increase outcome of quality research taking into account SCOPUS, ERA or Clarivate (JCR) (then ISI (SCI)) is still a big challenge for DBS, because the research performance of academic staff is an important index for any international or national accreditation of undergraduate and postgraduate programs.

1.1 Research Seminar Presentation

1.1.1 UNITECH Research Committee Seminar Presentation

MAY 2 2017 Professor Dr. Zhaohao Sun, Big Data Analytics & Artificial Intelligence.

1.1.2 National/International Research Seminar Presentation

Based on the invitation, Prof Sun delivered three research seminar presentations on Big Data, Analytics and Intelligent Systems at Chongqing Normal University in December 2017

Prof Sun was invited to deliver the following two research presentations on Big Data Analytics and Artificial Intelligence on 05 January 2017, and E- Government in Australia and China, on 30 Nov 2017 at Hebei University of Science and Technology (HUST), Shijiazhuang in 2017.

Prof Sun was invited to deliver a keynote speech on Innovation and Entrepreneurship for Accounting in PNG at CPA Annual Conference, Lae on 24 August 18.

1.1.3 DBS Research Seminar Presentations

09 Aug 2017 **Professor Dr. Zhaohao Sun**, Science of Research: Research as a search

13 Sept 2017 **Rueben Maino Daniel**, Autonomy of Public Universities in PNG (He left DBS in October 2017)

20 Sept 2017 **Gynellevin Hemetsberger**, Business Process Automation for SMEs in PNG

4 Oct 2017 **Gomi Gipe,** 'Applied Economic Research Methodology' (Applications and experiences with empirical studies about poverty, income inequality, and PNG's consumption function)

18 Oct 2017 **Bapa Bomoteng**, Financing Trends in Papua New Guinea State funded Universities – PNG Unitech Case

15 Oct 2017 **Rodney Naro**, Bit coin-An Alternate Crypto currency for PNG

2 List of Publications in 2017

In 2017, DBS published 12 peer-reviewed international journal articles. Another was in press in 2017.

2.1 Published Journal Articles

1. Adimuthu Ramasamy (2017). Is it Time to Play Hooky? An Investigation into Dimensions of Employee's Nonattendance of Work. Asian Academic Research Journal of Social Science & Humanities (ISSN: 2278-859X) (Online) http://www.asianacademicresearch.org/editorial.html 4(5): 214-231

2. Adimuthu Ramasamy (2017). Role of Continuous Quality Improvement in Higher Education: Limitations and Interpretations. Asian Journal of Educational Research**.** (ISSN 2311-6080) 5(3):96-111

3. Adimuthu Ramasamy, Ishmael Inore & Richard Sauna (2017). A Study on Implications of Implementing Green HRM in the Corporate Bodies with Special Reference to Developing Nations. International Journal of Business and Management. Vol. 12, No. 9; 2017 (ISSN 1833-3850 E-ISSN 1833-8119)

4. Strang D. K., & Sun Z (2017). Analyzing relationships in terrorism big data using Hadoop and statistics. Journal of Computer Information Systems. 57(1): 67-75. DOI: 10.1080/08874417.2016.1181497. SCI, SCOPUS indexed, ERA listed

5. Strang K.D., & Sun Z (2017). Big Data Paradigm: What is the Status of Privacy and Security? Annals of Data Science (Springer). 4(1): 1–17. DOI: 10.1007/s40745-016-0096-6. Google Scholar, ABI/INFORM, CNKI indexed

6. Sun, Z (2017). A logical approach to experience-based reasoning, Journal of New Mathematics and Natural Computation. 13(1): 21–40. DOI: 10.1142/S1793005716002939, SCOPUS indexed, ERA listed

7. Sun Z (2017). A Framework for Developing Management Intelligent Systems. *In* Information Resources Management Association (Ed) Decision Management: Concepts, Methodologies, Tools, and Applications. pp. 503-521. DOI: 10.4018/978-1-5225-1837-2.ch024. SCOPUS indexed.

8. Sun Z, Wang P. P (2017). A Mathematical Foundation of Big Data. Journal of New Mathematics and Natural Computation. 13(2): 83-99. DOI: 10.1142/S1793005717400014, SCOPUS indexed, ERA listed

9. Sun Z, Wang P. P (2017). Big Data, Analytics and Intelligence: An Editorial Perspective, Journal of New Mathematics and Natural Computation.13 (2): 75–81. DOI: 10.1142/S179300571702001X, SCOPUS indexed, ERA listed

10. Sun Z, Strang D. K, & Firmin S (2017). Business Analytics-Based Enterprise Information Systems, Journal of Computer Information Systems (JCIS), 57(2): 169-178. DOI: 10.1080/08874417.2016.1183977. SCI, SCOPUS indexed, ERA listed

11. Sun Z, Strang K. D, & Pambel F (2017). Privacy and security in the big data paradigm, Journal of Computer Information Systems**.** DOI: 10.1080/08874417.2017.1418631, In Press.

12. Thomas, Paul M., Kimata, James D., and Khan M. G. M (2017). Purchasing Power Parity Theory and Applications for Solomon Islands. Journal of Economics and Public Finance (scholink, http://www.scholink.org/ojs/index.php/jepf), 3(4), (ISSN 2377-1038 (Print) ISSN 2377-1046 (Online) Vol. 3, No. 4, 2017, DBS. [Google Scholar]

Apart from the published journals, the following articles have been submitted and are currently under review:

1. Talib, Muhammad N (2017) Service Packaging: A Pattern Based Approach towards Service Delivery (submitted to IEEE Transactions on Services Computing Dec 2017)

2. Talib, Muhammed N (2017) E-governance using ICT: A comparative study between Lahore, Pakistan and Lae, Papua New Guinea (submitted to APEC STUDY CENTRES CONSORTIUM CONFERENCE (ASCCC) on 20th February 2018)

2.2 Working Papers

The Research Centre of Big Data Analytics and Intelligent Systems (BAIS) collected following 10 working papers, each of them has been published in ResearchGate.net with DOI. Five of them have been cited by Google Scholar.

1. Sun Z (2017) Big Data Analytics and Artificial Intelligence - BAIS No. 17001, PNG UoT

2. Sun Z (2017) Innovation and Entrepreneurship for Development, BAIS No. 17002, PNG UoT

3. Sun Z (2017) How to use Microsoft Word to Develop a Journal Paper 2017, BAIS No. 17003, PNG UoT

4. Sun Z (2017) Intelligent Big Data Analytics 2017, BAIS No. 17004, PNG UoT

5. Sun Z (2017) Calculus of Big Data 2017 (Google Scholar indexed), BAIS No. 17005, PNG UoT

6. Sun Z (2017) Science of Research 2017 (Google Scholar indexed), BAIS No. 17006, PNG UoT

7. Sun Z (2017) Delegation intelligence-The Next Frontier for Making Business Success (Google Scholar indexed), BAIS No. 17007, PNG UoT

8. Sun Z (2017) On Unlearnability (Google Scholar indexed), BAIS No. 17008. PNG UoT

9. Sun Z (2017) Intelligence without data (Google Scholar indexed), BAIS No. 17009. PNG UoT

10. Sun Z (2017) Privacy and security in big data Driven Healthcare, BAIS No. 17010. PNG UoT

3 National and International Engagement (Outreach)

Prof Sun and colleagues of Federation University Australia (Iqbal and Andrew) applied a research grant on cybersecurity but unsuccessful in 2017.

3.1 Editing Journal & Other Research Activities

Prof. Sun, Z. and Prof. Paul Wang of Duke University have edited a Special issue on big data analytics and intelligence in Journal of New Mathematics and Natural Computation (Scopus indexed journal), which has been published in 2017.

Prof Sun has been editing two special issues on Big Data, Service and Intelligence in IJSSOE and on Big Data Driven Risk and Contingency Management in IJRCM, respectively with Dr Dickson Chiu of University of Hong Kong, and Prof Kenneth Strong of State University of New York, USA.

Prof. Sun has been servicing on the Editorial Board of Journals including

- Editor of Journal of New Mathematics and Natural Computation (http://www.worldscientific.com/worldscinet/nmnc).
- Associate editor of Journal of Intelligent and Fuzzy Systems (IOS)
- Associate editor of International Journal of Systems and Service-Oriented Engineering (IJSSOE).
- Associate editor of International Journal of Business Intelligence Research (http://www.igi-global.com/journal/international-journal-business-intelligence-research/1168).
- Associate editor and Strategic Advisor of International Advisory Board (IAB) at International Journal of Risk and Contingency Management (IJRCM).
- Member of the Editorial Board of International Journal of u- and e- Service, Science and Technology (http://www.sersc.org/journals/IJUNESST/).

3.2 Visiting other universities

Prof Sun visited Hebei University of Science and Technology (HUST), Shijiazhuang in November and December 2017, University of Hawaii and Chongqing Normal University in December 2017, Federation University Australia January in 2018.

3.3 Organizing international conferences

Prof Sun as a PC member or reviewer has been engaged in organizing the following conferences: i3e 2017 (India), CONFENIS 2017**,** SMC 2017 and ICAART 2017, 2018, and 2019; ICE-B 2017. ITS2017 (Internet Technologies & Society Conference) etc. He has reviewed a number of papers for each of them. As a steering committee member, he organized the HIKM 2018, Brisbane.

DEPARTMENT OF CIVIL ENGINEERING

Acting Head of Department: Mr Chris Kobal

Research interests for the staff members from the Civil Engineering Department are as follows:

Chris A Kobal, *Principal Technical Instructor and Acting Head of Department.*

Research Interests:

1. **Coconut Timber** – as a structural material. Coconut timber is currently not included in the Timber Structures Design Code list of timber species available for use as a structural material for structural designers. The aim is to carry out tests on timber specimens.

   A Paper 1s now being prepared for inclusion and presentation at this year's annual GVCCE.

2. **Solid Waste Management** – Domestic and Industrial Solid Waste. This has been expanded to include the two-year fulltime Master of Science in Solid Waste and Resources Management (MSc) program has been approved by the Academic Board for implementation in 2017.

   Solid waste is an ever-growing challenge and educating our engineers and Scientists on the best practice for this in of paramount importance. This knowledge can then be passed onto the rest of the communities concerned.

3, **Storm water 1 – Reduce quantity and reuse**

   Surface runoff from rain is disposed of through a series of drains to final storage in sinks either in the ocean or in designated temporary storage.

   - Lae experiences a high annual rainfall and most of the water goes to waste.
   - Lae uses underground water for its water supply. The surface storm water can be redirected to replenish aquifers which will eventually and inevitably run dry or be intruded by sea water as the demand for water increases with an ever expanding city and a rising population

4. **Storm Water 2 – *Treatment of Storm water for Health.***

Storm water in open drains can pose a health hazard and risk to human beings along its path. The prospect of this happening is increased when unsuspecting children play in the drains during rain Surface runoff may also carry with it dangerous diseases (apart from other usual debris) and if unchecked can pose a health risk to the communities along its path. The water and debris needs to be treated and/or removed prior to release into storage – by filters?

Overseas research in this topic area is current in Australia (university of Melbourne).

Dr. Mirzi Betasolo, Research Profile (2017)

Published papers:

Betasolo, Mirzi and Lageo, Anna and Kasai, William and Kathoa, Relvie and Kipit , William and Kueyak, Samson, Polypropylene Fiber (Disposable Plastic Cups) Reinforced Autoclaved Concrete (December 10, 2017). Papua New Guinea University of Technology, Global Virtual Conference in Civil Engineering (GVCCE) 2016. Available at SSRN: https://ssrn.com/abstract=3085379

Betasolo, Mirzi and Dromenge, Allan, Strengthening Rabaul Volcanic Ash (RVA) Cement Compressibility with the Addition of Lime (February 19, 2017). Papua New Guinea University of Technology, Global Virtual Conference in Civil Engineering (GVCCE) 2016. Available at SSRN: https://ssrn.com/abstract=2971147

Ambranga, Maling and Fincham, Rod and Betasolo, Mirzi, A Comparative Evaluation of the Structural Performance of Papua New Guinea River Gravel Using the Repeat Load Triaxial (RLT)- a Performance-Based Test (February 19, 2017). Papua New Guinea University of Technology, Global Virtual Conference in Civil Engineering (GVCCE) 2016. Available at SSRN: https://ssrn.com/abstract=3084408

Conferences/Workshops/Trainings Attended:

2nd GVCCE 2017, 27 Nov - 1 December

PNGUOT, Lae City
Conference Organizer/Chair/Presenter

NDRC 2017 Training Programme on South-South Cooperation of Addressing Climate Change
Chinese Research Academy of Environmental Sciences, Beijing, China; 8 - 23 November 2017

1st International Conference on Information Technology, Engineering, Education and Management Sciences (ITEEMS) – also 5th Information and Communications Technology (ICT) Congress; 13 October 2017

University of Makati, Makati City, Philippines
- Keynote Speech: Emerging Technologies, Technology
  Innovation in Industry and Academe Best Practices
  In Developed and Developing Countries
-Judge on Conference Paper/Reviewer

Sardinia 2017
2 - 6 October 2017; Sardinia, Italy
Presenter:
1. Lae City Second Seventh Landfill Rehabilitation
2. "Greening Civil", a Campaign to Mitigate Climate Change
3. Start-up Pitching : Unitech Resource & Energy Recovery System (URERS) Facility

Postgraduate Certificate in Student-Centered Teaching
21 - 25 August 2017; Workshop, JCU Cairns

Unitech Seminar Presentation
Presentation Title: Culture-Paradigm Shift Learning in Axiomatic Design Process
Date Presented: July 25, 2017

Supervised Research/Projects
Postgraduate:

Name of the Student	Title of the Research Project	Name of the Supervisor
Murray KONZANG	Impact on the Accessibility and Mobility of Traffic Caused by Development of Four Lane Highway and New Lae Port Development Project	Dr. Mirzi Betasolo
Grace WANTEPE	Health Monitoring of Girder Bridge: A case of Butibam and Bumbu Bridge of Lae City	Dr. Mirzi Betasolo

Undergraduate:

Name of the Student	Title of the Research Project	Name of the Supervisor
Anna LAGEO, Jonathan MICHAEL	Developmental Impacts on Groundwater REsources in Lae: A Case Studyon Lae City Water Supply	Dr. Mirzi Betasolo
Gibson PHILIP	GHG Impact in Lae City Measured by Respiratory & Malaria Health Issues	Dr. Mirzi Betasolo

Dr. Mirzi Betasolo List of Research Agenda:

Present Research Work

- RVA (Rabaul Volcanic Ash) Cement
- RVA Hollow Block
- Investigation on asphalt roads early failure in PNG
- Fiber reinforced concrete
- Material engineering sustainability
- Groundwater sustainability
- Rainwater harvesting
- Fiber Reinforced Concrete
- Recycling of Waste Paper in the University for Construction Material
- Energy Efficient Public Buildings in Papua New Guinea
- Drainage System, its impact in road infrastructures
- Bridge Health Monitoring
- Ground Stability
- GHG Monitoring in Lae
- Waste Management
- Bioenergy
- Biowaste management
- Paradigm Shift Learning in PNG

Future Research Interest

1. Basic and Advance Construction Materials

The objective is to achieve a comprehensive technical development of basic and advanced materials using latest materials technologies based on the condition of the limitation of our resources and energy, to enable a sustainable development of society. To include but not limited to study of materials related to composite structures, steel structures design, use of aluminium in building components and timber as a composite materials in structure. I am also interested in incorporating nano technology to advance materials engineering and structure components. 3D printing methodology may also be incorporated in the advance construction materials theory for cost and production effectiveness.

2. Energy-saving building component

My interests in the energy-saving building component developments include the following: Light-controlling glass, wood-based window sashes, and humidity controlling walls, which can significantly reduce the energy required for air-conditioning of buildings, thus help in the growth of climate change. In addition to this, a design of air flow to minimize energy use is another interesting research agenda.

3. Countermeasures in response to concerns about shortage of metal resources

Lack of metals availability in the future due to increasing demand and extreme unevenness in the distribution of underground resources interests me. Thus, developing an innovative metal from waste recovery is among my interest.

4. The development of environmentally friendly construction materials.

My interest in the development of green building materials includes recycling of plastics, paper, tin, wood dust, slug and other waste either for architectural or structural use.

5. Development of sustainable engineered lightweight construction material for use in residential building

My goals in the development of sustainable engineered lightweight construction materials is for use in economical residential building to includes materials such as shale resources, metals, other resources for similar use.

6. Other interest in construction engineering includes structural health and monitoring research

Structural stability such as analysis and design are of my interests to include health monitoring of structures for early warning on disaster to happen and for recommendation on building refurbishment.

7. As the need arises

As the need arises applies when my interests are not the best interest of the University or the company I am working for. As their employee I am in support to pursue what they seems best.

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Head of Department: Associate Professor Garry Sali

As concerns *teaching activities*, the Department offers a 4-year professional program and has two sections: A Communication for Development (C4D) Studies and a service-course sequence in English for Academic Purposes (EAP) for students across all disciplines of the University; and, a professional program Communication for Development degree program to train liaison and community development and public relations officers for resource development companies, government departments and non-government organizations. It also presently administers the Postgraduate Certificate Course in Student-Centered Teaching for the further specialized training of academic staff at PNGUoT.

In 2009, the Department began offering a Masters in Communication Studies (MCS) program. This program has both a course work and a dissertation component, where the students write a research paper on an appropriate topic in the final semester of their second year. In addition, a Masters of Arts in Organizational Leadership is offered in Cooperation with Development Associates International (DAI), The Christian Leadership Training College of Papua New Guinea (CLTC), and the Pioneers of Australia. Furthermore, a growing PhD program is underway, with one graduate to date and another enrolled.

As concerns *research activities*, the Department of Communication and Development Studies at the Papua New Guinea University of Technology is a department that blends three broad academic strands (Language and Communication Studies, Sociology, and Communication for Development). Through its individual members of staff, research is conducted in under general umbrellas (Linguistics and Culture, English for Academic Purposes/EAP, English for Special Purposes/ESP, Sociology, and Communication for Development). General and sub-topics include:

In Linguistics and Culture, focus is given to PNG national languages, comparative linguistics, and the interface between society and language across time. In EAP or ESP, research topics include:

classroom research, EAP/ESP methodology, course design, material design, genre analysis, rights analysis, critical EAP/ESP, reading and writing, testing and evaluation, computer-mediated language learning, EAP/ESP research, and socio-linguistic influences on the teaching and learning of EAP/ESP.

In the general area of Sociology, research foci include fieldwork, health, corrections, communication theory and practice, media studies, critical-cultural studies, and comparative higher education studies. Another thread is concerned with the problems of youth in society, especially on topics such as integration, sex education, and social behavior.

In the Communication for Development (C4D) area, the sub-topics of research interest include: communication in education, communication and gender, communication in resource management, conflict resolution, negotiation skills, partnership building, communicating development in such sectoral contexts as economic industries, healthcare, agriculture, and so forth. democracy and human rights, and HIV/AIDS.

Both empirical (quantitative) or qualitative approaches to relevant topics are employed by our academics, with trans-disciplinary innovations (such as action research) encouraged. The Department publishes a peer-reviewed organ, the *JCDS: Journal of Communication and Development Studies* in cooperation with the UNESCO Chair ofQuality Management of Higher Education and Lifelong Learning of "Lucian Blaga" University of Sibiu, Romania.

