THE ROYAL SOCIETY of WESTERN AUSTRALIA

PROMOTING SCIENCE

7TH ANNUAL POSTGRADUATE SYMPOSIUM 2005

CURTIN UNIVERSITY OF TECHNOLOGY

GEOLOGY SEMINAR ROOM
Building 312, Room 222

Curtin University of Technology

MURDOCH UNIVERSITY PERTH, WESTERN AUSTRALIA

THE UNIVERSITY OF NOTRE DAME AUSTRALIA

ECU EDITH COWAN UNIVERSITY

THE UNIVERSITY OF WESTERN AUSTRALIA

TABLE OF CONTENTS

MESSAGE FROM THE RSWA PRESIDENT 4

THE ROYAL SOCIETY OF WESTERN AUSTRALIA 5

SCHEDULE OF SEMINAR PRESENTATIONS 6

LIST OF POSTER PRESENTATIONS 7

ORAL PRESENTATION ABSTRACTS 8

ANTHONY FRANCIS 8
RICK HUGHES 9
ANNABETH KEMP 10
ERIN LOWE 11
JUNJI MIYAZAKI 12
NAVID MOHEIMANI 13
CHRIS NEWBOUND 14
MICHAEL PARSONS 15
CATE TAUSS 16
MIGUEL TOVAR-VALENCIA 17
AILBHE TRAVERS 18
JOY UNNO 19

POSTER PRESENTATION ABSTRACTS 20

SARAH BOURKE 20
JOHN COLLINS 21
FARON MENGLER 22
ANNE NURBAITY 23
STEPHEN O'DWYER 24
NATASHA PAULI 25
TOBIAS SCHOEP 26

MEMBERSHIP NOMINATION FORM 27

MAP OF CURTIN UNIVERSITY 29

RSWA COUNCIL 2004/2005 31

MESSAGE FROM THE RSWA PRESIDENT

Welcome to the Royal Society of Western Australia's 7th Annual Postgraduate Symposium. The objective of the Society is to advance and promote science, and in this regard the Society operates on several levels. One of our main objectives is to provide support, direction, and encouragement to young scientists. We endeavour to achieve this by introducing young people to science through our monthly meetings; our workshops that introduce science to students prior to their entry to university or TAFE; and by awarding RSWA medals to outstanding science students in their final years in each of the Universities.

As part of our charter to promote and encourage science, several years ago the RSWA initiated an annual Postgraduate Symposium where young researchers could meet other postgraduates from a variety of disciplines, and present the results of their research in a public forum. The 7th Annual Postgraduate Symposium continues this tradition, and we hope that it will be a valuable training and educational experience for all involved.

Dr Alex Bevan

President Royal Society of Western Australia

Curator of Mineralogy and Meteoritics, WA Museum

THE ROYAL SOCIETY OF WESTERN AUSTRALIA

The Royal Society of Western Australia is the premier society for scientists in Western Australia, and while there are innumerable specialist societies and associations now in the sciences, our Society remains the only holistic multidisciplinary association for scientists in the State.

The origin of the Royal Society of Western Australia indirectly lies in a history dating back to the original Royal Society (of London) that began with a group of scientists meeting in the mid-1640s to discuss the newly emerging philosophy of Science. Since the time of its official foundation in 1660, the Royal Society (of London) has seen a number of luminaries as Presidents, including Robert Boyle, Sir Isaac Newton, Sir Joseph Banks, and Sir Humphrey Davy and Lord Kelvin, all noted for their major contributions to science. Early in Australia's history, the various States inaugurated Royal Societies modelled on the original Royal Society, and in this regard, the Royal Society of Western Australia carries on this tradition. In essence, therefore, its roots lie in the model of the original Royal Society of the 1600s: the Royal Society of Western Australia has monthly scientific meetings, a scientific Journal, and a President and Council that run the affairs of its members.

The Royal Society of Western Australia has had a rich history in which there were forerunner societies such as the Western Australian Natural History Society (1891-1898), the Mueller Botanic Society (1897-1903), the West Australian Natural History Society (which was incorporated with the Mueller Botanic Society, and the Natural History and Science Society of Western Australia (see Jenkins 1965, JRSWA 48: 33-44; Withers 1998, JRSWA 81:1-4). After receiving a Royal Charter from His Majesty through the Governor in 1913, the Society assumed its title as the Royal Society of Western Australia in 1914, and in 1937, it became Incorporated.

The objective of the Royal Society of Western Australia is the advancement of science in Western Australia. Throughout its nearly 100-year history, the Society has pursued this objective principally through publication of scientific papers in the *Journal of the Royal Society*, through monthly meetings, and through the convening of symposia and workshops. In more recent times, the Society has expanded its role to one of promoting science in education, and taking acquired scientific knowledge to the public arena for the wider benefit of society. Despite the changes in the role of the Society during its history, it has remained holistic in its advancement of Science and has pursued or commented on a range of social, technological and scientific matters, where they interface or impinge on science.

