



JOURNAL AND PROCEEDINGS
OF THE
**ROYAL SOCIETY
OF
NEW SOUTH WALES**

Volume 139 Parts 3 and 4
(Nos 421, 422)

2006

ISSN 0035-9173

PUBLISHED BY THE SOCIETY
BUILDING H47 UNIVERSITY OF SYDNEY, NSW 2006
Issued December 2006

THE ROYAL SOCIETY OF NEW SOUTH WALES

OFFICE BEARERS FOR 2006-2007

Patrons	His Excellency, Major General Michael Jeffery AC, CVO, MC Governor General of the Commonwealth of Australia. Her Excellency Professor Marie Bashir, AC, Governor of New South Wales.
President	Prof. J. Kelly, BSc <i>Syd</i> , PhD <i>Reading</i> , DSc <i>NSW</i> , FAIP, FInstP
Vice Presidents	Mr D.A. Craddock, BSc (Eng) <i>NSW</i> , Grad. Cert. Management <i>UWS</i> . Mr J.R. Hardie, BSc <i>Syd</i> , FGS, MACE. Mr C.M. Wilmot <i>two vacancies</i>
Hon. Secretary (Gen.)	Dr E. Baker PhD <i>ANU</i> , MSc <i>USyd</i> , BSc (Hons), GradDipEd (Distinction <i>UTS</i>), AMusA, MRACI, CChem.
Hon. Secretary (Ed.)	Prof. P.A. Williams, BA (Hons), PhD <i>Macq</i> .
Hon. Treasurer	Ms M. Haire
Hon. Librarian	Ms C. van der Leeuw
Councillors	Mr A.J. Buttenshaw Mr J. Franklin Prof. H. Hora Dr M. Lake, PhD <i>Syd</i> Ms Jill Rowling BE <i>UTS</i> , MSc <i>Syd</i> A/Prof. W.A. Sewell, MB, BS, BSc <i>Syd</i> , PhD <i>Melb</i> FRCPA Ms R. Stutchbury
Southern Highlands Rep.	<i>vacant</i>

The Society originated in the year 1821 as the Philosophical Society of Australasia. Its main function is the promotion of Science by: publishing results of scientific investigations in its *Journal and Proceedings*; conducting monthly meetings; organising summer science schools for senior secondary school students; awarding prizes and medals; and by liason with other scientific societies. Special meetings are held for: the Pollock Memorial Lecture in Physics and Mathematics, the Liversidge Research Lecture in Chemistry, the Clarke Memorial Lecture in Geology, Zoology and Botany, and the Poggendorf Lecture in Agricultural Science.

Membership, as an Ordinary, Associate or Absentee Member, is open to any person whose application is acceptable to the Society. An application must be supported by two members of the Society. Subscriptions for the *Journal* only are accepted. The Society welcomes, from members and non-members, manuscripts of research and review articles in all branches of science, art, literature and philosophy for publication in the *Journal and Proceedings*.

ISSN 0035-9173

Copyright

The Royal Society of New South Wales does not require authors to transfer their copyright. Authors are free to re-use their paper in any of their future printed work and can post a copy of the published paper on their own web site. Enquiries relating to copyright or reproduction of an article should be directed to the author.

Acknowledgements

The Royal Society of New South Wales thanks the NSW State Government for its support of this *Journal*.

The Royal Society of New South Wales Community Heritage Grant

ROBYN STUTCHBURY

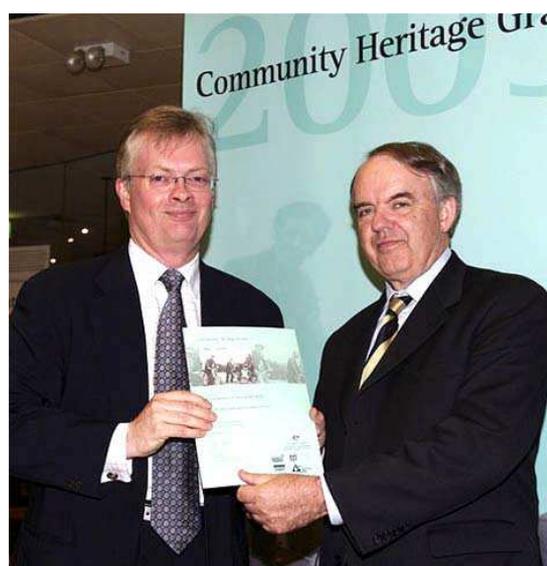
INTRODUCTION

Probably few members will be surprised to hear that the collection of books and other items owned by the Royal Society of NSW is of great historical and scientific significance. What might be more of a surprise is its degree of significance. This has been revealed by expert consultants during almost six months' investigation for our Community Heritage funded project. Their reports have been submitted together with our final report and our application for a second round of funding for 2007. The reports will be available through the Society's office and website.

Our \$5 500 (plus GST) grant was announced by the Federal Minister for the Arts and Sport, Senator the Hon. Rod Kemp, at the National Library of Australia, Canberra, on Wednesday 9 November 2005. A total of \$377 865 was distributed to 76 groups from around Australia to assist in the identification and preservation of community owned but nationally significant heritage collections. The Community Heritage Program is managed by the National Library of Australia and funded and supported by the Australian Government through the Department of Communications, Information Technology and the Arts, the National Library of Australia, National Archives of Australia, the Australian Film Commission and the National Museum of Australia.

Guidelines for the project called for a national significance assessment of the collection by a professional historian or similar expert and a preservation survey of the collection or part of a collection by an accredited professional. The recommended criteria for determining the significance of a collection are its historic, aesthetic, scientific and social values. The society's collection is rich in all of these values and the degree of significance was further assessed using the comparative criteria of provenance, rarity,

representativeness, condition and integrity, and interpretive potential.



John Hardie receiving the Community Heritage Grant on behalf of the Royal Society of NSW from the Federal Minister for the Arts and Sport, Senator the Hon. Rod Kemp.

WORKING GROUP

Soon after the Royal Society of NSW was granted Community Heritage funding, a working group of members of Council was formed to steer the project and assist consultants. All members of the working group are practising scientists with a keen interest in the history of science and the recognition that over the years, science has been sorely neglected.

Professor Jak Kelly, President, physicist;
Ms Robyn Stutchbury, Project leader,
geologist and science educator;
Mr John Hardie, Vice President,
geologist and educator;
Ms Christine van der Leeuw,
Honorary Librarian and scientist;

Dr Eveline Baker, Secretary, chemist and educator;

Mr Jim Franklin, Councillor, research physicist.

In November 2005 John Hardie attended the three-day intensive Preservation and Collection Management Training Workshop held at the National Library of Australia, the National Archives, the National Museum of Australia and the National Film and Sound Archives in Canberra. Information from the workshop proved invaluable and each person involved in the project was issued with a copy of the handbook outlining the procedures for the project.

TASKS OF THE WORKING GROUP

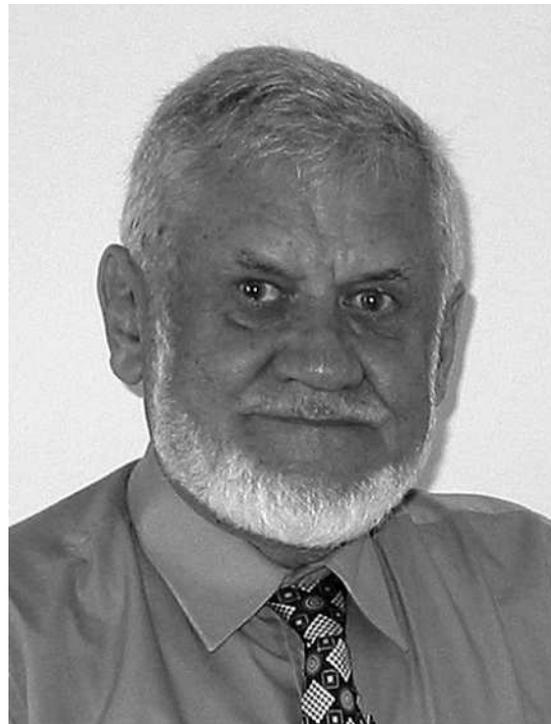
The working group contributed well in excess of 400 hours to the project. Some were spent on two major working bees at Darlington Road, where we concentrated on setting up, cleaning and labelling previously purchased metal shelving; opening 30 cartons of publications and sorting the books into topic areas. They were then listed on a spreadsheet according to the following categories: author, title, volume, year of publication, broad topic area, shelf location and comments such as condition, provenance, etc. The list could then be sorted according to any one of these categories. Our librarian also checked the Libraries Australia database for the availability of selected titles.

Time was also spent with the consultants at Mitchell Library and Prestons where, at each site, as many items as possible could be examined in one day.

EXPERT CONSULTANTS

The working group engaged two professionally qualified assessors conversant in science as well as history. Dr Peter Tyler we chose from the Professional Historians' Association list and Dr David Branagan, former Royal Society president and geologist, was chosen because of his long standing commitment to the history of science.

As indicated, each consultant tackled the project from a different perspective. Peter's overall consideration of the historical significance of the collection was based on the premise of there being a common perception that NSW (and Australia) was a cultural desert in 19th century, with little regard given to the small intellectual strata of society of the time. There is far more emphasis on convicts, bushrangers, squatters, in the early history. Peter also considered the preservation of the collection and later suggested some 30 recommendations for how it should be cared for.



Dr Peter J. Tyler, BA, MLitt, PhD, Grad.Dip.Ad.Ed., Hon.FAIEH; Consultant historian; Vice-President, Professional Historians' Association (NSW), who agreed to assess the overall historical significance of the collection according to National Library guidelines and to make recommendations for how it should be preserved and made accessible (Peter Tyler's report: 'Report on Historical Significance').

David Branagan examined the collection item by item, recording significance based on the recommended criteria and noting the condition and state of preservation of each. Both consultants generously contributed professional time far in excess of the hours covered by the grant.



Dr David Branagan, M.Sc, PhD, FGS, Hon Life Member, Geol.Soc.Aust., (Member of the Basser Library Committee, Australian Academy of Sciences) who agreed to use the criteria: provenance, rarity, representativeness, condition and integrity, and interpretive potential when assessing the significance of individual books and other items (David Branagan's report: "Report on the Cultural, Historical and Scientific Significance of the Society's Library and its State of Preservation".)

THE COLLECTION

The collection of the Royal Society has been subjected to a number of moves over a number of years with the last being from its rooms at Macquarie University to the current premises at

the University of Sydney. As a result of so many moves, the collection is now stored at various localities; some are at the Mitchell Library, where they are stored under archival conditions but without access to the public, and others are at the Darlington Road office where many of the items are in need of urgent preservation measures but have some access to members and researchers by appointment. The Royal Society's collection housed in the Dixson Library at the University of New England is in the care of librarians who provide full access to researchers and the public, whilst the eight pallet loads in commercial storage at Prestons is stored under plastic wrap and although relatively protected it is completely inaccessible for research.

Dr David Branagan has estimated that the total number of publications in the collection would be in excess of 45 000 with the bulk of these being serials at the UNE. This project examined some 1000 items that had been stored in 30 boxes at Darlington Road. Another 29 of the 48 boxes of various items at the Mitchell Library and 21 boxes (on two of eight pallets) of publications at Prestons were also examined.

IN CONCLUSION

It must be remembered that the collection has been in a state of decline since the NSW Government resumed the Society's building, Science House in Sydney, for the Rocks Redevelopment in the 1975. Although the 'green bans' movement prevented the demolition of Science House, which was the winner of the first Sulman Prize for architecture, it was never returned to science, becoming instead, Sports House. We would like to think that our collection might one day be rehoused in Science House, which was once jointly owned by the Royal Society of NSW so that in regaining it, the Society would have the opportunity to rebuild its library and collection to the standard set by the Royal Society of Victoria.

We should also take stock of the Liversidge collection and perhaps make it a focal point for future exhibitions. It is remarkable that Archibald Liversidge, who was Professor of Geology and Mineralogy, and later Professor of

Chemistry at the University of Sydney is celebrated at the Australian National University with streets and buildings named after him and yet, at the University of Sydney he goes unrecognised.

In his report, David Branagan comments, "In view of Liversidge's contribution to Australian Science and to the University of Sydney it is a sobering fact that the biography of Liversidge by Professor Roy Macleod, of the University, completed several years ago has not yet been deemed worthy of publication by Australian publishing houses. It is sad also that despite the naming of a street in Canberra for Liversidge his contribution to the University of Sydney remains without acknowledgement (by a named building etc.) within the grounds, or even within the Department of Chemistry."

Another outcome of the project is the recommendation that the Hargrave collection should be considered for World Heritage Listing. The section of the collection owned by the Power-

house Museum has already been listed and it seems fitting that the society's items should be included.

The Royal Society's Community Heritage project is seen to be the first step in preserving and making accessible the Society's collection of scientific books, journals and historical documents and other items. Our ultimate aim is to complete the assessments of the entire collection by once again calling on professional conservators, so that eventually our extensive and unique collection can be rehoused. Once rehoused, it will be possible to exhibit the rarer items and researchers and the public will be able to access various items of the collection. With this aim in mind, we have submitted the application for a second round of funding through the Community Heritage Program. Although we have all worked extremely hard to make the most of our expert consultants' contributions, we are aware that we have a long way to go before we can claim success.

R. Stutchbury
2006

The Royal Society of New South Wales

Report on Historical Significance

PETER TYLER

Keywords: Royal Society of NSW, Library Collection, Community Heritage Grant

THE BRIEF

In November 2005 the Royal Society was awarded a Community Heritage Grant to fund a Significance and Preservation Survey. The Community Heritage Grants Program is managed by the National Library of Australia and jointly funded and supported by the Australian Government through the Department of Communications, Information Technology and the Arts, the National Library of Australia, National Archives of Australia, the Australian Film Commission and the National Museum of Australia.

The grant is seen as a first step in supporting the effort to preserve the Royal Society's collection of scientific books, journals and historical documents by engaging professional expertise to guide the ongoing management and preservation of the collection.

In addition to an appraisal of the collection, this report gives a brief overview of the Society's development and an assessment of its significance in the intellectual life of New South Wales from early colonial times.

THE ROYAL SOCIETY

The Royal Society of New South Wales traces its origins to the 'Philosophical Society of Australasia' formed in 1821 when six men met at the home of Judge Barron Field. It soon grew to a dozen members, meeting in their homes by rotation. Nevertheless after about twelve months the society lapsed until another organisation with similar objectives was formed in 1850 as the 'Australian Philosophical Society'. By that time the educated population of the Colony was large enough to support such a ven-

ture.¹ The name was changed to 'Philosophical Society of New South Wales' in 1856, the year that the Colony gained responsible government. In May 1866, Queen Victoria granted permission to assume the present title 'The Royal Society of New South Wales'. The Society was incorporated under this name by Act of the NSW Parliament on 16 December 1881 'for the encouragement of studies and investigations in Science, Art, Literature and Philosophy'.

Because the Royal Society was incorporated under its own Act of Parliament, it can only be dissolved by legislation, unlike most corporate bodies where this power is vested in the members. Until 1935 women were not admitted to the Society, although scholarly papers by women such as by Fanny Cohen and Marie Bentivoglio were accepted for reading or publication. The first woman to be elected President was Dr Ida Browne, a palaeontologist who achieved that distinction in 1953.

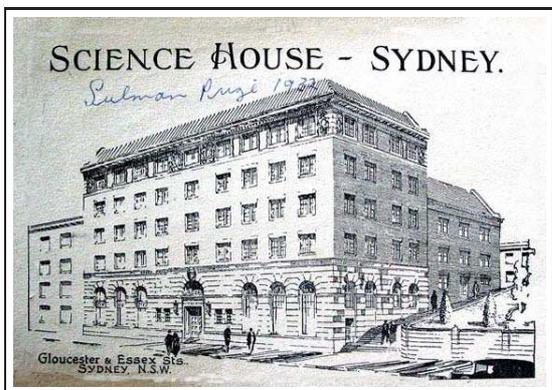
The Royal Society of NSW (henceforth described as 'the Society') set up 'Sections' dealing with particular branches of knowledge, including agriculture, architecture, astronomy, biology, chemistry, engineering, ethnology, fine arts, geography, geology, literature, mathematics, medicine, microscopy, physics, and public health. Those Sections gradually dispersed as new societies or professional associations were formed to cater for specialised interests in those fields. For example, the Linnean Society was founded in 1874 to promote 'the cultivation and study of the science of natural history in all its branches', with considerable financial support from its first President, the politician and amateur biologist Sir William Macleay. The particular focus of the Linnean Society has always been the biological sciences. Macleay was also

¹ In the first census year of 1828, the total population of NSW was 35,960. This had grown to 178,668 by 1851.

a foundation member of the Philosophical Society of NSW, and the two societies retained close links for many years.

