LINNEAN SOCIETY OF NEW SOUTH WALES

LINN S'O'C' NEWS

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IN THIS ISSUE

INCLUDED WITH THIS ISSUE
Record of Annual General Meeting, 19 March 2014
Form for donation to Scientific Research Funds

NEW MEMBERS

We welcome our new members:

Miss Marissa **Betts**, Macquarie University. Fields of interest: Biostratigraphy, early Cambrian carbonate sedimentology and stratigraphy.

Miss Sarah M. **Jaquet**, Macquarie University. Fields of interest: Palaeontology (Cambrian stratigraphy and taxa), systematic descriptions of molluscan groups.

Ms. Michaela **Larsson**, University of Technology. Fields of interest: Microbiology, ecology, harmful algal blooms, macroalgae, toxin production.

Ms. Rachel **Levin**, University of New South Wales. Fields of interest: Biology, microbiology, molecular biology, genetic engineering.

Mr. Kenneth R **Mills**. Fields of interest: Plant ecology and systematics.

Mr. Matthew **Pearson**. Fields of interest: Plant ecology, adaption, reproductive biology and taxonomy of aquatic and arid vegetation.

Ms. Purnika D. **Ranasinghe**, Queensland University of Technology. Fields of interest: Microbial ecology in environmental systems (insect gut), wastewater and soil, application of advanced molecular techniques

Mrs. Georgina **Roberts**, Latrobe University. Fields of interest: Bioarchaeology, stable isotope analysis, zooarchaeology, biological anthropology.

PAPERS PUBLISHED ONLINE IN VOLUME 135 OF THE PROCEEDINGS

Strusz, D. Silurian brachiopods from the Cappanana Formationn, east of Cooma, southern New South Wales (pp 1-17).

Smith, H. The genus Toxopsoides (Araneae: Desidae): New records and species from Australia (pp 19-43).

Timms, B.V., Morton J., and Green, K. Temporal changes in macroinvertebrate fauna of two glacial lakes Cootapatamba and Albina, Snowy Mountains, New South Wales (pp 45-54)

Holmes, W.K.B. and Anderson, H.M. The Middle Triassic megafossil flora of the Basin Creek flora Nymboidia Coal Measures, New South Wales, Australia. Part 9. The genera *Heidiphpyllum*, *Voltziopsis*, *Rissikia* and the affiliated cones, and *Yabeiella* (pp 55-76).

The *Proceedings* is published on line and may be accessed free of charge by anyone, at the website http://ojs-prod.library.usyd.edu.au/index.php/LIN

FIELD GUIDE TO ROYAL NATIONAL PARK

We have had many compliments about the new Field Guide to Royal National Park. *The Shire Life* that circulates in the Sutherland area said of the field guide, "A quite brilliant book has appeared". There is now a campaign to have World Heritage listing for the Royal National Park. The field guide was written without knowledge of this campaign, but it will certainly help the cause.

Bob Brown, the former leader of the Greens, strongly supports world heritage listing of the Royal National Park. He sends thanks for "the quite brilliant, brilliant Field Guide –it is just lovely. I wish Bass Strait wasn't so in the way".

Bob Brown has published a number of books on conservation and Tasmania's spectacular wilderness places.

AWARDS FROM THE SCIENTIFIC RESEARCH FUNDS

THE Sir WILLIAM MACLEAY MICROBIOLOGY RESEARCH FUND

RANASINGHE, Purnika L., Queensland University of Technology.
Project: Analysis of bacterial diversity, abundance and dynamic response to environmental challenge in an insect microbiome using 'next generation' sequencing and data visualisation
Lepidopteran species have communities of micro-organisms in their gut that are important in the insect biology. The composition, ecology and functional responses are poorly understood. Molecular analysis has allowed identification of multiple microbes with previously unexplained communities. The diamond-back moth (DBM) is a pest of brassicas and has evolved resistance to many insecticides. Two molecular methods of analyses have established an initial base line of the presence of microbial phyla and differences between two populations, one on cabbage and the other on broccoli. The 'next generation' sequencing is able to establish generic identity. Experiments raising DBM larvae on cabbage for three generations then switching onto the broccoli for three generations shows that the microbial communities in the gut change to those resembling the ones in larvae permanently reared on broccoli. Similarly, those changed from broccoli to cabbage have changed microbial communities. This project will use next generation sequencing to follow the changes in the microbial populations during the change over. Awarded $2,000.