SCHEDULE OF SEMINAR PRESENTATIONS

10:00	**REGISTRATION**	
10:30	**OPEN**	**Dr Alex Bevan, President of the Royal Society of Western Australia**
10:35	**WELCOME**	**Deputy Vice-Chancellor, Curtin University of Technology**
10:45	Ailbhe Travers	The Morphology and Dynamics of Low-Energy Sheltered Beaches
11:00	Annabeth Kemp	Toxic Cyanobacterial Blooms in the Freshwater Urban Wetlands on the Swan Coastal Plain
11:15	Anthony Francis	Australian Sequestrate Cortinarioid Fungi
11:30-12:00	**MORNING TEA**	
12:00	Cate Tauss	*Reedia spathacea* F. Muell.: Cyperaceae Phylogeny, Phylogeography and Conservation in South-west Western Australia
12:15	Erin Lowe	Response of Macroinvertebrates and Diatoms to Changing pH in Wetlands of the South-West of Western Australia
12:30	Junji Miyazaki	Eradication of Endogenous Bacteria in *Petunia hybrida* via Treatment of *in vitro* Axillary Buds with Plant Preservative Mixture (PPM^{TM})
12:45-1:45	**LUNCH**	
1:45	Michael Parsons	Kangaroo Herbivory, Competition and Impact on Species Used in a Restored Forest Community
2:00	Miguel Tovar-Valencia	Use of Satellite Information to Validate Rangeland Sustainable Management Practices on the Fortescue River Floodplain
2:15	Navid Moheimani	Culturing Coccolithophorid Algae for Carbon Dioxide Bioremediation
2:30-3:30	**AFTERNOON TEA/POSTER PRESENTATIONS**	
3:30	Rick Hughes	The Role of Hydrogen in Amorphous Silicon Semiconductors
3:45	Chris Newbound	Mitochondrial DNA Variation in the Genus *Cynopterus* Throughout Wallacea
4:00	Joy Unno	The Soldier Crab *Mictyris* (Latreille) in Western Australia
4:15	**CLOSE**	**Dr Alex Bevan, President of the Royal Society of Western Australia**
4:20	**CLOSING DRINKS**	

LIST OF POSTER PRESENTATIONS

2.30-3.30 pm

Presenters Name	Title of Poster
Sarah Bourke	Lipid Ratios as a potential tool for monitoring sub-lethal sediment stress in hard corals
John Collins	Purnululu National Park: Soundscape and Scenic Flights
Faron Mengler	Intrinsic Erosion Resistance on Natural Steep Slopes of the Northern Jarrah Forest
Anne Nurbaity	Arbuscular Mycorrhiza Fungi and Soil Salinity
Steve O'Dywer	Impact Assessment of Shack Settlement to Coastal Vegetation at Wedge Reserve, Central Coast Western Australia
Natasha Pauli	*The Effects Of The Quesungual Agroforestry System Of Western Honduras On Soil Macrofauna*
Tobias Schoep	Isolation and Characterization of *Pseudobutyrivibrio ruminis* Gene Promoters

ORAL PRESENTATION ABSTRACTS

ANTHONY FRANCIS

Australian Sequestrate Cortinarioid Fungi

CSIRO Forestry and Forest Products / Murdoch University School of Biological Sciences & Biotechnology

The truffle-like fungi allied to Cortinarius (the world's largest genus of mushrooms) are diverse and common in Australia. Called truffle-like because they usually grow underground and their spores mature inside enclosed ball-like fruitbodies, these fungi are important symbionts with plants, food for native mammals, nutrient-cyclers and confer a degree of resilience to ecosystems. However, because of their cryptic habit and ephemeral fruiting, they are far less well known than the above ground mushroom-like fungi, let alone the plants! My project is using ITS rDNA sequences in concert with classical fungal taxonomy to investigate the diversity and phylogenetics of the Australian assemblage of these fungi.

RICK HUGHES

The Role of Hydrogen in Amorphous Silicon Semiconductors

Murdoch University

Silicon is used extensively for making semiconductor devices such as solar cells. Amorphous silicon solar cells have many design and cost advantages over crystalline cells but a major hurdle still to be overcome is their degradation following exposure to sunlight. Many useful properties depend on its structure and bonding, which determine the density of states (DOS) in the valence band. This work has used lineshape analysis of spectra from valence band X-ray photoelectron spectroscopy (XPS) and Auger L1 L2,3V and L2,3-VV lines to study differences in the DOS of silicon in various forms and after various treatments such as light soaking and threshold heating and re-annealing.

ANNABETH KEMP

Toxic Cyanobacterial Blooms in the Freshwater Urban Wetlands on the Swan Coastal Plain

Department of Environmental Biology, Curtin University of Technology

Research has been undertaken into the ecology and toxicology of noxious cyanobacterial blooms in the wetlands on the Swan Coastal Plain. Of the 25 urban lakes sampled, 22 were found to have potentially toxic cyanobacteria in spring and summer with 17 lakes repeatedly experiencing serious blooms of multiple species. The major bloom forming species belonged to *Microcystis, Anabaena, Nodularia*, *Anabaenopsis* and *Aphanizomenon,* which is characteristic of temperate cyanobacterial blooms. The dominant nuisance species were *Microcystis flos-aquae*, *M. aeruginosa*, *Anabaena circinalis*, *A. bergii var. limnetica*, *A. spiroides*, and *Anabaenopsis elenkinii*.