Name of the Faculty/Position/Research Interests

Name of the Faculty	Position	Research Interest
Dr Eric Gilder	Professor	Higher education policy, scientific communication, technology and society, communication theory and practices across intercultural contexts, radio-TV history and legal aspects of broadcasting

		and the socio-psychological aspects of the communication process.
Dr Golam S. Khan	Professor	International migration, urbanization, health sociology, political economy, research methodology (qualitative) and family dynamics.
Dr Garry Sali	Associate Professor and Head of Department	Sociology of crime and deviance, prison systems, crime and development, and law and order problems in PNG.
Dr Rachael Aisoli-Orake	Senior Lecturer	English as a Second Language writing, Education/English curriculum and pedagogy, English for Academic Purposes, Cross- Cultural communication, development and responsibility and participatory research.
Dr Kaveri D. Mishra	Senior Lecturer	Mass media and journalism, Information Technologies Utilization, Comparative media studies, Gender studies.
Dr Apoi Yarapea	Senior Lecturer	Language documentation, discourse analysis, language education, production of learning materials for language at all levels (Elementary, Primary, Secondary and tertiary institutions), cross-cultural communication strategies, curriculum research, design, implementation and evaluation, English language development in PNG schools.

Mr George Wrondimi	Lecturer	Social work; social policy and planning; social mapping; community development;
Mary Kunenda Aisi	Lecturer	Development communication, gender and leadership, and mass media.
Imelda Ambelye (on study leave 2015-2016)	Lecturer	Enrolled in PhD Program at James Cook University(JCU-SASS), Australia. Research Topic: "Environmental education and natural resource management in Papua New Guinea" (Simon Foale, Supervisor).
Dr Francis Essacu	Lecturer	Natural resource management and environmental governance, Conflict Resolutions, Peacebuilding and Human Rights, Sustainable Development Projects Management, Sociology of Development, Development Policy, Development Leadership & Politics and Community Development - Gender inequality and Social Inclusion, Disaster Risks Managements.
Joshua Frank Kuri	Lecturer	Language development and practices via bilingual education; practices and effects of communication across developing societies.
Sheryl S. Makara	Lecturer	Emotional intelligence and leadership, critical thinking, communication in crime and sociology with relations to

		development, community development and participation.
Wilma Molus	Lecturer	Sociology of children, sociology of deviance and crime.
Michael Winuan	Lecturer	Enrolled in PhD Program (Year 2). Research Topic: "Means by which agricultural messages are communicated to farmers: A case study of OPIC and small-holder oil palm out-growers at Buvussi and Sarakolok sub-divisions in West New Britain Province" (Eric Gilder & Apoi Yarapea, Supervisors).
Rhonda Lakele Eva-Gwale .	Principal Technical Instructor	Information management, traditional knowledge, changing societies and gender issues. Graduate of Masters in Organizational Leadership (MAOL) Program.
Mrs Lucy Maino	Lecturer	Participatory development communication (PDC) whereby communication processes, techniques and media are used to engage stakeholders (individuals, groups, and institutions) in socio-economic change processes, cross-cultural communication, communication for agricultural innovation, participatory social mapping, community development, English for academic purposes.

Ngawae Mitio	Technical Instructor	Local community affairs/local governance.

Ongoing International Partnership Research Projects:

Yarapea, A. (Coor.). Papua New Guinea languages documentation project – Partners: PNG University of Technology and USA Livingtongues Institute of Endangered Languages.

Peer-Reviewed Publications:

Eastman, S. & Gilder, E. (2017). As America trump (ets), the world gets tinnitus: Construing the personal/political sphere of Donald Trump's supporters and its effectsupon accurately forecasting the election of 2016. "Uncertainty: Elections, Brexit, Terrorism, Geo-Policies, Islamic Revolution," *Romanian Review of Political Science and International Relations* XIV (1): 11–40.

Essacu, F. B. (2017). A case study to establish insights into reasons and nature of conflicts in resource based development projects in Papua New Guinea, *Journal of International Understanding* 43 (Japan): 5-24.

Essacu, F. B. (2017). Understanding emerging relationships between institutional structures and leadership modes in natural resource development communities in Papua New Guinea, *JCDS: Journal of Communication and Development Studies* III-IV: 27-43.

Mishra, K.D. (2017). A Love Story of fantasy and fascination: Exigency of Indian cinema in Nigeria, *Annals – Series on Philosophy, Psychology and Theology* 9(1-2), on-line ISSN 2067-113x Open Access, and print form, ISSN 2067-5690, / 2017 http://aos.ro/wp-content/anale/FPVol9Nr1-2Art.8.pdf

Mishra, K.D. (2017). Social Media revolution: The new digital frontiers of Journalism, *Journal of Advances in Humanities*5. DOI: 10.24297/jah.v5i1.6068.

Sali, G. (2017). Papua New Guinea state university students in conflict with social morality and the rule of law,*Korean Journal of Correctional Discourse*11 (1): 237-277.

Other Publications:

Essacu, F. B. (2017). Resource owners challenged (Business Focus), *The South Pacific Post*, Friday, 10th November, Page 21 (Port Moresby, Papua New Guinea).

Sali, G. (2017). Research experiences at The Kagoshima University Research Centre for The Pacific Islands. *South Pacific Newsletter* No. 28, pp.10-14. Kagoshima University Research Centre for the Pacific, Japan.

Scholarly Presentations:

Essacu, F. B. (2017). "The impacts of natural resource development projects on community livelihoods in Papua New Guinea: A case study from mining and agriculture projects," 8th Huon Seminar, Tuesday, 8 November, Papua New Guinea University of Technology, Lae.

Gilder, E. & Schram, A. (2017)."The Paradigmatic City (III): Customs and Costumes" conference, "From rags to riches: The transformation of a troubled settlement suburb and university in Lae, Papua New Guinea, into a cosmopolitan city community (UniCity),"University of Bucharest, Romania, and Ca' Foscari, Ca' Dolfin, Venice, Italy, 30 November – 2 December, 2017

Gilder, E. (2017). International conference and workshop, "Sustainable Development Goals: how toensure inclusive and equitable quality education and promote lifelong learningopportunities for all",UNESCO Chair on Quality Management of HigherEducation and Lifelong Learning, "Lucian Blaga" University of Sibiu and UNESCO HQ HE Section, Paris. Sibiu, Romania, 11-12 May.

Gilder, E. &Schram, A. (2017). "Sustaining the international public good of the state-supported research university so to meet SDG4," 2017 Australasian Aid Conference, Development Policy Centre, Crawford School of Public Policy, ANU College of Asia & the Pacific, Canberra, 14-16 February (first author presented).

Khan, G.S. (2017)."Stages of societal development and distinctive male-female roles: Resource for understanding history,"UNITECH Research Seminar presentation, PNG University of Technology, Lae, 08 August 2017.

Maino, L, Sar, L & Maino, M. (2017). "How effective is the Papua New Guinea agricultural sector in communicating with and amongst stakeholders in the promotion of Smallholder Agricultural Enterprises? A comparative case study of smallholder rice farmers in the Wain-Erap, Lae Rural, and Lae Urban LLGs in the Morobe Province," International Conference on Agriculture Extension, University of Goroka, Goroka, E.H.P, Papua New Guinea, 11-12 September, .

Mishra, K.D. (2017). "A new genre of Journalism – Citizen Journalism," Unitech Research Seminar Series, Papua New Guinea University of Technology, Lae, 17 October.

Sali, G. (2017). "The challenges of crime in Papua New Guinea with some reference to crime in Japan," Research Seminar No.175, 13 February 2017. The Interdivisional Education and Research Building. Research Center for the Pacific Islands, Kagoshima University.

Sali, G. (2017). "Papua New Guinea state university students in conflict with social morality and the rule of law," A paper presented at the Huon Seminar, "Celebrating 52 Years of Nation Building: Embracing Challenges beyond 2017," Papua New Guinea University of Technology, Lae, 7-8 November 2017.

Wrondimi, G. (2017) "The middleman's role in communication for development," Department of Communication and Development Studies Seminar Series, Papua New Guinea University of Technology, November 2017.

Journal Edited:

JCDS: *Journal of Communication and Development Studies* III-IV(2016-2017). Gilder, E., Khan, G., Mishra, K. D., Orake, R., Sali, G.Yarapea, A., & Florea, S. (LBUS) (eds.). ISSN: 1992-1322.

Postgraduate Research Supervision

The following tabulates and summarizes 2017 CDS Department Postgraduate Supervision.

Candidate	Program	Year	Supervisor(s)	Research Topic
Puso SEZUKA	MCS	1	Prof. Gilder/Assoc. Prof. Sali	The socio-economic impact of the internet in the market promotion of safari tourism in Northwest Botswana
Kerryanne MESKEREA	MCS	1	Dr Aisoli-Orake / Assoc. Prof. Sali	Evaluating and Determining the Extent and Effects of Restoring Clan Relationships Subsequent to Land Ownership Conflicts as a strategy for Rural Community Development: A Case Study of Central-Inland Pomio Rural LLG, Pomio, ENB Province.
Stanley EPENI	MCS	1	Dr Yarapea/ Prof. Gilder	The Politics of Resource Development in PNG & The Pacific Region: A Case study of New Britain Palm Oil Limited (NBPOL) - Palm

				Oil Development and Management in Papua New Guinea.
Jeremiah IKO	MCS	2	Prof. Khan/ Dr Aisoli-Orake	Needs, Problems and Challenges Faced by Rural Cocoa Farmers in Papua New Guinea; A Case Study of Wareo Area in the Kate Local Level Government Area in Finschhafen District, Morobe Province.
Nagiob JESSE	MCS	2	Dr Yarapea / Prof. Gilder	A communication system for facilitating downstream processing of locally grown rice: A case study on YabimMape LLG, Finschaffen District, Morobe Province.
Ian YENGKI		2	Dr Aisoli-Orake/ Prof. Khan	Topic: " Sustainable Development: A Strategic Communication Model for Stakeholders of Sepik Plain Oil Palm Project."
Elymas BAKUNG	PhD	1	Prof. Khan/Assoc. Prof. Sali	The Propagation of Socio-economic Restructure by Cult Doctrines and its Threats to the Future of the Existing Formal Socio-economic Structures in Morobe Province.
Michael WINUAN	PhD	2	Prof Gilder & Dr Yarapea	Impact of Nominated Channels to Communicate Messages on Out-growers' Receptivity: A Case Study of Oil Palm Out-growers at Buvussi, Kapore and Sarakolok.

Undergraduate Final Year Research Supervision (CD 472)

STUDENTS, SUPERVISORS, RESEARCH TOPICS - 2017

	Surname	First Name	Sex	Supervisors	Research Topic
1	APA	Agnes	F	Professor E. Gilder	Understanding The Effects of Lack of Manpower on Health Services: Survey on The Health Centre In Lae District, Morobe Province

2	BAILASI	Kay	F	Mr N. Mitio	Incorporated Land Group Re-Registration: A Case Study of the Communication Difficulties of Land Group Leaders in Milne Bay Estates
3	GAIRO	Roa	M	Dr A. Yarapea	Understanding the Impact of Mobile Phone on Student Learning in Morobe Province: A Case Study of Bugandi Secondary School in Lae City in Year 2017
4	GELIMBING	Henrietta	F	Dr. R. Aisoli-Orake	Early Childhood Learning and The Impact on Young Children. A Case Study of Unitech Play School and Taraka Elementary School 2017
5	HARPEN	Ben	M	Mr J. Kuri	A Research on Application of Rules & Regulations (Laws) Concerning the Use of State Lease Land: The Case Study of Three (3) Mile
6	IGORI	Tereshkova	F	Ms R. Gwale	The Impacts of Land Theft and Over Population within the Nobnob, Nagada And Siar Communities. A Case Study on the Bel Tribe (North Ambenob Local Level Area)
7	JACOB	Naomi	F	Mrs M. Aisi	Communicating the Importance of Empowering

					Communities Through Informal Sector Activities: Case Study of Lae District
8	JIMMY	Helen	F	Miss W. Molus	The Impacts of Urban Expansion on Ahi Customary Land Leading Towards the Formation of Incorporated Land Groups
9	KORAROME	Vicky	F	Mrs M. Harry	How Much Information Government Organizations in PNG, Know about the 'Communication and Development Studies (CDS) Programs Offered the Papua New Guinea University of Technology: A Case Study of Government Organizations in Goroka Urban, Carried Out in 2017
10	LANGA	Steven	M	Mr. J. Kuri	Significance of Participatory Communication in Reducing Petty Crime in Lae City
11	MALAI	Betty	F	Mr N. Mitio	Understanding the Negative Effects of Home Brew Consumption on the Youths in Bundi Comp Settlement. A Case Study on the Bundi Camp Settlement in Lae, Morobe Province

12	MALAM	Robert	M	Miss W. Molus	Assessment of Positive Attitudes Practiced Among Voluntary Treatment Partners (VTPS) in Reducing TB Prevalence at Butibam and Buimo Health Centers, Lae, Papua New Guinea
13	MARK	Paul	M	Mrs M. Aisi	Empowering Girls' Education Through Science Ambassador Program in PNG LNG Project Impact Areas
14	MILBA	John	M	Professor E. Gilder	An Effective Communication Plan is a Vital Tool in Successful Implementation of The Pilot Resettlement Project at the Porgera Mine
15	NULAI	Bernard	M	Professor Golam Khan	Communication Gap Within Incorporated Land Groups in Papua New Guinea. A Case Study of Communication Gap with Ahi Land Owners of Morobe Province
16	PEKI	Rita	F	A/Professor G. Sali	The Usage of Social Network as Communication by University Students: The Case Study of The Negative Impact of Face Book on Papua New Guinea University of Technology Students

17	PULAGIS	Ruth	F	A/Professor G. Sali	Communication Challenges in Service Integration: An Exploratory Study of Family and Sexual Violence Service Providers in Lae, Morobe Province
18	RERE	Able	M	Dr A. Yarapea	Housing Needs in Urban Centers in Papua New Guinea: A Case Study Of One Mile Settlement in Lae, Morobe Province
19	TIMI	Israel	M	Dr. R. Aisoli-Orake	The 'Tok Pisin' Language and Its Implications on the Academic Performance Of Students in Papua New Guinea: A Case Study of Two Upper Primary Schools in Lae (Morobe Province) in 2017
20	UVE	Selina	F	Mrs L. Maino	A Case Study on the Effects of Poor Electricity Service on the Academic Performances of Students at Limke, Lae, Morobe Province from 2010 To 2015
21	WAPHY	Simhron	M	Ms R. Gwale	Impacts of Illegal Mining on Porgera Special Mining Lease: Children Have No Hope for Future after the Closure of the Mine

22	WARPULU	Eileen	F	Mrs M. Harry	A Case Study On "The Lack Of Government Health Services in the Arisisi Village in the Year 2013-2017"
23	WIAVI	Jordon	M	Mrs M. Aisi	An Investigation on the Advantage and Disadvantages of Mobile Phones on Academic Progressions/Transition of First Years of Papua New Guinea 2016

DEPARTMENT OF ELECTRICALAND COMMUNICATION ENGINEERING

Head of Department: Dr Raj Kumar

Introduction

Electrical and Communications, arguably, is the most interdisciplinary of all technical subjects at a University. It is found in almost every single discipline whether it is word processing and data mining, computer technology-based surgery, detection of hostile face in a crowd through image processing, monitoring the soil property and fauna of a farmland/forest through multisensory network or in satellite monitoring of ocean, land use and abuse. Electrical and communication technology is used in the advanced systems of deep space technology. It may be used in a remote village to assist the villagers, nurses and doctors to identify disease from symptoms reported or logged in (using English or Pidgin) and the medicines to be prescribed from an intelligent off-line computer that rapidly mines and plays the role of the medical doctor in diagnosis and prescription. Connect a blood pressure measuring electronic device and a temperature measuring sensor to the computer, it becomes an “on line” computer in a village which can sometimes even do better than a medical doctor and a nurse for certain diseases if at the basic research level, the partnership between the medical doctor and engineer has produced a very intelligent diagnosing system. Energy Systems Analysis where an electrical engineer works together with those in natural, applied and social sciences can enable the government not only to effectively deploy energy resources, including renewable energy, but also to effectively plan and make policies regarding power generation and distribution and energy saving.

Since University of Technology is the premier University of Papua New Guinea in Technology, especially in the engineering disciplines, it is indeed pertinent that the research plan should aim at projecting and developing it as a leading institute in the Oceania, producing undergraduates that are competent to be top class engineers and leaders, able to position themselves as advisors and wealth generators for the community. Moreover, it is pertinent that that the University should generate new knowledge and new technology that is relevant to the local and national needs, including that which will take away dependence on hiring expertise from abroad but

make Papua New Guinean engineers and researchers as able to provide the needed technical and research expertise to attract foreign industries to invest in Papua New Guinea and produce a local job market and economic benefit to the nation. To be second class or lower in undergraduate and postgraduate education and research is to be perpetually dependent on expatriate expertise in engineering and research, with the local graduates and researchers being dependents and a burden until the national wealth is exhausted. Hence as a leading department in engineering our vision is set on producing undergraduates and postgraduates trained in state of the art technology and research techniques and findings that will make us as a department able to compete with the best of Universities in the Oceania, and, we hope one day, globally.

Teaching, Learning and Research and Innovation of a fast advancing engineering science and technology are the tasks that face the Electrical and Communication Engineering Department. Moreover, with the rapid decrease in the price of computer technology and electronic, electromagnetic sensors there are now more problems open to solutions by electrical and communication engineers within reasonable costs, an ability to manage large amount of data (large computer memory available in small chips) and at rapid speeds (faster microprocessor and communication speeds through light speed wireless and optical fibre systems).

An additional three priorities could be added when the Phase 2 (2017-2019) of the research plan is ready at the end of the first three years. One of the priorities for Phase 2 will be Sustainability where we project that about 70% of the full academic carder will be filled with national members of staff, of which a minimum of 80 % will have PhDs) and the rest with competitive expatriate members of staff expert in one of the ten specializations and able to work together giving significant research leadership in the global scenario.

Our basic commitments, in keeping with these priorities are:

1. A department that is fully integrated with Papua New Guinea industry and community, changing society and creating wealth.
2. Depth of quality and multidisciplinary in learning and applications through class room, laboratory and research programs which have measurable outcomes.
3. Research and Innovation work that is beneficial to the local community and contributes to knowledge and experience to international challenges in science and technology and their functions in society.

Vision

Cutting edge teaching and research programs that are based on experimental based courses and high impact research Amongst the top 20 electrical communication /computer engineering-discipline departments in the electrical and communication engineering discipline in the Oceania at the end of next three years. Internationally recognized research and technical leader for Papua New Guinea, at the end of the three years, in two of the three major research clusters

Academic Priorities and Basic Commitments

The major **academic priorities** for **phase one (2017-2019)** of the research plan was the following:

1. Integrate Research with Teaching and Learning
2. Connecting the academics with the community for its service
3. Make the teaching and learning process compatible with industry
4. Recruitment of the best talents nationally and internationally and retaining them.

Research within the Department in 2017

	Researcher's Name	**Research Title**
1.	Mr. Wilson Kepa	GSM based Industrial Automation and Protection Systems
2.	Ms. Rani	Smart Energy Management System
3.	Mr. David	A Tok Pisin based programming language for programming FPGA
4.	Mr. Lolong Karipinne Bonner	Shorter Duration Digital Impulses Generator To Enhance Digital Data Processing and Transport Rates On VSAT MODEM/CODEC/Routers
5.	Mr. Samy Aiau	Renewable Energy Sources for Morobe Province and future National Smart Grid for PNG
6.	Mr. Joseph Fisher	Design and Protection of Aircraft against Severe Electric Storms: with special reference to increasing use of Carbon Composite Material in aircraft body
7.	Mr. H. Kunsei	Array antennas and signal processing for Underground Mine Telecommunication Systems
8.	Dr. Raj Kumar	Smart Battery Management System

Description of the work:

1. **Smart Battery Management System**

This research is an embedded system designed for battery management and is specified as smart battery management system (BMS). It is interdisciplinary research which includes Battery, soft computing (Neural Networks and Fuzzy Logic) and embedded system. The BMS for battery monitoring uses artificial intelligence where artificial neural network and fuzzy logic is used to map battery behaviour. This system indicates battery status that results in timely detection and alarming of its non-working status which is very essential for reliability and safety of all instruments.