Despite the proliferation of specialised scientific bodies, the Royal Society retained an interest in all these fields, as perusal of the publications and activities will attest. Research was fostered through regular meetings, symposia, publications and international scientific exchange. Membership of the Society is now open to any person interested in these activities. From 1875 the Society rented premises in the Clark Assembly Rooms at 5 Elizabeth Street, Sydney, a property that it later purchased. When this was sold in 1927, the Society moved into temporary quarters in Castlereagh Street previously occupied by the University Club.

In 1931, the Society moved into the purpose-built 'Science House' at 157 Gloucester Street on land granted by the NSW Government. The building, designed by architects Peddle, Thorpe and Walker, won the first Sulman Prize for architecture in 1932.



From the Society's collection, a print from a sketch of Science House showing when it won the Sulman Prize for Architecture in 1932.

Other scientific societies and professional associations also occupied Science House, in particular the Linnean Society and the Institution of Engineers Australia, both of which were co-owners. The libraries of the Royal Society and the Linnean Society shared the same room, although they were catalogued separately.

In 1975 the building was resumed by the NSW Government with a view to its demolition as part of The Rocks redevelopment scheme. Changed community attitudes towards the value of heritage buildings prevented that grandiose redevelopment taking place; nevertheless the government retained the property, re-named Sports House while it was occupied by sporting associations that later moved to Wentworth Park. The change in nomenclature and usage perhaps reflected the priorities of the NSW Government.²

The Society held its last meeting in Science House on 4 August 1976, at which time the Institution of Engineers decided to move its national headquarters to Canberra. The Royal Society and Linnean Society then acquired Clarence House at 35 Clarence Street formerly owned by printing ink manufacturer W.T. Wimble. This was re-named as the Science Centre, where the Society remained until 1983. The new arrangement did not prove viable, so the two partners were forced to sell this building. The Royal Society moved into two cottages owned by Macquarie University, but later had to compress its activities into a single unit at 136 Herring Road, North Ryde. Because there was insufficient room for the library, the collection had to be dispersed or placed in storage. The Linnean Society moved to Milsons Point, where it still functions.

The Royal Society now operates from a small terrace house at 121 Darlington Road, Darlington, owned by the University of Sydney on the fringe of the University campus. Although held under lease, there is no security of tenure; at any time the University may require the premises for its own expansion.

The building is well-protected against intrusion by metal grilles on all doors and windows, with a connection to the University security service, but there are no smoke alarms. Fire extinguishers are plentiful, but this is meaningless when the premises are only occupied intermittently. The corrugated iron roof is rusty in patches, and may be liable to leak.

² The building has since reverted to its original name of Science House, and is occupied by commercial tenants, including the Sydney campus of Curtin University of Technology from Western Australia.

In place of the specialised interest sections that ceased to exist as other associations took their place, the Royal Society of NSW developed a decentralised structure to cater for scientific interests in regions where universities were established or industry flourished. This move was in line with political and social pressures for greater decentralisation of services. The first regional division of the Society was the New England Branch, which began on 24 March 1961 and operated very successfully for many years, although it is currently in recess. The existence of this Branch was a significant factor in the relocation of portion of the Society library to Armidale. An active Southern Highlands Branch currently provides a strong focus for the Society in that area of New South Wales, where its regular activities are accessible to people from Canberra.

PROMINENT MEMBERS

Notable scientists who have made a significant contribution to the reputation of the Royal Society of NSW include:

Rev. W.B. Clarke (1798–1878) was unofficial Geological Surveyor of New South Wales 1851–3, and reported on the goldfields in NSW. He was Vice President of the Society during a period when the Colonial Governor customarily held the office of President. Clarke is often described as ‘the father of Australian geology’.

Professor Sir T.W. Edgeworth David (1858–1934), a former President of the Society, was Professor of Geology at the University of Sydney, and a member of the first party to explore the region of the South Magnetic Pole in 1909, as part of Shackleton’s expedition.

Lawrence Hargrave (1850–1915) was a pioneer in aeronautics. He demonstrated the possibility of powered flight with models in 1884, invented the rotary engine in 1889 and the radial engine in 1890. His experiments with box kites in 1893 led to the development of the first practical aeroplanes. Hargrave joined the Royal Society in 1877 and delivered thirty papers to the Society in following years. Their publication in the *Journal and Proceedings* enabled the results of this research to be distributed internationally.

J.L. Gerard Krefft (1830–1881) was curator and secretary of the Australian Museum. He served on the council of the Philosophical Society of NSW and became a member of the Royal Society until 1874, when he left the Museum. A number of his zoological papers were published in the *Transactions of the Philosophical Society*.

Professor Archibald Liversidge (1846–1927) was Professor of Geology and Mineralogy, and later Professor of Chemistry at the University of Sydney. An active President of the Society, he bequeathed his extensive library to the Society.

J.H. Maiden (1859–1925) was the curator of the new Technological Museum in Sydney before becoming Director of the Botanic Gardens in 1896. He founded the National Herbarium in 1901. He was twice President of the Society.

H.C. Russell (1836–1907) became the NSW Government Astronomer in 1870. He wrote extensively on scientific matters and established uniform meteorological data collection procedures throughout the Australian colonies. He was President of the Royal Society on four occasions, and became the foundation President of the Australasian Association for the Advancement of Science.

Professor John Smith (1821–1885) was the first Professor of Chemistry and Experimental Physics at the University of Sydney. He was President of the Society on four occasions.

Sir Thomas Anderson Stuart (1856–1920) was the first Professor of Anatomy and Physiology at the University of Sydney. He was responsible for establishing the School of Dentistry. He held many public offices, including President of the Royal Society of NSW.

In addition to the many members who have made an outstanding contribution to Australian scientific research, distinguished international figures also appear on the Society’s rolls. Charles Darwin was elected as an honorary member in 1879, and Louis Pasteur was elected in 1883. Letters from Darwin and Pasteur acknowledging this honour are treasured items in the Society archives.

Another name that is linked to the Society during the nineteenth century is the American geologist James D. Dana, who was attached to the United States Exploring Expedition led by Charles Wilkes during the years 1838–1842. Dana made a geological survey of New South Wales in 1849, and later corresponded with Rev. W.B. Clarke. A number of the publications arising from these expeditions, including atlas folios, are held in the Society's collection. Some were donated by Professor Dana, as noted elsewhere in this Report, while others have been acquired elsewhere. The volume on geology is extremely rare, as a warehouse fire destroyed much of the limited print run prior to publication. The Society's copy was obtained by Professor Liversidge from the Smithsonian Institute in Washington.

The Society's membership did not consist solely of these high achievers. Many of the people involved had made their contribution to society in other fields, but retained a serious interest in aspects of science. Thus amongst the 328 members in 1866 we find 51 politicians, 36 merchants, and 19 clergymen.³ For some, the opportunity for social contacts and business networking may have been as important as the scientific discourse.

The range of scientific disciplines practised by Society Presidents between 1880–1961 is shown in Appendix C.

PRIZES, AWARDS AND MEMORIAL LECTURES

High levels of scientific achievement are recognised by the Society through the award of prizes or medals, some of which date back to the nineteenth century. Leading researchers are invited to present public lectures in their particular field, including prestigious events commemorating past scholars. Some of these awards are presented annually; other at less regular intervals.

The *Clarke Medal* for distinguished work in the natural sciences (geology, botany, zoology) done in or around Australia was first awarded in 1878.

The Society's *Clarke Memorial Lecture* in geology dates back to 1903.

The *Walter Burfitt Prize* for scientific work done in Australia or New Zealand was first awarded in 1929. It is awarded every three years for contributions of the highest scientific merit.

The *Society's Medal* for scientific research and services to the Royal Society of New South Wales was first awarded in 1884. Since then it has been awarded 66 times.

The *James Cook Medal* for outstanding contributions to science and human welfare in and for the Southern Hemisphere was first awarded in 1947.

The *Edgeworth David Medal* is awarded to an Australian scientific research worker under the age of 35 years. It was first awarded in 1948.

The *Archibald D. Ollé Prize* may be awarded from time to time for the best paper by a member published in the *Journal and Proceedings*. It was first awarded in 1956.

The *Royal Societies of Australia Eureka Prize for Interdisciplinary Scientific Research* was introduced in 2003. It is funded by the six State Royal Societies for award to the Australian partnership or team whose outstanding research involves the active collaboration of scientists in two or more disciplines.

The *Liversidge Research Lecture* in chemistry was first delivered in 1931 and is given every second year.

The *Pollock Memorial Lecture* in mathematics or physics is presented in association with the University of Sydney, and was first held in 1949. It is held about every four years.

The *Poggendorf Memorial Lecture* in agriculture was first delivered in 1987, and is held every two or three years.

The winners of each of these honours since their inception are listed on the Society website: <http://nsw.royalsociety.org.au/awards.html>

Many of the recipients were already at the zenith of their profession. Others, however, were talented younger scientists. A worthwhile research project would be to trace the subsequent careers of these award-winners, to see

³ A.A. Day & J.A.F. Day, 'A biographical register ...', *Journal and Proceedings, Royal Society of New South Wales*, Vol. 129, 1996, p. 137.

whether early promise was vindicated by their later contributions to science. (See recommendation 19)

SUMMER SCHOOLS

Beginning in the 1970s, the Society conducted a program of Summer Schools for senior secondary school students that ran for more than twenty-five years. With corporate sponsorship, these Summer Schools during the vacation gave leaders in their fields of science the opportunity to explain and demonstrate the latest research. An important objective was to create a sense of enthusiasm for science amongst young people. The success of these initial Summer Schools became a model for similar projects that were organised later by other scientific bodies.

Research into the participants in the annual Summer Schools would provide useful information for educationists. Did their school-day aptitude lead to a successful scientific career? If not, did the Summer Schools at least serve a valuable purpose by creating a greater awareness and understanding of the scientific method? It would also be interesting to discover where the students came from. Did particular schools or teachers have a strong influence? Boxes 1 and 2 in the Mitchell Library collection of Royal Society material include much of the relevant information, including programs, attendance lists, and group photographs of participants.

PUBLICATIONS

The flagship publication of the Society is the peer-reviewed *Journal and Proceedings of The Royal Society of New South Wales*. This has been published continuously since 1867, with slight changes in title. From Vol. I (1867) to Vol. VIII (1874) it was known as *Transactions of the Royal Society of New South Wales*. From Vol. IX (1875) it became *Transactions and Proceedings of the Royal Society of New South Wales*. From Vol. X (1876) the present title was adopted. Volume 139 (Nos. 409–410) will be published in 2006.

The Society holds one complete run of this serial in bound volumes from 1867 to 1969. Loose copies published subsequent to this date need to be bound without delay. Some of the early volumes require conservation treatment to prevent further deterioration of leather bindings. Two almost complete sets of duplicate bound copies exist, but these do not form a complete run, although it is possible that missing issues may be found amongst the unsorted boxes of stored material. Compilation of further complete sets is not a high priority, as other libraries also hold full runs of the *Journal and Proceedings*.

The Society also holds a bound volume of the *Transactions of the Philosophical Society of New South Wales*, 1862–1865. This was the forerunner to the present Royal Society. Some of the papers presented to early meetings of the Philosophical Society were published in the *Sydney Magazine of Science and Art* in 1857 and 1859. This publication is held in Mitchell Library as well as the Society's own library. Newspapers of the day were also inclined to publish the full text of Society lectures; in later years an abridged account of proceedings appeared in the press.

Several of the papers presented at meetings of the original Philosophical Society of Australasia in 1821 were collected by member Barron Field and published as *Geographical Memoirs on New South Wales* after he returned to London in 1825. A copy of this book is held by Mitchell Library.

The importance of the *Journal and Proceedings* in colonial scientific circles should not be underestimated. It provided the outlet for publication of much original material. To give an example of the quantity and diversity of information disseminated in this way, we can look at Vol. X, for the year 1876, but published by the NSW Government Printer in 1877. This consisted of 333 pages, plus three meteorological charts. The volume was edited by Professor A. Liversidge and contained 18 articles in addition to the text of four papers read before Sections of the Royal Society. Topics ranged across astronomy, geology, palaeontology, meteorology, mineralogy, oceanography, anthropology, botany,

dentistry and fine art etching (which of course was also a technique used in the illustration of scientific publications).

The index to articles in the *Journal and Proceedings* is presently on library cards, in alphabetical order by author. However, it does not appear to have been maintained post-2001. This should be brought up to date. When resources permit, it would be desirable to digitise this index and place it on a computer database. A subject index on cards appears to exist only for a couple of volumes (106–107). In 1975 A.A. Day compiled an 82-page subject index covering the first half-century, Volumes 1–50 (1867–1916) plus four years of the Philosophical Society of NSW (1862–1865). This contains approximately 2,500 alphabetic entries. It is understood that the *Journal and Proceedings* is listed on current bibliographic abstract databases (e.g. APAIS), but this coverage does not extend to earlier volumes published before the era of electronic indexing.

Because the *Journal and Proceedings* is exchanged with some 600 institutions in fifty countries throughout Europe, Asia, Africa, the Americas including every state of the USA, Australian scientific achievements are rapidly brought to the attention of international researchers. In return, Australia receives publications that are rarely available in this country. These mainly comprise journals, but sometimes books are received as well. As described elsewhere in this report, these journals and books are accessible from the Dixon Library at the University of New England.

Many early volumes contain a full list of current members of the Society, enabling researchers to track the scientific interests of prominent citizens of New South Wales.

The Society also publishes a *Bulletin* for members, giving information about future meetings, abstracts of lectures etc. This appears monthly, except in the months of December-January. The latest issue, Number 295, was published in June 2006. As the *Bulletin*, or under its previous title *Newsletter*, this publication has been in existence for some thirty

years. In its early days the Newsletter was little more than a meeting notice paper. The Society has not retained a complete consolidated file of the *Bulletin/Newsletter*, although it may be possible to reconstruct one from other sources. Although easily dismissed as ephemeral, this publication in its various forms is extremely valuable for tracing the history of the Society and its activities, containing detailed information that may not be readily available from other sources such as annual reports.

THE LIBRARY COLLECTIONS

When the Royal Society and the Linnean Society shared the library premises in Science House, members of each Society were allowed to borrow from either collection, although they were catalogued separately. As a broad generalisation, the Royal Society concentrated on the physical sciences while the Linnean Society covered the life sciences, but there was considerable overlap. After the two societies moved to separate premises, it is believed that much of the Linnean Society library collection was dispersed amongst other institutions.

Because of the space restrictions imposed by several changes of location since vacating Science House, the Royal Society's extensive library itself has become dispersed over a number of sites. This has hindered use of the material by researchers.

By 1960 the Library had grown to some 40,000 volumes. In 1983, when the Society relinquished the Science Centre in Clarence Street, about 30,000 items, mainly serials received on exchange with other institutions, were transferred to the Dixon Library at the University of New England in Armidale. That Library prepared and published a separate catalogue of the Royal Society collection in 1989, listing about 1,700 titles.⁴ This arrangement has been mutually beneficial, providing an accessible domicile for a large part of the Society's collection, at the same time as greatly enhancing the University's own library. The Society's New England Branch did much to facilitate this solution to a difficult problem.

⁴ Dixon Library. *A Catalogue of The Royal Society of New South Wales Collection*, Armidale, University of New England, 1989.

After removal of a large component of the library collection to Armidale, the remainder of the collection was transferred to the premises then occupied by the Society at Macquarie University. However, when Macquarie University required this area for its own expansion, it was necessary to place much of the material into external storage, partly at Mitchell Library and partly in an industrial warehouse.