The microcystin content in natural bloom samples was also determined using HPLC and ELISA. From the 32 lakes samples, 28 were positive for microcystins with the common variants being MYST-LR and MYST–YR. Total toxicity of scum samples ranged from < 0.05 to 8428.6 µg/L with the most toxic samples being collected during winter. The toxicity of Herdsman Lake, for example, was more than 100 times greater in winter than in summer. Besides microcystins, nodularins were also detected as *Nodularia* blooms have become common in Yangebup Lake. These and other results will be presented and discussed.

ERIN LOWE

Response of Macroinvertebrates and Diatoms to Changing pH in Wetlands of the South-West of Western Australia

Department of Environmental Biology, Curtin University of Technology

The acidification of wetlands in Australia is a growing problem with processes such as urbanisation, agriculture and mining contributing to decreasing pH. Biota such as macroinvertebrates and microalgae are considered sensitive to these changes and are commonly used as biomonitors around the world. However, in Australia, limited research has been carried out using these two groups as indicators of acidity. The objective of this study was to investigate the use of these biomonitors and their response to pH. 20 wetlands were selected from the south-west of Western Australia with sampling conducted seasonally. The relative merits of diatoms and macroinvertebrates were assessed using multivariate analyses and pH was found to be a key factor in determining their distribution. Although both groups were affected by pH, diatoms appeared to be more sensitive.

Supervisor: A/Prof Jacob John

JUNJI MIYAZAKI

Eradication of Endogenous Bacteria in *Petunia Hybrida* via Treatment of *in vitro* Axillary Buds with Plant Preservative Mixture (PPM^{TM})

Department of Environmental Biology, Curtin University of Technology

Plant Preservative Mixture (PPM), a proprietary mixture of two broad-spectrum isothiazolone biocides, was recently introduced as a prophylactic anti-bacterial agent in plant tissue culture. Its efficacy for eradicating endogenous bacterial contaminants in *Petunia hybrida* was tested. Plantlets of *P. hybrida* were artificially infected by *Sphingomonas paucimobilis*. Endogenous bacteria were histologically observed. Axillary buds treated with PPM-containing medium effectively eliminated contaminant bacteria; this was confirmed by indexing of leaves of plantlets raised from PPM-treated axillary buds. PPM existing in axillary buds was quantitated by HPLC.

Co-author: Dr Beng Tan

NAVID MOHEIMANI

Culturing Coccolithophorid Algae for Carbon Dioxide Bioremediation

School of Biological Sciences and Biotechnology, Murdoch University

Culturing coccolithophorids is an attractive alternative for application in the sequestration or recycling of carbon dioxide. Coccolithophorids can fix carbon both by photosynthesis and also by producing calcium carbonate plates known as coccoliths. They also produce high amounts of lipids which can possibly be used as a renewable fuel.

We studied the mass cultivation of *Pleurochrysis carterae* CCMP647 in number of photobioreactors including airlift, carboys, plate reactors, tubular (Biocoil) reactors and outdoor raceway ponds. This species grew well in all types of photobioreactors examined except for the Biocoil. Culture in outdoor raceway ponds (paddle wheel mixed) was the most successful. We have maintained semicontinuous cultures for a period of 12.5 months. The highest biomass achieved has been 3.9 g total dry weight. L with the coccolith weight of 0.319 g/L during the spring and summer period. The most sustainable mean generation time of 2 ± 0.9 days was achieved during the same period of time. Productivity of 0.1 g/L/d was also achieved in raceway photobioreactors. Total lipid content of the cells ranged between 30-50% of total dry weight. Bacterial, algal and protozoan contaminations did not present significant difficulties during cultivation.

Co-author: M. Borowitzka

CHRIS NEWBOUND

Mitochondrial DNA Variation in the Genus *Cynopterus* Throughout Wallacea

The University of Western Australia

The Indonesian archipelago provides a unique opportunity to study recent genetic and speciation events, as the archipelago covers a geographic region where Australian and Oriental faunal sets meet. Over the last 14,000 years changes in sea level have fragmented populations of many vertebrate species. This study examines mitochondrial DNA (mtDNA) to assess variation within and between populations, with a view to understanding the patterns and processes of recent evolutionary events and the impact of demographic factors. It also allows comparisons of genetic results obtained from mtDNA and previous allozyme and morphological studies, taking into consideration the effect of isolation, island size, and geographic distance on genetic variation within and between populations.