2. **GSM based Industrial Automation and Protection Systems**

Global System of Mobile Communication (GSM) is playing a mutual role in the communication industry in providing data, voice and Short Message Service (SMS) where real time distant communication is reality. In the PNG context as is being revealed at the Internet Filtering and Policy workshop, Port Moresby, "With the increase in technology, Papua New Guinea now has over 900, 000 internet users and 3.3 million people out of the total population of 8 million use a mobile phone." (Charles Punaha CEO NICTA, 2016). This project is a multipurpose state of the heart machine to human remote communication system using GSM as a choice of infrastructure.

GSM based industrial automation, protection and monitoring systems is very challenging yet beneficial. Today in the 21st century with emerging technology in industrialization, equipment and workers safety is considered to be the highest priority. Tracking, automation and surveillance systems using sensors for systems like electrical motor automation, pressure measurements, acceleration, flow rate, inclination, temperature, humidity, and hazardous gas leakage concentration using wireless sensor networks (WSN) is found to be the promising solution regardless of the geography and settings of the industry.

3. **Space Technology Based Smart Grid System Evaluation for PNG: Focusing on Markham District New Township Solar- wind Renewable Energy Supply**

A portable weather station with an inbuilt data logger and a modem was installed on an 8 meter constructed tower at the Umi solar and wind site at the end of August 2016. Please note that the portable weather station has the capability of remote monitoring and transfer of data from

the site to a computer in an office however the set will require a web base IP address which requires a use of internet domain name set up. Hence currently travelling every two weeks, to and from the research station site at Umi, Markham District and manually downloading the data on a flash drive.

During the 2017 study program the portable weather station set up at Umi, Markham District in the Morobe Province was logging in the ground-based measurements of solar irradiances and wind speeds and wind directions. The portable weather station has been logging in the solar irradiance, wind speeds and directions starting September 2016 and throughout the 2017 study program these data have been downloaded onto a flash twice every month to the end of 2017 and will continue into year 2018. These data will be analysed and compared with the GIS data (completed in 2016 with the assistance of Dr Sailesh Samanta, Head of GIS section, Department of Surveying and Lands Studies, PNG University of Technology) and simulate the solar and wind power generation at the Umi site for the new Umi Township for the Markham District.

For the 2017 study program the following were carried out

- Ground-based measurements (data logger) of solar irradiances and wind speeds at the Umi weather station research site (continuing into 2018).
- Analysis of the ground-based measurements of solar irradiances and wind speeds for the Umi site.
- Developed solar and wind models and started simulations using the Matlab/Simulink and ETAP (Electrical Transient Analysis Program) simulation software packages.

The simulations will be basically on the power flow or load flow analysis on the various models of distributed power systems. In the simulations I am limited to 25 bus power systems, while the Ramu grid has over 80 buses.

4. Renewable Energy Sources for Morobe Province and future National Smart Grid for PNG.

In this work a study of renewable energy (RE) sources available in PNG with a focus on the Morobe Province is carried out, while mapping for Wind energy and Solar energy potential in the whole of Papua New Guinea is done. Following the identification and calculations of significant RE resources in certain areas, the work will design and optimize the connection of

the RE sources not only to local town/village residences, but also to the main Ramu power grid, which is largely driven by hydroelectric power and increasingly by diesel generators.

5. **Array Antennas and Signal processing for Underground Mine Telecommunication Systems.**

It is recognized that wireless communications in the underground mines will have advantages over the wired (e.g. using leaky wave cables) telecommunication systems currently used in underground mines including for the location and communication with miners trapped by tunnel collapse or explosions.

However, the underground mine presents a formidably harsh environment for space waves radiated by antennas. In this work a new design for array antennas is sought, with appropriate measurements of underground signal propagation measurements done to design against interference due to multiple reflections from the cave surfaces as well tunnel bends and junctions. Initial work has made progress in the design of an array antenna that is simple in structure but will generate a single beam with significant reduction in additional beams which lead to waste of battery power as well as multipath signals emanating from the unwanted side lobes. This will also cut down on the need for reflectors which are commonly used in above ground wireless telecommunication systems.

6. **Design and Protection of Aircraft against Severe Electric Storms: With Special Reference to Increasing Use of Carbon Composite Material in Aircraft Body**

To make aircraft lighter and faster, both commercial aircraft (reduction in fuel) and military aircraft (allowing for faster manoeuvres when combating enemy aircraft) increasingly use carbon composite material. These have less withstanding power to lightning strikes, less shielding effectiveness for internal electronic system and demand a different geometrical structure to reduce the effects of severe electric storms. Moreover, with climate change and increase of earth surface and atmospheric temperatures, the thunder storms are expected to increase in severity calling for different strategy to handle future threats to land, sea and air borne systems and devices. The research work has successfully modelled and simulated realistic scenarios of aircraft-lightning electrodynamics to generate and analyse transient currents on aircraft surfaces which are almost impossible to measure when direct hits occur, as recent work on this at the Netherlands National Laboratory has shown (aircraft are deliberately flown into thunder storms).

7. Lightning Protection of Aircraft, Power Systems and Houses containing IT Network Electronics

Over the past decade there has been an increasing interest in lightning and lightning protection for several reasons, including the proliferation of microelectronic equipment and IT systems in mission critical systems as well as in everyday use in banks to homes. Lightning strikes to power lines produce large fast transient voltage and current surges which trickle down to IT systems, military command and control systems as well as to several other microelectronic equipment and control systems. Moreover, aircraft are struck by lightning when it is parked on ground, landing and taking off or in military operations where the aircraft has to keep close to ground even when the atmosphere is electrified by a thunder clouds. Unusual phenomena have been recently observed which includes a lightning flash in the USA which stretched to over 350 km (say from Kuching to Bintulu), and in 2016 about 300 reindeer in Norway were killed by a single lightning strike to ground. Severe thunderstorms may soon become more common if the temperature signature of the earth surface with climate change continuous as at present. Whereas a single lightning phenomenon was expected to last only for one second, it has been recently observed that a single lightning event may last as long as seven seconds, packing in immense amount of energy and repeated strikes at one location or to one object. The energy and intensity of lightning may continue to increase causing damage and electronic rust, as well as increasing threat to human life. In this paper we explore the protection of electronic equipment, structures and in-house systems from lightning. The paper will also explore lightning related Electrostatic Discharge (ESD) threat to aerospace vehicles and microelectronic systems. This is especially so with the increased use of non-metallic, composite material for the aircraft body. Moreover, the paper will report on the important lightning techniques used in the protection of electric power systems and houses.

8. Observations on Electrostatic Discharge Theats to Aircraft Body and to Aerospace Electronics

Electrostatic Discharge (ESD) is a well-known threat to aerospace vehicles and microelectronic systems. This is especially so with the increased use of non-metallic, composite material for the aircraft body. Moreover, the severe lightning flashes to aircraft also commence with ESD on the aircraft body. The ESD results in the initiation of positive leaders that grow towards the thundercloud from one part of the aircraft. Moreover, a negative leader is launched towards the ground or another cloud. In this paper, we discuss the induced electric charges due to the vertical electric field component of the thundercloud charge center. Further, the electric

currents induced on the surface of the aircraft body or equipment by the horizontal component of the thundercloud generated electric field is examined. From the electrostatic fields computed prior to the initiation of corona or the initial leader, we show that in addition to the most commonly identified part of the aircraft from which leaders are initiated, namely the radome, the main wing tips, the curved surface of the mid-wing and the stabilizer tips experience highly enhanced electric fields. These electric field enhancements may also lead to the generation of electric breakdown.

Publications in 2017

Journal

1. Fisher, J., Hikma Shabani, P.R.P Hoole, M.R.M. Sharip, K. Pirapaharan, Al-Khalid Hj Othman, Norhuzaimin Julai, R. Harikrishnan, and S.R.H. Hoole (2017) “Observations On The Electrostatic Discharge Threats To Aircraft Body And To Aerospace Electronics”, Journal of Telecommunication, Electronic and Computer Engineering, e-ISSN: 2289-8131 Vol. 9 No. 3-10 (pages 95-98). http://journal.utem.edu.my/index.php/jtec/article/download/3161/2245.

2. Hoole, P. R. P., J. Fisher, K. Pirapaharan, Shirley Anak Rufus, Al Khalid Hj Othman, Norhuzaimin Julai, K.S. Senthilkumar, Ahmed M A Haidar, Mohd Ridhuan Mohd Sharip, and S.R.H. Hoole (2017). “Lightning Protection of Aircraft, Power Systems and Houses containing IT Network Electronics”, Journal of Telecommunication, Electronic and Computer Engineering, e-ISSN: 2289-8131 Vol. 9 No. 3-10 (pages 1-7), http://journal.utem.edu.my/index.php/jtec/article/viewFile/3145/2229

3. Kavi, M., Y. Mishra and M.D. Viltahgamuwa, "Adaptive DC Arc-Fault Detection Stratgey in PV Systems Using Multistage Morphological Fault Detection Algorithm", IEEE Transaction on Sustainable Energy (under review)

4. Kavi, M., Y. Mishra and M.D. Viltahgamuwa, " DC Arc-Fault Detection in PV Systems Using Multistage Morphological Fault Detection Algorithm",IEEE Power and Energy Society General Meeting (PES GM), Portland OR, USA, 2018 (under review)

5. Kunsei, H., K. Bialkowski, M. S. Alam, and A. M. Abbosh (2017), "Improved Wireless Communications in Underground Mines Using Reconfigurable Antennas," IEEE Transactions on Antennas and Propagation, Accepted with revisions.

6. Kunsei, H., K. Bialkowski, and A. M. Abbosh (2017), "Investigating Link Reliability of a Pattern Reconfigurable Antenna in Straight Tunnel for Underground Mines," IEEE Communications Letters

7. Kumar, Manoj and Raj Kumar (2018). “An Ultra-Low Power Segmented Digital-to-Analog Converter,” International Journal of applied of Engineering Research (IJAER), Volume 13, No. 4, pp. 1833-1837.

8. Kumar, Raj., Awasthi Yogendra Kumar., Singh, Himanshu., Sharma, Manish Kumari, Sarita (2017) “Vase Shape UWB Antenna”, Advanced Science Letters, Volume 22, Number 11, pp. 3714-3718(5)

9. Sharma, M., Y. K. Awasthi, H. Singh, R. Kumar (2017), “Compact UWB Antenna with High Rejection Triple Band-Notch Characteristics for Wireless Applications”, International Journal of Wireless Personal Communication (SPRINGER), pp.1-15 ISSN: 0929-6212

Conference Papers

1. Raj Kumar and Deepak (2017). “Routing and security analysis in vehicular ad-hoc networks (VANETs)”, IEEE International Conference on Power Electronics, Intelligent Control and Energy Systems (ICPEICES), IEEE *Xplore*: http://ieeexplore.ieee.org/document/7853606/

2. Sammy S. Aiau1, Kadasamy Pirapaharan1, Sailesh Samanta1, Paul R. Hoole (2017). “Renewable Energy Resources Mapping in Papua New Guinea: Solar and Wind Power, Case Study in Markham Valley, Morobe Province, Papua New Guinea”, 2017 IEPNG Engineering Conference in Port Moresby from 18 - 19 April, 2017.

List of Research Students

Researcher’s Name	Supervisors	Program	Research Title	Remarks
Mr. Wilson Kepa	Dr. Raj Kumar	MPhil	GSM based Industrial Automation and Protection Systems	Work in progress
Ms. Rani	Dr. Raj Kumar	MPhil	Smart Energy Management System	Work in progress

Mr. Lolong Karipinne Bonner	Dr. Raj Kumar Dr. K. Pirapaharan	MPhil	Shorter Duration Digital Impulses Generator To Enhance Digital Data Processing and Transport Rates On VSAT MODEM/CODEC/Routers	Started in Year 2016, work in progress
Mr. David Chen	Dr. Raj Kumar	Ph.D.	A Tok Pisin based programming language for programming FPGA	Work in progress
Mr. Gibson Kupale	Dr. Raj Kumar	Ph.D.	Analysis and control of nonlinearity in fractional order electro-mechanical systems	Work in progress
Mr. Samy Aiau	Dr. Raj Kumar Prof. P.R.P. Hoole Dr. K. Pirapaharan	PhD	Renewable Energy Sources for Morobe Province and future National Smart Grid for PNG	Registered in Year 2015, work in progress
Mr. Joseph Fisher	Prof. P.R.P. Hoole Dr. K. Pirapaharan	PhD	Design and Protection of Aircraft against Severe Electric Storms: with special reference to increasing use of Carbon Composite Material in aircraft body	Registered in Year 2015, thesis submitted

DEPARTMENT OF FORESTRY

Head of Department: Dr Mex Peki

UNITECH's Forestry Department is the only academic institution in the South Pacific island region to confer undergraduate and postgraduate degrees in Forestry.

Education is the university's principal mission and the Forestry Department aims to provide high quality academic and administrative support services not only for undergraduates, but with increasing focus on the training of postgraduate students. Our postgraduate program continues and further develops research skills they began learning through Year 3 courses (especially 'Experimental Design'), and culminating in Year 4 (final year research project).

Our overall educational challenge in forestry is to produce professionals, both men and women, with the necessary technical skills. Foremost amongst these is the ability to solve problems. It is to develop this problem-solving capacity that our department's research activities fundamentally fit into our education mission. To achieve this goal requires that the faculty themselves are not only well versed in research but apply that knowledge through active research projects and programs. This five-year plan is our first departmental articulation of the strategies and mechanisms by which we hope to enhance our department's research activity component. The document also points out current, significant constraints in attaining our objectives that must be overcome at the university level.

FOREST/FORESTRY RESEARCH THEMES

The Forestry Department has long recognized the multi-faceted value of Papua New Guinea's forests, and over the years has woven this into its academic and research program. Sustainable forestry in PNG requires a cross-disciplinary approach, which today means blending aspects of the economy, social features, environment services and climate change.

The Department structures its Research Development Plan and Post Graduate Study Program around a number of specific research themes:

- ✓ Ecosystem and Environmental Services

- ✓ Forest Biology, Ecology& Biodiversity
- ✓ Forest (health) Protection
- ✓ Wildlife Management, Community-Driven Forest Conservation.
- ✓ Role of Forests in Climate Change
- ✓ Silviculture, Including Reforestation and Plantation Management
- ✓ Agro-forestry/ Social and Community Forestry and Multiple land-use
- ✓ Wood Science and Technology; Timber Production/Utilisation
- ✓ Forest Engineering
- ✓ Forest Policy, Economics and Forest Product Marketing
- ✓ Appropriate Technology
- ✓ Remote Sensing and GIS
- ✓ Biomass Energy

SUMMARY OF FACULTY MEMBERS - 2017

Name	Position	Research Interest
Dr. Mex Peki	HOD & Senior Lecturer	Forest inventory including measurements and estimation of timber volume, biomass and carbon in plants (above ground). Sustainable Forest Management and Planning
Dr Osia Gideon	Professor	- Plant systematic (specialist in the families Rubiaceae, Portulaceae, Costaceae, Zingiberaceae & Arecaceae) - Plant diversity and Conservation - New Guinea Biogeography - History of New Guinea Botany (exploration and biographies of botanists) - Sustainable use of biodiversity (traditional and contemporary uses) - Forest Policy for Sustainable Development
Mr. Peter Edwin	Lecturer 2	Wood science and technology; forest management (Currently, PhD study University of Melbourne)
Mr. Rapo Pokon	Lecturer 2	Plant biology, pest and disease
Mr. Haron Jeremiah	DHOD & Lecturer 1	Forest Economics and marketing
Mr. Diaiti Zure	Lecturer 1	Natural forest Silviculture; Forest Genetics; Soil-plant-microbial interactions and nutrient dynamics under changing environmental conditions; Ecological and molecular responses of plants and trees (crops) to climate change; and Evolution, phylogenetic and diversity of secondary medicinal plant metabolites (Currently study leave; PhD in Taiwan)
Mr. Leonard Wana	Principal Technical Officer [ARD]	Forest Inventory & GIS
Mr. Eko Maiguo[1]	Principal Bulolo University College & Lecturer 2	Silviculture and Forest Management
Mr. Louis Veisami[1]	Technical Instructor 2	Forest Mensuration and Inventory
Mr. Benson Gusamo[1]	Lecturer 2	Wood Science & Technology, Forest Products, Non-timber Forest Products, Bio-energy
Mr. Bazakie Baput[1]	Lecturer 1	Community Forestry, Agro-forestry and Forest Ecology

Mr. Olo Gebia[1]	Lecturer 1	Forest ecology and plant biology; Forest biodiversity
Mr. Tombo Warra[1]	Technical Instructor 1	Plant Ecophysiology and Conservation Ecology
Mr. Russell Tarutia[1]	Technical Instructor 1	Forest Surveying and GIS
Mr. John Beko[1]	Technical Instructor 1	Silviculture and Plant Propagation
Miss Pricilla Menin[1]	Technical Instructor 1	Community Forestry, Communities response on forest plantation and projects
Mr. Leonard Hansutan[1]	Technical Instructor 1	Phytoremediation - plant/soil and toxic chemical relationship
Mr. Samson Aguadi[1]	Technical Officer 1	Forest Enumeration through Imagery, Forest App Development and Forest Harvesting Operation Planning.
Mr. Koniel Alis[1]	Technical Officer 1	Bio-energy and Sawmilling

Note: [1] Means Faculty members based at Bulolo University College (BUC)

ON-GOING RESEARCH PROGRAMS IN THE DEPARTMENT (2017)

The Forestry Department has a number of on-going research activities, which are segregated according to general theme and briefly described below, noting the principal investigators involved:

- **Ecosystem and Environmental Services**

- **Forest Biology, Ecology & Biodiversity**

1. Effects of altitude on soil seed bank community along an altitudinal gradient in Morobe Province, Papua New Guinea (Olo Gebia).
2. A review of genius Ixora in Papuasia region with an exploration of sources of species richness including flower-dependent niche partitioning (Heveakore and Gideon)
3. Using distribution of geomatridae moths to understand the changes in forest along the latitudinal gradient in PNG (Jason Paliau and Rapo Pokon)
4. Exploring root causes of *Piper anduncum* competitive ability with an investigation of possible mitigative control measures in the Bulolo *Araucaria* plantations (Morobe Province, PNG (Clifford Single and Larry Orsak)
5. Patterns of Fern Species Richness and Beta Diversity in Highlands Ecosystems of PNG (Gibson Sasonika and Osia Gideon)

- **Forest (health) Protection**

1. Fruit fly community observation and assessment in PNG forests for forest health analysis (Reedley Opasa and Rapo Pokon)

2. The Importance of latex as a defense against folivorious insects in a tropical rainforest (Grace Luke and Osia Gideon)

- **Wildlife Management, Community-Driven Forest Conservation**

1. The Role of Indigenous Knowledge in Forest Management: Implication for the Multi-purpose National Forest Inventory in PNG (Constin Bigol & Mex Peki)

- **Role of Forests in Climate Change and Carbon Trade**

    1. Modeling of Forest Soil Carbon on Primary Forest Types in Morobe Province using Terrain Attributes (Leroy Moripi and Mex Peki)
    2. Estimating above ground biomass and carbon in selected forest types in PNG (Bruno Kuroh & Mex Peki)

- **Silviculture, including Reforestation and Plantation Management**

1. Clonal Propagation for Eaglewood (John Beko)
2. Investigating seed propagation and agar wood formation of Papua New Guinea Eagle wood (*Gyrinops ledermannii*): Seed germination and fungi efficacy (John Beko)
3. Variation in soil moisture, pH and texture in cultivated eaglewood (*Gyrinop* sp) sites (John Beko)
4. The potential effect of different hormone concentrations on the root initiation and development from stem cuttings of *Santalum macgregorii* (John Beko)