AWARDS FROM THE BETTY MAYNE RESEARCH FUND FOR EARTH SCIENCES

MARISSA, Betts, Macquarie University
Project: Fossils, rocks and Cambrian clocks: a multi-proxy approach to establish stage subdivision for the early Cambrian of Australia
Early Cambrian biostratigraphic schemes currently in use for Australia are out of date and overdue for re-evaluation. Paucity of trilobites in Australian rocks of this interval means that other methods of correlation must be utilised. These include zonations based on small shelly fossils (SSFs), combined with lithostratigraphic correlation and matching of curves based on carbon and oxygen isotopes. The biostratigraphic aspects of the project have been completed, and the lithostratigraphic work (including section sampling and thin section preparation) is well under way. Suitable horizons (i.e. those without significant diagenetic alteration) in the measured sections will then be sampled for stable isotope analysis in order to prepare isotope curves for comparison and correlation with global patterns of isotopic variation. Awarded $1,400

JACQUET, Sarah, Macquarie University
Project: Molluscan fauna from the Middle Cambrian Monastery Creek Phosphorite Member, Queensland
The Middle Cambrian Monastery Creek Phosphorite Member (MCPM), a 15-20 m thick phosphatic limestone, is exposed c.140 km SE of Mt. Isa, in western Queensland. This unit yields diverse and exquisitely preserved three-dimensional fossils – the result of phosphate impregnation that produces an extremely fine replication of body structures. The project aims to (1) document the micromolluscan fauna of the MCPM and (2) investigate the embryological development, anatomy, preservation and body plan evolution of ancestral molluscs using scanning electron microscopy, Synchrotron Radiation X-ray Tomographic Microscopy (SRXTM) and/or Micro-Computed Tomography. These techniques will provide a 3-dimensional visualization of previously inaccessible internal cellular features in ancient fossils, potentially answering a number of significant questions concerning developmental processes and evolution of body plans in early molluscs. Awarded $1,160.

GARRATT, Dr Mike, honorary associate, University of Wollongong
Project: Unlocking the origins of the early land vascular plant story in Australia
The project aims to document the occurrences and determine the age of the pre-*Baragwanathia* flora at Yea, Victoria. The sudden appearance in Late Silurian strata of *Baragwanathia* up to 45 cm long displaying well-developed leaves and sporangia buds at this site is baffling – there must be earlier plants ancestral to this flora preserved in the 1300 m rock section beneath the *Baragwanathia* level. Some tantalising evidence of more primitive plants has recently been found in these rocks. Awarded $840.

THE JOHN NOBLE FUND FOR INVERTEBRATE RESEARCH

FABRICANT, Dr Scott, Macquarie University
Project: Evolution of colour change and thermoregulation in *Kosiuscola* grasshoppers.
The chameleon grasshopper (*Kosiuscola trisinis)* of the Australian Alps, including Tasmania, is unique among the acidid grasshoppers: it changes colour with temperature. It is black when cold and bright turquoise when hot. Thinner patches of cuticle (Stifer patches) and colour granules that can be rearranged according to temperature are features of the cuticule that can assist in thermoregulation in grasshoppers. Only the males show this change, but males and females have the same intracellular structure. There are four species in the genus, arranged according to altitude. Only *K. tisinis* shows this colour change. This project will use electron microscopy images of the cuticle and epidermal cells of all for species to determine how the structure relates to thermoregulation. Awarded $1.400

THE JOYCE VICKERY SCIENTIFIC RESEARCH FUND

BARRY, Dr Katherine L., Macquarie University.
Project: Cryptic male choice in a sexually cannibalistic praying mantid
In the praying mantid, the female is known to mate many times. Males are known to be able to adjust their ejaculate if in competition with other males in an attempt to gain an advantage. Female quality is known to be significant, i.e. do males adjust ejaculate according to the condition of the female, i.e. ejaculate more sperm if the female is in good condition with a larger number of eggs. Mating experiments with well fed and not so well fed females will be followed to assess the number of sperm in the ejaculate and number and condition of the offspring. Awarded $1,400.