Co-authors: S. Hisheh, R. How, and L.H.Schmitt

MICHAEL PARSONS

Kangaroo Herbivory, Competition and Impact on Species Used in a Restored Forest Community

Department of Environmental Biology, Curtin University of Technology

We measured western grey kangaroo (*Macropus fuliginosus*) browsing effects at two recently rehabilitated bauxite mines in southwestern Australia. Sixteen species were assessed for the effects of both herbivory and planting density inside and outside exclosures for ten months following establishment. Despite geographical separation by 50 km with a difference of 400 mm annual rainfall, the browsing trends at both mines were largely indistinguishable. By two months there were significant reductions in shoot mass and survival for plants exposed to browsing, while plants at low density were 25% larger than closely spaced plants. By the first (summer) harvest, seedlings of five species were significantly impacted by browsing (shoot mass), reaching seven species by the second (winter) harvest. Survival mirrored that for biomass. Grazing optimization was identified in three native legumes with high growth rates (*Acacia alata, Acacia lateriticola and Viminaria juncea*). Plants with higher levels of protein were not favoured, while those species highest in polyphenolics, salts and sulphur were often avoided. Similar to deer species of North America and Europe, plant architecture was a prominent selective agent for kangaroos. In this case, grasses and grass-like species (Poaceae, Cyperaceae and Xanthorrhoeaceae) were most likely to be impacted. We showed the effects of herbivory to be profound; which can result in a markedly different plant composition in restored landscapes. In our study, herbivore preference often equated to herbivore impact, however future planting in rehabilitated areas should allow for resilience and compensation by some species. It is suggested that these species prone to grazing optimization are identified by land managers as they may serve as biotic refuges for nearby recalcitrant or vulnerable species. Plants with grass-like architecture should be defended during establishment at least within the first year of recruitment.

CATE TAUSS

Reedia spathacea F. Muell.: Cyperaceae Phylogeny, Phylogeography and Conservation in South-west Western Australia

School of Plant Biology, University of Western Australia

South-west W.A. is a globally significant centre of diversity for the large family Cyperaceae (sedges) however the evolutionary relationships within this group of sedges have hitherto been unclear. *Reedia spathacea* is a rare, monotypic genus restricted to a small number of disjunct wetlands within the high rainfall zone of south west W.A. The wetlands it inhabits are regionally atypical as they are maintained by factors largely independent of climate such as artesian flow from the deep Yarragadee aquifer. Some of these wetlands have critically endangered conservation status.

Reedia spathacea was used as a focus in this study to explore the phylogeny of the sedge genera of the region using DNA sequences of the chloroplast gene *rbcL* as well as morphological and pollen characters. The intraspecific phylogeny of *Reedia spathacea* was also examined using chloroplast Restriction Fragment Length Polymorphisms (RFLP) to gain insight into its historical biogeography.

Cladistic analysis indicated the phylogenetic evidence was consistent with *Reedia* as a relictual ancestor of the sedges in the region. It also highlighted inconsistencies in the current circumscription of several other sedge genera. However RFLP markers did not distinguish significant genetic differences between the extant populations of *Reedia*, suggesting that these populations have not been reproductively and/or geographically isolated from each other for a lengthy period.

The genetic and morphological findings of this study have implications in the conservation and management of *Reedia spathacea* and the threatened ecological communities it inhabits.

MIGUEL TOVAR-VALENCIA

Use of Satellite Information to Validate Rangeland Sustainable Management Practices – Fortescue River Floodplain

Department of Environmental Biology, Curtin University of Technology

The Fortescue River was dammed (Ophthalmia Dam) north of the mining town of Newman, in the Pilbara in 1981. The aim was to replenish and maintain the aquifer on which both the town of Newman and the associated mining operations depend. After 1982 pastoralists 70 kilometres downstream of the Dam claimed that their Station productivity was affected by a lack of flooding. However, flooding is not regular as it depends largely on periodic cyclonic events and when this happens the Dam generally overflows. In addition the undammed Jigalong River contributes significantly to the extent of flooding on Roy Hill Station.

More than 20 studies have been commissioned since 1982 to determine if loss of productivity and death of trees has occurred downstream of the dam. These studies have been unable to determine if the Dam is a direct cause. This is because range condition prior to dam construction was already very poor as a result of many years of high stocking rates. Also there is no suitable base line to use which can establish reasonable comparative evaluations of vegetation condition. In addition, Ethel Creek Station (closest to the Dam) has conducted a comprehensive rehabilitation process (destocking, culling of kangaroos and brumbies, smaller paddocks, more and rotation of watering points, mechanical seeding, fire prevention and combat of fires). Moreover, during the last 7 years the region has experienced rainfall volumes greater than the historic mean. In this period the Fortescue River flooded on 4 occasions.

Comparisons may be made of management outcomes between paddocks and between stations. Information retrieved from satellites can be correlated to the level of green vegetation biomass on the ground. One of these parameters is the Normalised Difference Vegetation Index (NDVI). Since 2001 biweekly NDVI values for paddocks have been extracted from the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor at 250 metres resolution. Preliminary results are showing that paddocks in Ethel Creek when compared to Roy Hill deliver higher and longer NDVI values, which suggest that management practices are more efficient on Ethel Creek than at Roy Hill Station in terms of grazing productivity and ecosystem rehabilitation.