- **Agro-forestry/ Social and Community Forestry and Multiple land-use**

1. Motives for grassland burning and the consequent threat status in Markham Valley (Haron Jeremiah)

- **Wood Science and Technology; Timber Production/Utilisation**

    1. Physical Wood Strength of *Anisoptera thurifera* for Constructional use in Papua New Guinea (Peter Edwin
    2. Wood strength testing to use in the design of house and bridge structures (Peter Edwin)
    3. Strength Dynamics of *Araucaria cunninghamii* (Hoop) from Bulolo Forest Plantation
    4. Conducting natural durability test using soil bed trials by lesser known timber species: *Macaranga aleuritoides* and *Trema orientalis* (Steven Keki and Benson Gusamo)
    5. Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG (Steven Komut and Mex Peki)

6. Comparing physical and mechanical properties of in the sapwood and heartwood of *Terminalia brassii* (Regina Ombolu and Mex Peki)

- **Forest Engineering**

1. The productivity Study of Skidding Operation at Bulolo Pine Forest Plantation
2. Study on Soil Compaction on Skid Trail and Landings due to Harvesting Activities in Bulolo Forest Plantation

- **Forest Policy, Economics and Forest Product Marketing**

1. Role of Policy in Export Trade of Round logs in PNG, Guyana and Gabon (Haron Jeremiah)
2. PNG Forest policy now and for the future (Dambis Kaip & Mex Peki)

- **Appropriate Technology**

1. Mini-Pro Solar Kiln Timber Dryer – Drying of hardwood timbers using solar energy (low power consumption) technology (Peter Edwin & Ono Pendis)

- **Remote Sensing and GIS**

1. Land use and land cover detection using medium and high resolution data by remote sensing techniques in the Markham valley of Morobe Province, PNG (Russell Tarutia)
2. Measuring Forest Land Use Change in PNG between 2000 -2015 (Gewa Gamoga & Mex Peki)

- **Biomass Energy (Koniel and Benson Gusamo)**

  - Trial Production of Wood Pellets from Sawdust with Cassava Starch from Five Native Timbers for Bio-energy Purpose

POSTGRADUATE RESEARCH PROJECTS IN 2017

Post Graduate Candidate's Research Titles in 2017

#	Name	PG CODE	THESIS/ RESEARCH TITLE	PRINCIPAL SUPERVISOR	External Supervisor
1	Dambis Kaip*	MPhil/2	PNG Forest policy now and for the future	Dr. Mex Peki	Dr. Ruth Turia
2	Gewa Gamoga*	MPhil/2	Measuring Forest Land Use Change in PNG between 2000 -2015	Dr. Mex Peki	Dr. Abe Hitofumi
3	Constin Bigol*	MPhil/2	The Role of Indigenous Knowledge in Forest Management: Implication for the Multi-purpose National Forest Inventory in PNG	Dr. Mex Peki	Dr. Ruth Turia
4	Steven Komut	MPhil/2	Physical, Mechanical and Wood Working Properties of *Trema orientalis* (L) Blume in PNG	Dr. Mex Peki	Professor M Hossain
5	Bruno Kuroh*	MPhil/2	Estimating above ground biomass and carbon in selected forest types in PNG	Dr. Mex Peki	Dr. Cossey Yosi
6	Leroy Moripi*	MPhil/1	Modeling of Forest Soil Carbon on Primary Forest Types in Morobe Province using Terrain Attributes	Dr. Mex Peki	Dr. Peter McIntosh and Mr. Nalish Sam
7	Clifford Single	MSc/2	Exploring root causes of *Piper anduncum* competitive ability with an investigation of possible mitigative control measures in the Bulolo *Araucaria* plantations (Morobe Province, PNG).	Dr. Larry Orsak/Mex Peki	
9	Koniel Alis	MSc/1	Trial Production of Wood Pellet from	Mr. Benson Gusamo	

			Sawmill Waste for Bio-energy Purpose		
11	Haydrian Morte	MPhil/2	Effect of Labour Cost to Informal Sawn Timber Production Using Portable Mills along Bukawa and Bulolo roads, Morobe Province, PNG	Mr. Haron Jeremiah	
12	Reedley S. Opasa*	MPhil/2	Fruit fly community observation and assessment in PNG forests for forest health analysis	Mr. Rapo Pokon	Dr Novotny
13	Jason Paliau*	MPhil/1	Using distribution of geomatridae moths to understand the changes in forest along the latitudinal gradient in PNG	Mr. Rapo Pokon	Dr Novotny
14	Grace Luke*	MPhil/1	The Importance of latex as a defense against folivorious insects in a tropical rainforest	Prof. Osia Gideon	Dr Novotny
15	Gibson Sasonika*	MPhil/2	Patterns of Fern Species Richness and Beta Diversity in Highlands Ecosystems of PNG	Prof. Osia Gideon	Dr Novotny
16	Miller Kawanamo*	MPhil/2	Tree species diversity and forest structure in different vegetation types and disturbance levels	Prof. Osia Gideon	Dr Novotny
17	Enock Kaledimimo*	PhD	Modern and traditional resource ecology of culturally and socially important tree species in PNG (to be further refined)	Prof. Osia Gideon	Dr Novotny
18	Bulisa Iova*	MPhil/2	The effect of habitat types on bird communities in different elevations throughout	Prof. Osia Gideon	Dr Novotny

			PNG. Exploration of Beta-diversity, Alpha-diversity and abundance		
19	Jacob Yombai*	MPhil/1	Diversity and community composition of ants (Hymenoptera: Formicidae) in the forest of PNG	Prof. Osia Gideon	Dr Novotny
20	Heveakore Maraia	MSc/2	Review of the Genus *Ixora* (Rubiaceae) in the Papusia region, with an exploration of sources of species including flower-dependent niche portioning	Prof. Osia Gideon	
21	Samson Aguadi	MSc/1	Addressing speed and accuracy of identifying plants in PNG via leaf image classification algorithm	Prof. Osia Gideon	
22	Anthony Troy Turagavuli	MSc/1	Technique for Improving Seed Germination in *Santalum macrogoria*	Prof. Osia Gideon	John Beko

Note *Candidates under PNGFA NFI - EUFAO Projects

UNDERGRADUATE RESEARCH PROJECTS IN 2017

Final Year Student Research Reports in 2017

No.	Student Name	Title	Principal Supervisor(s)	External Supervisor
1	Chrisestom Sow	Range comparison of boron symptoms in *Araucaria hunsteinii*	Rapo Pokon	
2	Joachim Wafewa	Assessing (site) growth performance of teak provenance trial at Situm	Mex Peki	Anton Lata
3	Fitler Lakora	Study of soil seed bank in primary forest to determine presence of invasive species already in the soil seed bank	Osia Gideon	
4	Rita Samuel	Litter fall assessment in a lowland logged-over forest	Rapo Pokon	
5	Joshua Ombo	Assessment of earthworm population in fertilizer-rich oil palm soil and normal recovering forest soil adjacent in Ramu	Rapo Pokon	William Unsworth
6	Peter Noimbano	Assessment of shallow landslides using 1-D and 3-D slope stability analysis	Leonard Wana	
7	Isaac Wano	Assessment of most demanding wood products in Lae	Haron Jeremiah	
8	Rexford Felix	Land use/land cover change detection using GIS models for Huon Gulf District of Morobe Province, Papua New Guinea	Leonard Wana	Dr. S. Samantha
9	Roger Yara	Assessing of nitrate (NO_3) concentration in Hobu River by random land use practice against forest cover area	Leonard Wana	
10	Victoria Bongsap	Traditional use of insects In Naeweb & Huon districts, Morobe Province	Rapo Pokon	
11	Ben Troniap	Identifying endophytic fungi for *Gyronops ledermanii*	Rapo Pokon	John Beko
12	Moro Suave	Does boron deficiency in *A. cunninghamii* make it vulnerable to termite infestation?	Benson Gusamo	

13	Jim-Ach Akuli	Assessing density and mechanical properties of mangrove timbers along different intertidal zones and carbon estimation	Benson Gusamo	Dr. Lawong Balun
14	Elaine Midi	Natural durability of hardwoods of Oomsis Secondary Forest, Morobe Province, PNG	Benson Gusamo	Benjamin Vali
15	Regina Ombolu	Comparing physical and mechanical properties of in the sapwood and heartwood of *Terminalia brassii*	Mex Peki	Benjamin Vali
16	Delarose Sow	Studying treatment characteristics of secondary timber species	Benson Gusamo	Benjamin Vali
17	Martin Wamung	Reproductive success of *Spathodea campanulata* as an invasive species	Osia Gideon	
18	Joel Kenneth	Comparing species diversity of Butterflies between Botanical garden and Natural forest (Ngalakumbun village)	Leonard Wana	
19	Samuel Gibson	Investigating the legality of harvesting timber through assessment of species and volume data under the Category of Timber Authority-01 in Nawaeb District.	Leonard Wana & Haron Jeremiah	Dr. Cossey Yosi

ONGOING RESEARCH COLLABORATION WITH EXTERNAL PARTNERS

Apart from internally funded research programs, Forestry Department has been blessed with *number* of opportunities to conduct collaborative research with external partners over the last five years. The formal projects that contain research components include:

1. **Improving the Papua New Guinea balsa value chain to enhance smallholder livelihoods (FST 2009/16) (include the duration of the project) [ACIAR PROJECT]**
    a. Trial Utilization of Balsa End Grain-Panel as Core Material for Door Making, Furniture Component, Packaging and Bee Hive Boxes: An Implication for Creating Balsa Market Opportunity in Papua New Guinea (Benson Gusamo)

2. **Technical support to the Papua New Guinea Forest Authority to implement a multi-purpose National Forest Inventory (GCP/PNG/006/EC) (March 2013 to February 2016) extended [EU FAO PROJECT]**

    a. Most of the research activities here are done by FAO –PNGFA sponsored Post Graduate Students (see table 2).

3. **Enhancing Value Added Wood Processing in Papua New Guinea (FST/2012/092) (July 2014 to 2018. [ACIAR BPROJECT]**

    a. Current staff from DOF Unitech Involved in this Project

- ✓ Dr. Mex Peki – Team Leader Unitech Partner Institute
- ✓ Mr. Haron Jeremiah – Researcher & Research Project Objective 2 leader
- ✓ Mr. Benson Gusamo – Researcher
- ✓ Mr. Peter Edwin – Researcher (on PhD studies Melbourne)
- ✓ Mr. Ono Pendis – Research Officer (ACIAR)

b. Research Activities

i. Preservative Treatment Characteristics of Timbers from Oomsis Secondary Forest, Morobe Province, PNG (Benson Gusamo & 1x undergraduate student)
ii. Investigating Natural Durability of Timbers from Oomsis Secondary Forest, Morobe Province, PNG (Benson Gusamo & 1x undergraduate student)
iii. Investigating Wood Density Trends at Different Inter-tidal Zones as an Parameter to Above-ground Biomass/Carbon Stock in Mangrove Forest, Lae, Morobe Province, PNG (Benson Gusamo & 1x undergraduate student)

iv. Comparing Physical and Mechanical Properties in the Sapwood and Heartwood of *Terminalia brassii* in Unitech Plantation (Mex Peki X 1 undergraduate student).
v. A Role of Industrial Wood Preservation Practice on Mitigating Climate Change (Benson Gusamo)

SEMINAR /WORKSHOP AND CONFERENCE

1) Jeremiah, H (2017). Assessment of Timber sawmilling, marketing and policy Gaps in PNG

Paper presented at the ACIAR workshop at Lae Project Sector workshop, 21st April 2017, PNG Forest Research Institute.

2) Peki, M (2017). Facilitate a training workshop on research design and methods for staff of Timber and Forestry Training College, PNG Forest Research Institute and Forestry Department engaged in ACIAR Project titled "Enhancing Value Added Wood Processing in Papua New Guinea" (FST/2012/092) at Timber & Forestry Training College, Conference room on 05th July 2017.
3) Gusamo, B (2017). Balsa – A Potential Forestry Crop for Innovative Products and its Market Prospect in Future, PNG University of Technology Research Seminar #19 – August 22, 2017, Rose Kekedo Lecture Theatre (RKLT)
4) Maiguo, E (2017). Assessment of Vulnerability and Impacts of Climate Change on Forests in Papua New Guinea (PNG), Paper presented at 8th Huon Seminar Series 07th to 08th November 2017, RKLT

CONSTRAINTS

World-competitive research today occurs only when certain, mandatory infrastructure is present. Because forestry relies so much on field work, reliable personal transport (4-wheel drive vehicle) is our foremost constraint. While lab space and overall research funding are general issues at UNITECH, high quality research is often possible in forestry at surprisingly low cost and our lab space is good compared to other departments.

Less mentioned but probably most fundamental to achieving world-competitive research, however, is access to relevant primary literature. This is woefully inadequate at UNITECH: we rely on antiquated interlibrary loan hardcopies which themselves are limited, plus a few free access journal networks provided by non-profit institutions that do not access many forestry journals. In contrast, researchers overseas enjoy electronic access via an appropriate level of subscription to the Web of Science that would include a spectrum of high calibre Forestry and related journals.

Expatriate faculty, and certain senior national faculty suffer less from this deficiency if they have library connections (via overseas schools they attended, overseas advisors they studied under, etc.), or can pull in literature during overseas annual leaves (i.e. Expatriates). Faculty lacking such connections are at a disadvantage within the Forestry Department and more generally in the university. Currently it is the national faculty who have not recently gone on overseas study leave who suffer disproportionately; it is essential that this inequality be recognized and addressed through much-improved university-wide access to primary literature.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Acting Head of Department: Mr Sipa Benny

Introduction

The Mathematics and Computer Science department offers a four year degree in Computer Science and also teaches Mathematics and Computing courses to other 12 academic departments. The department comprises of 14 full-time academic staff that specializes in fields of mathematics and/or computer science.

The department has continued to change the its computer science curriculum to adapt the new technology and changes in the IT industry. The current first and second year are on new curriculum while the third and fourth year on the old curriculum. By the 2018 the old curriculum would be phased out completely. The department is also embarking on involving more industrial input into the design and delivery of the content of the new curriculum.

1. List of published papers

[1]. Remus, Dieter**;** Ursul, Mihail (2017). Van der Waerden rings. *Topology Appl.* 229:148--175. MR3688668

[2] Ursul, Mihail (2017)**.** Torsion-complete and algebraically compact groups with compact endomorphism rings. *Comm. Algebra* **45,** no. 11, 4817--4832. MR3670353

[3] Ursul, Mihail, V.Bovdi and M.Salim, UAEU, United Arabic Emirates),

Completely simple endomorphism rings. 16 pages. Submitted to the Journal “Applied General Topology”(Spain).

2 List of seminar presentations

[1] (Professor, Dr. Mihail Ursul

Department of Mathematics & Computer Science, University of Technology, Lae, PNG, Topological endomorphism rings,

A talk given at the Department of Mathematics of UAEU University, AlAin, May 2017, 30 minutes.

[2] Dr Lakoa Fitina

Department of Mathematics & Computer Science, University of Technology, Lae, PNG, Cartesian Products of Hypergraphs,

A talk given at the Department of Mathematics and Computer Science, PNG University of Technology, September 2017

[3] Dr Lakoa Fitina gave a series of seminars on Cryptography to some members of the MCS staff**.**

3. Current list of research projects

[1] Lakoa Fitina

A topological view of hypergraphs and their connectivity

[2] Lakoa Fitina, with Priscilla Chris

Decomposing a finite topological space with a view to creating a secret sharing scheme

[3] Lakoa Fitina, with Isaac Angra

Secret sharing schemes based on elliptic curve groups

[4] (Lakoa Fitina, John Lanta, Priscilla Chris and Isaac Angra), Secret Sharing over Topological Groups

[4] (Mihail Ursul jointly with Dieter Remus, Germany), Refinements of compact ring topologies.

[5] Raymond Kuna, The Hartman-Mycielski functor in the class of topological rings

DEPARMENT OF MECHANICAL ENGINEERING

Head of Department: Professor John Pumwa, Ph.D.

Introduction

The Department of Mechanical Engineering considers engineering research to be very important as it leads to an expansion of knowledge and discoveries of new products and services. It is through research that leads to breakthroughs in engineering and technology. Research and experimental development comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Engineering research is the systematic investigation and study of materials and sources to establish facts and reach new conclusions, so it shapes people's understanding of the world around them. Research involves testing hypotheses and predictions using testable data and a full battery of scientific and engineering tools and methods.

Focused Research Areas

The department has decided to concentrate and focus on the following areas of research in mechanical engineering:

i. *Design and Manufacturing*
ii. *Energy and Environment*
iii. *Materials Characterization*
iv. *Engineering Education and Management*

The department encourages faculty to conduct their research concentrating and focusing in the above areas.

Research Seminars

Departmental staff and postgraduate students are encouraged to present seminars regularly and as often as possible. The research coordinator is encouraged to schedule regular research seminars basing on the above areas of research interest.

Faculty Research Interests

The following Table provides research areas of interest for the current faculty members:

Academic Staff Members	Research Areas
Professor John Pumwa, Ph.D.	Tribology (Friction, Wear and Lubrication), Failure Analysis, Energy, Biodiesel, Vehicle Emission Effect on the Environment, Engineering Education.
Professor Nicholas Lambrache, Ph.D.	3-D modeling of weak parts and subsystems, Finite Element, Simulation on stresses – including dynamic stresses and fatigue, Fatigue experiments on computer-controlled devices, Statistical interpretation based on accumulated data from the mine site, Material Science interactive research on minerals affecting strength of metal alloys in mining equipment.
Kamala K. Muduli, Ph.D.	Supply Chain Management, Sustainable Development, Operations Management, Health Care, Waste Management.
Syed Wahid, Ph.D.	Research in the Broader Area of Energy, Renewable/Sustainable Energy, Environment and Pollution, Heat Exchanger's, Behavior/Control of Heat Flow at the Interface of Materials, Tribology, MEMS in Energy Exchange Applications.
G M. Arshed, Ph.D.	Numerical Analysis, Fluid Dynamics
Mr. Jack Khallahle	On Study leave
Mr. Samuel Dunstan	On Study leave

Mr. Steve Ales Korokan	On Study leave
Mr. Brian N'Drelan	Renewable energy – use of solar to provide power, efficiency management of renewable energy, Statistical analysis of Failure of mining equipment – study of the properties of the mineral being mined and the effects on life expectancy of equipment components, Safety Analysis of Causes of Accidents leading to analysis of design and even management of existing practices – looking at ethical implications.

