



THE LINNEAN SOCIETY OF NEW SOUTH WALES

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The Betty Mayne Scientific Research Fund for Earth Sciences

Betty Florence Mayne (1930-1991)

Betty Mayne was born in Young, NSW, on 13 April 1930. She was educated at the Presbyterian Ladies College, Pymble, prior to joining the nursing profession in which she served for some years.

In 1982, Betty retired from nursing and undertook extensive overseas travel. On returning to Sydney she became interested in the study of earth science and soon became a very keen and knowledgeable amateur mineralogist. She joined what was then the Friends of the Geological and Mining Museum (FOGAMM) Inc, serving as Vice President and in other executive positions. Betty was also a member of the Mineralogical Society of NSW Inc; she became its President in 1990, and organised the very successful Annual Seminar for the Mineralogical Societies from the rest of Australia.

Betty was a keen collector of minerals from worldwide locations, as well as gathering fossils and petrological specimens from around Australia. She was actively adding to her extensive collection up until her untimely death in July 1991.

Betty's will stipulated that her collection was to be sold at auction, with the proceeds to be evenly divided between the 2 societies so closely associated with her earth science interests. The Mineralogical Society of NSW has used its share of these funds to purchase mineral specimens for the Australian Museum collections.

The Friends of the Geological and Mining Museum, more recently The Earth Exchange Museum Society (TEEMS), also purchased specimens for the collection of the latter museum. However, with closure of the Earth Exchange in September 1995, TEEMS invested its share of the Betty Mayne bequest pending winding up of the society. After consideration of various options, the TEEMS council decided that donation of the accumulated capital be transferred to the Linnean Society of NSW to establish "The Betty Mayne Scientific Research Fund", the purpose of which is to assist students of the earth sciences, would be a fitting memorial to perpetuate the memory of their fellow geologist.

The Betty Mayne Scientific Research Fund commenced with a donation of \$36,216.05 from TEEMS, which the Linnean Society of NSW has supplemented with an additional \$35,000 from reorganisation of its own funds. These amounts have been invested, with the intention of 50% of interest earned to be disbursed in the form of research grants to be first awarded in 1998.

Grants Awarded

Since 1988 the Society has made available annually, in individual grants to research workers throughout Australia, a proportion of the interest from the capital invested in the Betty Mayne Scientific Research Fund for Earth Sciences. The remainder is reinvested to increase the capital and to try to maintain the value of the fund against the effects of inflation. How successfully this has been achieved can be judged from the following figures:

Annual awards from the Betty Mayne Research Fund

Summary of the awards made from the Betty Mayne Research Fund.

Year	Capital invested	No. grants	Total Awarded
1998	\$71,216	1	\$700
1999	\$71,216	7	\$2,320
2000	\$78,216	5	\$2,085
2001	\$78,216	4	\$2,180
2002	\$81,990	6	\$2,270
2003	\$88,154	4	\$1,600
2004	\$90,800	3	\$2,177
2005	\$98,937	3	\$2,486
2006	\$97,799	3	\$1,900
2007	\$102,884	1	\$940

Year	Capital invested	No. grants	Total Awarded
2008	\$107,437	2	\$2,200
2009	\$112,610	1	\$1,500
2010	\$118,005	1	\$1,000
2011	\$122,484	2	\$2,500
2012	\$127,189	2	\$2,408
2013	\$133,898	No App'ns	\$0
2014	\$137,546	3	\$3,400
2015		1	\$2,450
2016		4	\$5,900

2016 Awards

Recipient: Mr Kyle Ferguson, University of Queensland

Project: *Geochemically 'fingerprinting' fossils collected from Chinchilla, an Australian Pliocene age fossil deposit.*

Synopsis: The Chinchilla Sands are exposed for 65 km between Nangram and Warra, Northern Darling Downs, Queensland and are one of the richest Pliocene (5.3-2.6 million years ago) age fossil deposits in Australia. Thousands of Pliocene age fossils have been excavated from this region for well over a century and a half. However, the palaeontological importance of the collection is still poorly understood. Adequate documentation and site localities for a substantial portion of Chinchilla material makes it difficult to determine stratigraphic positioning. The Pliocene was warmer than today but similar temperatures are predicted for the end of the twenty first century, hence understanding Pliocene ecosystems and climate has become increasingly important.