AILBHE TRAVERS

The Morphology and Dynamics of Low-Energy Sheltered Beaches

School of Earth and Geographical Sciences, University of Western Australia

Low-energy beaches constitute a significant proportion of global coastal reaches. However, their morphology and dynamics are poorly understood with minimal research focused specifically on areas sheltered from the full impacts of ocean swell. Such environments are found along the coast of southwestern Australia where the presence of semi-submerged and discontinuous Pleistocene ridges provides many of the site-specific conditions under which sheltered beaches occur.

The research reported here delineated a range of profile morphotypes (exponential, segmented, concave-curvilinear and convex-curvilinear) along sheltered reaches in Cockburn Sound, a semi-enclosed micro-tidal basin where locally generated wind waves prevail. Identified morphotypes have, in turn, been related to their physical setting with modes and levels of spatial and temporal variability associated with discrete profile forms within sheltered environments. Results suggest that profiles in most exposed sites, the concave-curvilinear group, are subject to most change while change is minimal for exponential forms in most protected locations. Generally profile variability is episodic in nature and appears to be concurrent with high-energy low-frequency (storm) events. In this context the research examined changes in beach morphology occurring for the most variable morphotypes, concave-curvilinear, with the onset and passage of a typical winter storm. This facilitated the formulation of a qualitative model for morphologic change associated with these low-energy, sheltered morphotypes.

The information derived through this research is critical to the development of a generalised model of low-energy beach dynamics. Such a model would provide coastal managers with a useful tool for management of beach resources in low-energy environments as distinct from their high-energy counterparts.

JOY UNNO

The Soldier Crab *Mictyris* (Latreille) in Western Australia

Edith Cowan University, Joondalup

The soldier crab *Mictyris* is well known from tropical and temperate coastal Australia, colonising sandy tidal substrates, and frequently observed in swarms. In Western Australia *Mictyris* is represented by one species, *Mictyris* cf *longicarpus*, occurring from subtropical arid Shark Bay to tropical semiarid Dampier Peninsula. It inhabits a variable range of environments within the milieu of tidal sand flats. Eighteen regional study sites were used to characterise the range of environmental factors that the crab can tolerate. The species occupies mid-tidal to high tidal settings: from metahaline carbonate dominated sands of a tidal sandy bar in the Shark Bay area, to oceanic-water-bathed tidal lagoons of strandplains of the Gascoyne Delta, to oceanic archipelago-framed tidal sandflats and tidal delta shoals of the Dampier Archipelago, to oceanic carbonate-quartz sands of the tidal flats, beaches, and tidal lagoons on the Broome region. In the habitats, the salinities of open ocean waters, the groundwater and the pore waters also show wide variation. While substrates of soldier crab habitats are predominantly sand, grainsize may vary from very fine to fine sand to medium sand, and the carbonate, silicic, and organic matter content of the sand and interstitial mud similarly varies widely. The study shows the Western Australian soldier crab to be versatile species, able to inhabit a wider range of niches on sandy tidal flats than more habitat-restrictive species such as *Ocypode* (the ghost crab), or *Uca* (the fiddler crab).

POSTER PRESENTATION ABSTRACTS

SARAH BOURKE

Lipid Ratios as a Potential Tool for Monitoring Sub-Lethal Sediment Stress in Hard Corals

School of Earth and Geographical Sciences, University of Western Australia

Here we present preliminary results from a new rapid analysis method for determining coral lipid ratios. Change in coral lipid content has been suggested as an integrated measure of coral condition and studies have shown links with growth, metabolism and reproduction. Tissue samples were collected from colonies of *Acropora latistella* and *Turbinaria mesenterina* in the Port of Dampier, W.A. where they are subject to dredging related sediment addition. The mean lipid ratio of *T. mesenterina* was almost twice that of *A. latistella*. This difference in lipid content concurs with what is known of the different distribution of these species along a turbidity gradient within the field site. This first study has shown that inter-colony variation within species can be considerable (up to 140 % of the mean). However, this may be reduced by quantifying colony size and repeatedly sampling the same colony over time. This lipid ratio technique was able to provide rapid and robust measures of natural variation in coral lipid content, irrespective of coral morphology. This will allow for a baseline data set of coral lipid content to be established. The results of this study suggest that the lipid ratio technique may be able to provide rapid, robust measures of sub-lethal stress levels in corals and be a useful tool for coral reef monitoring.

JOHN COLLINS

Purnululu National Park: Soundscape and Scenic Flights

The University of Western Australia

Each aircraft makes a noise. In remote National Parks a lack of man-made noise is an asset. The noise of aircraft conducting scenic flights is viewed by many ground users as an unwanted intrusion. It produces a conflict between ground and aerial tourists over the use of National Park resources.

Fly Neighbourly Agreements are the principal aircraft management tool used in Australia. At Purnululu the Fly Neighbourly Agreement does not separate ground users from scenic flights. Promulgated flight paths are established to ensure safe aircraft operation but do not address environmental impacts or conflict with ground users.