Undergraduate Research Projects

The following are final year Mechanical Engineering Students projects offered in 2018 as part of their partial fulfillment of their degree:

Title No.	**Suggested Description**	**Suggested by (Lecturer)**	Students
1	Assessment of Vehicle Emissions Effects on Environment	Prof. John Pumwa	Willie Pua, Jason Mote
2	Design of a Friction and Wear Test Rig	Prof. John Pumwa	Lious Weldon, Jaybesteen Kekeya
3	Financial Effects from Friction and Wear of Machinery	Prof. John Pumwa	Gibson Teithegna, Hero Pya
4	Sago Extraction machine	Prof. John Pumwa	Murukau Jal, Steven Kaman
5	Autonomous Robot. The study and design of parameters in which robotics can be employed. There will be computer programs generated by the students.	Prof. Nicholas Lambrache	Ryan Rombuk, Ezekiel Kerua, Kenya Seta, Yanon Muram
6	Design and fabrication of a Gene Gun Prototype for Genetic Transformation of Plants	Prof. Nicholas Lambrache	Junior Kalep & Malcolm Maliso
7	Microstructural Characterization and Mechanical Properties of Alloys	Dr A MOHAMED (NEW STAFF), Prof N Lambrache	Willie Pua, Jason Mote
8	Study Corrosion Under Insulation in Aggressive Marine Environments	Dr A MOHAMED	Harrison Apana &

		(NEW STAFF), Prof N Lambrache	Keven Gaitu
9	**Maintenance Inventory management (Unitech Transport Vehicles)**. The project will require understanding of the operation of the transport department, the number of equipment, the current maintenance practice. Data collection of equipment failures, analysis of the frequencies of failures and generating a mathematical model, to simulate and predict spare parts requirements.	Mr Brian N'Drelan/ Mr E.R. Sirisena	Amanda Habitein
10	**Design of Waste Management Incinerator for Schools - menstrual Hygiene management.** Project inline with UN Wash Program, through ATCDI. This program can be enlarged to cater for disposal nappies (materials).	Mr B. N'Drelan / Prof K. Muduli	Maria Puy, Natasha Puluspene
11	Desalination plant	Mr Karo Komuna	Jason Harold, Anthony Paal
12	Solar Water Pumping	Mr Karo Komuna	Joshua Harau, Brad Puy
13	Design of a Solar Oven	Dr G.M. Arshed	McDomert Yarus, Patrick Thomas
14	Design of a Solar geyser	Dr G.M. Arshed	Delma Lipu, Ruthie Delkin
15	Design and fabricate anaerobic chamber for producing sustainable energy	Dr Syed Wahid	Robin Pa, Daniel Nimiago
16	**Design of a wind turbine for running pump for Irrigation.** The research into bringing water to areas of the Ramu Sugar farm where water is critical, or not getting sufficient water.	Dr Syed Wahid	Simon Muliap, Aso Yame, John Wamugl
17	The Use of Biomass Fly-Ash in Cementitious Materials	Prof K. Muduli	Simanibu Waram, Percy Wariambu

Postgraduate Students Research

The following projects are being conducted by the Postgraduate Students:

Item	Research Projects	Status	PG student
1	Mechanical Component Failure In Inventory Management	Continuing	Brian N'Drelan (PhD)
2	Feasibility Study of Mini Hydro Power Plant for Six Villages in Eastern Highlands Province	Continuing	Joram Seth (MTech)
3	Studying the possibility of interfacing the Ultrasonic Digital Flaw Detector to a PC/Laptop to carry out UT testing, interpretation of test results.	Continuing	Thomas Peter (MTech)
4	PDI Optimization in Automatic Control of Vessel Fluid Level	Continuing	RoboamPabuar (MTech)
5	Corrosion Rates in Atmospheric and Seawater Environment of Lae Port on Selected Metallic Alloys	Completed (2017)	Stephanie Konts (MTech)
6	Evaluation of current livestock and aquaculture small-scale feed mill equipment used in PNG and development of strategies for best practice under various operating requirements	(Incomplete)	Jimaimah Nathaniel (MTech)

List of Publications

1. Biswal, J. N., K. Muduli, J. Pumwa, S. Satapathy (2017), Analysis of Sustainable Supply Chain Design Criteria for Thermal Power Plants, Huon Seminar, PNG UNITECH, 7th-8th Nov,2017.

2. Brian N'Drelan "*Sustainability of a Company's Operation or Process Through Reliability Centred Maintenance"*, 2017 IEPNG National Conference Innovation and Sustainability, IEPNG, Port Moresby, PNG, 18 April 2017 - 19 April 2017

3. Khan, Ovais U., G. M. Arshed (2017). *"High Resolution Numerical Schemes and Supersonic Flow over a Backward-Facing Step"*, 55th AIAA Aerospace Sciences Meeting, AIAA Science and Technology Forum and Exposition, Grapevine, Texas, USA, January 2017

4. Pumwa, John (2017). **"***Mathematics as a Means of National Development*", 2017 IEPNG National Conference Innovation and Sustainability, IEPNG, Port Moresby, PNG, April 18, 2017.

5. Pumwa, John (2017). **"***Waste Cooking Oil as a Fuel Source for Diesel Engines"*, The Proceedings of the Sardinia Symposium, Waste Management – 2017, Wessex Institute of Technology, Southhapton, UK, October 2 – 6, 2017.

6. Wahid, S. (2017). "Speak Out For Engineers (SOFE)", IMechE News Bulletin, No. 179, 2017.

7. Wahid, Syed M. S. (2017). "*Waste to Energy-Review of Waste Management Activities and Challenges, Papua New Guinea".* Proceedings of Sustainability, Technology and Education 2017, Sydney, 11-13 Dec 2017.

8. Wahid, S. M. S. (2017). Automotive brake wear: a review, Journal Environ Sci Pollut Res, https:doi.org/10.1007/s11356-017-0463-7.

DEPARTMENT OF MINING ENGINEERING

Head of Department: Dr Gabriel Arpa

The Mining Engineering departments offer two degrees- Bachelor of Engineering in Mining Engineering and Mineral Processing Engineering. There are 13 academic staff, 4 Technical staff, 2 Administrative staff and two auxiliary staff. Two of our academic staff are currently on study leave. Mr. Wilson Kobal is undertaking PhD studies in Queensland University of Technology and Mr. Gideon Yowa is enrolled for Masters of Science in Mining Engineering under the Australian Awards Scholarship at the James Cook University, Australia.

Currently, we have 5 students enrolled in Master of Philosophy in the Department embarking on research in Mining and Mineral Processing field.

Research Theme and Focus Areas

The Departments research focus and interest is centred on resource exploitation and extraction techniques, environmental solutions to mining related waste and safety. The main focus areas are;

- Mining production optimization
- Geological modelling and evaluation of uncertainties
- Engineering geology
- Geomechanics and rock mass deformation and behaviour
- Alluvial mining techniques and resources evaluation
- Optimization of gold recovery system
- Innovative solution to Acid Rock Drainage (ARD) problems from mine waste

DR. GABRIEL ARPA, SENIOR LECTURER

Research Priority Areas

- Feasibility study of Kassam Pass Underground Tunnel Construction., Lae PNG.
- Site Blasting specification for Hidden Valley open pit mine using blast vibration monitoring. Morobe Mining. Lae Papua New Guinea.
- Modelling of the Deep Sea Tailing Placement System and Practice in Papua New Guinea.
- Sedimentation Studies of the Watut and Markahm River system and their effect on the environment and Lae Wharf system. Lae Papua New Guinea.
- Mineral Economic studies of mines in PNG after Extension of Mine Life
- Geomechanics Studies of Wafi-Golpu Underground Mining (Block Caving)
- Mechanics of Phytoremediation – Environmental Engineering

UPDATE ON RESEARCH ACTIVITIES IN PROGRESS FROM 2017

Underground Mine Ventilation, Physical and Simulated Modeling

Gabriel Arpa, Luther Wesley

Abstract

Mine ventilation is the process of allowing enough fresh air into underground mine environments so as to make the working area conducive for man and machine to operate. The air flows through ventilation circuits. The plan and design of the ventilation system of any underground mine is thus very important. Also, keeping careful monitoring and managing any existing mine ventilation system makes sure that ventilation is effective. The project involves building a mine ventilation model that can be proven effective for simulation and real time measurement. The model will also serve as an education model for students and up and coming mine ventilation engineers.

Fig. Design and constructed physical model. Mining Laboratory, PNG UNITECH

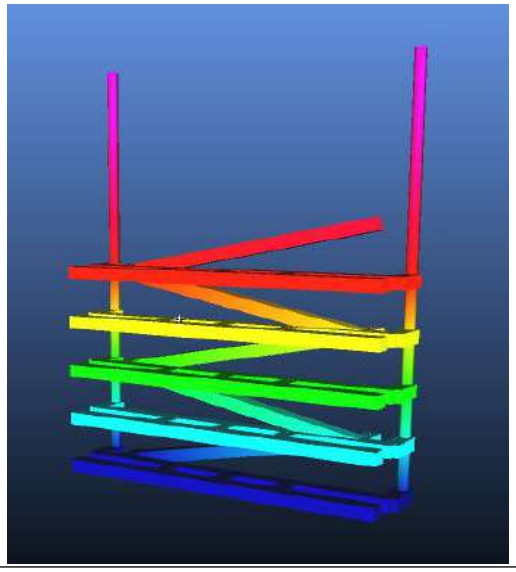

Fig. Ventilation modeling using Ventsim Software

Hydraulic Fracturing in Inducing Block Cavability

Gabriel Arpa, Jason Ivungi

Abstract

Hydraulic fracturing is fast becoming an economical means of preconditioning for caving operations. A detailed understanding of the various hydraulic fracturing parameters can help as an aid to a successful fracturing program. For this project, two of these parameters - the stress conditions with respect to the three principle stresses and mineral composition were studied so as to understand fracture interaction with natural joints and mineral composition for hydraulic fracturing.

It can be concluded that study of the mineral composition of the host rock is often necessary to understand better what types of additives and proppants may be suitable to increase fracture as well as to keep open the fracture. Secondly, depending on the type of rock, igneous, metamorphic or sedimentary - the processes involved in its formation will affect how fractures will develop and grow as was the case for the cementation process involved in the *Leron Sandstone* specimens.

Laboratory Test and Results

UCS test were conducted on Leron Bridge (Markham) Sandstone.

Fig. Mode of failure for the sandstone

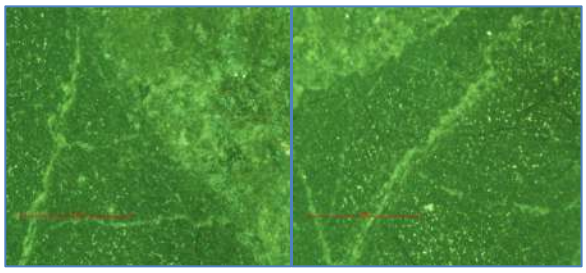

Fig. Set1: Sandstone. Fractures occur in the carbon stains before growth into the rest of the rock. (Microscopic image)

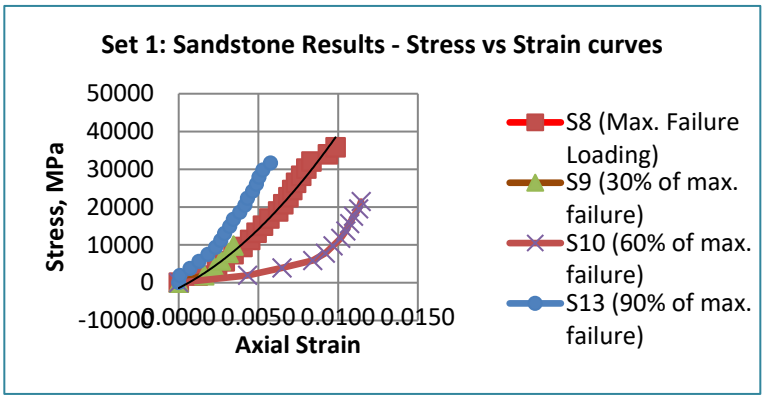

Fig. Stress-strain curves for Set1: Sandstone,

A New Mercury Recovery and Gold Smelting System

John Witne[1], Gabriel Arpa[1], Philip Samar[2], Takaiku Yamamoto[3]

1 – Mining Engineering Department PNG Unitech
2- PNG Mineral Resources Authority
3 – Kyoto University, Japan

The Mercury recovery and smelting test shows that mercury vapour was condensing outside the designated area, rather than the condensers mainly as a result of certain important mitigating factors, mostly related to the design parameters of the Mercury Recovery Kit. The design parameters identified are;

a) The hood was not large enough to channel all off take gas into the extraction pipe and into the sparger.

b) The hood, extraction pipe and fittings were not insulated to retain heat and was exposed to the outside temperature which were at times as low as 15^{o}C and 30^{o}C during the day.
c) The extraction pipes were made of two different materials of completely different physical and chemical properties influencing heat transfer and condensation.
d) The extraction pipe connecting the hood to the sparger was horizontal or almost flat, allowing mercury to condense and settle along the pipe.
e) The pipe was too large and too many fittings resulting in large pressure drop across the hood and condensers affecting smooth flow of hot gas and mercury vapour.
f) The materials used for pipes and fittings are not good conductors resulting in heat loss and plating of mercury inside the pipe, fittings and hood.
g) The driving force which is the retorting and off take gas temperature was not high enough to maintain the vapour temperature until it reaches the condensers without proper insulation.

The overall test results showed that the Mercury Recovery Kit looks promising and can be used for retorting and smelting to recovery mercury. However, for the Mercury Recovery Kit to operate or function efficiently certain design modifications are required

Staff Members' Research Profile

Mr. Ken Ail Lecturer II

- A critical analysis of the PNG Mineral Taxation Regime
- Bougainville's new mining taxation regime

- A review of the hydrocarbon taxation regime in PNG
- Sustaining the economic and social developments in the Post-Porgera mine era
- Risk-based evaluation techniques for discounted cash flow modelling of long life mining projects
- Suitable sluicing techniques for improving the efficiency of recovering alluvial gold with different size distributions

Abstract

Techniques for Analysing and Reconciling the Progressive Mineral Taxation Regime of Papua New Guinea

Ken Ail

Mineral endowed nations use progressive tax systems to raise more revenues from the mining industry. However, no study has been conducted to investigate how progressivity distributes burdens and the degree to which revenues are collected and redistributed to a society. Given the gap, this study investigates the revenue collecting potentials of Papua New Guinea's (PNG) progressive mineral taxation regime. PNG Taxation Review Committee (2015) has recommended the re-introduction of the APT, reduction of the CIT rate and a negotiated PBR is being applied at the Ramu Nickel mine. In the past, PNG's mineral taxation regime has been unstable and unpredictable despite maintaining the progressive tax system since 1972. However, the performance of the tax system between has never been properly studied.

The purpose of this study is to identify whether a progressive tax system, when applied to the mining industry, collects revenue in a manner that does not distort investment decision making. It is hypothesised that governments can collect more tax revenues through devising a more progressive tax system that includes indirect taxes and non-tax benefits.

The historical METR for PNG was found to be 30 percent and NETR was 20 percent. The overall industry level tax performance for PNG was slightly above the global average METR of 17 percent (Chen and Mintz 2015b; Swan 2012). This study found that the FPPE has been the cause and it does not reflect the actual performance of present taxation regime. Further, the real NETR for

PNG is 20 percent, which shows investors do not pay at the statutory rate of 30 percent. Thus, PNG does not require a CIT rate reduction as it will cause the real NETR to further decline to suboptimal levels, which could result in substantial revenue losses.

- Amongst other recommendations made in this this study, the ad valorem royalty rate increased to 4 percent seems to be a suitable substitute for phasing out the FFPE as it increases the total government revenues by 10 percent. This option could raise more revenues than if the basic tax instruments are combined with the APT and FPPE, which is the most unattractive combination.

- Another option is to adopt the FPE type to reduce the overhead management costs and achieve a high performance similar to the Bougainville experience.

- Maintain the present the CIT and the 30 percent rate

- Make direct tax instruments more progressive by adopting an accelerated depreciation, 2:1 thin capitalisation rule, discourage tax holidays, a suitable LCF policy and strengthening the capacity of the tax administration.

- Government of PNG needs to build capacities like skills development and provide seed capital to encourage the communities to capture more of the quasi-rents instead of making policy provisions for them to struggle against the financial risks in the quest to earn dividends through equity participation.

Abstract

A Critical Analysis of PNG's Mineral Taxation Regime

Kaepae Ken Ail, Bryan Maybee and Daniel Packey
Department of Mineral and Energy Policy
Curtin University Graduate School of Business
Bentley Campus, Perth WA
Email:ken.kenail@gmail.com

Abstract

In ascertaining the existence of rents generated by the mining industry, mineral taxation regimes have been successfully devised to capture those rents but historical evidence has been overlooked

over rational explanation using the taxation theory. Taxation policies tend to ignore the historical performance of tax instruments in terms of transferring the mineral wealth to the community. This paper uses historical data to extrapolate the performance of PNG's mineral taxation regime to draw some evidence-based policy recommendations for the GoPNG to consider along with that of the 2012-2015 Taxation Review. The historical evidence suggest that PNG's progressive mineral taxation regime comprising of the ad valorem royalty, corporate income tax (CIT) and dividend withholding tax (DWT) is efficient in capturing a higher magnitude of tax revenues for PNG compared with the problematic RRT and the state equity participation. The present structure of the progressive tax instruments has performed efficiently in generating revenues from the mining industry over the last four decades since 1972. However, there are avenues for PNG to make the tax instruments more progressive by adopting accelerated depreciation, suitable loss carry forward policy, a thin capitalisation rule of 2:1 debt-to-equity ratio, ban tax holidays and strengthen the tax administration.

Ms Mary Kama - Lecturer II

Abstract Huon Seminar 2017

Reaction kinetics of iron oxides in the tails of floated Ok Tedi magnetite skarn ore

[1]M. Kama and [2]K. Gena

The Magnetite skarn ore (MSO) is one of the many sulfide ores that are mined by Ok Tedi Mining Limited (OTML). Copper minerals are floated and collected as copper concentrates whilst pyrite, iron oxides and other gangue minerals form the tails. Hence, economic grade and quantity of iron are lost in the tailings as sulfides and oxides. Therefore, the objective of this paper is to investigate the iron ore reaction kinetics (IORK) of the iron oxides so that sponge iron can be produced for mini steel plants in Papua New Guinea.

About 1 kg of MSO sample was used for the flotation test work. Several flotation tails samples were reduced by coconut charcoal carbón at various temperatures and times. Control and fluxed samples were compared.

The EDAX analyses of:-

(i) unfloated Ok Tedi MSO tails showed; 50.1 % Fe, 31.7 % O, 6.2 % C, 4.5 % Si, 2.4 % Ca, 1.9 % S, 1.9 % Mg, 0.7 % Al, 0.4 % Mn, 0.2 % K and 0.1 % P.

(ii) fluxed sample reduced at 1000 °C in 60 minutes showed; 42.2 % Fe, 23.3 % C, 21.5 % O, 5.0 % Ca, 3.1 % S, 2.5 % Si, 0.9 % Mg, 0.6 % K, 0.4 % Al, 0.3 % Mn, 0.3 % Cu and 0.1 % P.

(iii) control sample reduced at 1000 °C in 60 minutes showed; 50.2 % C, 27.9 % Fe, 13.0 % O, 3.0 % S, 2.2 % Si, 1.7 % Ca, 0.8 % Mg, 0.4 % K, 0.3 % Mn, 0.3 % Al, 0.2 % Cu and 0.1 % P.

The results suggested that the reduction of fluxed samples produced higher grade of metallic iron at 1000 °C. However, the results also showed that the CO_2 was unstable at this temperature and beyond 60 minutes. Therefore, reduction temperature and time need to be kept below 1000 °C and 60 minutes, respectively for better results.

Dr. John Witne – Senior Lecturer

Research Interest and Research Area

- Evaluating the long term stability of Mine Waste and Tailings to assess the long term potential of acid mine drainage and the release of heavy metals such as Cu, Pb, Zn etc. into the environment.
- Evaluating the potential of bacterial leaching some of PNG's sulphide ores and concentrates using various cultures.
- Isolating indigenous bacterial cultures from mine run-offs and other sources around PNG. A comparative study on the potential of indigenous cultures verses imported cultures on their potential to extract mineral ores and concentrates.
- Design and fabrication of cheap and affordable mining and processing equipment for small-scale gold miners in PNG.
- Production of Activated Carbon from Locally grown Coconuts.
- Recovery of Powder Gold from tailings produced by both small scale miners & large scale mining operations.
- Production of pH modifiers from Banana Trunks and Leaves.