As part of this heritage survey, a small team of Society representatives has examined these scattered collections in order to provide an overall assessment of their significance and physical condition. Members of this team include Council members Mr John Hardie and Ms Robyn Stuchbury plus consultants Dr David Branagan and Dr Peter Tyler. Other Society members have provided practical assistance.

A complete listing of the library collection at Darlington has been prepared by Ms Stuchbury. This includes many of the rare and historic items, and forms the main focus of a separate appraisal prepared by Dr David Branagan, formerly Associate Professor of Geology at the University of Sydney, who has published widely on both geology and the practice of nineteenth-century science in Australia. Some of the listed works are unobtainable in any other library in New South Wales.

During the preliminary survey, the books were arranged on steel library shelving in a fairly consistent, logical manner, with the exact location listed on the collection database so that any volume can be accessed readily. However, this is in no sense a library catalogue. In his report, Dr Branagan has indicated which volumes require urgent conservation treatment.

Amongst the outstanding works on these shelves there are three books from the sixteenth century, the oldest being the Latin text by Cyrillus, *In Johannem*, dated 1508. This has been re-bound and is in excellent condition. It was part of the private library bequeathed to the Society by Professor Archibald Liversidge.

Although there is very little dated from the seventeenth century, there are thirteen volumes from the eighteenth century, such as the

Emanuel Bowen *Complete System of Geography*, published in 1747. These books have intrinsic historic interest. The majority of the Darlington collection comprises works published during the nineteenth century – 471 titles, but many more actual volumes because some of these form part of an extended series, such as *Curtis's Botanical Magazine*, dating from 1787, but published almost weekly between 1879–1897, and 24 volumes of *The Astronomical Register*, published between 1863–1886. There are 255 titles from the twentieth century plus another 21 whose publication date cannot be determined. In addition to these listed monographs, a separate listing has been prepared of large items, principally geological atlases from the late nineteenth century, particularly from the Dutch East Indies (now Indonesia) and the United States of America. There are also some rare twentieth century ethnographic and geological maps from Eastern Europe.

The nature of the collection is of particular historic interest for what it reveals about the interests of Australian scientific workers during the second half of the nineteenth century, when the Royal Society included most of these practitioners amongst its membership. Most of the books dating from an earlier period appear to have been donated or bequeathed to the Society, a fact that demonstrates the importance of the Society in their lives. However, it also means that they may duplicate works already in the collection, or may be peripheral to the Society's core interests.

A sample of items in the collection has been checked against other Australian library catalogues to assess their rarity. Many are not available in New South Wales, although they may be held in other Australian collections, but sometimes not open to the public, such as the Supreme Court of Victoria.⁵ An example of an arcane publication is the 1930 *Report on the Reconstruction of the Tokyo Imperial University Library*; only one other copy is known to exist in Australia, at the University of Melbourne. On the other hand, works that would seem to be equally obscure such as the 1904 report of

⁵ For example, Baron von Mueller's *Descriptive Notes on Papuan Plants* (1875).

the Royal Society of London's Coral Reef Committee on *The Atoll of Funafuti* are held by at least ten other libraries in Australia, including three in New South Wales.

A spot check of medical books from the nineteenth century revealed that none of these are held in the comprehensive Medical History Library of the Royal Australasian College of Physicians, generally regarded as the best source for this material in New South Wales. An example is: A. Becquerel, *Traité des Applications de L'Electricité a la Thérapeutique Médicale et Chirurgicale*, Paris, 1857.

The Society collection also includes early editions of *Encyclopaedia Britannica*, *The Australian Encyclopaedia*, and *Oxford English Dictionary*, as well as the *Historical Records of Australia*. While the encyclopaedias are not unique, they provide a useful supplementary resource for scholars of nineteenth-century science, because they contain accounts of contemporary knowledge.

One advantage of a collection such as this arises from its rare books being on open access where scholars can browse along the shelves and so discover relevant material that may not be identified readily from traditional library catalogues. The value of serendipitous discoveries should not be discounted in historical research.

Although the collection of monographs and journals held at the Society's premises in Darlington appears to be in reasonable condition and adequately housed, it is not located in a climate-controlled environment that would prevent future deterioration. Being situated on the upper level of a nineteenth-century terrace house whose structural condition is uncertain, the collection is vulnerable to water penetration in the event of roof leakage. Older buildings such as this are prone to be dusty, and may harbour damaging vermin.

The entire collection needs to be professionally catalogued in accordance with a recognised system, such as Dewey Decimal. The catalogue should be made available on-line, and listed with the 'Libraries Australia' database (formerly 'Kinetica') to facilitate inter-library loans of items other than rare or unique material. Every one of the other five state Royal

Society libraries is listed on this database.

Eight pallets packed with cartons of monographs and bound serials belonging to the Society are held in storage at Prestons, on the outskirts of Sydney. A sample of about 25 per cent of this collection was examined by JH, DB, RS, and PT on 31 March 2006. This revealed that some of the rarest and most significant items of the Society's collection are located at this site, where they are totally inaccessible to researchers.

Because the cartons are housed in a warehouse alongside perishable goods, there is serious risk of damage by rodents or insect pests, despite the precautions taken by the property owner, who is President of the Southern Highlands Branch of the Society. It is a matter of considerable urgency that this material be relocated and properly catalogued.

Mitchell Library at the State Library of New South Wales holds 48 boxes of manuscript material, principally archival records of the Society. A contents list is held in the Manuscripts Section of the Mitchell Library, but is somewhat unreliable. A sample comprising about 60 per cent of this collection was examined by JH, DB, RS, and PT on 30 March 2006. Further information is given in the 'archives' section of this Report.

The material located at the University of New England was inspected several years ago by Dr Branagan. Exchanges of serials continue as previously, with active journals available on open access in the main library shelves. They are also available on inter-library loan. The older, inactive part of the collection is housed in a designated room at the Dixson Library, and identified as The Royal Society of New South Wales Collection by a bookplate and the Society crest embossed in gold on the spine of each volume.

Although the core collection presently housed at Darlington is not very accessible to researchers, the Society is able to photocopy particular articles on request, at cost. This service is not publicised, however. In any case, the lack of an accessible catalogue means that few people know of the collection's existence. The Society's material held in Mitchell Library

theoretically is available for public perusal, but because it does not form part of the Library's own collection it is not properly catalogued and is difficult to retrieve. The material housed in a suburban warehouse is completely inaccessible to the public, although it appears to include some rare and valuable items.

The purpose-built cedar bookcases that housed the Society's collection in Elizabeth Street and later at Science House had to be modified to fit into the Clarence Street property, which had lower ceilings. When the Society moved to a small unit at Macquarie University, there was no space for these handsome bookcases, which were purchased by the Historic Houses Trust, where they have been installed in the 'Royal Society Reading Room' in the Caroline Simpson Library and Research Collection at the restored Mint Building, 10 Macquarie Street, Sydney.

It is clear that the present dispersal of the Society's library collection is a major impediment to research in the areas of science that are so strongly represented. Ideally, all this material should be consolidated into a single entity located in central Sydney, as was the case during the years that the Society occupied Science House in Gloucester Street. This facility could become a centre for the study of the development of scientific activity in New South Wales, accessible both to scholars and interested members of the public. Indeed, such a Centre could become a focus for increasing community understanding of the nature of science, in a time when science and technology are viewed with suspicion or indifference by sections of society.

PROVENANCE

Much of the early material in the collection was donated by other institutions or by individual members of the Society. Bookplates sometimes identify the original owner. Many of the early editions are personally inscribed by the authors, or the donors. In some cases the pages are uncut, indicating that the volumes have never been opened.

Amongst the rare volumes are the two parts of Professor J.D. Dana's Volume XIII report on

crustacea prepared following the United States Exploring Expedition in the early years of the nineteenth century. These were published in 1852, and are inscribed 'For the Royal Society of New South Wales from the Author, James D. Dana, New Haven, Connecticut, December 25, 1893.'

A significant amount of material was bequeathed to the Society by former President Professor Archibald Liversidge. This material usually bears Liversidge's signature and/or bookplate, adding to its interest and value.

Mitchell Library benefactor David Scott Mitchell collected items relating to the Royal Society, and these are catalogued as part of his bequest to the State Library of NSW. This includes a printed *Catalogue of the Scientific Books in the Library of the Royal Society of New South Wales, 1889*. This is a volume of 110 pages, listing the entire Royal Society collection by author. It is bound with other leaflets and pamphlets that form part of Mitchell's bequest (DSM/042/P87). Many of these carry Mitchell's signature. Other Royal Society publications in the Mitchell Library collection were donated by Alfred Lee, and carry his bookplate.

One item in the Society collection that is truly unique is a volume containing beautifully arranged but delicate specimens of marine algae. The provenance of this book, which resembles the similar treatment of pressed flowers or other botanical specimens during the nineteenth century is revealed by a bookplate inside the front cover:

Marine Algae
 Collected and Mounted by
 The Reverend James Yuill,
 Free Kirk Minister of
 Peterhead, Aberdeenshire, 1854
 Presented to the
 Royal Society of NSW
 by David Reid
 'Holmsdale', Pymble
 27.10.1920

There can be taxation advantages for the donors of private libraries to the Royal Society, which may partly account for the large number of volumes acquired in this way.



A plate from Yuill's *Marine Algae* 1854; although the contents are in good condition, the volume itself needs urgent attention. (Photograph: Robyn Stutchbury)

PORTRAITS AND PHOTOGRAPHS

Also housed in the Society's premises at Darlington are many paintings or photographs of considerable historic interest:

§ Framed photograph of Rev. W.B. Clarke, known as 'the father of Australian geology' – 48 x 35 cm

§ Framed oil painting of Sir T.W. Edgeworth David, by Norman Carter (from a photograph) – 73 x 59 cm

§ Framed painting of Royal Society seal, designed by A. Liversidge, with handwritten description of significance of the emblems. c. 1885, artist unknown, possibly Liversidge – framed size 60 x 46 cm [See Appendix A]

§ Framed photograph of delegates to Pan-Pacific Science Congress, University of Sydney, 24 August 1923 – 19 x 115 cm (Needs re-mounting)

§ Framed photograph of 5 Elizabeth Street, Sydney, former home of Society. Donated by Museum of Applied Arts & Sciences, 1967 – image size 50 x 39 cm

§ Framed lithograph (?) of W. Spence by T.H. Maguire, 1849 – image size 29 x 24 cm

§ Framed lithograph of J.S. Henslow by T.H. Maguire – 29 x 24 cm

§ Framed photograph of 'Experimental model of a flying machine made by Lawrence Hargrave, 1890' – image size 36 x 43 cm

§ Framed commemorative poster, Australia sesquicentenary 1938, 'a nation as virile as the sunlight which animates its people'. Eleven illustrations and short text by C.H. Bertie, mounted on a reproduction painting of eucalypt trees – image size 49 x 37 cm

§ Framed lithograph (unglazed) of 'The distinguished men of science of Great Britain living in the years 1807–8'. Includes portraits and signatures of 50 individuals, in a library setting (the Royal Society of London?). Amongst these are Banks, Cavendish, Davy, Herschel, Jenner, Watt. Image size 54 x 31 cm (Needs conservation)

§ Unframed mounted photograph H.G. Smith, President 1913. Image size 54 x 39 cm

§ Unframed mounted and retouched photograph Robert Hunt CMG, Deputy Master, Royal Mint, Sydney (died 27/9/1892). Oval, image size 51 x 40 cm. (Mount stained)

§ Unframed mounted photograph by Sidney Riley of J.H. Maiden, President 1896 & 1911 – image size 36 x 29 cm

§ Framed photograph of J.A. Pollock in military uniform, 'presented to the Royal Society of New South Wales by A. Raincloud (?), September 1959'. Image size 25 x 19 cm. (Should be re-mounted)

§ Framed portrait engravings of Fellows of the Royal Society of London: T.H. Huxley, M. Faraday, C. Darwin, J.C. Maxwell, W. Harvey. Each image approx. 20.5 x 13.5 cm, framed size 39 x 29 cm. (Mounts stained, frames slightly damaged - need some conservation work)

§ Portfolio labelled 'Prints and Engravings. Eminent men in the fields of Science and the Arts'. This folder contains many mounted lithograph prints (some, perhaps all, donated or bequeathed to the Society). These comprise: portraits of Buffon, John Smeaton, Pascal, W. Harvey, Newton, Nicolas Bacon, Napoleon, Louis Napoleon (1848), Sir Robert Peel (1846), Wiclif (sic), George Edwards, Porson,

John Locke (1734), Gilbert Burnet (1724), Henry Spelmann, Thomas Martyn & Cambridge University (1799), Rene Hauy, Nelson & Trafalgar (1805), C. Rollin (1763), Mirabeau, Laurens Sterne (1780), Milton (1805), Dr Price (1776), G.G. Stokes (1892), Col. Richard Lovelace (1794), Nicolas Poussin, Diderot, Dante, Richard Arkwright, Charles Dickens, Graf von Rumford, Alfred Tennyson, Thomas Pennant, Charles Perrault (1694), Peter Lely, Jane Grey, Johannes Flamsteed (1712), Sir Martin Frobisher, Mungo Park (1820), J. de Lalande, Voltaire, Earl of Bute, Oliver Cromwell (1728), John Evelyn, William Wollaston, Aylmer Lambert & deer park, Duke of Wellington (1839), three unidentified figures. A few of these were printed 'Under the Superintendance of the Society for the Diffusion of Useful Knowledge'.

A large number of photographs, albums and lantern slides are held at Mitchell Library, on loan from the Society (Box 29). These appear to be of considerable historic interest, including portraits of many of the leading figures in scientific circles late 19thC – early 20thC, e.g. Sir Alfred Roberts, Lawrence Hargrave, Dr Anderson Stuart, J.H. Maiden, Professor John Smith. There are also lantern slides of early colonial Governors Brisbane, FitzRoy, Hunter, King, leading officials such as Sir Alexander Macleay and Sir Edward Deas-Thompson, and medicos Balmain and Bland. Lantern slides on aviation dated 1898, Cook's landing place, and Governor Brisbane's Observatory may be unique.

Some of the lithographs of famous men (and one woman) could be profitably disposed of through antiquarian bookstores. Mostly they are in fine condition, wrapped in tissue paper. The Society may wish to retain a small number of portraits of the giants of science, but many are prints of notable figures whose achievements were in other fields, e.g. Nelson, Napoleon, Lady Jane Grey. These could be valuable acquisitions for people engaged in the restoration and furnishing of heritage buildings.

A number of the photographs and lithographs held at Darlington are not appropriately stored, and are likely to suffer damage through careless handling.

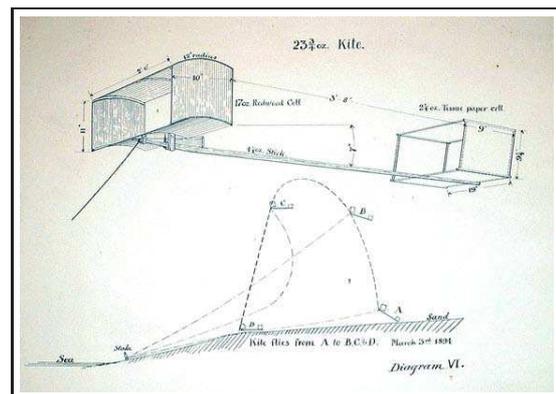
OTHER MEMORABILIA

Other notable items held at Darlington comprise:

§ Original bronze plaque attached to Lieutenant Cook's landing place at Kurnell, commemorating 'the discovery of these shores . . . the auspices of British Science' by James Cook and Joseph Banks, 'the Columbus and Maecenas of their time'. Affixed by The Philosophical Society, 1821. - 47 x 38 cm (Restored, but showing some damage by shotgun pellets?) [See Appendix B]. There is also a framed plaster cast (damaged) of this plaque.

§ Corporate Seal press (c. 1884) with dies for embossing an early version of Royal Society of NSW emblem, based on Royal crest of Queen Victoria.

§ Of immense historical interest are fourteen original drawings by Lawrence Hargrave illustrating the results of his aeronautical research into rigid stable aeroplanes and his designs for lightweight motors to power flying machines. These were later published in the *Journal and Proceedings* of the Society in 1895 and 1909, and were used as the basis for further developments by aviation pioneers in the United States and Europe. The drawings are in good condition, separated by tissue paper in a large hardboard portfolio.