It is recommended that:

1. The soundscape at Purnululu be determined;
2. The environmental impacts of scenic flight aircraft be assessed;
3. Acceptable limits of change to the Purnululu soundscape be established, using worlds best practice benchmarks;
4. The Fly Neighbourly Agreement be renegotiated to ensure ongoing air safety, mitigation of on ground impact and optimise the amenity of the soundscape;
5. A soundscape monitoring program be established using a procedure similar to that used in the Grand Canyon National Park.

FARON MENGLER

Intrinsic Erosion Resistance on Natural Steep Slopes of the Northern Jarrah Forest

School of Earth and Geographical Sciences, The University of Western Australia

Alcoa World Alumina Australia (Alcoa) mines bauxite and rehabilitates jarrah forest in the high rainfall zone of the Darling Ranges, Western Australia. Alcoa's bauxite pits are generally on relatively flat slopes (5-10 degrees) where the risk of post-mining erosion is low. Up to 15 percent of new mining areas contain ore held within steeper areas of the landscape (>11 degrees or 1:5) where there is greater risk of erosion developing. Alcoa has rehabilitated a number of steep slopes over the last 20 years (e.g. Falcon area at Jarrahdale, Marloo South at Huntly and Mt William at Willowdale). Some of these steep areas have been successfully rehabilitated, while others have been significant failures. The reasons behind the success or otherwise of rehabilitation in these steep areas has not always been clear or appropriately monitored. It is likely that some failures have been related to rehabilitation operations while others may be related to environmental conditions (e.g. rainfall, flow-concentration, regolith and surface characteristics). It is critical to appropriately plan and design these steep slopes at the pre-mining stage to reduce the risk of unstable landforms and unsustainable ecosystems developing in rehabilitated areas. Proven rehabilitation methods for steep pits will allow Alcoa to continue to meet completion criteria and the expectations of stakeholders and the broader community. Stable steep slopes in natural areas can provide clues to the better design of erosion-resistant slopes in mined areas. This poster presents data derived from a landscape survey identifying the natural features and processes that protect intact jarrah forest slopes from erosion. These findings form part of a Master of Science by Research project.

ANNE NURBAITY

Arbuscular Mycorrhizas and Soil Salinity

Soil Science and Plant Nutrition, School of Earth and Geographical Sciences, The University of Western Australia,

Mycorrhizas are symbiotic associations between fungi and plant roots which are present in most soils. The fungi receive soluble carbon sources from the host plant whilst nutrients are passed back to the plant roots. The formation and function of mycorrhiza is affected by edaphic conditions such as soil salinity, which is a major environmental problem in Western Australia. In some circumstances, the Arbuscular Mycorrhiza (AM) fungi have been shown to enhance salinity tolerance of the plants. However, different fungi may have different mechanisms in improving the growth of plants in saline soils. Suggested mechanisms of salt tolerance by AM fungi are: (1) improved plant mineral nutrition and/or stimulation of root development leading to increased root growth, (2) plant water balance such as reduced water stress of the host plants and dilution effect of toxic ion such as sodium and chloride, (3) increased leaf sequestration of chlorides, and (4) osmotic adjustment by production of compatible solutes of the plant. Despite the variability of experimental results about AM fungi and salinity, this symbiosis may have beneficial implications for plant survival in saline soils, which in turn will have valuable contribution in managing salt-affected soils.

STEPHEN O'DWYER

Impact Assessment of Shack Settlement to Coastal Vegetation at Wedge Reserve, Central Coast Western Australia

School of Natural Sciences, Edith Cowan University

Gradient analysis was used to assess disturbance to coastal vegetation at Wedge on the central coast of Western Australia. Wedge has supported a shack settlement for +50 years and is subject to increasing pressures from greater visitor, tourist and recreational numbers. Data from 96 quadrats within the dunes of Wedge Reserve were collected for vascular flora and environmental characteristics. Square root transformed percentage species cover and 19 environmental variables were used for indirect and direct gradient analyses (NMDS, CCA). Distance from the coast, landform, and number of native species delineated the natural succession of vegetation patterns from coast to inland. This succession was classified as five individual landform units (foredune, primary dune, swale, secondary dune, flat and tertiary dune) within two broad landform types (1 & 2), and sampling sites were assigned a control (outside settlement) or impact (within shack settlement) status and landform type for analysis. CCA and NMDS then separated out variation in disturbed areas and identified that, although plant diversity was reduced, and contrary to expectations, impact sites had greater vegetation cover (30%) compared to control sites. The reverse held true for percentage bare ground. Two native species, *Acacia cyclops* and *Myoporum insulare* and a non-native grass, *Bromus diandrus* had significantly greater cover at impact sites. A range of native species had greatly reduced cover at impact sites relative to control sites. Gradient analysis highlighted a number of variables that were strongly correlated to vegetation patterns, including conductivity at 50 cm depth which was higher at impact sites.