Post Graduate Research

Mr. Manau Saki	Metallurgical Characterization of Crater Mountain Gold ore
Mr. Yawas Dekba	Genetic Modeling of the Bauxite Deposit, Manus Province, PNG
Mrs. Blacky	The effect of copper minerals in gold cyanidation. A case study on Ore from Kainantu
Mr. Rayen Tagai	Modeling the Dispersion, fall out and settling of Deep Sea Tailings Placement
Mr. Hans Matarab	Innovation Mine Design and Production Scheduling of Industrial Minerals – Case study on the Bauxite Deposit in the Manus Province, PNG

DEPARTMENT OF SURVEYING AND LAND STUDIES

Head of Department: Professor Dilip Kumar Pal

A. Priority Research Areas of the Department

The department's research activities revolve around the pivot 'Land and allied resources' optimum utilization, management and valuation; Climate studies, Disaster Risk Reduction and Disaster Risk Management. The department is primarily involved in the process of developing human resources adept in the holistic management of land resources and to eke out best value out of them in a sustainable manner through coordinated research activities. It is also actively involved in finding solution to Disasters Risks and Disaster Management, Disaster linked to climate change, tectonic activities. The human resources developed in the department have a wide exposure to the state of the art technology e.g. recent developments in the field of Remote Sensing, Geographic Information Systems, Photogrammetry, Global Positioning System / GNSS, use of latest Total Stations and allied implements of the digital era.

The department is also involved in a number of research programs including densification of Benchmark points for PNG using latest GPS / GNSS technology, GIS, remote sensing, and cartographic communication through development of thematic maps for PNG, property valuation and land management research programs as well as student projects.

Some specific areas are given below:

1) Climate change studies
2) GIS & RS in Hydro and Solar Electricity planning and development
3) GIS & RS in Solid Waste Management and EIA
4) Land suitability for Rice cultivation in PNG using Remote Sensing and GIS
5) Forest Biomass monitoring using Remote Sensing and GIS
6) Forests and Societal management
7) Inventorying Environmental Resources
8) Disaster Risk Reduction / Disaster Risk Management (DRR & DRM)
9) Urban sprawl detection
10) Groundwater mapping

11) Land use planning and management

12) Land Administration studies

13) Migration studies

14) Asset valuation studies

15) Cadastral Data Modeling

16) Management of incorporated land groups (ILG)

17) GNSS Survey and Vertical Adjustment of Madang Network

18) GIS In Customary Land Tenure Investigation

19) RS & GIS in Urban and Regional Planning

20) Mining and Its Impacts on Property Market

21) Residential Property Management

22) Public Educational Facility Management

23) Property Development Process in Papua New Guinea

24) Low Income Housing in PNG: Challenges and Opportunities

25) AHI land mobilization policy

26) Impacts on customary land owners under Plantation Redistribution Scheme

27) Impacts & effects of special agriculture and business lease (SABL) on customary land owners

28) Causes and effects of urban land values

29) Road Alignment (Horizontal/Vertical)

30) Drainage Design

31) Subdivision Design

32) Control Surveys using GPS/GNSS

33) Local Geoid study using GPS heighting on heighted MSL Benchmarks

34) GPS/GNSS to Cadastral Surveying in PNG

35) Infrastructure Development Surveys

36) Geodetic Control Surveying using GPS/GNSS

37) ILG (Integrated Land Groups) Customary Land Registration, etc.

B. List of Publications in Peer Reviewed Journals

1. Das, R. K., Samanta, S., Jana, S. K., and Rosa, R. (2017). Polynomial Interpolation Methods in Development of Local Geoid Model. *The Egyptian Journal Remote Sensing*

and Space Sciences, Elsevier publication, ISSN 1110-9823, http://dx.doi.org/10.1016/j.ejrs.2017.03.002. (Index in SCOPUS)

2. Karigawa, L., Babarinde, J. A., & Hoils, S. (2017). A Comparative Analysis of Customary Land Associations and Sustainability Issues in Papua New Guinea. *Land Tenure Journal, Issue 2016,* pp. 90-119. (Indexing or listing is not yet known).

3. Menggenang, P., and Samanta, S. (2017). Modelling and Mapping of Landslide hazard Using Remote Sensing and GIS Techniques. *J Modeling Earth Systems and Environment, Springer, 3(3)*1113-1122. 10.1007/s40808-017-0361-5. (Indexed in Google Scholar)

4. Sekac, T., Jana, S. K., and Pal, D. K. (2017). Identifying potential sites for hydropower plant development in Busu catchment. *Spat. Inf. Res. (2017)., Springer publication-Singapore, 25(6),* ISSN: 2366-3286 (print version) ISSN: 2366-3294 (electronic version).10.1007/s41324-017-0145-z. (Indexed in Google Scholar)

Note: *Papers Listed below were published online by the Department of Surveying and Land Studies, PNG University of Technology. This is the third year of the launching of this new Journal.*

5. Bhunia, G. S., Shit, K. P., and Pal, D. K. (2017). Costal wetland identification and Mapping Using Satellite Data. *Melanesian Journal of Geomatics and Property Studies, Vol. 3,* ISSN (Online): 2414-2557.

6. Bak, P., Jana, S. K., Sekac, T., Das, R. K., and Pal, D. K. (2017). Mapping of Rural Road Network Using Remote Sensing and Geographical Information System - A Case Study, Nebilyer Rural District, Western Highlands Province, *Melanesian Journal of Geomatics and Property Studies, Vol. 3, Issue 1,* ISSN (Online): 2414-2557.

7. Iuda, O., and Samanta, S. (2017). Land Use and Land Cover Change Assessment from 1995 to 2015 using GIS and Remote Sensing Techniques: A case study in the Logging Concession. *Melanesian Journal of Geomatics and Property Studies, Vol. 3,* ISSN (Online): 2414-2557.

8. Poi, N., Sekac, T., Jana, S. K., Kari, L., and Pal, D. K. (2017). Remote Sensing & GIS base spatial data infrastructure for rural development planning at micro level - A Case Study of Gumine District in Simbu Province, PNG, *Melanesian Journal of Geomatics and Property Studies, Vol. 3, Issue 1,* ISSN (Online): 2414-2557.

9. Renagi, O., and Babarinde, J. A. (2017). Sustainable Energy Policy for Papua New Guinea Incorporating Mandatory Environmental Impact Analysis (EIA). *Melanesian Journal of Geomatics and Property Studies, Vol. 3,* ISSN (Online): 2414-2557.

C. List of Conference Proceedings

1. Gupta, S. (2017). A GIS integrated approach on long term efficient traffic management - Lae, Morobe, PNG ". *Conference Proceedings of the 8th Huon Seminar, The Papua New Guinea University of Technology, Taraka Campus, November, 7-8, 2017.*

2. Igo, C. R., Sekac, T., and Pal D. K. (2017). GIS and Remote Sensing in Identification and Change Detection of Wetland Reclamation Areas in Port Moresby, PNG. *Conference Proceedings of the 8th Huon Seminar, The Papua New Guinea University of Technology, Taraka Campus, November, 7-8, 2017.*

3. Jana, S. K., Sekac, T., and Pal D. K. (2017). Exploring Vulnerable areas for Malaria in Morobe Province of Papua New Guinea - Remote Sensing and GIS as Potential Tools, *Geospatial World forum, 23-25 Jan, 2017 | Hyderabad, India*

4. Samanta, S., Pal, D. K., Aiau, S. S., and Palsamanta, B. (2017). Geospatial Modelling of Potential Renewable Energy in Papua New Guinea, *Geospatial World Forum, 23-25 January, 2017, Hyderabad, India.*

5. Sekac, T., Jana, S.K., and Pal D. K. (2017). Earthquake Induce Liquefaction Susceptibility Evaluation In The Earthquake Prone Areas of Morobe Province, Papua New Guinea, *Conference Proceedings of the 8th Huon Seminar, The Papua New Guinea University of Technology, Taraka Campus, November, 7-8, 2017.*

6. Sekac, T., Jana, S. K., & Pal, D. K. (2017). Identifying potential sites for hydropower plant development in Busu catchment: Papua New Guinea, *Conference Proceedings of the SERI Seminar, The Papua New Guinea University of Technology, Taraka Campus, November, 2, 2017.*

7. Sekac, T., Jana, S. K., Pal. I., and Pal D. K. (2017). Earthquake Risk Assessment in Momase Region of Papua New Guinea using GIS, *International Expert Forum on "Mainstreaming Resilience and Disaster Risk Reduction in Education" Integrating SDG, SFDRR and UNFCCC Paris Agreement, held on 1 - 2 December, 2017, ASIAN INSTITUTE OF TECHNOLOGY, THAILAND.*

D. Book Chapters in Professional Edited Books

1. Babarinde, J. A. (2017). A Case Study of United Kingdom in Planning and Politics Interaction, In: Book of Readings on Urban and Regional Planning in Nigeria, Egunjobi, L. (Ed.), President, Town Planners Registration Council of Nigeria.

E. Winning Project

PIURN
Project Title: Towards National Drinking Water Standards in Vanuatu: Applied Research and Capacity Building

Research Team Members and Affiliations

Ø Dr Krishna Kumar Kotra, Lecturer, School of Biological and Chemical Sciences, FSTE, The University of the South Pacific (USP) – Principal Investigator

Ø Dr Sailesh Samanta, Associate Professor, Dept. of Surveying and Lands, PNG University of Technology (PNGUNITECH) – Co-Investigator / Co-funder

Ø Dr Srikanth Bathula, Senior Lecturer, Dept. of Applied Sciences, PNG University of Technology (PNGUNITECH) – Co-Investigator

Ø Mr Erie Sammy, Hydrogeologist, Dept. of Water Resources, Govt. of Vanuatu – Co-Investigator / Co-funder

Ø Dr Lokesh Padhye, Senior Lecturer, Oceania Water Research Consortium (OWRC), Dept. of Civil and Environmental Engineering, University of Auckland, New Zealand – Co-Investigator / Co-funder

Ø Dr Martin S. Andersen, Senior Lecturer, School of Civil and Environmental Engineering, and director of Connected Waters Initiative (CWI), University of New South Wales, Sydney, Australia – Co-Investigator / Co-funder

Objectives of Proposed Study:

1. To investigate the water chemistry of drinking water resources in the study area and to delineate the mechanisms controlling the water quality.
2. To develop national drinking water standards in Vanuatu from a comprehensive data set of water quality parameters.
3. To provide training for staff from various Govt. departments, NGO's, USP staff/Students besides community leaders in regards to survey, analysis and interpretation of quality of drinking water resources.

Budget: 43,311 Fiji Dollars
Project Duration**:** 2 years (01-10-2017 to 30-09-2019)

F. Undergraduate Research Projects

The following are final year Surveying and Lands Department Students projects in 2017 as part of their partial fulfilment of their degree:

Year 4 BGIS Students Research Project 2017

Nº	**Student**	**Project Title**	**Supervisor**
1	Bobby Aipanga	Using GIS to manage solid waste in Lae City for proposed re-location of current dump site.	A/Prof. Sujoy Kumar Jana

2	Richard Akuila	Application of GIS and Remote Sensing in road network monitoring specifically for maintenance purposes within Lae City.	Mr Lewi Kari
3	Bradley Bebinaso	Creating a database management system using GIS for managing facilities of Unitech staff houses	Mr Lewi Kari
4	Levi Beko	Utilising GIS and Remote Sensing techniques to identify drought areas in Bulolo district	Mr Lewi Kari
5	DikaDavai	Using GIS/Remote Sensing Applications to Integrate & Implement an effective solid waste management system in Hanuabada village, NCD	A/Prof. Sujoy Kumar Jana
6	Porejane Harley	GIS approach in shoreline change detection and coastal erosion monitoring study along Caution Bay	A/Prof. Sailesh Samanta
7	McLaren Hoping	Utilizing GIS techniques to map and assess coverage & interference of WI-FI signal within Unitech	Mr Lewi Kari
8	Livingstone Jack	Integration of Remote Sensing and GIS to assist in forestry management in Bulolo district of Morobe Province.	A/Prof. Sujoy Kumar Jana
9	Jessica Jota	Application of remote sensing and GIS in Military Barrack management to minimise its impact on local communities - case study: Igam Barracks.	Mr Samudra Gupta
10	Gideon Kambao	Using the applications of RS and GIS in sustainable urban development planning in Lae district.	Mr Job Suat
11	Wilson Kumne	Environmental conservation using Remote Sensing and GIS application; a case study; forest reserve, degradation prediction and monitoring in Bulolo district, Morobe/New Ireland Province	A/Prof. Sailesh Samanta
12	Benjamin Matambuai	Using RS/GIS to investigate and design a traffic light control system to reduce traffic congestions in Lae city	Mr Samudra Gupta
13	Issac Mathew	Change detection of land use and land cover through GIS/RS techniques over a 20 years period in Lae city	A/Prof. Sailesh Samanta
14	Godwin Muriki	The change detection of land use/land cover in Bulolo district, using Remote Sensing & GIS; multi-spectral data and multi-temporal data.	Mr Lewi Kari
15	Delilah Nori	Using GIS in `mapping fear index of zones in Papua New Guinea University of Technology campus	Mr Lewi Kari
16	Eluzai Nuahui	Suitability assessment of oil palm cultivation in Ramu Valley	Mr Lewi Kari
17	Sedrick Pena	Suitability analysis to locate site for development of new secondary schools in Western Highlands Province	Mr Lewi Kari

		(WHP), Papua New Guinea (PNG) by integrating GIS and Remote Sensing approach.	
18	Rua Puka	Using GIS and Remote Sensing technologies to map coastal villages and settlements and to detect change in urban built up in Port Moresby (Hanuabada village & Kkoki Settlement)	A/Prof. Sujoy Kumar Jana
19	Isikeli Jarrod Solien	Using GIS to analyse power line risk and evaluate power quality and reliability (using basic reliability indices).	Mr Samudra Gupta
20	Carl Tugel	Application and use of GIS technology to propose new proper bus stops and bus shelters for Lae city.	A/Prof. Sujoy Kumar Jana
21	Chryzoe Warkarat	Planning of new pipelines for water and sewerage provisions from the Malolo estate (8-mile) to the Makana vicinity (9-mile), Port Moresby using GIS for planning and management.	A/Prof. Sailesh Samanta
22	Stonney Yak	Urban planning: Applications of GIS and RS in Port Moresby Souths (taroma area)-urban planning based on land use change analysis using remote sensing data	Mr Job Suat

Year 4 BTSR Research Project 2017

№	**Student**	**Project Title**	**Supervisor**
1	Mechoir Loraine	Unitech Sport Oval Subdivision proposal	Mr. Mela Popeu
2	Paul Nobert	Identification Survey of the Western End of Unitech Boundary	Mr. Mosese Tagicakibau
3	Waki Josaiah	Residential Subdivision of Unitech	Mr. Mosese Tagicakibau
4	Kakare Joel	Comparison of Traverse methods in Mining Environments	Mr. Navua Kapi
5	Mondo Stanley	Subdivision on the vacant land at the back of Unitech Rainforest Habitat	Mr. Mela Popeu
6	Bernard Kenneth	Residential subdivision in Bumbu Police Barracks	Mr. Mela Popeu
7	Fege Francis	Residential subdivision proposal, (Male Dorm) - PNG Unitech Campus	Mr. Mosese Tagicakibau
8	Lerori Alfred	Proposed bridge site survey of the temporary bailey bridge at 11-mile, Lae, Morobe Province	Mr Job Suat
9	Golabe Bruce Imax	Boundary Identification Survey of Bumbu Police Barracks Lae	Mr. Mela Popeu
10	Mathias Lalo	Proposed residential subdivision for staff quarters	Mr. Mosese Tagicakibau
11	Vali Mae	Re-identification of centreline alignment and road design for independence drive (UOT to Tent-City Police station)	Mr. Mosese Tagicakibau

12	Salle Mark	Storm water drainage management	Mr. Mela Popeu
13	Simon Jerome	Stormwater drainage design of the proposed residential Subdivision Area opposite Habitat	Mr. Mosese Tagicakibau
14	Rapa Larry	Create a Management Plan for Sewer water and Portable Water Utilities of PNG Unitech using Surveying approach	Mr Job Suat
15	Tavua Tamut	Road design alignment in Bumbu barracks (Horizontal & Vertical)	Mr. Mosese Tagicakibau
16	David Joshiah	Updating Lae main wharf Tide Gauge (MSL)	Mr. Heva Honeaki
17	Koleala Tequille	Application of identification Surveying and cadastral reform in a partial boundary re-establishment of PNGUOT along the PTC road	Mr. Mosese Tagicakibau
18	Mespuk Clifford Jnr.	Design of Storm Water Drainage System from UOT to Igam Junction	Mr. Mosese Tagicakibau
19	Urim Maximillan	Deformation monitoring survey of the Markham Bridge	Mr. Mela Popeu
20	Topo Turalom	Redefining the current road alignment & intersection of Bumbu road and Milford haven road	Mr. Mela Popeu
21	Bidau Anthony	Bumbu drainage system	Mr. Mela Popeu

Year 4 Property Studies Research Project 2017

№	Name	Project Title	Supervisor
1	Vune Julian	Acquisition of Customary Land for Telecommunication Towers in Eastern Highland Province	Mr. Jerry Mille
2	Kiso Kenneth	Housing Provision for Primary School Teachers and Its Impact on the Residential Property Market in Lae City	Mr. Jerry Mille
3	Momis Janelle	An Investigation into Land Dealings between Customary Landowners and Multiple Purchasers in Kimbe Bay, West New Britain Province	Mr. Suman Holis
4	Koloa Esther	Analysis of Residential Property Rights in Lae City	Mrs. Rosemary Adu-Mcvie
5	Pawa Dian	Application of the Real Estate Development Model for an Understanding of the Economics of Real Estate Development in Lae City: The Case of a Proposed	Prof. Jacob Babarinde
6	Waulas Jonathan	Viability Analysis of a Campus Restaurant at Unitech, Lae	Prof. Jacob Babarinde

7	Timbie Talitha	Is Customary Land Tenure a Hindrance to Economic Sustainability? A Case Study of Eastern Highland Province	Mr. Lepani Karigawa
8	Kelly Kevin	Management of Residential Properties in Port Moresby Using an Integrated Software	Mr. Lepani Karigawa
9	Lume Stanley	Illegal Dealings in the Allocation of Alienated Land for Economic Development Activities: A Case Study of Lae, Morobe Province	Mr. Lepani Karigawa
10	Kinne Joseph	An Investigation into Residential Property Vacancy and Absorption Trends in Lae City	Mr. Lepani Karigawa
11	Bernard Roger	Multi-tenanted Property Pricing Using Hedonic Model: A Case Study of Lae City	Prof. Jacob Babarinde
12	Petrus Jeffrey	An Investigation into Land Taxation System in PNG: A Case Study of Lae	Mr. Suman Holis
13	Erick Todiat	Trends in Prices of Single Family Dwellings in the City of Lae: An Empirical Analysis	Prof. Jacob Babarinde
14	Wau Martin	Problems of Urbanisation and their Effects on City Sustainability: A Case Study of Lae City	Prof. Jacob Babarinde
15	Gunigin Zephaniah	Introducing Supplementary Valuation Roll for Consistency and Accuracy in Papua New Guinea: A Case Study of Lae City.	Mrs. Rosemary Adu-Mcvie

G. Postgraduate Students Research Project, 2017

The following projects are being conducted by our Postgraduate Students, Department of Surveying and Land Studies:

MPhil and PhD Research Project

No	**PG Student**	**Discipline**	**Supervisor (S)**	**Research Project**	**Status**
1	Cathy KOLOA	PhD	A/Prof. Sailesh Samanta & Prof. Dilip Kumar Pal	Hydro Morphometric Analysis and Hazard assessment of major river basins in PNG using Remote Sensing and GIS Technology	Completed (2017)
2	Catherine RUPA	MPhil /2	A/Prof. Sujoy Kumar Jana & Dr. Cozen	Application of GIS and Remote Sensing Technology to Identify Crime Hotspot & using Crime Prevention Through Environmental Design: A Study of the Papua New Guinea University of Technology, Lae	Completed (2017)