One of Hargrave's plates, numbered in the right corner by pencil, 'P154', with an annotation in what appears to be his handwriting in the lower left corner, 'Plate 6 for L. Hargrave's paper on Aeronautical work'.

§ Architectural floor plans of Science House, Gloucester Street, Sydney, by Peddle, Thorp & Walker, 1929. (3 sheets)

§ Copy of congratulatory memorial presented by the Royal Society of NSW to Queen Victoria on the occasion of her Jubilee (1887). Donated to Society by Mrs E. Wilkinson, a descendant of the Society President C.S. Wilkinson who signed the memorial.

§ The bound volume of marine algae collected and mounted by Rev. J. Yuill in 1854 has been mentioned earlier in this Report, under the 'provenance' section. It would be desirable for this volume to receive some conservation treatment.

Memorabilia at other locations comprises:

§ Royal Society material held at Mitchell Library includes a very fine collection of lantern slides relating to the development of aviation, other objects, and Society members. There are also stereoscopic pictures/slides from the Franklin Expedition to Antarctica (box 28). Although facilities to view early lantern slides are difficult to find, this material deserves to be reproduced in another format.

§ Nineteen medallions collected by Professor Liversidge from overseas conferences and exhibitions between 1867–1902 are held at Mitchell Library (box 36), on loan from the Society. There is also an unusual microscope slide scale. These items have been inspected by the research team. After minor restoration treatment, these could form the basis for a fine visual display illustrating Australia's involvement in nineteenth century international science.

§ Many photographs of Society members and functions such as annual dinners are contained in box 29 at the Mitchell Library.

§ Mitchell Library also holds a pewter inkwell that belongs to the Society (condition or value undetermined).

To provide safekeeping during a period of frequent change of premises, former Secretary and President (1975) Mr Edric Chaffer held several items belonging to the Society at his home in Chatswood. With a reasonably secure environment now available at Darlington, two boxes of these artefacts have been returned to the So-

ciety following the commencement of this heritage survey. These include a carriage clock in a leather viewing case inscribed with the Society's name, donated by Professor Smith. There are also some fairly mundane laboratory artefacts used by Faraday in his research, apparently obtained by Professor Liversidge circa 1908.

ARCHIVES

The Society offices at Darlington have several filing cabinets containing correspondence and financial records. Based on a preliminary scan, these files include material of historic interest as well as ephemera and current business records of the Society. This material needs to be examined more closely, and archived or discarded as appropriate. It is understood that long-serving Secretary of the Society Dr Maren Krysko may also have some files relating to her period in office.

A valuable collection of historic correspondence has been carefully preserved in a bound, interleaved volume. According to the title page, this comprises 'A collection of letters and ephemera to members of the Society 1878–1974'. That description is not correct; in fact the 58 items comprise handwritten letters written between 25 February 1818 and 25 January 1896. Most are addressed to the Society, but some were sent to members such as pastoralist Henry Kater (who presumably donated or bequeathed them to the Society). This correspondence is from such prominent scientists as Sir John Herschel, Douglas Mawson, Charles Darwin, Professor James Dana, Baron von Mueller, Louis Pasteur and Professor R.W. Bunsen.

Amongst the material of undoubted archival and research significance is a leather-bound Cash Book recording all transactions between April 1911 and June 1930, together with a matching Ledger for the period 1912–1966.

Mitchell Library at the State Library of NSW is temporarily holding 48 boxes of Royal Society material in its manuscript collection. A contents list is available from the Mitchell Library, and a copy is held by the Society, which retains ownership. In 2004, Dr Anna Binnie prepared a report for the Royal Society on a

small part of the collection, including a detailed inventory of some cartons. She also partly rearranged the collection, so that the Mitchell Library contents list now may not be accurate. One carton (box no. 3), containing material dated 1932–1974, is marked ‘not to be accessed before 2025AD’. This fifty-year embargo apparently relates to unsuccessful candidates for Society awards and prizes, including the reasons for their rejection. Following her inspection, Dr Binnie recommended:

‘That we take possession of it [the material], move it into our offices at University of Sydney and take on what ever restoration work or preservation work is required. We should . . . investigate the possibility of lodging this material in the University of Sydney Archives which are located on the top floor of Fisher Stack. It would be kept in a controlled library environment, it would be accessible to scholars and there is some security for the material.’

As noted earlier, some of the material at Mitchell Library has been examined cursorily as part of the present research. It appears to be a very diverse and somewhat indiscriminate collection, ranging from vital records such as the minute books of the various sections of the Society between 1876–1989 (boxes 9–11), to petty cash books, taxation returns and staff attendance registers. Financial records are comprehensive, and have been retained far beyond the statutory requirements. Some culling would be desirable. Correspondence relating to property management is significant, particularly during the Science House period. A bound correspondence register covering the period 1883 to 1911 (box 23) provides a useful guide to the activities of the Society at that time.

The material contained in some boxes appears rather haphazard. An example is box 28, marked ‘fragile’. Amongst the eighteen items listed are lantern slides, printing blocks of the Society emblem, a tape recording of the Governor-General’s speech, a medal from the 1886 Colonial and Indian Exhibition in London, letters about engagement of an office boy, and the 1935 insurance policy. Although these items can be identified from the Mitchell Library list, it would be easy for researchers to overlook them when perusing the 49-page typewritten

list because there is no coherent sequence. Some items that have been kept appear to be worthless – ‘7 feet rubber tubing’ or ‘1 piece of board’ (box 29).

At the other extreme are the minutes of the Royal Society Council from 1867 to 1914 in box 39. Minutes of the preceding Philosophical Society of Australasia 1856–1866 are in box 41. A register of members 1856–1888 is in box 45. A register of subscribers 1912–1941 is in box 33. All of these documents are vital to an understanding of the history of the Society.

Historic material relating to the Society Library also is contained within the archives. This includes notes on transfer of part of the collection to other institutions (box 20), layout of the shelving at Science House (box 28), and a register of library users 1890–1954. Folder 9 in box 17 is described as ‘Historical Background of the Royal Society of New South Wales, early Office Bearers and other items of historical interest including proposed amendments to the Act of Incorporation (1976–81)’. Some of this is duplicated in filing cabinet drawers in the Society office. Folder 10 in box 17 apparently contains the original handwritten subject index 1867–1916, and one printed copy (which is not available in the Society’s own bound set of *Journal and Proceedings*).

In its own collection, Mitchell Library holds original material relating to the Society including the minute book of the Philosophical Society of Australasia from 27 June 1821 to 14 August 1822 (FM3 99). A facsimile of this volume is held by the State Records Authority of NSW as well as by the Society. There is also an item described in the Mitchell Library card index as ‘Bronze medal of the Royal Society of New South Wales awarded to Thomas Whitelegge for a list of the marine and fresh-water invertebrate fauna of Port Jackson and the neighbourhood, 1889. Presented by Miss Whitelegge, January 1960’ (R191 EEE).

SECONDARY SOURCES CONSULTED

In preparing this report, a number of secondary sources have been consulted, as listed in the bibliography. These have been perused for refer-

ences to the Society, or mention of its leading members and their place in the scientific history of Australia.

However, the select bibliography lists only a small fraction of the material that is available. The 'Guide to Sources' published in R. MacLeod (ed.), *The Commonwealth of Science* provides a comprehensive (but not exhaustive) bibliography up to 1988, when the book was written. *The Historical Records of Australian Science* published by the Australian Academy of Science have included regular bibliographic updates.

The most sympathetic account of scientific development in Australia can be found in the numerous works of Ann Moyal (Mozley). Yet even her overview of scientists in colonial Australia, *A Bright and Savage Land* glosses over the Royal Society of New South Wales, although the work of a number of its prominent members is discussed. On the other hand, her two-volume *The Web of Science* is based on the extensive correspondence of Rev. W.B. Clarke, and contains many references to the Royal Society.

Many general histories of Australia pay scant attention to colonial scientific endeavour. The Royal Society of Victoria is mentioned more often than its NSW counterpart – for example, in connection with Antarctic exploration and for its sponsorship of the ill-fated Burke and Wills expedition. An example is Manning Clark in his six-volume *A History of Australia*. Russel Ward displays the same bias in *Australia Since the Coming of Man*.⁶ This Victorian orientation may reflect the Melbourne origins of many Australian historians, although Clark maintains that:⁷

'As they saw it, Victoria's duty as the wealthiest and the leading member of the Australian colonies was to succeed where New South Wales . . . had failed in removing the mantle of mystery which lay over the centre of the continent.'

During that period of intense colonial ri-

valry, this is a view that would not have been shared by citizens of New South Wales. The failure of Burke and Wills must have been a chastening experience for the Royal Society of Victoria. Where Manning Clark deals briefly with men of science, his interpretation can be fanciful or apocalyptic, describing W.B. Clarke as being:⁸

'on weekdays a geologist and on Sundays a man of God, reminded the members of his congregation that gold fed the sinful lusts of the flesh . . .'

W.B. Clarke is mentioned in Geoffrey Blainey's *The Rush That Never Ended*. A History of Australian Mining. Clarke also rates a passing reference in Blainey's later book *A Shorter History of Australia*, although the word 'science' does not appear in the index to this volume.

Something of an exception amongst historians is John Molony's *Penguin Bicentennial History of Australia* where he can find space for ANZAAS, as well as mentions of Royal Society of NSW members W.B. Clarke, Sir Edgeworth David, Lawrence Hargrave, Gerard Krefft, and H.C. Russell. There is even a photograph of one of Hargrave's experiments. Molony also observes that:⁹

'Scientific effort was strengthened by the foundation of societies which had their model in the Royal Society of London (founded 1662). By the 1860s Royal Societies had been formed in New South Wales, Tasmania, Victoria and South Australia . . . the peak of nineteenth century scientific organization was reached in 1888 with the holding of the inaugural conference of the Australasian Association for the Advancement of Science . . .'

Another exception to the usual pattern is Beverley Kingston in Volume 3 of the Oxford History of Australia – *Glad, Confident Morning*, which covers the last four decades of the nineteenth century. Kingston points out that a rich intellectual life was available for those

⁶ R. Ward, *Australia Since the Coming of Man*, revised edition, Sydney, 1982, p. 128.

⁷ C.M.H. Clark, *A History of Australia, Vol. IV, The Earth Abideth for Ever 1851–1888*, Melbourne, 1978, p. 144.

⁸ *ibid*, p. 7.

⁹ J. Molony, *A Penguin Bicentennial History of Australia*, Melbourne, 1987, p. 155.

so inclined, but most successful men despised ‘useless’ knowledge in their pursuit of money. Nevertheless, she notes that:¹⁰

‘Scientific research was aided by royal societies in all colonies except Western Australia. These pre-dated the universities and were mixed gatherings of gentlemen amateurs and serious scholars. Wives and daughters collected botanical specimens and made intricate drawings ...’

Limitations of space presumably restricted any detailed analysis of this theme. She mentions Lawrence Hargrave as a shipwreck survivor and only incidentally as an aeronautical pioneer. Kingston sees science as a substitute for religion in a materialist society – an alternative belief system – but she does not pursue this notion.

Kingston’s comment about the mixture of amateurs and scholars is borne out by the membership lists of the Royal Society prepared by A. & J. Day.

Science and technology receive more coverage in general histories discussing twentieth-century Australia, where we find occasional references to applied research, particularly in the medical sciences, agriculture, or through official agencies such as CSIRO. The role of professional scientific societies is overlooked. Writing of the 1920s, Heather Radi claimed that:¹¹

‘There were no traditions in Australia to support the contemplative life against the practical. Education was still imbued with utilitarian considerations ...’

However, the experience of the Royal Society in New South Wales during the nineteenth century suggests that there was indeed an active intellectual interest in Australia from the early days of settlement.

LaTrobe University historian David Day ignores science in his *Claiming A Continent. A New History of Australia*. ANZUS is discussed, but not ANZAAS; the CIA but not CSIRO. The emphasis is probably a reflection of the preoccupa-

tion of many Australian historians with political and labour history. Given their grounding in the humanities, some of them may feel uncomfortable dealing with the foreign territory of the sciences.

Although the *Historical Records of Australian Science* is a respected journal in the field, obviously there is scope for considerably more scholarly discourse about the role and function of the scientific societies in Australia.

HISTORICAL CONTEXT

Vice-Regal Support

The first naval Governors of New South Wales, in the twenty years from Phillip to Bligh,¹² were preoccupied with survival in the remote settlement, and with the management of unruly convicts and ambitious military officers. These pressures left them little time for other pursuits.

When Major-General Lachlan Macquarie became Governor in 1810, many of the early difficulties had eased. Food supply was assured, social structures had become more stable, and a few people had become relatively prosperous. This more secure environment allowed Macquarie to create many of the landmarks of the new colony, including many fine public buildings. Essentially a practical man, he played little part in scientific or intellectual life, despite being a collector of natural history specimens, as demonstrated by the recent acquisition by Mitchell Library of a cedar display chest that belonged to him. Nevertheless, he did not share the passion for classification and naming of specimens that many of his contemporaries exhibited.

The Philosophical Society of Australasia, antecedent of the Royal Society of New South Wales, was founded in 1821, the same year that Macquarie’s successor, Sir Thomas Brisbane, became Governor (-General) of New South

¹⁰ B. Kingston, *The Oxford History of Australia*, Vol. 3, 1860–1900, *Glad, Confident Morning*, Melbourne, Oxford University Press, 1988, p. 91.

¹¹ H. Radi, ‘1920–29’, in F. Crowley (ed.) *A New History of Australia*, Melbourne, 1985, p. 391.

¹² This statement excludes Acting Governors or Administrators such as Grose, Patterson, Johnston and Foveaux, who were junior army officers.

Wales. However, as Supreme Court judge Baron Field reported:¹³

‘I am sorry to add that that infant society soon expired in the baneful atmosphere of distracted politics, which unhappily clouded the short administration of its President, the present Governor of New South Wales.’

Obviously the Philosophical Society was modelled on the Royal Society of London, which through its sponsorship of the Cook and Banks expedition to the South Pacific, had been a progenitor of the European settlement of Australia. The ‘Royal’ prefix could not be applied to its antipodean imitator until Queen Victoria gave her assent in 1866. Although there is no for-

mal relationship between the two bodies, the similar intellectual aspirations became apparent after the change of name. Each of the six Australian colonies eventually established their own versions of the Royal Society, with that in Tasmania, founded in 1844 being the first.

Three of the colonial governors of New South Wales were Fellows of the Royal Society of London – Bligh, Brisbane and Denison. William Bligh had no opportunity to pursue his scientific interests, but Governors Brisbane and Denison both became active in the local counterpart of the Royal Society, as did Denison’s successor, Sir John Young (Table 1).

1821 Formation of the Philosophical Society of Australasia

1821–1822 Major-General Sir Thomas Brisbane. He was an astronomer of note, whose papers were published by the Royal Society of Edinburgh and the Astronomical Society of London.

1850 Formation of the Australian Philosophical Society

1850–1855 Hon. Edward Deas-Thomson, Colonial Secretary.

1856 Philosophical Society of New South Wales

1855–1860 Sir William Denison. Papers presented:

09.05.1856 ‘On the development of the railway system in England, with suggestions as to its application to the Colony of New South Wales’

12.11.1856 ‘Irrigation’

08.07.1857 ‘On the Moon’s rotation’

12.08.1857 ‘On railways’

08.09.1858 ‘On the filtration of water through sand’

10.08.1859 ‘On the dental system of mollusca’

19.09.1860 ‘On bridge building’

1861–1865 Sir John Young

1866 Royal Society of New South Wales

1866–1867 Sir John Young (now President of The Royal Society of New South Wales)
Paper presented:

13.08.1862 ‘On the performance of the A.S.N. Co’s steamer *Diamantina* from Sydney to Brisbane and return to Sydney’

1868–1872 Earl of Belmore (President)

1872–1879 Sir Hercules Robinson (President)

1879–1885 Lord Loftus (President, 1879, Honorary President 1880–5)

1885–1890 Lord Carrington (Honorary President)

1891–1893 Earl of Jersey (Honorary President)

1893–1895 Sir Robert Duff (Honorary President)

1895–1899 Viscount Hampden (Honorary President)

1899–1901 Earl Beauchamp (Honorary President until 1900)

Table 1. Presidents of the Royal Society of NSW from 1821 to 1901.