Awarded \$1,500

Recipient: Mr Ian Houshold, EPA Tasmania

Project: *The role of meteoric versus endogenic processes in the geomorphic evolution of the Cliefden Caves landscape.*

Synopsis: Karst caves in southeastern Australia have developed through solution by naturally acidic groundwater. Caves and surrounding landscapes contain significant records of the development of surface and underground landforms but little consensus currently exists regarding the interpretation of these features. Earlier work focused on the history of surface/groundwater interaction e.g. the influence of gaining and losing streams, percolation flows etc. Later interpretations have emphasized the role of endogenic drivers (such as the production of sulfuric acid through oxidation of sulphides or production of carbonic acid). These processes rely on deep-sourced groundwater and are less dependent on shallow groundwater and surface land-forming processes. Resolution of these conflicting interpretations is needed.

Awarded \$900

2015 Awards

Recipient: FOX, Jodi (University of Tasmania)

Project: The physical volcanology of the Cenozoic volcanics, NW Tasmania – Geological mapping of the Cape Grim and Stanley areas.

Synopsis: Cape Grim and Stanley are located in northwestern Tasmania and were two sites of Cenozoic volcanic activity. The Cenozoic rocks at these locations include well preserved basaltic sheet lavas, pillow lavas, lobate lavas, volcanic breccia and tuff. The age, relative timings, processes and products of volcanic activity in these areas are not well understood. Volcanic sequences at these locations represent examples of Tasmania's most recent volcanism and it is important that they be studied further. This study will provide the first radiometric ages for the Cenozoic volcanic rocks at Cape Grim. The Nut at Stanley is a morphologically unique geological feature worthy of further detailed geological examination. Interpretation of magnetic data will provide new, detailed information about the distribution of the Green Hills Volcanics.

Awarded: \$2,450.00

2014 Awards

Recipient: BETTS, Marissa (Macquarie University)

Project: Fossils, rocks and Cambrian clocks: A multi-proxy approach to establish stage subdivision for the Early Cambrian of Australia.

Synopsis: The Cambrian period is one of the most underdeveloped parts of the international geologic timescale. A major impediment to the development of the Cambrian timescale and global correlation is the paucity of comprehensive biostratigraphic, lithostratigraphic and chemostratigraphic data, especially from East Gondwana (of which Australia forms a major part). First Appearance Datum (FAD) points of agnostid trilobites are primarily used to define boundaries in the upper half of the Cambrian. However, lack or 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: \$1,400.00

Recipient: GARRATT, Dr Mike (honorary associate, University of Wollongong)

Project: Unlocking the origins of the early land vascular plant story in Australia.

Synopsis: 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: \$840.00

Recipient: JACQUET, Sarah (Macquarie University)

Project: Molluscan fauna from the Middle Cambrian Monastery Creek Phosphorite Member, Queensland.

Synopsis: 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: \$1,160.00

2013 Award

No award was made in this year.

2012 Awards

Recipient: Couzens, Aidan M C (Flinders University)

Project: Using micro-computed tomography (mCT) to reveal molar enamel patterning in Australian marsupial herbivores.

Synopsis: Teeth are fundamental to dietary adaptation because they must effectively reduce food to scales at which chemical digestion can occur. In addition to being the most common vertebrate fossils, teeth are also highly variable in shape, making them ideal for evolutionary studies. The most important aspect of tooth shape determined by developmental processes at the enamel-dentine-junction is the distribution of enamel on the crown (the enamel cap) since this dictates tooth shape. This project will address this adaptive model by clarifying whether there is an association between thicker enamel and zones of tooth abrasion. To complete this project, non-destructive X-ray micro-computed tomography (mCT) will be used to investigate Pleistocene and modern lower molars, collected from sites in central and south central Australia, with focus on macropodids and diprotodontoids.

Awarded: \$1,500.00

Recipient: Nguyen, Jacqueline (University of New South Wales)

Project: Evolution of fossil and modern passerine birds of Australasia.