3	Herro Losea	MPhil /1	A/Prof. Sailesh Samanta	Watershed Delineation on the Existing Bioregions & Analysing Changes in Stream Networks Using GIS & RS Technology: A Case Study Developments along the Corridor of PNG-LNG Onshore / Upstream Project	Continuing

M. Sc in RS & GIS Research Project

No	PG Student	Discipline	Supervisor (S)	Research Project	Status
4	Francis James Irara	M. Sc in RS & GIS	Mr. Job Suat & Mr. Lewi Kari	Applying Geographical Information System & Remote Sensing for holistic and harmonious urban development planning in Small Island Development State (SIDS) coastal city-a case of Madang City in PNG.	Completed (2017)
5	Jackson Colleen	M. Sc in RS & GIS	Mr. Lewi Kari	Crime mapping: Identifying crime hotspots in Port Moresby	Completed (2017)
6	Tavune Maman	M. Sc in RS & GIS	Mr. Lewi Kari	Land cover/Land use change analysis of a lowl land forest ecosystem: Case study of Sogeram Concession, Madang	Completed (2017)
7	Malan Perry	M. Sc in RS & GIS	A/Prof. Sailesh Samanta	Developing a model approach for assessing levels of deforestation and forest degradation for addressing REDD plus in PNG.	Completed (2017)
8	Pedro Pumuye	M. Sc in RS & GIS	A/Prof. Sujoy Kumar Jana	Mapping of Potential Landslide Zones along the Okuk Highland Highway of PNG	Completed (2017)

ALLOCATION OF RESEARCH FUND FOR 2017

Item	Applicant	Department	Title of Research	Approved Amounts (K)
1	**Prof. S. Gopalakrishnan** **Toksy Zeipi (MPhil/2)**	Applied Physics	Extraction and Assessment of the quality of coconut (*Cocos nucifera*) Oil (Triaclyglycerides) using mannan degrading enzymes purified from the crop of the Brown Garden Snail Helix aspersa Muller (Gastropoda Pulmonata)	8, 716.00
2	**Prof. Khan Golam** **Jeremiah Iko (MCS/2)**	Communication & Development Studies	The Study of Needs, Problems and Challenges Faced by Rural Cocoa Farmers of Wareo Area of Kate Local Level Government in Finschafen District, Morobe Province, Papua New Guinea	2, 522.00
3	**Dr Apoi Yarapea** **Jessie Nagiob (MCS/2)**	Communication & Development Studies	Communicating System for facilitating downstream processing of local rice- a case study of Yabim/Mape LLG in Finschafen district	2, 336.00
4	**Dr Rachael Aisoli - Orake** **Ian Yengki (MCS/2)**	Communication & Development Studies	Sustainable Development Strategy: A Communication Model for Stakeholders of the Sepik Plain Oil Palm Project	2, 480.00
5	**Wycliffe Antonio (PhD Candidate)**	Surveying & Land Studies	Geoinformatics and Land Management	9, 360.00
6	**Andrew Pai** **(A PhD Candidate)**	Surveying & Land Studies	Towards a culturally inclusive valuation model for Customary land takings compensation: The Case for Papua New Guinea	7, 622.00
7	**V. Rokotamana (BULA Sponsored student)**	Agriculture	Trip to Research Site Expenses	500.00
8	**Dr. Ronnie Dotaona**	Agriculture	Efficacy of Different Formulation of entomopathogenic fungi against sweetpotatoe weevils in PNG	6, 222.00

	Gerega Maiga (MSc/1)			
9	**Prof. Jojo Panakal** **Philip Epemu (MSc/1)**	Applied Physics	Indoor Radiation Levels and use assessment in the populace in the city of Lae in Papua New Guinea	5,000.00
10	**Prof. Manoj Mukhopadhyay** **Muteng Mugang (MSc/1)**	Applied Physics	Geological Interpretation of gravity anomalies over selective areas in PNG	4, 132.00
11	**Prof. Eric Gilder** **Puso Sezuka (MCS/1)**	Communication & Development Studies	Relational Dialectics between Communications and Culture in Internet Marketing Tourism Marketing Destination. A comparative Study of Botswana and Papua New Guinea	12, 749.82
12	**Prof. Cletus Gonduan** **Jackson Taviri (MPhil/2) GAP std**	Architecture & Building	Modular Design and Delivery of Remote Medical Infrastructure in PNG	4, 482.00
13	**Mr. Reilly Nigo** **Nigel K. Kiaka (MPhil/1)**	Applied Science	Designing a suitable drying System for Higher Altitude Conditions: Using Gembogl, Simbu Province as a model	7, 600.00
14	**Dr Apoi Yarapea** **Stanley Epeni (MCS/1)**	Communications & Development Studies	A Communication Perspective on Resource Management: A Case Study of Enga Teachers College Students' Resources Management Practices.	2, 632.00
TOTAL				**76,353.82**

ALLOCATION OF CONFERENCE FUND IN 2017

Item	Applicant	Department	Conference Details	Amount (K)
1	**Moses Kavi PhD Student**	Electrical & Communication Engineering	IEEE Power Society (PES) General Meeting, Chicago, Illinois, USA 16– 20th July 2017 **Paper Titled**: *Challenges in high Impedance Fault detention due to increasing Penetration of Photovoltaics in Radial Distribution Feeder.*	4, 500.00
2	**Dr. Mitzi Betasolo**	Civil Engineering	Venue: Forte Village/S. Margherita di Pula (CA) Italy, 2-6 October 2017 **Paper titled**, *"Lae City Second Seventh Landfill Rehabilitation* and *"Greening Civil" A Campaign to Mitigate Climate Change*	11,811.10
3	**Jerry J. Walliah (PhD Student)**	Architecture & Building	8th Huon Seminar, Lae, PNG UNITECH, 7-8 November 2017 **Paper Titled:** *The Need for leadership Practice in PNG in enabling the Indigenous Building Contractors to venture into higher Potential Markets.*	4, 226.14
4	**Mrs. Lucy Maino**	Communication & Development Studies	International Agriculture Extension Conference, University of Goroka, 10-12th Sept 2017. **Paper Titled:** *How Effective is the Papua New Guinea Agricultural Sector in Communicating with and amongst Stakeholders in the Promotion of Smallholder Agricultural Enterprises? A Comparative Case Study of Smallholder Rice Farmers in Wain-Erap, Lae Rural and Lae Urban LLGs in the Morobe Province.*	2143.12
TOTAL				**22,680.36**

Influence of Surfactant on Protonation Equilibria of Amino and Carboxylic Acids

Dr. Srikanth Bathula
Senior Lecturer
Department of Applied Sciences
srikanth.bathula@pnguot.ac.pg

Abstract

Protonation constants of L-Arginine and succinic acid have been determined pH-metrically in surfactant-water mixtures of varying composition (0.0-2.5 w/v) at 303K and at an ionic strength of 0.16 mol dm^{-3}. Linear variation of protonation constants with mole fraction of the solvent mixture has been attributed to the dominance of the electrostatic forces compared to non-electrostatic forces. Distribution of species and effect of influential parameters on the protonation equilibria have been discussed.

Biological Effects of Natural Background Radiation

Dr. Jojo Panakal John
Professor
Department of Applied Physics
panakal.jojo@pnguot.ac.in / jojo@jojopanakal.com

Abstract

Radiation is ubiquitous. Every object in the universe is exposed to ionising as well as non-ionising radiations, right from the creation of the universe. We are almost oblivious of the radiation since we are insensitive to them. Radiation exposure comes from terrestrial, extra-terrestrial and manmade sources. Exposure to ionizing radiations is mostly by the naturally occurring primordial atomic species like Uranium, Thorium and Potassium. Many exposures to natural radiation sources are modified by human intervention to nature. Major contribution to the background radiation exposure arises from the natural sources while the man made radiation is very small fraction of the existing natural radiation. Among the non-ionising radiations ultraviolet (UV) and microwave radiations are most important sources of radiation exposure to human beings. Ionising radiations can affect atoms, molecules, cells, tissues, organs and/or the whole body depending on the nature, amount and time of radiation exposure. If radiation interacts with the atoms of the DNA molecule, or some other cellular component critical to the survival of the cell, it may affect the ability of the cell to reproduce and survive. Acute high doses as well as chronic low doses have effects on human health. High doses affect primarily blood forming organs, reproductive and gastrointestinal tract organs, skin, muscle and brain. The outcome of the exposure may vary from nausea to occurrence of death depending on the severity of exposure. At low doses the probable effects are Genetic, Somatic and In-Utero. Normally, at low doses, such as that received every day from background radiation, cellular damages are rapidly repaired. At extremely high doses, cells cannot be replaced quickly enough, and tissues fail to function.

Where/Who Am I? Self-Construing an Expatriate Academic Acting across Global Boundaries of Function, Role and Places

Dr. Eric Gilder
Professor
Department of Communication and Development Studies
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Abstract

The author is a transplanted, oft-wandering academic, who has crossed many borders (academic, geographical and cultural) over his thirty-plus years of teaching, research, and service. In this presentation, he will outline the challenges of mediating these personal functions and social roles via a Kellian psychological model of "dimensions of transition." As detailed by Iyer (2013, 17 July) and Reiche (2014, August 21), the stressful process of displacement of exile indicate that Kelly's insights can be very helpful for this writer coming to a better understanding of himself as a social actor in a fast-transitioning global environment (itself vexed between choices of increasing globalization and, at the same time, increasing division). In the theoretical section, the presentation will draw from works of Kelly (1955), Bannister and Mair (1968), Feixas (n.d.), Feixas, and colleagues (2009), Gilder (2003), among others. As Kelly put it succinctly, "people, too, are events."

Green gun: Metarhizium as a Bio-insecticide

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Abstract

Biological pesticides or biopesticides are naturally-occurring microorganisms or other agents that kill or antagonize with pests. Entomopathogenic fungi such as those from the genera *Beauveria* and *Metarhizium* are naturally infect insect species and have been developed and commercialized into bioinsecticides from insect microbial control.

In this study, the sweetpotato weevil, *Cylasformicarius*, was used as a model insect to investigate the virulence of indigenous tropical isolates of *Metarhizium* for biopesticide development. The results of identification and virulence studies are presented and discussed.

Dinosaur Age Relict 'Masalai' Hoop and Klinkii Pine in Papua New Guinea: Sometimes Blessed, Sometimes Cursed by the Same Soils?

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Abstract

Hoop (*Araucaria cunninghamii*) and Klinki (*Araucaria hunsteini*) are PNG's last surviving members of a group of primitive, sometimes bizarre-looking trees. In the Wau-Bulolo area, some Klinkii pines were once the world's tallest tropical trees; halfway across the world, another primitive gymnosperm known as Redwood (*Sequoia sempervirens*) produces the world's tallest trees in similar-textured soils to what *Araucaria* grows in.

How high PNG *Araucaria* and American redwoods grow may seem irrelevant to figuring out why the once prime *Araucaria* growing environment around Bulolo now produces excessive termite killed trees, but both facts seem to trace down to the soil. In fact, the same soils that may have prevented PNG *Araucaria* from naturally going extinct millennia ago seems to turn into a killer when *Araucaria* is grown plantation-style. Even more intriguing, boron deficiency in these soils may be making trees even more vulnerable to termite attack – but indirectly -- by influencing the shape of the root zone.

A 'big picture' lesson learnt from the puzzling out of this story is the critical role of basic concepts in figuring out technical problems. Universities of technology today are pressured by declining budgets and external pressures to focus more on applications and less on concepts, more on virtual practicals and less on field work. I cannot fathom how I would have ever worked out how everything was interrelated in a way that may explain why plantation *Araucaria* in Bulolo has developed such extensive termite problems had my own education not been rich in basic concepts, field practical, and an array of scattered facts and experiences.

Smart Battery Management System

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Abstract

The Smart Battery Management System is interdisciplinary, diversified research area starting from industrial application to sophisticated embedded system designwhich includes Battery, soft computing (Neural Networks and Fuzzy Logic) and system design.

This involves the development of an embedded system/instrument for battery monitoring. The instrument is designed using artificial intelligence technique and non-linear behavior modelling of the batteryand is implemented using PIC microcontroller coupled with battery parameter sensors.

The instrument is online and indicates battery status that results in timely detection and alarming of itsnon-working status which is very essential for reliability and safety point of view in all battery powered systems.

This work involves the design and development of a smart online battery monitoring instrument for automotive industry. It can be extended to other applications like inverters, UPS Communication equipment etc.

Big Data Analytics & Artificial Intelligence

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Abstract

We are living in an age of trinity: big data, analytics and artificial intelligence (AI). This presentation first introduces the characteristics of this age of trinity, and then explores big data, analytics and AI and their relationship with examples. It looks at how to use AI to enhance big data analytics and business intelligence. It also introduces the presenter's research in big data, big data analytics, business analytics and AI. The approach proposed in the presentation might facilitate the research and development of big data, intelligent big data analytics, intelligent business analytics and business intelligence with their applications.

Volcanism & Geothermal Fields in PNG — Scope for Renewable Energy Search by Geophysical Exploration

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Abstract

PNG hides some of the most dangerous Volcanoes on earth; they belong to the Ring-of-Fire in SW Pacific. As many as 70 volcanoes stretch in an arc in PNG Provinces: North Solomon (7), New Ireland (3), Manus (3), East New Britain (7), Morobe (4), West New Britain (15), Pangalu peninsula (1), Milne Bay (5), Oro (8), Central (2), Madang (6), East Sepik (4), Southern Highlands (3) & Eastern Highlands (2). Most recently active volcanoes include (last eruption in parentheses): Manam (2006), Karkar (1979), Ritter Island (1993), Pago (2003), Ban (1960), Lamington (1956), Langila (2006), Ulawun (2005), Rabaul (1994, 2006) and Bagana (2006). Some of these volcanoes are spectacular calderas that have been the source of massive eruptions: Long Island (10x12 km), Karkar (5 km). Rabaul city is located within the caldera of the same name. This means that people need to live side-by-side with a volcano that has produced at least three VEI 4+ eruptions in the last 100 years. Times are quieter right now in PNG.

Geothermal Fields genetically relate to PNG Volcanoes. Geophysical methods can help locate permeable structures with high-temperature water or steam and estimate the amount of heat that can be withdrawn from the ground in a given time period. Once a field is developed, geophysical measurements can further be used to help site additional production and injection wells, to understand the details of the permeability structure, and to provide constraints on reservoir models used in the management of the geothermal field. The primary exploration targets are: Co-located heat, Fluid & Permeability. Geophysical interpretation in geothermal fields is complicated by two factors: (i) Great variety of rock types in which geothermal system is found: sediments, a mixture of rocks such as tuffs, flows, mudslides, intrusive rocks or volcanic-hosted fields, (b) Geologic structures at geothermal systems are often quite complex. Further, a structure may not necessarily determine the location or economic viability of the geothermal field.

Consequently, the exploration strategy for geothermal energy differs substantially from that for petroleum fields. Temperature at depth can be sensed directly in boreholes or estimated by extrapolation of heat-flow measurements in both shallow and deep holes. Because the fluid flow patterns can be complex, the deeper zones of hot fluids are often not directly beneath the shallow high heat-flow anomalies.

Passing reference is made in the Seminar to the Geophysical Exploration methods commonly applied in geothermal exploration; such as: Seismic, Electrical Self Potential, Microgravity, Microseismicity, etc. Surface geophysical methods provide important information for site selection of early wells at many geothermal fields. For example, the gravity anomalies can detect the dense, thermally-altered sediments to guide early drilling. Surface and borehole geophysics are deployed at later stages in the development of a field, when wells must be sited to provide adequate production or injection capability, or to provide constraints to tune reservoir models.

PNG Geothermal Resource Mapping: (i) Kairiru Island, Wau (ii) Bulolo, (iii) Lihir Gold Mine

Geothermometry: (a) West New Britain: TalaseaStation, Rabili, Magouru & Bakakama; mature geothermal water; 300-320 ^{0}C, (b) Milne Bay: Seuseulina & Yayaibola; 280 ^{0}C

PNG Energy statistics (2010): Power sources: Fossil fuel 49.6%, Hydro 42.1%, Geothermal 8.3%

A Model for Smart Energy Control System for Palm Oil Processing Plant using Hybrid Lead Compensated Fuzzy - PID Controllers

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Abstract

This research ventures into an investigation on the art of modern control engineering and its applications that can be suitably utilized to establishing Smart Energy Control System in the Palm Oil Processing Industry in Papua New Guinea to improve efficiency of energy utilization in the production plants. While basing this research in the application of Control System, the Fuzzy Logic Control System (FLC) and Proportional plus Integral plus Derivative Controllers are the classes of control systems used to determine the design of an Ideal Energy Control System. Since Fuzzy Logic Control System covers the application of classical control system and can define parameters of control system properly in situations where the application of later methods become ambiguous and ill defined, FLCS introduces a new strength that can be harnessed in the designs of better controllers. Both closed loop system as well as other control subsystems that are ill-defined by classical methods can be approximated with fuzzy logical reasoning methods based on experts experience and knowledge of the system. Since this involves impartation of expert's knowledge from human to Intelligent Controller, the Fuzzy Controller is closer in spirit to a human expert.
Knowledge of Classical methods of Analyzing control system is very important in formulation of mathematical modeling in control systems and helps one to predict system behavior. FLCS, PID and Lead Compensation are combined in this research work to formulate a Hybrid Control System. The proposed hybrid system utilizes the strengths of each individual component control system to produce a better system with better performance characteristics. This achieves the aim of designing smart energy control systems model for applications in Palm Oil Processing Plant and elsewhere. The mathematical Model is constructed in MatLab and in Simulink simulation environment.

A Review on Traditional Salt Production Practices Around the World and Analysis of Six Salts Obtained from Three Provinces of Papua New Guinea

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Abstract

Salt has been the subject of interest as a very useful trade commodity since its discovery and inception. Salt was used for enhancing the taste, seasoning and preserving foods, tenderizing meat, treating diseases, etc. Prior to present-day industrial manufacture of salt, it was produced by as many as five different strategies using traditional equipments in order to fulfil the needs, by adopting certain techniques with specialized indigenous equipments like pots, ladles, trays and filters, mostly of plant and siliceous origins. The making of traditional salts was extensively practiced in the past and is still being practiced by certain groups of people around the world and in particular, certain provinces of Papua New Guinea (PNG). Each ethnic group has its own traditional practice of making salts. Various studies indicated that at least three types of salt (black ash, block and powder) were in use for culinary and medicinal applications. In this paper, (i) a quick review on various salt production practices around different parts of the world; and (ii) a summary of results obtained on the analysis of traditional vegetal salts obtained from three provinces of PNG are presented. The study concluded that the salts used in PNG are safe for regular consumption but for two, which contain marginally high potassium content.

A Critical Analysis of the PNG Mineral Taxation Regime

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Abstract

Mineral and petroleum taxation component of the PNG Taxation Review (2012-2015) needs a critical assessment with respect to how the actual taxes have performed between 192 and 2014. The blue-sky approach to tax policy formulation, which collated the collective views of the community has partly influenced the recommendations made to the National Executive Council (NEC). Resource extraction theory suggests that a tax system must take into account the ability of a mining project to generate rents from which taxes are imposed. An ideal tax regime is the one that provides win-win strategy for the investor, government and the community. This is achieved through ensuring a mine is profitable and generates long term rents and therefore sustainable tax revenues for the government. Given the key principle, a community influenced tax policy could contradict the tax revenue maximizing objective of the government and financial rewards that flow to the investors. Basing on the performances of the former Bougainville mine, and the existing Ok Tedi and the Porgera mines between 1972 and 2014, this paper analyses some recommendations of the PNG Taxation Review Committee. The study uses historical data from to compute progression coefficients that are plotted on a Lorenz curve, along with other variables such as the marginal effective tax rate (METR) and net effective tax rate (NETR). The study finds that most of the basic taxes such as the corporate income tax (CIT), withholding taxes and ad valorem royalty and indirect taxes (payroll taxes) capture a greater share of the mineral wealth for the PNG citizens. Contrastingly, the resource rent tax (RRT) or additional profit tax (APT) and equity participation do not capture significant revenues for the PNG government. Hence, the article argues that PNG does not need a major tax deregulation such as reduction in the CIT rate. It however needs to develop policies to protect the tax base against profit and cost shifting and build the capacity of the tax administration agencies to enhance the maximum transfer of mineral wealth to PNG citizens.