BOAST, Dr Alexander P., University of Adelaide
Project: Ancient DNA and coprolite analysis of the Kakapo
The once widespread kakapo of New Zealand is now reduced to a few small populations, but there are abundant skins, skeletal material and coprolites in collections. This project will focus on the coprolites to investigate genetic diversity, diet and the parasite community over the last 3,000 years. Awarded $1,200

BOISSEAU, Romain, P.G.E., University of Sydney
Project: Investigating the mechanism through which cannibalised males inhibit female remating in the Australian redback spider, *Latrodectos hasselti*
Some traits are costly, in terms of Darwinian "struggle for survival" but favourable for reproductive success. Cannibalism of the male must be an extreme example. In the redback spider, the male "somersaults" to a position that facilitates being eaten during copulation. This allows longer copulation and somehow reduces subsequent female receptivity, thus reducing sperm completion. Other cannibalistic spiders also show this reduced receptivity, but little is know about it. Experiments with mating trials will investigate the nature and mechanism of this reduced receptivity. Awarded $600.

BOND, Peter, University of Queensland
Project: Marine debris ruins inshore environments
Pollution of plastic items has a widespread detrimental environmental impact. The broken-down fragments are of particular concern because they can be ingested by marine life. Further breakdown in the gut may release toxic substances. Fish, concentrating on the hardyhead will be sampled from inshore environments of north Stradbroke Island. Growth parameters, reproduction, diets and habitat will be assessed, as little is known of these factors for most species. Contents of the gut will be analysed to see what they have been eating. Samples of intestine will be analysed for mercury and arsenic. Polluted and pristine environments will be compared. This work will be crucial for fisheries management. Hardyheads are used for bait and are an important part of the diet of commercial fish species. The results will be communicated to the North Stradbroke communities. Awarded $1.400.

GEARY, William L, Deakin University
Project: Fire and the drivers of predator interactions in a semi-arid mallee environment.
Fire drives habitat succession and is an important agent of ecosystem structure and function. The predator guild is also an important agent. Top predators (dogs/dingos) suppress smaller predators (foxes, cats) and large herbivores (kangaroos). In the absence of the large predators, the native fauna is known to suffer because of the prevalence of foxes. Some predators take advantage of a post fire landscape and increase prey consumption along the burnt/unburnt ecotone. These complex relationships will be investigated in the Victorian mallee region using four survey methods: camera trapping, scat surveys, track surveys and unmanned aerial vehicles (UAVs) to obtain a more accurate assessment of the community dynamics. The use of UAVs has the potential to revolutionise landscape ecology. Awarded $1.000.

LEVIN, Rachel, University of New South Wales
Project: Comparative transcriptomics and genetic engineering of *Symbiodinium* as a strategy to reduce coral bleaching due to Anthropogenetic warming
Rising temperatures induce expulsion of the endosymbiont *Symbiodinium* leading to coral bleaching. This project plans to identify the genes responsible for the heat stress response. Through genetic engineering, it is hoped to increase the thermal tolerance of *Symbiodinium.* With a more robust heat tolerance, there is the potential to reduce coral bleaching. Funds are requested for access to the High Resolution Confocal and Spectral Imaging Facility and the Flow Cytometry Facility to do this work. Awarded $ 1,800.

O'HANLON, Dr James, Macquarie University.
Project: Chemical basis of ant attraction and its function as an egg dispersal strategy in Phasmatodea
Some plant seeds have a fleshy, food reward appendage that attracts ants that then transport them to their nests, hence effecting dispersal. Some Phasmids (stick insects) have eggs with a similar attractant and the ants take them to their nests for safe-keeping. Five major chemical components of the ant attractant have been identified. Experiments will be done to determine which one(s) attract ants. These experiments have been done on plant seeds and the results will be compared with those from plants to determine if phasmids use the same chemicals or if they have evolved different attractants. Phasmids already resemble plants (sticks). Could this be another example of convergent evolution? Awarded $650.