NATASHA PAULI

The Effects of the Quesungual Agroforestry System of Western Honduras on Soil Macrofauna

The University of Western Australia / Centro Internacional de Agricultura Tropical

Agricultural practices that promote increased diversity and abundance of soil macrofauna may improve soil quality and productivity, due to the influence of soil macrofauna on organic matter breakdown, nutrient cycling and soil structure. In marginal farming environments, such an increase in soil quality could have important ramifications for food security, income and quality of life. Southern Lempira department in Honduras is one such marginal environment. There is a pronounced dry season, and the landscape is hilly, with steep slopes and shallow soils that are susceptible to erosion. Increasing population pressure has forced smallholder farmers to intensify farming techniques. The need for shorter fallow periods, a decrease in the use of slash-and-burn agriculture, and promotion by extension agents has resulted in the large-scale adoption of an indigenous agroforestry system known as the 'Quesungual System', based on slash-and-mulch of vegetation and rotation of maize, sorghum and beans. A distinctive feature of the Quesungual System is the inclusion of naturally regenerated trees and shrubs within the plots, which create a high level of structural and species diversity within each field.

This poster presents an overview of ongoing research on the interaction between farmers, trees and soil macrofauna within the Quesungual system. The hypothesis of the research project is that the Quesungual Agroforestry System, through its use of structurally and taxonomically diverse plant species, diverse organic matter inputs, and crop rotation is creating a spatially and temporally heterogeneous soil environment, which leads to multiple niches for soil macrofauna and allows for increased soil biota abundance and diversity, with flow-on effects for soil quality. The study looks at the factors that influence soil macrofauna distribution, diversity, abundance and heterogeneity of community composition over varying spatial and temporal scales, using a variety of techniques including collection of soil fauna, farmer interviews, and spatial analysis of low-altitude photography.

TOBIAS SCHOEP

Isolation and Characterization of *Pseudobutyrivibrio Ruminis* Gene Promoters

Department of Medicine and Pharmacology Laboratory, Fremantle Hospital

This study involved the construction of novel plasmids for analysis of DNA fragments from the rumen bacterium *Pseudobutyrivibrio ruminis* strain 0/10, resulting in identification of four gene promoters. A novel primer extension method was used to identify five transcription start sites among these and a promoter identified from *P. ruminis* strain OR38 in a previous study. Comparison of promoters, from this and other studies, revealed a consensus sequence resembling the binding motif for RNA polymerase sigma70-like factor complex, including the well characterized –35 and –10 elements. Consensus sequences established for these elements were: TTGACA and ATAATAT A respectively, interspaced by 15 – 16 bp. Among the newly identified promoters, the consensus for the –10 element was extended one nucleotide upstream and downstream of the standard hexamer (boxed). Promoters also contained possible UP elements, and were significantly more curved than protein-coding regions. Promoter strengths were measured by both the quantitative SYBR green real time PCR and ß-glucuronidase assays. No correlation was found between the composition and context of elements within *P. ruminis* promoters, and promoter strength. However, a mutation within the –35 element of one promoter revealed that promoter strength, and the choice of transcription start site were both sensitive to single nucleotide changes.

Co-authors: K. Gregg, Centre for High Throughput Agricultural Genetic Analysis, Murdoch University

THE ROYAL SOCIETY of WESTERN AUSTRALIA
PROMOTING SCIENCE

MEMBERSHIP NOMINATION FORM

We, the undersigned Members of *The Royal Society of Western Australia*, desire to nominate:

Name (in full): _____

Profession: _____

Academic Qualifications: _____

Mailing Address: _____

Email Address:_____

as an/a (Ordinary / Student / Life / Honorary) Member (please circle)

ACCEPTANCE OF NOMINATION

I, the person named above, desire to become a (As stated above) Member of the *Royal Society of Western Australia*, and enclose the subscription fee due for the current year

($AUS _____) ($AUS 50 for regular membership, $AUS 25 for student membership)

I understand that my nomination will not be processed without this payment.

Signed _____ Date: / / 2005

APPLICATION FOR STUDENT MEMBERSHIP

This is to certify that the above mentioned nominee is a student

Institution name_____

Supervisor name_____

Supervisor signature_____

PAYMENT

I wish to pay by: Cash / Cheque / Money Order / Credit card (please circle)

If you wish to pay by credit card, please complete the following:

VISA MASTERCARD BANKCARD (please circle)