Efficacy of *Trichoderma* as a Bio-control Agent Against *Fusarium* and *Rhizoctonia*

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Abstract

Trichoderma spp. has been used around the world as a biocontrol agent against a variety of pathogenic fungi. However, most research concentrated on a *Trichoderma* spp. against a single pathogenic fungus and not against multiple pathogenic fungi at the same time. This study tested the efficacy of *T.harzianum* against *Rhizoctonia* and *Fusarium* isolated from infected bean and tomato plants through dual culture under laboratory conditions. *T. harzianum* was also used against *Rhizoctonia* and *Fusarium* separately or in combination under greenhouse and field conditions using bean and tomato plants.

Dual culture of *Trichoderma harzianum* with *Rhizoctonia* and *Fusarium* isolated from infected bean plants showed growth inhibition of 60.1% and 63.3%, respectively, whilst, dual culture of *T. harzianum* with the same pathogenic fungi isolated from infected tomato plants showed growth inhibition of 54.9% and 61.5%, respectively. In a separate set of trials in the greenhouse and fields with bean and tomato, highly significant reduction of disease incidence was observed when the soil was inoculated with *T. harzianum* compared to inoculation only with *Rhizoctonia* and *Fusarium.* Inoculation of *T. harzianum* five days ahead of the pathogenic fungi significantly reduced the amount of disease compared to treatment combinations when *T. harzianum* was applied along with *Rhizoctonia* and *Fusarium* at the same time. Significant disease reduction was observed both from the greenhouse and field experiments with bean and tomatos even when *T. harzianum* was applied against *Rhizoctonia* and *Fusarium* combined.

The results from this research will be valuable to the bean and tomato growers in PNG in areas where soilborne diseases due to *Rhizoctonia* and *Fusarium* are significant.

Examining project learning, project management competencies and project efficiency in project-based firms (PBFs)

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Purpose

The paper uses survey data to examine the statistical relationship between various 'higher-order' dimensions of Project Management Competencies and Project Efficiency among a sample of Project-based Firms (PBFs), and rank the relative importance of perceived factors that inhibit the transfer of knowledge across projects.

Design/methodology/approach

The research philosophical approach adopted was post-positivism, a half-way house between positivism and phenomenological approaches. We used a largely structured survey questionnaire with an inclusion of a few open-ended items. The survey data collected was largely based on the "perceptions" of mostly experienced project management practitioners, whose perspectives on project processes and performance are likely to be more dependable. Because of budget limitations, a total of 260 questionnaires were mailed to randomly selected project-based firms (with an enclosed self-addressed and stamped return envelope). Of the 260 questionnaires sent to project-based firms, a total of 58 questionnaires were returned, representing a return rate of just over 22%.

Findings

Results indicate that 'High time pressures towards the end of the project', 'Too much focus on short-term project deliverables', and 'Fear of negative sanctions when disclosing project mistakes' were three top ranked factors that inhibited knowledge transfer across projects. Some 'higher-order' project management competencies like 'Dynamic competencies', have relatively a greater impact in predicting Project Efficiency. Dynamic competencies will only continue to increase in importance as today's project environments are characterized as continuously evolving, turbulent, complex, and require the need to be effective in dealing with various uncertainties. Once

included in the regression equation, the 'ownership variable' dominates all other explanatory variables in predicting project efficiency among a sample of Project-based firms (PBFs), most likely driven by the project management competencies of MNCs. However, the project efficiency of state-owned PBFs did not significantly differ from that of 'International firms that were not MNCs'. Specific conditions may have led to such an outcome. We show that enhancing Project efficiency requires the reinforcement of multiple but specific factors.

Practical implications

We argue that the creation of a client-led 'no-blame culture' within PBFs can ensure the development of a 'safe' environment in which project team members can acknowledge project mistakes without the fear or danger(s) that may come with such admission. That may require changes in project organizational culture that reduces power distance, lowers sensitivity to hierarchal power relations, enhances team building efforts, and foster a 'learning climate' that tolerate 'trial and error' experimentation. It may also require strengthening clients' specific capabilities. Such change may require time and patience, but could take advantage of 'positive' aspects of participatory practices, personal relationships, and consensus decision making approaches. One managerial implication point to the need to tailor scarce resources into building up multi-dimensional 'higher-order' competencies like 'Dynamic Competencies', that have a relatively higher significant impact in enhancing project efficiency. Linking MNCs with local PBFs as collaborative mega project delivery partners may lead to enhancing project management competencies of the later, conditional on their absorptive capacity.

"Corporate Social Responsibility: An Indian Perspective"

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Abstract

Corporate Social Responsibility (CSR) has emerged as a well-developed academic discipline. It is now being recognized as an area that is beyond charity or philanthropic activities undertaken by the companies. CSR is now very much part of the business processes and activities of the organizations. It has become greatly embedded in the overall strategic framework of Business Organisations.

Our research journey in the field of CSR was started in 2002 when the concept of CSR was in the nascent stage in India.

The second author became part of drafting committee of ISO 26000, the International Guidance Standard on Social Responsibility of Organizations by International Organisation for Standardization, Geneva. She represented developing countries in the committee. This standard integrated social responsibility in the supply chain of the organizations and is more holistic than many other I SO standards.

The Companies Act 2013 in India, made CSR mandatory for the business organizations. The companies have to spend 2% of the net profit on CSR activities every year and have to form board level CSR committee for the purpose. There are other initiatives that are part of CSR cause. Developing guidance on good-governance and social accountability of organizations are some such initiatives.

- It is true that CSR will grow further in coming years. It is vital for the developing countries and it helps them to further the cause of sustainable development. But there are challenges that need to be addressed. Developing awareness and skill development for implementation of CSR is a major challenge.

*Presented the seminar

Culture-Paradigm Shift Learning in Axiomatic Design Process

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Abstract

Teacher-centered learning pedagogy is a passive approach but most standard practices in many engineering courses than the active approach that is student-centered learning pedagogy. For a country like Papua New Guinea which is rich in culture diversity, the social structure or group identity forms the lines of conflict affecting teacher or student-centered approach. With the advent of technological tools to support teachers in engaging student, the choices are too many to explore. Consequently, the confusion to which learning methods and technical tools are appropriate to the student that have culture affiliation and use such affiliation in engaging them in higher order thinking, knowledge integration and self-efficacy requires support to get the right instructional methodologies based on the Axiomatic design (AD) principle. The results show that the combination of AD law simplifies what learning design for engineers can create a paradigm shift in culture to educational synergy.

"Scalar Bound States Using Worldline Monte Carlo" – Test Case: One loop Effective action.

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Abstract

In our new approach we try to develop, the Worldline Monte Carlo Formalism. We begin with application of this technique to study the simple case of one loop effective action and extend it to verify the results for the three / four point function in ((phi)^2(chi)- theory. Later we propose using the same technique to test the results for the Lowest Bound state mass in the worldline formalism by summing up all ladders and crossed ladders in the (phi)^2(chi) - theory with zero mass of the particle.

Stages of societal development and distinctive male-female roles: Resource for understanding history

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Abstract

With the beginning of human civilization, men and women performed their distinctive roles in the society. Apart from biological aspects of sexuality, men-women relationships included labor-intensive economic activities too. There was specified division of labour sometimes naturally determined for a cause by both men and women. From 'hunting-food gathering' stage though to industrial development, the division of labour persisted in different forms. To consider sexuality and gender, we know that sex is biologically determined while gender is socially constituted. Because of this biogenic and socio-centric facts, men populace got supremacy over women through their vital roles in decision-making and policy planning for familial and social affairs. From time immemorial, this fact of male dominance existed in family and society regardless of any given social structure. This paper attempts to highlight how social construction of male-female differences is historically outlined as an observable phenomenon. The analyses carried on in this study employing historical methods.

Superimposing GPS Heighting Extracted via LiDar DEM for Feasibility Purposes

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Abstract

The Global Navigation Satellite Systems (GNSS) has emerged as a successful technology in providing precise position of points on the surface of the earth over the reference ellipsoid with sub-metre to centimetre level of accuracy. The heights from this are ellipsoidal heights necessitating its transformation into orthometric heights by integrating a geoid model, which provides separation (N) of the geoid with the reference ellipsoid. EGM96 Geoid Model was the vertical component of the PNG94 at the time of gazettal of the PNG's Geodetic Datum in 1996. EGM 2008, an improved model is now the accepted global geoid model is widely employed for the purpose yielding sub-metre accuracy. In Papua New Guinea (PNG) the demand of large scale maps with one or two metre contour intervals is ever increasing particularly for urban infrastructure development and as well on major engineering projects such as the liquefied gas pipelines running over half the rough terrains of PNG. It has become imperative to optimize the use of GPS in derivation of the orthometric heights with minimum levelling employed. The present study has been contrived in tune with this where Madang town of PNG, a fast-developing town in the country, has been taken up as the study area.

GPS survey as well as spirit levelling was carried out connecting thirty-three control points distributed in the area. The ellipsoidal heights from GPS were transformed to orthometric heights by integrating the EGM 2008 geoid model. The accuracy of or-thometric heights was found to be about a meter. Also, a local geoid model was developed using 15 points from the cited 33 points. The heights of remaining 18 points were used for checking the efficiency of the local model where notable improvement in accuracy level to 0.6 m has been achieved. With this accuracy achievement concluded from the study, the application of feasibility investigation of Storm water drainage Levels (RL) can be directly extracted via LiDar Image and Field GPS verification.

Balsa – A Potential Forestry Crop for Innovative Products and its Market Prospect in Future

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Abstract

Balsa (*Ochroma pyramidale* Sw.), a light weight and low density (90-310 kg/m^3) tropical hardwood native to South America is widely grown as a tree crop in East New Britain Province, Papua New Guinea (PNG). It is a fast growing tree species with harvestable age at 6-7 years and finds its end uses in light constructions: bouys, life-jackets, surf boards, toys, mounting boards, packaging box, insulation boards, etc. A small balsa industry in PNG supplies *ca.* 10,000-17,000 m^3 of sawn boards and end-grain panels annually to international market as 8% share of contribution to Ecuador who dominates the market with 90% supply. At present times, scientific discoveries and technological changes are making inroads for innovative wood products that find end uses in many engineering applications. Lately, the properties of balsa end-grain-panels to offer high impact strength and excellent thermal and sound insulations have led to manufacture of innovative products. For instance, use of balsa end-grain-panel in composite products meets many engineering applications (e.g. wind turbines to generate bio-energy, thermal insulation boards, in ship and aeroplane constructions). Global environmental issues (high energy consumption and CO_2 emission) and sourcing of raw materials from renewable resource are exerting pressures on innovative/engineered wood products whilst at the same time will play a role in mitigating climate change. The global market demand for balsa from industrialised nations as an ideal raw material for innovative products is expected to rise in future. PNG anticipates in expanding balsa plantations under government's (PNG Forest Authority) long term plan *"painim graun planim diwai"* to meet the market demand.

Space Weather Predictions Related to Geomagnetic Storms

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Abstract

Space weather refers to the state of the magnetosphere and ionosphere which is determined by the solar wind. Under disturbed conditions, satellites and ground-based technological systems such as communication networks and electric power grids can suffer harmful effects. Biological systems also get affected. Hazards can be minimized if the occurrence, duration and severity of storms can be accurately predicted in a timely manner. Thus, space weather forecasting is important.

Currents within the earth's core produce the main source of earth's magnetic field. At ionospheric heights, electric currents are the important sources of magnetic field. These currents are controlled by the solar wind. The two controlling parameters of the solar wind are the solar wind speed and the southward component of Interplanetary Magnetic Field (IMF).

The solar wind speed can be predicted by observing the solar coronal structure. Prediction of southward component of IMF is even more difficult. During sunspot maximum phase, CMEs play a crucial role in producing southward IMF. During the declining phase of the solar cycle, coronal holes have expanded from polar locations to equatorial regions. The fast wind interacts with slow stream ahead, creates a plasma and field compression called Corotation Interaction Region (CIR). The reverse waves steapen into shocks which can produce southward IMF. Another mechanism which can enhance southward IMF is the geometrical mapping from solar equatorial plane in which the IMF is ordered, into a magnetospheric system. This is responsible for the seasonal variation of geomagnetic activity.

Solar wind flows radially outwards and solar magnetic field is frozen-into the plasma. But non-radial flows are observed associated with CMEs, CIRs etc. We developed a model which can find out the non-radial flows of the solar wind. The difference between the occurrences of southward component of IMF in 'Away' IMF sector (outward IMF) and that in 'Toward' IMF sector (inward IMF) shows a sinusoidal variation in a year. Any variation from the sinusoidal pattern implies a non-radial solar wind flow. Non-radial solar wind flows are associated with CMEs and CIRs. The effects of non-radial flows of solar wind are analyzed to explain the geomagnetic activity.

Coconut Oil Extraction Using Enzymes from Giant African Snail in Different Processing Methods

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Abstract

Coconut (cocos nucifera L) is an important oil producing crop of the coastal people of Papua New Guinea. Coconut oil has nutritional and economic purposes due to the medium chain fatty acid content and used for pharmaceutical purposes.

Enzymatic extraction is efficient method of extraction. Mannan degrading enzymes like mannase and galactomannanase from Giant African Snails (GAS) were purified and utilized in extracting coconut oil.

Grated coconut was mixed with crude (GAS) enzymes and commercial enzymes, with distilled and tap water; using the methods of thermal, chilling, thawing, mechanical expression and enzymatic were tested in this study.

The quality conformity test of free fatty acid (FFA), proximate analyses, Iodine value and peroxide value were analyzed for these different methods.

Status of Postgraduate Programs at Unitech and the Future Prospects

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Abstract

Postgraduate studies and research is the cornerstone for the sustainable development of any country. Highly trained skilled and knowledgeable people are necessary not only for innovation but also to use the innovation for sustainable economic and social development. In the 21st century, postgraduate studies are not a luxury but a requirement. Without postgraduate studies and research there is no innovation and without innovation there is no sustainable national development. Universities are recognized as institutions for the advancement of knowledge, scholarship and innovation and the postgraduate programs are the conduits through which universities develop research capacity for functional economy and to solve complex issues. To move PNG forward there is no shortcut or alternative but to build a highly qualified knowledge nation through a quality PG academic program. Educated and qualified manpower is the greatest asset for any country.

PNG University of Technology (Unitech) started its journey of postgraduate studies through graduating its first PhD in 1976 in Civil Engineering. At the initial stage, most of the PG students were the overseas staff. The momentum of PG studies did not continue for long. Unitech could not take the advantage of the generous financing for a sustainable PG program and research through institutionalizing the postgraduate programs foreseeing the importance from the stand point of human capacity building and succession planning. The PG programs mostly was in hibernation during the nineties to early 2000s. This was mostly because of the mass exodus of the expatriate as well as national academic staff. Unitech became at a crisis point in terms of recruiting and retaining qualified staff. From the mid- 2000, PG programs rejuvenated through re-focusing on the research and scholarship character development and re-introduction of GAP Scholarship schemes, ACIAR Scholarship schemes and NZAID for women in Agriculture.

Currently, all the 13 academic departments have the PG programs up to the PhD levels. Altogether, there are 15 PhD, 24 Masters, 2 PGD and 2 PG Certificate courses at Unitech. There are about 200 registered students in different programs, which is probably the largest PG programs in PNG. Two of the department are also offering the PG courses in distance mode. The number of enrolment in PG programs is increasing every year. By utilizing the strength in PG studies and research capabilities, Unitech could be a powerhouse in producing highly qualified manpower for the whole of Pacific Island Nations if the existing PG programs can be further strengthened.

Certain Congenital Anomalies in High Background Radiation Areas – A Case Control Study

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Abstract

The first documented excesses of congenital anomalies were among children of survivors of the Hiroshima and Nagasaki bombings. On the South west coast of India, the 57 km coast line of Kerala is one of the high background radiation areas (HBRA) in the world. The monazite sand present in this region is an orthophosphate of thorium and rare earths and typically contains thorium oxide (~9%) and uranium oxide (0.35%) along with phosphorous pentoxide, rare earths, titanium oxide, cerium oxide, iron oxide, and silicon dioxide. According to the reports of World Health Organization, the south west coast of Kerala is a potential area for significant epidemiological studies of high background radiation in the human populations. The monazite-bearing regions of Kerala, which has a significant resident population living at comparatively higher background radiation levels, gives a comprehensive opportunity to examine the effects of prolonged exposure even to very low dose-rates.

Though there have been numerous studies on inhalation dose and external dose levels, investigations on the health effects of high background radiation are quite scanty. Occurrence of certain forms of cancer – lung and cervix- has been found higher in the region as compared with all other parts of the country. The cases of certain congenital malfunctions in the region are also reportedly high; but there has been no report of any correlative study between radiation and malfunctions. In the present study we have made a 3:1 matched case control study of the congenital malfunctions – mental retardation and cleft lip/palate – to explore the effect of natural background radiation.

Higher risk of mental retardation was observed in children whose mothers were affected by high blood pressure at the time of pregnancy. Risk was greater in children whose mothers' delivery were assisted with forceps. These are only indication from the study and are to be studied thoroughly. Conditional logistic regression did not suggest any statistically significant association of either mental retardation or cleft lip with high level natural radiation.

A GIS Integrated Approach on Long-term Efficient Traffic Management – Lae, Morobe, Papua New Guinea

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Abstract

Divided by ridges of high mountains and dense with tropical rain-forests, Papua New Guinea has some of the world's most difficult terrain to traverse. As of 2014, PNG's total road length was only about 30,000 km where the country's terrain area is 462,840 sq. km. approximately. Present road network is insufficient to connect various corridors of economic importance to the country inspite of several planning and policies of the Government. The varied geography has limited the growth of existing transportation infrastructure at per with economic growth of major cities like Port Moresby and Lae, driven by strong economic boom in the past several years. Rise is city traffic and ever-increasing traffic congestions are evident of this situation. Unlike Port Moresby, Lae was not very fortunate to receive dedicated fund like PGK700 ($264.9 m) for development of its city roads prior to 2015 South Pacific Games. Moreover, there are no reliable and up-to-date traffic counts for the entire nation. This study aims to understand and analyse the traffic situation and traffic management issues of Lae City based on primary traffic data collection and integrate this data with Geographic Information System (GIS) to enable digitally store/retrieve, edit, update, analyse these data over time and simulate time dependent traffic situation for present and future traffic management.

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In the New age of Digital Journalism the Impact and Influence of Social Media Revolution Across South Asia– A Case Study of Rise of Citizen Journalism

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Abstract

With the advancement and rise in technology, Social Media across South Asia is playing a vital role and influencing the region, changing the Social and Political landscape. It is witnessing a rapid change across the region with the newer and more interactive media across the world making inroads.

Revolutions in technology have a wide impact in mass communication and journalism in many ways - instantaneous information, user-generated content and interactive news platforms have become the order of the day. Today mainstream media has become dynamic and interactive with social media playing a vital role in changing the dynamics of news reporting and production. An offshoot of this partnership has given power to ordinary citizens to play the role of journalists thus making way for a new genre in journalism called citizen journalism.

This paper will analyse and understand the general notion of Citizen Journalism via social media across South Asia in countries like India, Nepal, Pakistan, Sri Lanka and Bangladesh.

The main aim is to understand and study how the phenomena of Citizen Journalism is roping citizens in these countries and the issues that interest them and are being highlighted. The diverse platforms available for citizen journalism and also comprehend the role in the society.