ROBERTS, Georgina, Latrobe University
Project: Long-term adaptability of *Vombatus ursinus* (common wombat) in southwestern Tasmania – an investigation using stable isotope analysis in the archaeological record.
Bone collection from caves range in age from ~ 35,000 to 11,000 years BP. Wombats made up about 30% of the diet of the Aborigines (Bennetts wallaby made up 70%). Stable isotope analysis of tooth enamel uses the ratio of stable oxygen to stable carbon isotopes that can be related to the environment where the enamel was formed. Sequential analysis can reveal events within the lifetime of the individual (seasonal patterns, migration, weaning events), based on known growth rates of the teeth. Wombats have rootless teeth that grow continuously, allowing preservation of a high-resolution record of the stable isotopes. This project will use high-resolution sequential analysis to derive local climate in the last two years of the individual's life and hence climatic change from 35,000 - 11,000 years (through the last glacial period). The stable isotopes can also indicate changes in diet and hence changes in the vegetation. Awarded $2,400.

SOLEY, Dr Fernando, Macquarie University
Project: Predator-prey interactions between an araneophagic assassin bug (*Stenolemus giraffa*; Hemiptera: Reduviidae) and a theridiid spider (Parasteatoda sp)
The best known predators of spiders are other spiders. Some even prey on spiders in webs. Some assassin bugs also prey on web-building spiders. How do they do it? Some produce vibrations that mimic prey caught in the web to lure the spider to the edge of the web and some use stealth to catch the spider. The spider species differ in their response to web invasion and some even counter attack. Reports of experiments done with different assassin bugs and different spider species are not comparable. It is thought that the nature of the web influences strategies, e.g. assassin bugs lure spiders with dense webs out to the edge. Further observations in the Kinberleys are required. Awarded $750.

BOOK REVIEW

Alexander Macleay – from Scotland to Sydney by Dr. Derelie Ann Cherry
Published in 2012 by Paradise Publishers
147 Cherry Lane, Kulnura, NSW 2250 Australia
www.alexandermacleay.com

We all know of Macleay Street in central Sydney and the Macleay River and district on the mid-north coast of New South Wales – but who was Macleay? Now we know! Dr Derelie Cherry has spent years researching and recently published the first detailed biography of Alexander Macleay. This beautifully prepared and presented book with numerous references details the life of a remarkable man who had a wide influence on the political, social and scientific structure of early Australia and helped to elevate our country from a penal settlement to a successful colony within the British Empire. The book is enlivened by old illustrations, photographs (many taken by Derelie) and by numerous quotes from letters written by Alexander Macleay's eldest daughter Fanny to her brother William.

Alexander Macleay was born in 1767 and spent his early years in the Caithness district of northern Scotland where he commenced his life-long interest in and desire to collect insects. In 1786 he moved to London and began work in the wine industry. In 1795 he joined the Public Service where he rose to become Secretary of the Transport Board and held that position until 1817 when it was disbanded and he was placed on a small pension. In 1791 he had married Elizabeth. Over the years they produced 17 children but due to the high infant mortality rates of the times only 10 survived to adulthood.

Alexander became a Fellow of the Linnean Society in 1794 and held the position of secretary for 27 years without any financial consideration. In 1809 he was elected a Fellow of the Royal Society and in 1824 became a member of the Council. His passion for acquiring insects grew and by 1825 his collections were considered to be one of the finest in private ownership in England. He purchased a number of other collections including the Australian specimens that Captain Cook had given to Sir Ashton Lever. He made many useful contacts including the botanist Joseph Banks. To avoid the summer heat, dust and pollution of London the family escaped when possible to a country residence, Tilbuster House in Surrey. It was here that Alexander developed a notable garden and introduced into cultivation many new plants from overseas. During this period the growing family was suffering severe financial problems and when offered the position of Colonial Secretary in the expanding colony of NSW, Alexander accepted. He arrived in Sydney in 1826 with his wife and six daughters. Sir Ralph Darling had been appointed the new Governor in 1825 following the political, social and administrative problems arising during the time of previous Governor, Thomas Brisbane and from the controversial reports of Commissioner Bigge. There was a good relationship

and respect between Governor Darling and his Colonial Secretary Macleay who had been acquainted in England and held similar conservative political views.. At the time the colony was a mixture of convicts, emancipists and free settlers. The population of Sydney numbered 12,000 and a total of 37,000 in the Colony; 2/3 were either convicts or of convict origin.