¹³ B. Field, *Geographical Memoirs on New South Wales*, London, 1825, p.v.

This involvement sheds new light on the interests and responsibilities of early Governors, some of whom, despite being military or naval men were active in the intellectual life of the Colony. A fruitful research topic for historical research would be a study of Governors as men of science rather than as colonial administrators.

Although later Governors held the position of President, management of the Society was effectively delegated to the elected Vice-President. The first elected President was Professor John Smith from the University of Sydney, who took office in 1880. The incumbent Governors then accepted the ceremonial position of Honorary President:

After Federation in 1901, the Governor-General of the Commonwealth became Patron of the Society, with the State Governor as Vice-Patron. From 1938 it became the practice for both Vice-Regal representatives to accept appointment as Patrons of the Society, although occasionally the Governor-General declined.

From Gentlemen Amateurs to Scholarly Research

Until the middle of the nineteenth century, most scientific effort in the colonies took the form of collection and description of the unique flora and fauna or identification of geological features. This was understandable, given the preoccupation with survival by exploiting the natural resources of a strange new continent. Specimens were collected avidly, then sent to England for further analysis. The Colonial Museum, later to become the Australian Museum, began collecting in 1827 but it was not until the establishment of the University of Sydney in 1850 that it became possible to conduct laboratory-based research in New South Wales. The university also provided a cadre of trained scientific researchers. These developments formed the foundation for the revival of the Philosophical Society and its successors, and should be explored in more detail.

In the 1850s there was a common core of scientific understanding possessed by many educated men. This was the age of the gentleman

amateur, products of the Age of Enlightenment. As knowledge expanded and became more specialised it became impossible for any one person to have a sound grasp of each branch. Ultimately this reached the stage where there was hardly any common ground, and practitioners of different disciplines found it difficult to communicate. Sir Charles Snow was later to write about the 'two cultures' of the arts and the sciences, but within science the gulfs were just as wide. Despite this chasm, the Royal Society has always attempted to provide a forum for the meeting of minds.

In any case, it is not entirely clear that the fragmentation into specialist societies was only due to scientific barriers. The personalities and ambitions of leading protagonists could also be a factor – this certainly seems to be the case when Sir Alexander Macleay and his coterie of followers founded the Linnean Society in 1874. The internal politics of colonial scientific societies and the relationship with their respective colonial museums could serve as a research topic in its own right.

New South Wales was the first colony to be established in Australasia and has remained the most populous state, with over one-third of the Australian population, yet its achievements have sometimes been neglected by historians. This paucity of research into the history of New South Wales is being redressed in 2006 as a result of substantial funding for publications to commemorate the Sesqui-centenary of Responsible Government

Rivalry between the colonies was endemic during the second half of the nineteenth century, the period when the various Royal Societies were established. Customs barriers at colonial borders and differing railway gauges served to perpetuate tensions that were only partially relieved after Federation. Following the goldrushes of the 1850s, Victoria became the dominant colony due to its economic prosperity. It is interesting to speculate whether political rivalries carried over into the activities of the six Royal Societies. A comparative study of these Societies might reveal new insights into the competitive nature of some scientific research.

The cross-disciplinary nature of the Society's activities (and collections) is notable. This has persisted even after the formation of specialist bodies. The breadth of the Society's concerns is shown not only by the diversity of articles in the *Journal and Proceedings* but also by the professional disciplines of the people elected as President of the Society. These are enumerated in Appendix C.

A notable feature of early membership lists of the Society is the significant number of ministers of religion. Some of the leading Australian scientists of the mid-nineteenth century followed this profession, such as Rev. W.B. Clarke and Father J.E. Tenison-Woods. These were amongst the few men in the Colony with a tertiary education. Furthermore, the nature of their occupation allowed them to pursue scientific inquiries without the restrictions of regular working hours that other men faced. Ministers and priests contributed many scholarly papers to the Society *Transactions* or *Journal and Proceedings*. It must be remembered that this took place at a time when the gulf between science and religion appeared to be widening as new theories (e.g. Darwin) displaced Biblical certainty. A rewarding area for further study would be the contribution of clerics to the advancement of science in New South Wales. The annals of the Royal Society would yield much information for this research.

A National Organisation

The Royal Society was influential in the establishment of the Australasian Association for the Advancement of Science in 1888, particularly through the lobbying of Professor Liveridge. This later became known as the Australian and New Zealand Association for the Advancement of Science (ANZAAS), and for a period was the gathering of choice for professional scientists. Its influence declined in recent years with the proliferation of specialist bodies, so that we have again reached the stage where scientists cannot speak with a unified voice.

As noted earlier, much of Australian histo-

riography ignores the scientific and intellectual forces within the six colonies that later became a nation. If referred to at all, innovations or individuals are dismissed in a sentence or two, with no attempt to place them in the broader context of the evolving society. These omissions suggest that there may be serious distortions in Australian history as commonly understood.

An interesting historical sidelight is that the Royal Society of NSW was an official repository for international patents until the Commonwealth Patents Office was established in the 1930s. Unfortunately, there do not appear to be any surviving records of this function within the Society; presumably the relevant files were transferred to the government agency, although the National Archives may hold some relevant material.

SIGNIFICANCE

Joseph Dyer wrote in 1858, in his preface to the first issue of *The Sydney Magazine of Science and Art*, that New South Wales was still 'a community where politics, professional occupations or mercantile pursuits engross nearly the whole population.' He observed that the colony:¹⁴

'can yet boast few gentlemen of leisure who feel pride and interest in pursuing science for its own sake, and are ready to devote both time and money to its advancement. Such a class will doubtless arise, especially now that science is becoming fashionable under the auspices of our energetic and sagacious Governor, Sir William Denison.'

Despite the sycophantic tone, his doubts seemed justified when he announced in the second issue, twelve months later, that there were too few subscribers to justify continuing with the publication, because 'the constant attention to business, which is characteristic of colonial life, appears very unfriendly to the development of a taste for science, literature and art.'¹⁵

Cynics might suggest that nothing much has changed in the following century and a half. Another writer of the time despaired that the

¹⁴ J. Dyer, *The Sydney Magazine of Science and Art*, Vol. I, 1858.

¹⁵ *ibid*, Vol. II, 1859.

‘public mind is most anxiously directed to the wretched condition of the roads of the colony, and when even the streets of the metropolitan city are in a state of dangerous decay’ there was little inclination to explore abstract ideas or discuss new inventions.¹⁶ Again, little has changed, the pessimists would argue.

Nevertheless, the situation was not as dire as Dyer proclaimed. From his own statement, the Royal Society had 178 members in 1858, which was probably a healthy complement of the colony’s educated men. Obviously this number was insufficient to sustain a viable commercial publication; yet only nine years later in 1867 the Society began to publish its own journal.

In the preparation of this Report it became clear that the resources of the Royal Society provide unrivalled insight into the rich scientific and intellectual life of New South Wales from early colonial times. The Royal Society and its predecessors give a new perspective on aspects of nineteenth century life that are far removed from the historical stereotypes of convicts, squatters, gold diggers and bushrangers.

The Royal Society was at the forefront of discourse on many of the most contentious issues that engaged the international world of science. Prominent members like Clarke and Krebbs corresponded with Charles Darwin about his theories of evolution, at a time when such views were deeply unpopular in Australia, and regarded by many as heresy. Later members of the Society were early proponents of the concept of continental drift and plate tectonics at a time when most of the geological establishment ridiculed such notions.

An ongoing debate that was particularly relevant to the Australian scene was the division between pure science and applied technology. There were members of the Society in both camps, yet they were able to work together. A brief perusal of the *Journal and Proceedings* will reveal papers dealing with theoretical issues alongside articles aimed at increased economic development.

Much of the material in the collections provides a valuable resource for researchers in many

fields, not least the history of science. The history and philosophy of science is taught as a separate academic discipline in both the University of Sydney and the University of New South Wales (as well as some interstate universities). Courses are offered at both undergraduate and postgraduate levels, suggesting that there is considerable interest in this field. Furthermore, the collections should provide a valuable resource for scholars in other historical areas – social, cultural, intellectual, administrative, political, mining history, for instance – in addition to academic disciplines such as sociology or economics.

At present, the majority of this important collection is inaccessible because of its dispersal around several locations, and the lack of a viable catalogue. Much of it is housed in unsatisfactory conditions that may result in rapid deterioration. Efforts must be made without delay to preserve this vital component of Australia’s intellectual heritage.

One of the great contributions of the Royal Society of New South Wales to Australian science may have been its function as sire, midwife and nursemaid for a host of other associations. As noted previously, the parallel development of Royal Societies in the other five colonies is an important question that should be explored in more depth. Did they work together in the advancement of science, or were they competitors?

RECOMMENDATIONS

As part of the conditions of the Community Heritage Grant, the Royal Society of New South Wales has given an undertaking (Clause 8) that:

- (a) the materials to be preserved are part of the collection of the organisation . . . and that these are legally owned or held by that organisation
- (b) the materials are, or will be made, accessible to the public; and
- (c) in addition to physical access, bibliographic access will be ensured where appropriate – not only to users of the organisation, but as widely as possible to other Australian libraries and or-

¹⁶ ‘Boydell’s patent endless railway – the Megaethon’, *The Sydney Magazine of Science and Art*, Vol. I, 1858, p. 15

ganisations. The National Library of Australia will also list the applicant's collection in one of the bibliographic services.

In view of the limited time available for this project, and the small budget allocated, it has not been possible to provide a comprehensive appraisal for this Report. Nevertheless there has been a judicious examination of key elements of the collection.

Detailed proposals concerning the conservation and preservation of individual items as well as the collection as a whole are of course the province of a specialised consultant, and will be the subject of a separate report.

In accordance with the objectives of this Heritage study, the historical significance of the Royal Society collections has been identified. Recommendations are made in relation to the measures that should be taken immediately to preserve a valuable collection for the benefit of the Australian community. As part of the assessment process, it has been possible to identify a number of proposals that may be investigated when resources are available. Some of these could become topics for postgraduate or undergraduate research students, after the Society collections become accessible.

Priority A:

Recommendation 1 – That action be instigated urgently to restore or repair items in the Darlington library that have been identified as in need of conservation treatment. This includes both books and photographs etc. See the report from Dr Branagan.

Recommendation 2 – That the shelf list of material in the Darlington collection be converted to a full library catalogue on Dewey Decimal system as soon as resources permit, and shelved accordingly.

Recommendation 3 – That the complete Royal Society library catalogue be included on national library databases.

Recommendation 4 – That the Society collection temporarily housed in a warehouse at Prestons be relocated and catalogued as a matter of urgency.

Recommendation 5 – That the Darlington library collection be relocated to the ground

floor, transferring the administrative office to the higher floor. This would also provide easier access to the collection by researchers.

Recommendation 6 – That appropriate smoke alarms be installed.

Recommendation 7 – That each item on the shelf list of material in the Darlington collection be checked against national library databases to determine the uniqueness or rarity of each item in Australia.

Recommendation 8 – That the collection be pruned of material that is already widely available in Australia. This will provide additional space for library material relocated to Darlington. Surplus items may be sold to produce additional revenue, or donated to other libraries.

Priority B:

Recommendation 9 – That the Society take steps to house all the disparate elements of its collection under appropriate conditions in the one location in central Sydney, to form the nucleus of a Centre for the Study and Promotion of Scientific Activity in New South Wales.

Recommendation 10 – That the Society collection temporarily held by Mitchell Library be fully described and culled of extraneous material that has no archival or historic significance.

Recommendation 11 – That the Society collection temporarily held by Mitchell Library be relocated to the Society's own premises when this becomes possible. This action was recommended by Dr Anna Binnie. (p. 19)

Recommendation 12 – All Society material that is presently held by individual members should be returned to the Society for appropriate conservation and storage.

Recommendation 13 – That funding be sought to digitise the important collection of historic lantern slides and other visual material. This might then be made available to researchers and the general public through the national 'Pictures Australia' database.

Recommendation 14 – That loose copies of the *Journal and Proceedings* between 1996–2006 be hard-bound in order to provide a complete run of this publication in a consistent, secure format.

Recommendation 15 – That action be commenced to compile a complete index to articles in the *Journal and Proceedings* since its inception. Some work has already been undertaken for earlier years, but this needs to be integrated into a comprehensive index.

Recommendation 16 – That a complete run of the Society Bulletin/Newsletter be compiled, and bound or otherwise stored in a satisfactory manner. It may be possible to acquire missing issues from the State Library or Parliamentary Library legal deposit, or from individual Society members' personal files.

Recommendation 17 – That the collection of lithographs and prints be carefully examined to determine whether this material is relevant for the Royal Society collection, and that surplus items be disposed of through dealers in antiquarian prints.

Recommendation 18 – That a comprehensive history of the Society be commissioned to trace its origins and development over a period of 185 years, placed into the broader context of Australian history. Several Society members have written articles on the history of the Society, but these need to be consolidated and updated.

Priority C:

Recommendation 19 – That the filing cabinets in the Darlington office of the Society be carefully examined to determine the archival value of non-current items, with redundant or insignificant material culled as appropriate.

Recommendation 20 – That a suitable cabinet or panel be acquired in order to display the extensive collection of medallions and commemorative plaques that are in the Society's possession.

Recommendation 21 – That a research project be commissioned to study the subsequent scientific careers and achievements of winners of the various Awards and Medals presented by the Society. Did they progress to greater achievements, or drift into obscurity?

Recommendation 22 – That a research project investigate the long-term benefits of Summer Schools in creating greater scientific awareness amongst schoolchildren.

Recommendation 23 – That a scholar of Australian colonial history be encouraged to study the role of colonial Governors as men of science rather than as colonial administrators.

Recommendation 24 – That suitable scholars be encouraged to explore the relationship between science and religion in mid-nineteenth century Australia, as shown by the contributions from religious clerics.

Recommendation 25 – That research be encouraged into the internal politics that resulted in a proliferation of colonial scientific societies.

Recommendation 26 – That a comparative study be undertaken into the origins and development of each of the six colonial/state Royal Societies in Australia, and their contribution to Australian science.

Recommendation 27 – That research be undertaken to trace the development of the Society's emblem. This has changed several times over the years, with different versions appearing on the same issues of bound journals, for instance.

Recommendation 28 – That a biographical register of Society members be compiled for the hundred years from 1867–1966. Alan Day has prepared a comprehensive biographical register of the Society from 1850–1866. This would be a valuable resource for future research into the significance of the Society.

Recommendation 29 – That historians be invited to explore the role of women 'behind the scenes' in the development of the Society, particularly during the period before 1935 when they were not eligible for membership.

Priority D – Long-term Objectives:

Recommendation 30 – That the complete *Journal and Proceedings* be digitised, and made available through the society's website.

Recommendation 31 – That negotiations take place with other scientific societies in New South Wales with a view to establishing a peak body that can represent the interests of all involved.