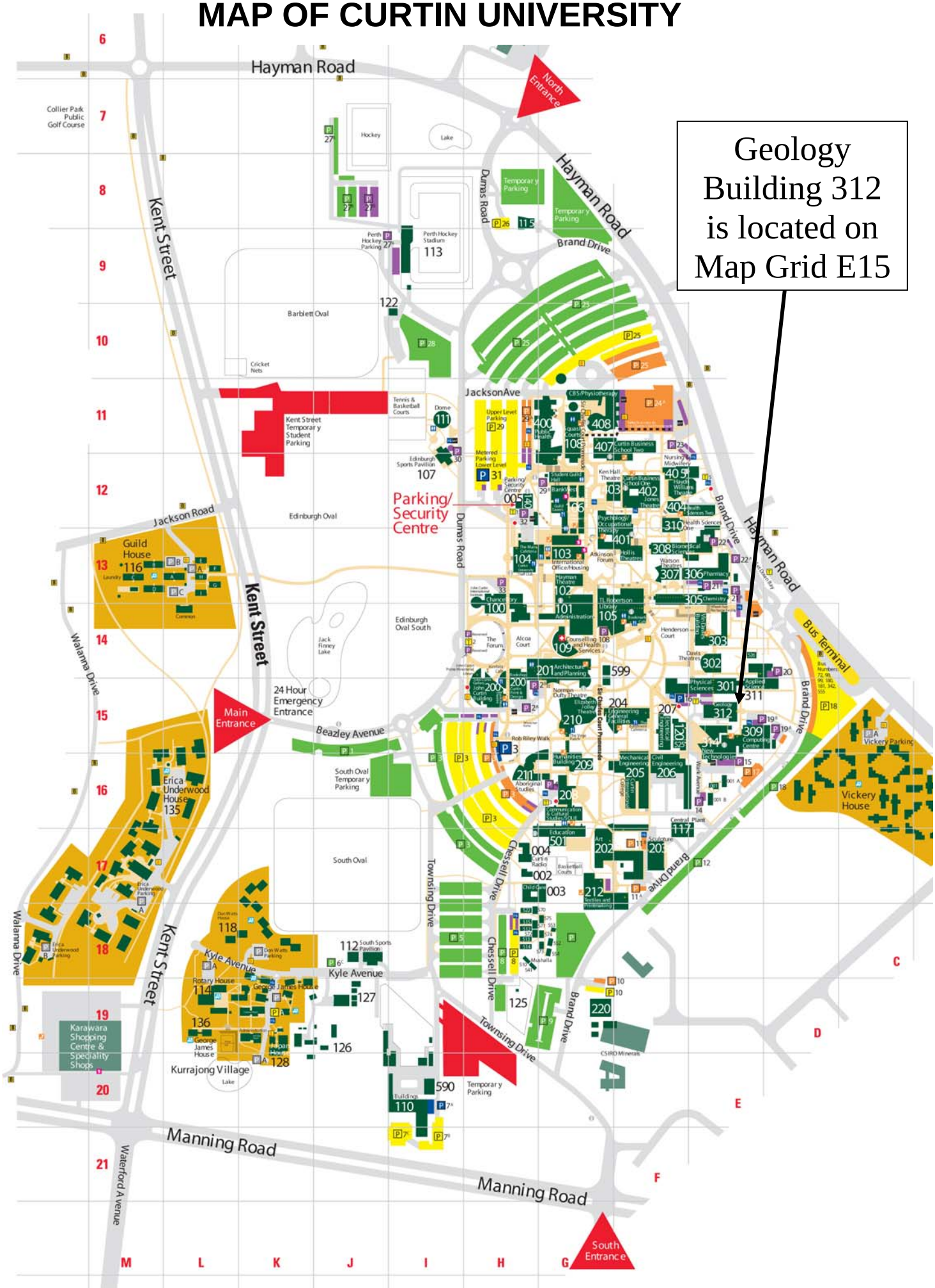
Card No. _____Signature: _____ Exp Date: ...../.....

Signatures of Proposers: (1)..... Printed Name:.....(2) .....

Printed Name:..... (3) ..... Printed Name:.....

Office Purposes:
Nomination received :_____ (Membership Secretary)
Fee received: _____ (Honorary Treasurer)
Elected: _____ (President)
Notify New Member: _____(Membership Secretary)

MAP OF CURTIN UNIVERSITY



RSWA COUNCIL 2004/2005

The Royal Society of Western Australia
To promote and foster science
in Western Australia

Patron
Her Majesty the Queen
Vice-Patron
His Excellency
The Governor of Western Australia

President	A W R Bevan BSc (Hons) PhD
Senior Vice-President	C Walker BSc (Hons) PhD MBA
Junior Vice-President	P O'Brien BSc (Hons) PhD
Immediate Past President	G G Thompson MEd PhD
Council Secretary	L Milne BSc (Hons) PhD
Membership Secretary	M Bennet-Chambers BSc (Hons)
Proceedings Secretary	M Brocx BSc (Hons)
Hon Treasurer	P O'Brien BSc (Hons) PhD
Hon Editor	K Meney BA PhD
Hon Journal Manager	J E O'Shea BSc (Hons) PhD
Hon Librarian	M A Triffitt BA ALIA
Publicity Officer	V Semeniuk BSc (Hons) PhD
Postgraduate Representatives	P Drake BSc MSc
	L C Delfs BSc (Hons)
Councillors	A Pearce BSc MSc
	R Hough BSc (Hons) PhD
	W Stock


THE ROYAL SOCIETY OF WESTERN AUSTRALIA INC
FOUNDED 1913
INCORPORATED 1937
CYGNIS INSIGNIS