Along with other colonists Macleay was keen to acquire by grant or purchase as much land as possible and later held huge stock runs on the coast south of Sydney, on the southern tablelands and west along the Murrumbidgee River. However following droughts and low prices Fanny wrote in frustration to her brother, 'the farming concerns take the money we really require to live respectably'. Alexander was able to avoid bankruptcy in the 1840's when his son William took over his financial affairs, moved into Elizabeth Bay House and moved his father to Brownlow Hill at Camden.

Governor Darling was replaced in 1831 by a new Governor, Richard Bourke. Alexander Macleay had many conflicts of opinions with the new Governor on the rights of ex-convicts and free immigrants and other proposed social and legal changes and was continually criticised with scathing comments in some of the expanding Press. In 1837 Macleay was controversially removed from the office of Colonial Secretary. Despite deteriorating health and personal financial problems he persevered and stayed on in Australia to contribute to the development of the colony. In 1843 he was elected to the Legislative Council and became the first Speaker. He retained his seat until his death in 1848.

With my own deep love for natural science subjects I was engrossed in the sections of the book dealing with Alexander Macleay's life-long interests in entomology and botany. After becoming secretary of the Linnaean Society in London in 1798 Macleay had many contacts with international experts with interests in plants and botanical discoveries from around the world. Hence he was in a position to procure or swap many new plants that he desired - including Chinese Wisteria which he presented for propagation in England in 1819. The extensive gardens at Tilbuster Lodge in Surrey were developed to include a great variety of plants - especially roses. On being appointed Colonial Secretary in the Colony of New South Wales Macleay took with him numerous plants that he knew would travel well and adapt to the new environment. During his 22 years in the colony Macleay was actively involved with the Botanic Gardens which had been established in1816 under Governor Macquarie. An 1827 register of cultivated plants in the Sydney Botanic Gardens notes many which had been introduced by Macleay. As well as wisteria, he introduced jacaranda from South America and also the port wine magnolia. The development of the gardens in the 54 acres (22 hectares) around his now Heritage listed Elizabeth Bay House was commenced soon after the land grant in October 1826 although construction of the house only began in 1835. Fanny Macleay and her father spent much time identifying new plants being discovered in the Colony. (Derelie's book includes two exquisite paintings by Fanny pp 197 and 301) of collections of native and introduced flowers). In 1841 the famous visiting British botanist Dr J.D. Hooker reflected that 'Macleay's gardens proved a botanist's paradise'. Sadly those trees and gardens are now long gone - Heritage Listed Elizabeth Bay House today stands isolated in a jungle of concrete and glass high-rise buildings.

Alexander Macleay's eldest son, William Sharp Macleay was involved in government administration, including to France and Cuba. He inherited his father's entomological interests and passed most of his early collections to his father. On his return from Cuba in 1836 he was elected to the councils of both the Linnean and Zoological Societies. In 1839 he sailed with his cousins William Macleay and John Macleay to NSW. Here in Sydney he had a close association with the Australian Museum. William who had taken-up a large property on the lower Murrumbidgee River was appointment to the Legislative Council in 1855 and then moved back to Sydney where he commenced an active interest in natural history. William Sharp had always been a close guide and mentor to his cousin. William soon built-up a large collection of diverse material. He was a trustee of the Australian Museum for 26 years and helped with the formation of the Entomological Society and the Linnean Society of NSW in 1874. Alexander Macleay's collections, on his death, passed through his son William Sharp Macleay to William and became part of the vast collections bequeathed to the University of Sydney to become part of the Macleay Museum.

For me, Alexander Macleay will be best remembered for his contributions to the development of the Government Gardens (now the Royal Botanic Gardens, Sydney; the establishment of the first museum in Sydney, now the Australian Museum (incidentally with my Gt,Gt,Gt Uncle William Holmes as first Curator) and the first public library - now the State Library of NSW.