SELECT BIBLIOGRAPHY

Books and Articles

- Australian Academy of Science. *Historical Records of Australian Science*.
- Blainey, G. *The Rush That Never Ended. A History of Australian Mining*, Melbourne, 1963.
- Blainey, G. *A Shorter History of Australia*, Melbourne, Heinemann, 1994.
- Branagan, D.F. 'Words, Actions, People: 150 years of the scientific societies in Australia', *Journal and Proceedings of the Royal Society of New South Wales*, Vol. 104, 1972, pp. 123–141.
- Browne, W.R. 'The Royal Society of New South Wales (Scientific Societies in Australia 6)', *Proceedings of the Royal Australian Chemical Institute*, March 1961, pp. 100–9.
- Clark, C.M.H. *A History of Australia*, 6 volumes, Melbourne University Press, 1962–1987.
- Crowley, F. (ed.) *A New History of Australia*, Melbourne, Heinemann, 1985.
- Day, A.A. & Day, J.A.F. 'A biographical register of members of the Australian Philosophical Society (1850–55) and the Philosophical Society of New South Wales (1856–66)', *Journal and Proceedings of the Royal Society of New South Wales*, [Part I] Vol. 117, 1984, pp. 119–127, [Part II] Vol. 129, 1996, pp. 123–132.
- Day, David. *Claiming a Continent. A New History of Australia*, Sydney, Harper Collins, 2001.
- Dixson Library. *A Catalogue of The Royal Society of New South Wales Collection*, Armidale, University of New England, 1989.
- Ellis, Judith (ed.) *Keeping Archives*. Melbourne, D.W. Thorpe, in association with the Australian Society of Archivists, 1993.
- Field, Barron (ed.) *Geographical Memoirs on New South Wales by Various Hands*, London, John Murray, 1825.
- Heritage Collections Council. *Significance. A Guide to Assessing the Significance of Cultural Heritage Objects and Collections*, Canberra, Commonwealth of Australia, 2001.
- Home, R.W. 'History of Science', in *The Australian Encyclopaedia*, Vol. 7, Sydney, 1988.
- Kingston, B. *The Oxford History of Australia*, Vol. 3, 1860–1900, *Glad, Confident Morning*, Melbourne, Oxford University Press, 1988.
- MacLeod, Roy (ed.) *The Commonwealth of Science. ANZAAS and the Scientific Enterprise in Australasia*, Melbourne, Oxford University Press, 1988.
- Maiden, J.H. 'A contribution to a history of the Royal Society of New South Wales', *Journal and Proceedings of the Royal Society of New South Wales*, Vol. LII, 1918, pp. 215–361.
- Molony, J. *The Penguin Bicentennial History of Australia*, Ringwood, Viking, 1987.
- Moyal, Ann. *Scientists in Nineteenth Century Australia. A Documentary History*, Sydney, Cassell, 1976.
- Moyal, Ann. *Invention and Innovation in Australia: the Historian's Lens*, Brisbane, Department of Economics, University of Queensland, 1986.
- Moyal, Ann. *A Bright and Savage Land: Scientists in Colonial Australia*, Sydney, Collins, 1986. (Revised edition, Melbourne, Penguin, 1993)
- Moyal, Ann. *The Web of Science. The Scientific Correspondence of the Rev. W.B. Clarke, Australia's Pioneer Geologist*, Vol. 1, 1836–63, Vol. 2, 1864–78, Melbourne, Australian Scholarly Publishing, 2003.
- Mozley, Ann. *A Guide to the Manuscript Records of Australian Science*, Canberra, Australian Academy of Science with ANU Press, 1966.
- Royal Society of NSW. *Catalogue of the Scientific Books in the Library of the Royal Society of New South Wales*, Sydney, F.W. White, 1889. (Held by Mitchell Library, David Scott Mitchell Collection)
- Royal Society of NSW. *List of Periodicals Received Regularly by the Society's Library*, Sydney, Royal Society, 1935.
- Royal Society of NSW. *A Century of Scientific Progress. The Centenary Volume of the Royal Society of New South Wales*, Sydney, Royal Society, 1966.
- Royal Society of NSW. 'History of the Royal Society of New South Wales', typescript, 7 pp., author unknown, undated (post-1959).

Serle, Geoffrey. *The Creative Spirit in Australia. A Cultural History*, (Originally published as *From Deserts the Prophets Come*), Melbourne, Heinemann, 1987.

Sydney Magazine of Science and Art, Vol. 1, 1857, Vol. 2, 1859. (Held by Mitchell Library)

Ward, Russel. *Australia Since the Coming of Man*, Sydney, Lansdowne Press, 1982.

Internet Websites

Bright Sparcs (Australian Science Archives Project): <http://www.asap.unimelb.edu.au/bsparcs/biogs>

Libraries Australia:

<http://librariesaustralia.nla.gov.au/apps/kss>

Linnean Society: <http://www.acay.com.au/~linnsoc/info.html>

Picture Australia:

<http://www.pictureaustralia.org/>

Royal Society of New South Wales:

<http://nsw.royalsociety.org.au>

APPENDICES

Appendix A – The Society Emblem

A framed painting of the emblem, with explanatory handwritten inscription, hangs in the Society's rooms in Darlington. According to the inscription the emblem was designed by 'A. Liversidge, Hon. Sec'.

'In the above Seal most of the charges have a double significance i.e. they each represent one of the sections of the Society and have a symbolic meaning as well, as follows:-'

'The retort and condenser expresses the Chemical Section, the crossed pick and hammer with fossils and crystal represent the Geological & Mineralogical Section and are symbolic of the mineral resources of the Colony; the rising sun and stars, the crest of the Colony, also represent the Astronomical and Physical Section; the Golden Fleece is symbolic of the country's Pastoral resources; the acorns and the bee stand for the Botanical & Zoological Sections, and are further respectively symbolic of the small beginnings of the Society and

of industry; the caduceus indicates the Medical & Sanitary Sections and also stands for Commerce. The Royal Crown and Lion are charges of the Royal Arms and show the connection with the Old Country; the serpent is symbolic of wisdom and of the continuity of the Society, which the encircling cable and garter represents the Unity of the Society as a whole.'

Notes: 1. Liversidge makes a common mistake by attributing the caduceus to medicine, a practice that apparently originated with the U.S. Army Medical Corps in the nineteenth century. The caduceus, a winged staff with two entwined serpents was actually the symbol of Hermes (Mercury), the messenger of the Gods in classical mythology. The symbol of medicine and health is the staff of Asklepios (Aesculapius), God of medicine, which is entwined by a single serpent and without wings.

2. The acorn and bee are curious symbols to adopt, as they are introduced species that are not native to Australia.

Appendix B – The Kurnell Plaque

A brass plaque (47 x 38 cm) commemorating the landing of James Cook and Joseph Banks at Kurnell was affixed to the rocks on Inscription Point near the landing site on Wednesday, 20 March 1822, the year after the Philosophical Society of Australasia was founded. As President of the Society, Governor Sir Thomas Brisbane joined the party who went to Botany Bay to fix the plaque to the rocks about 25 feet (8 metres) above sea level, and to drink a toast to Cook and Banks. A notable astronomer who established an observatory at Government House, Parramatta, Thomas Brisbane was a Fellow of the Royal Societies of London and Edinburgh, and a corresponding member of the Institute of France.¹⁷

The original plaque is now held at the Royal Society premises in Darlington.¹⁸ It appears to have undergone some conservation work, although it still bears small indentations that may have been caused by shotgun pellets. The Society also holds a plaster cast of the plaque made in 1895 – including the indentations – which is framed and mounted behind glass. The bottom left corner of the plaster cast is broken, but could be repaired. Several other casts were made at the same time, but it is not known whether these survive.

Appendix C – Scientific Disciplines of Society Presidents

Many scientific disciplines are represented by the people who were elected as President of the Society between 1880 and 1961. This is indicative of the broad range of interests shared by members of the Society. Although a President customarily served only for a single year, several have served another term after a gap of some years. These are only enumerated once in this table.

Occupation	No. of Presidents 1880–1961
Chemist	14
Geologist	10
Engineer	6
Physicist	5
Agriculturalist	3
Astronomer	3
Biochemist	3
Botanist	3
Anthropologist	2
Mathematician	2
Medical practitioner	2
Palaeontologist	2
Zoologist	2
Auditor	1
Bacteriologist	1
Microbiologist	1
Palaeobotanist	1
Physiologist	1
Statistician	1
Surveyor	1
Veterinary surgeon	1

Although there appears to be a preponderance of chemists and geologists, this is a little deceptive. A number of the other occupations could be grouped under a broad discipline such as ‘life sciences’, although this field of knowledge is more the province of the Linnean Society of New South Wales, which for many years shared premises with the Royal Society of New South Wales.

By the time this survey commenced (1880), the period of the ‘gentleman-amateur’ that characterised the early years of the Society was giving place to professional scientists.

During the 1960s, the rules of the Society were altered to permit the President to hold office for two successive years. This has facilitated greater continuity in policy, as well as making reform easier to achieve.

¹⁷ See *Historical Records of Australian Science*, Vol. 15, No. 2, December 2004 for three papers on Brisbane and his work.

¹⁸ Other memorials to Cook and Banks were later erected at Kurnell closer to the actual landing site, and more accessible to visitors.

ACKNOWLEDGEMENTS

The author extends his appreciation to the Royal Society of New South Wales for the opportunity to participate in this project. Special thanks are due to individual Society members who provided assistance and advice: David Branagan, Alan Buttenshaw, Edric Chaffer,

John Hardie, Jak and Irene Kelly, and Robyn Stutchbury.

Photographs used in this report are by Robyn Stutchbury, Peter Tyler and the Historic Houses Trust.

Dr Peter Tyler, BA, MLitt, PhD, GradDipAdEd, HonFAIEH
Consultant Historian, Peter J Tyler Associates
Vice-President, Professional Historians' Association, NSW
Life Member, National Trust of Australia (NSW)
Member, Australian Historical Association

© Peter J. Tyler

12 May 2006, revised and corrected 17 July 2006

The Royal Society of New South Wales

Report on the Cultural, Historical and Scientific Significance of the Society's Library and its State of Preservation

DAVID BRANAGAN

Keywords: Royal Society of NSW, Library Collection, Community Heritage Grant

INTRODUCTION

Some 750 volumes in the Society's library have been individually examined. The value of each item has been estimated based on four primary criteria: (1) historic, (2) aesthetic, (3) illustrative, and (4) scientific, research or technical. Modifiers such as representativeness; rarity; condition, completeness or intactness and integrity; and interpretive potential have been taken into consideration during the assessment.

For this collection the two criteria of most significance are (1) and (4), although a few items fall into the other two categories. Nevertheless some volumes of historic and scientific importance also are important from either or both aesthetic and illustrative categories.

The items regarded as being most valuable are set out in Table 1 (pages 102–107).

The state of preservation of each volume has been assessed and five grades assigned to separate those volumes needing most urgent attention, (some 5%), and a further 5% needing dome repair, from the remainder of the collection which varies in individual condition from moderate (the greater portion of the collection) to fine.

The items in most need of urgent preservation attention are listed in Appendix 1.

The conditions in which the library are presently housed have been examined. These are not satisfactory for a library of this value. A temporary improvement would be to move it downstairs in the Society's rooms. A truly satisfactory solution would be to move the library into the space it once occupied in Science House.

The Library covers the widest range of scien-

tific literature, from astronomy to zoology, but with major material on geology, botany, scientific and naturalist societies and catalogues of major exhibitions.

The collection contains original material by the pioneer aeronautic researcher, Lawrence Hargrave.

The library contains a collection of the works of Archibald Liversidge, including unique scientific notes. The influence of Liversidge on the development of Australian Science is evident from the collection.

While the collection has considerable value in its own right, more significantly, it also has important cultural and historical value, indicating the strength of cultural and scientific interest by a dedicated colonial society.

This library, consisting of an estimated 45 000 volumes has been in existence for at least 135 years. Including, as it does, material from even earlier Australian colonial times, it encapsulates much of the history of science, often carried out in difficult economic and practical conditions, in New South Wales – and indeed of Australia – for more than 150 years. The significance of the collection has been gradually lost sight of by successive NSW State governments.

The Most Significant Volumes

The most significant volumes appear in Table 1 on the following pages. These have been selected from a list of some 750 items held at the Society's rooms after the short-listing of over 130 volumes assessed as significant. Making the selection was very difficult.

Author	Title	Year	Significance
Tucker, T.G. & Spencer, W.B.	The Australian Critic v 1	1890	Representative of various short-lived literary and scientific publications in the Australian Colonies with distinguished editors. Of relative rarity. Front cover missing, poor condition, requires rebinding.
Lemire, C.H.	Itineraire kilometrique, voyage a pied en Nouvelle Caledonie	1877	Historically important for its links with Pacific scientific exploration. Of relative rarity and of high interpretive potential, particularly because of his extensive work in Asian archaeology. Poor condition, needs binding or casing. Only one other copy in Australian libraries – State Library of NSW
Agricola Georgius	Opuscula [disbound]	1546	One of the most significant of the Society's collection, this rare Latin volume contains 'almost all he wrote on mineralogy and geology' (Eyles, 1955). Possibly not yet translated into English. Although disbound it is preserved in a designed box. Book contents need treatment. Agricola, volume named as Rudolphus is held in one library as a book, and in another only in microfilm.
Stoliczka, F.	Scientific Results of the Second Yarkand Mission 1878-1891	1891	Links scientific work done in India with that done in the Australian Geological Surveys. W.T. Blandford, one author, developed the Gondwanaland concept. The volume is therefore of considerable historical significance and typical of a number of Asiatic Colonial volumes in the Society's collection. In reasonable condition.
Sydney University Magazine	Sydney University Magazine	1855	No. III July 1855 (to be cont'd quarterly) [includes, inter alia: Article 'Elevation of the Dry Land', quoting Rob't Chambers & G. Mantell] Periodical devoted to literature, philosophy, science and art and therefore of considerable aesthetic significance and a socially important record of the early period of the University of Sydney. In reasonable condition.

continued on next page

Author	Title	Year	Significance
Liversidge, A.	Notes of Courses of Royal School of Mines, London	1869–70	The importance of these unique volumes goes beyond the Liversidge provenance because the handwritten notes encapsulate the type of instruction of the time. The handwriting itself is aesthetically pleasing. In fine condition.
Jensen, H.I.	Unpublished work on Seasonal Forecasting	1958	Jensen was an esteemed member of the Royal Society, a student of T.W. Edgeworth David and an author of controversial articles of scientific significance to researchers. Requires some restoration. Donated by H.I. Jensen.
Klaproth, M.H.	Essays	1797	Scientifically significant European chemist, who published on Australian mineralogy. Requires some repair.
Pliny, C.	Historia Mundi	1548	Before Pliny died in the eruption of Vesuvius in AD 79, he was renowned as an historian and acute observer and recorder of natural phenomena. This is an early printed version of his work. In reasonable condition as a rebound volume.
Cuvier, G.	Lectures on Comparative Anatomy 2 vols.	1802	Cuvier's work on palaeontology influenced many scientists researching Australian fossils. French influences on Australian sciences have been largely neglected. Illustrations aesthetically pleasing. Rebound version of reasonable condition.
Adams, Quincy J.	Report on Weights & Measures	1821	Important historical record of the work of the intelligent sixth president of the USA, written several years prior to his presidency and at a time when reviews of weights and measures were being considered. Reasonable condition.
Gregory, O.	Dissertations & Letters by Don Joseph Rodriguez	1815	Trigonometrical Survey of England & Wales by Colonel Mudge & Captain Colby. The publication deals with the controversy about the methods and efficiency of the trigonometrical survey of England and Wales at a period when NSW surveys were beginning. Urgently in need of rebinding.

continued on next page

Author	Title	Year	Significance
Hargrave, L.	Aeronautical and other papers, including drawings	1884–1909	One of the most significant scientific and technological aeronautical collections in Australia and when considered in combination with the Hargrave holdings at the Powerhouse Museum and other minor holdings, this material is of international importance and should be considered for World Heritage listing. Requires urgent conservancy.
Sydney Harbour Bridge Advisory Board	Sydney Harbour Bridge Advisory Board, Plans & Designs	1903	Historical document which indicates the long drawn out stages of planning and design that preceded the building of the bridge. Requires restoration.
Bentham George	<i>Flora Australiensis: A Description of the Plants of the Australian Territory</i>	1863	One of seven volumes (1863–1878) by Bentham forming part of an extensive holding of botanical publications on the Australian flora which continued with the publications of von Meuller and J.H. Maiden, all in the Society's Library. This botanical collection formed a basis for the studies which led to the technological uses of botanical products, evident from numerous volumes in the Society's collection. Some require repair.
Curtis	Curtis's Botanical Magazine series 4	1787–ca. 1900	A major collection of some 65 generally well bound botanical magazines begun by W. Curtis 1787 and continuing with various editors through to the 1900s, of not only great historical and scientific significance, but also containing many superb coloured, and black and white plates of aesthetic value. Volumes in varying condition, but generally good.