Synopsis: Passerines (songbirds) are the largest and most diverse order of birds, comprising about 60% of all living bird species. They have a global distribution and occupy a wide variety of ecological niches. Australasian taxa have an important role in understanding the evolutionary and biogeographic history of passerine birds. There has been very little work on fossil passerines in the Australasian region. Over 500 specimens of fossil passerines have been recovered from Riversleigh, north-western Queensland, which is one of the richest tertiary localities for passerine material in Australia. This project is expected to expand the fossil record of passerine birds in Australia and New Zealand and to improve our understanding of the evolution and biogeography of passerines.

Awarded: \$908.00

2011 Awards:

Recipient: Amy Macken (Flinders University of South Australia)

Project: Long-term variation in small mammal communities: the impacts of late Pleistocene climate change and implications for future management of species.

Synopsis: Long-term baseline data is being collected on small mammal occurrences and abundances in the Naracoorte region of south-eastern South Australia. Turnover and extinction thresholds for small mammal communities and their resilience to past climatic and environmental change will be investigated. Sub-fossil material (~45000 to 740 yrs BP) of possums from deposits within the Wet Cave at Naracoorte Caves has been analysed to determine the relative abundance of various species over time. Five sedimentary units in the Wet Cave appear to correspond to differing climatic and environmental conditions in the past. Recently, 5 new charcoal samples have been acquired and funding to obtain two radiocarbon dates on these is requested.

Awarded: \$1,000.00

Recipient: R. Armstrong Osborne (University of Sydney)

Project: Palaeozoic palaeokarst and relict cave sediments from Cathedral Cave, Wellington Caves, NSW, Australia: implications for regional geology and geomorphic history.

Synopsis: Potassium-argon (K-Ar) dating of clays at Jenolan Caves provided the first evidence for survival of ancient sediments in caves of eastern Australia. This is a demanding and expensive

technique that only works on clay with sufficient potassium content. Dating of multiple particle sizes has great potential to elucidate the depositional history. In the case of Jenolan, K-Ar dating recognised large inherited grains of Devonian age, medium-sized syndepositional / early diagenetic particles of Carboniferous age, and fine, late-stage diagenetic particles of Late Permian and Middle Triassic age that grew while the Jenolan Caves were buried under the Sydney Basin. Two new, preliminary K-Ar dates obtained from palaeokarst and relict sediments in the Cathedral Cave at Wellington demonstrate the potential of this technique. A further 4 samples will be analysed to provide further age constraints on these cave infill sediments as part of a wider project involving XRD, SEM studies, isotopic analyses, palaeomagnetism, and strontium dating to fully understand palaeokarst formation at Wellington Caves.

Awarded: \$1,500.00 (emergency grant)

2010 Award:

Recipient: W.B.K. Holmes (Hon. Research Fellow, University of New England)

Project: The Middle Triassic Megafossil Flora of the Basin Creek Formation, Nymboida Coal Measures, NSW, Australia.

Synopsis: The project aims to complete the documentation of fossil plants from Nymboida, the richest palaeobotanical site of Triassic age in Australia. So far, Keith Holmes has published eight papers in the Proceedings of the Linnean Society of New South Wales describing significant parts of this flora. The funding sought will enable completion of this major project with preparation of one or two further parts, as well as ensuring the curation of previously described material.

Awarded: \$ 1,000.00

2009 Award:

Recipient: Yong Yi Zhen (Palaeontology Section, Australian Museum, Sydney)

Project: Late Ordovician conodont biostratigraphy and palaeobiogeography of Northeast Gondwana.

Synopsis: The project involves extensive systematic revision of two important Late Ordovician conodont faunas from Queensland: 1) the Fork Lagoons Beds, Emerald area, central Qld, and 2) the Carriers Well Formation and other Upper Ordovician units in the Broken River region of north Qld. Earlier incomplete studies suggested both faunas are late Katian in age, but possible occurrence of *Amorphognathus ordovicicus* implies that they may extend well into the Hirnantian (latest Ordovician). If so, these will be the youngest Ordovician conodont faunas known from eastern Australia, and thus will infill crucial gaps in the conodont biostratigraphic successions of this region, and enable a better understanding of the Ordovician biogeographic affinities of Northeast Gondwana. The project will extend over three years.

Awarded: \$ 1,500.00