As the first biography of Alexander Macleay, a remarkable man in our history and his family's involvement with our Society this detailed and beautiful book should be a "must read" for all our present day members.

Keith Holmes, February 2014

LINNEAN SOCIETY OF NEW SOUTH WALES

For Security reasons, there is now a locked gate between the carpark and the Classroom. If it is locked when you come to a lecture, just wait and someone will come and let you in.

PROGRAMME

Wednesday 23 April, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

A/PROF. JUSTIN SEYMOUR

Future Fellow, Plant Functional Biology and Climate Change, University of Technology

MARINE MICROBIAL ECOLOGY: FROM DROPS OF SEAWATER TO OCEAN BASINS

Microorganisms form the foundation of the marine food-web and are the engine-room for the ocean's major biogeochemical cycles. Consequently, the composition and function of these microbial communities strongly influence the productivity of fisheries and governs the ocean to atmosphere exchange of climatically important gases. The ecological and biogeographical dynamics of these important marine microbial populations are controlled by diverse biotic and abiotic process operating over a continuum of spatiotemporal scales. Our work has shown that large-scale oceanographic features including currents, eddies and up-welling events influence the composition and function of microbial assemblages across regional scales. At these large-scales, recurring biogeographic trends in community-level characteristics are linked to specific physical and biological characteristics of the environment. However, from the perspective of an individual microbe, large-scale environmental gradients and seasonal cycles are inconsequential. The world of a microbial cell is defined within a fraction a single drop of seawater. Surprisingly, at this microbial scale physical and chemical gradients are often more pronounced than over regional scales. Our work has demonstrated that the behavior of marine microbes is well adapted to exploit this patchy microscale seascape and that this leads to microenvironmental partitioning of microbial communities and enhanced rates of chemical cycling in the ocean. Our new insights into the environmental processes shaping the composition, function and diversity of marine microbes, at both the very small scales of microbial interactions and the larger scales of oceanographic processes, is fundamentally important for ultimately understanding the over-all function of the ocean, both now and in a climate change influenced future.

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Wednesday 21 May, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

A/PROF ANGELA MOLES

School of Biological, Earth and environmental Sciences, University of New South Wales

RAPID EVOLUTION IN INTRODUCED SPECIES: WILL WEEDS IN NEW ZEALAND AND AUSTRALIA EVENTUALLY BE ACCEPTED AS UNIQUE NATIVE TAXA?

Introducing species to a new environment creates excellent conditions for evolution. The species is released from its native enemies. It is also exposed to a new suite of biotic pressures from herbivores, pollinators, pathogens and competitors, and a new suite of abiotic pressures such as different rainfall, temperature,

disturbance regime, soil fertility. Our work with herbarium specimens collected over the last 150 years has shown that 65% of the short-lived, sexually reproducing plant species introduced to Australia and 33% of the species introduced to New Zealand have undergone significant morphological change in at least one trait since their introduction. Glasshouse experiments suggest that differences between source and introduced populations are retained when they are grown in common conditions. As gene flow between introduced populations and their source populations is extremely limited, it seems inevitable that introduced species will eventually evolve to become unique new taxa. At this point, we will have to decide whether to accept them as new native species, or try to exterminate them. While most ecologists don't like the idea yet, I think acceptance of introduced species is just a matter of time.

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Wednesday 23 July, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

DR. JUDITH FIELD

School of Biological, Earth and environmental Sciences, University of New South Wales

PLANT USE THROUGH TIME IN THE HIGHLANDS OF NEW GUINEA

Dr. Field and colleagues study plant microfossils, such as starch and phytoliths, found in cultural sediments and on stone tools to determine plant use. They are looking at the way plants have been used through time from initial colonization through to the Holocene.

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Wednesday 22 October, at 6 pm, in the Classroom, Royal Botanic Gardens.
Enter through the gate to the Herbarium Carpark, on Mrs. Macquaries Rd.

Prof MARTIN VAN KRANENDONK

School of Biological, Earth and environmental Sciences, University of New South Wales

EARLY LIFE ON EARTH: EVIDENCE FOR A DIVERSE BIOSPHERE 3.5 BILLION YEARS AGO

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Drinks will be served from 5.30 pm

EVERYONE WELCOMED