continued on next page

Author	Title	Year	Significance
Ridley, W.	Kamilaroi Dippl and Turrubul Aboriginal Languages	1866	A particularly significant volume of social importance. It is an early attempt to systematise Aboriginal languages. This volume is annotated and corrected by hand with numerous ink additions. It was owned by Hyde Clarke FRS (1868) and passed on to Liversidge in 1896. The Society's library also contains numerous other volumes of ethnographic importance. In need of repair.
Yuill, J.	Marine Algae (mounted specimens) collected by J. Yuill	1854	A unique volume of finely preserved and presented 'pressed' algal specimens from the British Isles donated to the Society in 1920. The arrangement of the specimens is particularly artistic and so of great aesthetic value. Condition reasonable for such a fragile collection.
Cyrrillus	In Johannem [Latin]	1508	There are no other holdings of this volume in Australia according to our Libraries of Australia search and so very rare. Written by Saint Cyril of Alexandria circa 417 AD, it deals with the theological controversy between Cyril and Nestorius about the 'absolute oneness' of the incarnate Christ (hypostasis). Of great significance both spiritually and socially. <i>In Johannem</i> is an abbreviation of the title 'Opus insigne beati patris Alexandrini in evangelium Johannis'. Possibly passed on to the Society from Thomas George Croft, London, after 1867. It has been well rebound but edges are stained.

continued on next page

Author	Title	Year	Significance
Dana, J.D.	Geology (vol X) US Exploring Expedition	1849	Of the very limited edition of this work most were destroyed by fire before distribution. The work summarises important observations of the geology of the Sydney Basin made by Dana in company with the Rev. W.B. Clarke, during their short time together in 1839–40.
Scientific Tracts	2 volumes of various papers,	1820s	These two volumes are part of the Liversidge collection consisting of early scientific papers, regarded by him as of significance worthy of preservation indicated by the binding. In reasonable condition.
Aeronautical Society of Great Britain	Annual Reports, 1–10, 1866–75 and others to 1893.	1866–1893	These volumes are being investigated as to whether they were used by Hargrave in his aeronautical research into human flight. Originally owned by Henry Richardson of Greenwich. Other details yet to be determined. Well conserved.
Tokyo Imperial University Library	<i>The Disaster of September 1st, 1923 as it affected Tokyo Imperial University and Other Places</i> together with <i>Reconstruction Album containing the final report on the Tokyo Imperial University Library, 1923–29</i>	1929 1930	These two volumes had special relevance to Sydney because members of the University were in Sydney for the second Pan-Pacific Congress at the time of the great Kanto Earthquake which destroyed much of Tokyo and its university. Professor F. Omori was at the Riverview Observatory with the Society's Councillor, Reverend Father E.F. Pigot, seismologist, and quite by chance saw the evidence of the destructive earthquake as it was being recorded on the observatory's seismograph, Father Pigot renewed physical contact with the Japanese scientists when he and other Society members visited Tokyo for the Third Pan-Pacific Congress in 1926 and viewed the rebuilding, which was well underway.

continued on next page

Author	Title	Year	Significance
Haüy, R-J	Traité Élémentaire de Physique	1803	One of the most significant scientific studies of crystallography, which formed the basis for modern research. Rebound and in good condition.
Sydney Magazine of Science and Art	The Sydney Magazine of Science and Art – orig. red cover	1858–9	A local example of the intellectual development of Sydney society. It has obvious links with other similar publications such as that of Sydney University. Of scientific and social significance. One copy in need of rebinding.
Philosophical Society of Australasia	Philosophical Society of Australasia Minute Book	1821–1822	Facsimile of the records of the society which was the forerunner of the Royal Society. The original is held in Mitchell Library. The facsimile has been bound.

THE BRIEF

In November 2005 the Royal Society was awarded a Community Heritage Grant to fund a Significance and Preservation Survey of its collections. Details of the reason for the grant and its full scope are given in Dr Peter Tyler's Report on the Historical Significance of the collections, which is presented separately and which should be read before this report. The outline of the history of the Society is also given in Dr Tyler's report and should be referred to, as it is relevant to the vicissitudes of the Library since the formation of the Society. His report gives information on the various moves of the Society since its foundation. These need not be repeated here in any detail, but occasional reference will be made where such activities have been particularly relevant to the condition and accessibility of the Society's Library.

INDIVIDUAL EXAMINATION OF THE LIBRARY'S BOOKS

My role in the project has been to examine the individual volumes, and to assess, in as far as possible, their significance based on cultural, historical and scientific criteria as well as their physical condition. An attempt has been made to assign values to each volume or set of volumes within the framework of the four primary criteria set out in the grant requirements. For a listing of the volumes regarded as most significant in one or other of the categories, see Table 1. A listing of other significant volumes is in Appendix 2.

Between February and May 2006 I have examined some 750 titles, including some long runs of journals, in the rooms of the Royal Society of New South Wales at 121 Darlington St. Chippendale, leased from the University of Sydney.

Approximately 9000 volumes, mainly of older serials, are presently in temporary storage at Prestons near Liverpool. Many of these were retained in Sydney when the bulk of the serials, some 30000 volumes, was moved to the University of New England in the 1980s. It is clear that the presently stored volumes were consid-

ered by the Society's then librarian and Council to be important, in every sense of the word, and worthy of retention at the Society's head office in Sydney. These volumes were included in a summary listing this author made of the Society's holdings, when they were housed at the Macquarie University site in 2000. It was not possible, in the limited time available for the recent inspection, to carry out a complete check of these volumes in storage, so the range of age and condition still need to be assessed. However a brief statement is given of the sampling carried out there (Appendix 3) with a listing of the sample items examined.

I have previously examined the Serials belonging to the Society now held in the Library of the University of New England, but not for this present assessment. A copy of the catalogue of these holdings, prepared by the University of New England and the Society (1989) is available.

Other material belonging to the Society is held temporarily in care by the Mitchell Library. Most of this material is essentially archival (see Dr Tyler's report), but there are significant artefacts listed and described by Dr Tyler. Some at least of these archives relate to the history of the Society's Library.

HISTORY OF THE LIBRARY

The Library of the Society has gone through a number of stages, related mainly to the physical moves of its headquarters, which the Society has made over the years since its formation in the 1870s. The resources of the Library have naturally been affected by the various phases of activity of the Society, which has been a function of both residence, economic stability or otherwise, and variations in scientific activity within New South Wales.

The Society has had an Honorary Librarian since its earliest years, and this position continues today. At various times in the past the Society had paid library staff, particularly when the library was functioning at Science House, Gloucester Street, up to the 1970s. At present the major task of the Honorary Librarian is to ensure the recording and transfer of incoming

periodicals from around the globe to the holdings at the University of New England, Armidale, mentioned above. The reason for the placement of these holdings is explained later in this report.

The Library became well established during the Society's first residence at 5 Elizabeth Street, Sydney from 1874. At this stage it provided a somewhat specialist adjunct of scientific publications to those in the State Library and those of State Departments, such as the Department of Mines, the Royal Botanic Gardens, and the University of Sydney and the Technical College. The wide range of journals already being obtained on exchange, from both Australasian and international sources, was widely appreciated and used. Prior to 1900 Society funds – probably aided by a government subsidy – allowed the Society to carry out a considerable amount of fine binding using ornamental cloth covers, leather spines and corners, including the addition to the titles of the Society's 'logo'; a small version on spines and a larger version on covers. The binding was done by Sydney firms, among which was John Sands. This binding program was particularly important in preserving those publications originally issued in paperback, including numerous limited government issues, and the reports of local societies. While the bulk of these volumes is in relatively good condition, some of the most heavily used now require some restoration or repair.

In the 1920s the scientific and technical societies of New South Wales were heartened by the news that a building dedicated to Science would be provided by the State for a nominal rent. The State Government would retain ownership of the land. This encouragement was a great boost to Science. Science House, in Gloucester Street, was constructed and leased by the State Government to the main lessees, The Royal Society of New South Wales, Linnean Society of New South Wales and the Institution of Engineers, Australia. It became available in 1931 and a number of smaller scientific and technical Societies also occupied offices.

A joint Library was set up consisting of the holdings of the libraries of the Royal and Linnean Societies, although separate catalogues

were retained. The Linnean Society's section included a large collection of offprints supplied by authors from every part of the world. These proved particularly useful in the days before rapid copying was available. That reprint collection has now been dispersed. As far as I am aware the Linnean Society's books are lodged in the Library of the University of New South Wales, but I am not aware of whether or not the conditions involved loan or donation. The Institution of Engineers maintained its own library, which was quite specialised.

In 1934 the Royal Society became aware of serious defalcation by its then Treasurer, and lost considerable money, which was never recovered. However the Society continued to operate, albeit in more restrained circumstances. This certainly limited spending on special binding, except for exceptional items, and limited the purchase of specialist books. Nevertheless the Library operated at its most successful, and the large exchange system continued. It was efficiently maintained, with some paid staff, long hours, lending facilities and good access for members and the scientific community at large. This excellent scientific operation continued until the 1970s.

When the Government decided to offer the building to various sporting bodies (it became Sports House in 1976) the Society was offered cash compensation. The Society, in association with the Linnean Society, bought a property at 35 Clarence St Sydney, and the combined Library was re-established. Unfortunately the move to Clarence Street coincided with a downturn in the economy and the building failed to attract lessees. The Societies abandoned the project after considerable loss in 1983.

The continuing exchange of journals, mainly from international sources, increased the pressure on the Royal Society. At this time the Society entered into negotiations with the University of New England to house much of this material. This resulted in the bulk of the serials being transferred to Armidale in 1983, and, as mentioned earlier, a catalogue of this material was prepared. At this time there was a quite large active Society Branch at Armidale, mainly consisting of academics.

The Royal Society, through the good grace of Macquarie University then moved to a house in the grounds of that University, at North Ryde, within the lease of the Robert Menzies College. There the Library, including a number of the old serials mentioned earlier was housed in a series of large enclosed glass bookcases, while the separate books were housed in several smaller enclosed glass bookcases. However the venue could not be operated over the whole period of a business week, so library access was quite limited and lending and library use decreased, although cataloguing continued, particularly for the incoming serials, which were then forwarded on to the University of New England.

In 2001 the lease was revoked, as the College engaged in redevelopment, and at short notice the Society was moved into smaller quarters in an apartment in an accommodation block belonging to the University. The very limited space meant that the Library had to be almost completely packed away. Archival material was sent to the Mitchell Library at this time to join that which had previously been deposited there. The Library was packed into boxes, and the large bookcases sold to the Historic Houses Trust. Fortunately a ten-year lease was arranged with the University of Sydney in 2003 when the Society moved into its present quarters. However, while the site provides good quarters for efficient office use with an excellent venue for technical meetings nearby, the location is unsuitable for library storage and access for members and other users.

It is clear that the library has suffered considerably by the various moves. It has also suffered by the lack of permanent, paid, qualified staff, although it must be admitted that a number of dedicated honorary librarians, some qualified in both librarianship and science, have done their best to maintain the Library. To some degree there has been more attention paid to the journals, many of which are not readily available elsewhere in Australia.

In summary the Library had steady growth from its beginning, with some episodes of particular expansion, reaching its maximum period of use, and thus of social values in the 1970s. Since then, although the addition of serials and occa-

sional gifts of books continues, and the Society's journal consequently also continues to reach an international audience, the value of the Library as an accessible resource for scientific and historical research has considerably diminished.

EVIDENCE FROM THE BOOKS

Particular periods in the Library's history can be noted in various ways through examination of the volumes. The fine binding, with the Society's 'logo', in the 1890s, has already been mentioned.

There are at least three phases of date stamping of volumes recognisable (1890s, 1920s and 1960s), and, marked on the endpapers, at least three separate systems of cataloguing are evident, one using the Dewey System. These matters can probably be more accurately assessed from the several card catalogues, which are some years out-of-date. There has not been time for me to study these for the present project.

The Liversidge Collection

In the early period one of the major influences on the Society's Library was clearly Professor Archibald Liversidge. From the time of his arrival in New South Wales in 1872 Liversidge was a major activist for Science. He encouraged not only the Royal Society for which he was Honorary Secretary between 1874 and 1884 and later president, but he was also essentially the founder of the Australasian Association for the Advancement of Science (AAAS) in the 1880s through the Royal Society's Council. There is a very full set of his own bound publications, mainly reprints, which to a great extent were originally published in the Society's Proceedings. They attest to the variety of research work he undertook, the fruits of which were often presented first at the regular monthly meetings of the Society. The quality of this work must have been an inspiration to other members and indeed to researchers throughout Australasia. There are also volumes which belonged to him, and which he passed on to the Library, perhaps when he retired and returned to England

in 1907. Perhaps of even greater value from the point of view of the history of science, are the several volumes of handwritten notes he took as a student while at the Royal School of Mines in London in 1869–71. These record not only his own studies but indicate the type of instruction then being given by lecturers of the quality of Professor W. Warrington Smyth.

Liversidge was responsible for obtaining the rare volume *Geology* of the US Exploring Expedition, 1838–42 by J.D. Dana that has already been mentioned in Dr Tyler's report. Liversidge was very probably also responsible for the acquisition of the King-Fitzroy *Beagle* volumes and the *HMS Fly* Expedition volume by J.B. Jukes, all seminal works connected with Australian exploration and geology.

In view of Liversidge's contribution to Australian Science and to the University of Sydney it is a sobering fact that the biography of Liversidge by Professor Roy Macleod, of the University, completed several years ago has not yet been deemed worthy of publication by Australian publishing houses. It is sad also that despite the naming of a street in Canberra for Liversidge his contribution to the University of Sydney remains without acknowledgement (by a named building etc.) within the grounds, or even within the Department of Chemistry.

Other Society members, such as the pastoralist and Legislative Council member Henry Kater, the Reverend William Woolls and the astronomer John Tebbutt of Windsor, also made donations of library items during this early period.

Later History

A later period of binding occurred in the late 1920s, perhaps in anticipation of the move into Science House. This was less elaborate than the binding carried out in the 1890s, but was nevertheless effective. In 1933 the Society was presented with a number of volumes by the Pharmaceutical Society of New South Wales. While this 'donation' contains some interesting volumes, others are not of such value. A considerable number are in poor condition from water damage, possibly from the time they were presented. The rare items of these volumes would

benefit from rebinding.

Another period of binding occurred, probably in the 1960s. There is evidence from the mid 1960s that the value of many volumes to the Society's members was questioned by Council members. There was clearly some debate about the need to keep certain volumes in the Society's rooms, rather than possibly offering them for sale, storing them or sending them with serials to the University of New England. At least a few of the very rare and valuable volumes were appreciated and some were rebound, while a few were boxed.

It is clear that the difficulties of access to the library in the past twenty or so years because of the limited opening hours and the lack of awareness of the Library's contents by many researchers has, over the years, reduced the impact that the collection might have had. Numerous volumes have uncut pages, indicating that they have never been used, despite their potential value to researchers.

THE RANGE OF THE COLLECTION

The collection is, naturally enough, quite eclectic. Although there is a considerable number of serials which are held in other libraries within New South Wales, some runs, particularly of early issues, are not available elsewhere, as indicated by the searches of the Hon. Librarian.

Individual Volumes

What I have selected as extremely rare and valuable items have already been listed in Table 1. However there are many different items likely to attract the attention of other assessors. These are listed in Appendix 2, already referred to. In this appendix the items of interest are grouped under the various scientific disciplines usually adopted for library classification. However, many of the volumes, particularly those of the nineteenth century, contain a wide range of subjects, at a time when many of the disciplines were just emerging from a broad 'scientific' field.

Articles documenting colonial scientific activities prior to the formation of the Society and

describing the meetings of the Society's predecessor, the Philosophical Society of New South Wales, in the 1850s, are available in several local publications such as the *Sydney Magazine of Science and Art* in 1857 and 1859. The following period is covered by *Transactions of the Philosophical Society of New South Wales*, 1862–1865.

Nineteenth Century Science and Technology

Many important aspects of research and development of Australian science and technology during the second half of the nineteenth century are covered by the Library's holdings.

While the emphasis of the Royal Society has been more on the physical, chemical and geological sciences with the associated technical fields, the Library has a considerable range of important biological (particularly botanical) publications. This might seem surprising in that attention to the biological sciences has tended to be the province, within New South Wales, of the separate Linnean Society. The reason for this can probably be traced back to the period prior to the formation of the Linnean Society mainly through the Macleay family. In this prior period the Royal Society would have attracted gifts and exchanges, notably from Victoria.

Thus the Society's Library contains copies of *Flora Australiensis* by George Bentham, assisted by Baron Ferdinand von Mueller. Von Mueller continued to send his own later publications expanding Bentham's work. In addition the NSW Botanist J.H. Maiden was an enthusiastic member of the Royal Society and it was doubtless his encouragement that ensured other interesting biological items continued to reach the Library.

Following the interest in early geographical exploration there are reports on the later Horn and Elder expeditions, reminders of Leichhardt's still unsolved death, The Reverend W.B. Clarke's writings on gold and geology. Related to both geology and exploration is the documentation of a momentous mineral – social phenomenon, the discovery and development of the Broken Hill orebody. This documentation con-

sists of the Quarterly reports of the Broken Hill Proprietary Company from its inception in 1883 to 1911.

The first publications of Lawrence Hargrave relating to his aeronautical experiments are found in the Society's journal, and his drawings also come within the purview of the Library, a small volume on aeronautics possibly owes its presence in the Library's collection to Hargrave.

Interspersed with the above are copies of short-lived Australian colonial scientific and literary societies; these items are rarely to be found in Australian libraries. It is likely that these last-mentioned will, in the end, prove most useful to researchers examining the history of Australian scientific endeavour, particularly in the period prior to Federation.

The Society's library contains a fine collection of books and reports on Astronomy. This includes a long run of the reports of the Sydney Observatory, initially through H.C. Russell and reports of the private observatory at Windsor run by John Tebbutt, the 1870s transit of Venus, and publications from the British Astronomical Society and other sources. There are also more recent volumes dealing with the life of Copernicus and other early researchers.

It is hard to evaluate in monetary terms much of the Library's 19th century material, which by exchange or gift, emanated from various British colonies outside Australia. However its scientific and historical value can be assessed. While perhaps of less direct interest to Australian scholars there is now a wide web of international researchers involved in studying the epoch of colonialism and empire.

The spread of information of the Society's holdings of these topics, which might be regarded locally as somewhat esoteric, could very likely attract considerable interest among scholars from many countries. Among other items they contain Dutch East Indies – which is now Indonesia – Pacific Islands, Indian and African material of geological, botanical, meteorological, anthropological and ethnographic content. There is information on various Polar expeditions, and material related to the Tokyo Earthquake of 1923. Preparation of a full catalogue and listing on the Society's web pages could

likely see a dramatic rise in interest in the collection from outside Australia.

CONCLUSIONS

The Library of the Royal Society of Sydney has been in existence for at least 135 years. In total it consists of an estimated 45 000 volumes. Including, as it does, material from even earlier Australian colonial times, it encapsulates much of the history of science in New South Wales – and indeed of Australia – for more than 150 years. The history of Australian Science is now established in its own right as a significant discipline in studies of Australian History – see for instance the *Historical Records of Australian Science*, which began in 1966 as the *Historical Records of the Australian Academy of Science*. The first volume contains a seminal paper on the work of Lawrence Hargrave, which paper drew on the Royal Society's papers. Nevertheless the importance of science, and even of technology, to the development of Australia has, in the past, been underplayed in major histories of Australia, as is discussed in Dr Tyler's report.

The Library covers the widest range of scientific literature, from astronomy to zoology, but with major material on geology, botany, scientific and naturalist societies and catalogues of major exhibitions, the last named of which, in themselves, cover the widest range of scientific and 'practical' aspects of the developing colonies – and indeed the nation – particularly during the crucial period of the late 19th century. Material on individual scientists from various periods in the history of the Society is available to researchers, and has already proved an important source for some researchers in the history of Australian science (e.g. Branagan 1972; Inkster & Todd 1988; Gilbert 2001; Macleod unpubl.).

There is no doubt that the collection has considerable value in its own right, but, possibly more significantly, it also has important cultural and historical value, indicating the strength of cultural and scientific interest by a dedicated colonial society largely, in its earliest days, of men, and which has been preserved, and cultivated to varying degrees by the Society, often in

difficult economic and practical conditions over almost 150 years.

While many of the journal runs still held in Sydney are not unique to this library, some contain exquisite illustrations in a number of formats, including lithographs, woodcuts, and copper engravings, which deserve to be more widely known. Brief displays of these at the Society's meetings have evinced considerable admiration, and means of displaying them more widely must be investigated.

Listing of the books shows that over the years many volumes, which should be together, have been separated. The listing will enable the material to be grouped more satisfactorily. Of course, cataloguing should be carried out as a priority before the final list is placed on the Society's website.

COLLECTION LISTS AND RECOMMENDATIONS

The results of my investigation – limited by time and funding – of the Library of the Royal Society of New South Wales are encapsulated in Table 1 and the appendices.

Spreadsheet Data

There is, in spreadsheet form (held by the Royal Society), a fuller list of the books examined, indicating their titles, publication sources and dates, format, general subject content (scientific discipline) and condition (refer to Appendix 1). Perhaps more important is that an attempt has been made to assess the specific scientific and cultural value of each volume on a numerical scale. Naturally enough this assessment is very subjective, and depends to a considerable extent on my own background and specific areas of interest.

The value of a book depends on a number of factors. The interest of the subject to the reader is an important factor, as is the quality of the presentation, and the knowledge of the author. Other books have value because of their unique quality, including perhaps the place of the author in the history of his/her subject. Others have a monetary value because of the quality

of presentation, beauty of illustrations, or their rarity. It is difficult to give an exact evaluation of any book, so any such evaluation must be very subjective.

In my opinion the volumes in the collection of most overall value are those which shed light on aspects of the history of science in Australia, and which are likely to be held in few libraries. In this category I place the volumes of some of the smaller and often short-lived Colonial scientific societies (e.g. The Queensland Naturalists Society, The Geelong Field Naturalists & The Geological Society of Australasia 1880s–1907).

State of Preservation

Some important volumes are in urgent need of repair. These have been identified. Other less important volumes also need attention. In general it can be stated that the physical conditions in which the volumes are presently housed are far from ideal, either for their preservation or for their use. Some decisions need to be made urgently about these matters. An ideal solution, not just for the Library, but for the advancement of Science in New South Wales, would be the *generous return of Science House to the scientific community of the State*, so that it could be put to the purpose for which it was built.

Similar Collections

Other collections with which the (NSW) Royal Society's might be compared are those of the Royal Society of Victoria, Royal Society of South Australia and the Royal Geographical Society of Australia (South Australian Branch). These societies seem to have been more highly regarded within their own states, than has the Royal Society of New South Wales, in that some government funding, either real or in kind, has continued for them in recent years. The Royal Society of Victoria owns its building in central

Melbourne, and has additional funding through its parking facility which is used by the public. That Society is able to use its building for functions, scientific gatherings, and to house its library in excellent conditions.

Likewise the Royal Society of South Australia has its own rooms within the Library-Museum-Art Gallery complex of Adelaide, an ideal city situation for meetings and co-operation with other groups, and its library is readily available. So too the Geographical Society has its own library intact within the main Library of South Australia building.

General Comments

While I agree with almost all of the comments about the Library, and its history, as described by Dr Tyler, I do not consider that, for a collection of this significance, the volumes are adequately housed at the Society's present quarters. The collection has suffered from its more recent moves. Much of it was better housed when at its (first) site at Macquarie University (during the second, shorter period at Macquarie University it was largely packed in boxes), when climatic conditions were more controlled, as the volumes were then contained within glass cases and the temperature was relatively stable.

These cases were too large to fit the present site at the University of Sydney and were sold to the Historic Houses Trust.

A minor amount of redistribution of books is required to bring together various volumes which have close relationships.

Dr Tyler's Recommendation 4, moving the books at 121 Darlington St to the Ground floor, would be a decided improvement on the present situation. However I would only regard this as a very temporary step, necessarily of quite limited duration.

I endorse the priorities listed in Dr Tyler's Report, and will not repeat them here.

APPENDIX 1

The following list shows volumes requiring repair. These fall into two categories: A – those requiring urgent and considerable attention and B – those requiring some remediation.

A – Requiring Urgent and Considerable Attention

- The Australian Critic* [Melbourne] T.G. Tucker & W.B. Spencer 1890 (Shelf 6-1)
- Itineraire kilometrique, voyage a pied en Nouvelle Caledonie* C.H. Lemire, 1877 (Shelf 6-4)
- Journal of the Elder Scientific Exploring Expedition 1891–2 (with maps)* (under the command of) D. Lindsay 1893 (Shelf 6-4)
- Descriptive Catalogue of the Specimens of Rocks of Victoria in the Industrial and Technological Museum* 1894 (Shelf 5-1)
- Historical Records of New South Wales 1783–1793* (vol. 1 pt 2) (Shelf 6-2)
- The History of New Holland from its First Discovery*, introduction by Rt Hon William Eden, John Stockdale publisher 1787 (Shelf 6-3)
- The Climate of NSW*, H.C. Russell 1874 (Shelf 6-4)
- Report on the Geology & Goldfields of Otago*, F. Hutton & G.H. Ulrich 1875 (Shelf 5-2)
- Duncan's Edinburgh Dispensary* A. Duncan 1830 (Shelf 5-3)
- Pharmacopoeia Universalis or Complete Encyclopedia of Materia Medica* 1872 (Shelf 5-3)
- Oeuvres completes de Christiaan Huygens 1659–66* (vol. 16) Société hollandaise des Sciences 1929 (Shelf 5-6)
- Elements of Natural History* J. Blumenbach 1825 (Shelf 4-1)
- The Australian Naturalist* vols 1 & 2 1906-48 (Shelf 4-1)
- Supplement to the Pharmacopoeia: Treatise on Pharmacology* S.F. Gray 1836 (Shelf 4-3)
- Paris's *Pharmacologia* J.A. Paris 1832 (Shelf 4-3)
- Dissertation and Letters by Don Joseph Rodriguez, the Chevalier Delambre, Baron de Zack, Dr. Thomas Thomson, Dr. Olinthus Gregory and others, either to impugn or to defend the Trigonometrical Survey of England and Wales by Col. Mudge and Capt. Colby*, 1815 (4-4)
- An Outline of the Sciences of Heat and Electricity* Thomas Thomson 1839 (Shelf 4-4)
- On Sound*, J. Tyndall 1875 (Shelf 4-4)
- Niger Flora* H.D. Trotter et al. 1848 (Shelf 3-2)
- A Maori – English Lexicon being a Comprehensive Dictionary of the New Zealand Tongue ... (part 1 Maori-English)*, William Colenso, 1898 (2-1)
- Abstracts of papers communicated to the Royal Society of London 1937–40* (Shelf 2-2)
- Technics: The Journal of the Stawell Technical College and School of Mines* (six issues, 1892) (Shelf 2-3)
- Life and Scientific work of PG Tait*, C.G. Knott 1911 (Shelf 2-3)
- Spectrum Analysis*, H. Schellen 1872 (Shelf 2-3)
- Broken Hill Proprietary Reports (and Statements of Accounts)*, 1885–1911 (unbound volumes from 1896–1911) (Shelf 1-3)
- Geelong Naturalist*, Second Series complete from March 1904 – June 1913, also July 1922, Geelong Field Naturalists Club (established 1880) (Shelf 1-3)
- Contributions to the Natural History of Labuan and the adjacent coasts of Borneo*. [part 1, all published] James Motley & Lewis L. Dillwyn, 1855 (Shelf 1-3)
- An Act to consolidate the Statutes relating to the corporation of the City of Sydney*, NSW Act No. 35, 1902, NSW Legislative Assembly 1902 (Shelf 1-3)
- Sydney Magazine of Science and Art* 1858–1859 (Shelf 1-3)
- Geology of the Provinces of Canterbury and Westland, NZ*, J. von Haast 1879 (Shelf 1-4)
- Aeronautics* [supplement to *Knowledge and Illustrated Science News*] Issues 1–12, (January to November 1908 + loose sheets October–November 1913, and article (obituary) of Wilbur Wright) B. Baden-Powell & J.H. Ledebauer, 1908 & 1913, (Shelf 1-5)
- Iconographia crinoideorum*, N.P. Angelin, 1878 (Shelf 1-5)
- Cyclopaedia: or an universal dictionary of Arts and Sciences*, J.E. Chambers, (all 4 vols) 1786 (Shelf 1-6)

B – Requiring Some Remediation

- History of New South Wales from the Records, {Governor Phillip 1783–1789}* 1889 (Shelf 6-1)
- Southern Science Record & Magazine of Natural History*, vols 1 & 2, 1880–85 (Shelf 6-3)
- Handbook of New Zealand*, 1st edn. James Hector, 1879 (Shelf 6-4)
- Catalogue of the Chilean Exhibition at the Philadelphia Centenary Exhibition 1876 (Shelf 6-4)
- Opuscula*, Georgius Agricola 1546 (Shelf 6-5)
- Asiatic Society of Bengal Centenary Review, Researches of the Society 1784–1883* (Shelf 6-5)
- Geology & Palaeontology of Queensland & New Guinea* 1892 R.L. Jack & R. Etheridge Jnr (Shelf 5-2)
- Essays* M.H. Klaproth 1797 (Shelf 5-3)
- Unpublished work on Seasonal Forecasting*, H.I. Jensen (Shelf 5-3)
- Manual of Medical Jurisprudence and State Medicine*, Michael Ryan 1836 (Shelf 5-4)
- Dr Leichhardt's Briefe an seine Angehörigen.*, G. Neumayer & O. Leichhardt, 1881 (Shelf 5-3)
- Textbook of Embryology, Man and Mammals*, O. Hertwig 1892 (Shelf 4-1)
- Royal Society of London, *Reports of Malaria, Mediterranean Fever and Sleeping Sickness Commissions 1900–10* (Shelf 4-1)
- Accum's System of Theoretical and Practical Chemistry*, by Frederick Accum (1807) (Shelf 4-3)
- Chemical Essays* S. Parkes 1823, vol. 2 only requiring repair (Shelf 4-3)
- Theory & Practice of Hydro-Mechanics*, Institute of Civil Engineering 1884–85 (Shelf 4-4)
- Practical Applications of Electricity*, Institute of Civil Engineering 1884 (Shelf 4-4)
- Aeronautical and other papers, L. Hargrave 1884–1909 (Shelf 4-5)
- Report on Designs and Tenders* submitted in connection with the proposed Bridge over Sydney Harbour to connect Sydney with North Sydney, Sydney Harbour Bridge Advisory Board (1903) (Shelf 4-5)
- Flora Australiensis: A Description of the Plants of the Australian Territory*, vol. 1. George Bentham, 1863 (Shelf 3-1)
- Botanical Magazine or Flower-Garden displayed*, (vol1& 2 in one) W. Curtis 1787 (Shelf 3-3)
- Agriculture of Oberlantz*, L. Jacobi 1860 (Shelf 3-5)
- Marine Algae*, collected & mounted by the Rev James Yuill, 1854 (Shelf 3-6)
- Index perfectus as Caroli Linnaei*, F. von Mueller (Shelf 3-6)
- Australian Dictionary of Dates and Men of the Time*, H. Heaton 1879 (Shelf 2-1)
- Kamilaroi, Dippl and Turrubul Aboriginal Languages* (also other languages) W.M. Ridley, 1866, (Shelf 2-1)
- Environment: A Magazine of Science*, vols 1 to 3 (lacks issue no. 1) Science Teachers' Association (E.G. Booth), 1934–36 (Shelf 2-2)
- Record of the Royal Society of London 1912* (3rd edition) (Shelf 2-3)
- Biographical Memoirs of Fellows (Royal Society of London 1891–1966)*, N.H. Fairley 1966 (Shelf 2-3)
- BANZ Antarctic Research Expedition 1929–31: vol. 6 (2) *Isopoda*, H.M. Hale 1952 (Shelf 2-5)
- The Micrographic Dictionary* J.W. Griffith & A. Henfrey 1883 (Shelf 2-6)
- Description of the Star Camera at the Sydney Observatory* 1892 (Shelf 2-6)
- The Disaster of September 1st, 1923* as it affected Tokyo Imperial University and other places, 1923; together with *Reconstruction Album containing the final Report of the Tokyo Imperial University Library, 1923–29* (Shelf 2-6).
- Sydney University Review*, Nov. 1881- July '83 [issues nos 1, 2, 4 & 5] (Shelf 1-3)
- Les premiers Nouvelles concernant L'eruption du Krakatau en 1883*, M. Dietrich, 1884 (Shelf 1-3)
- Catalogue of Books on Natural Science* in the Radcliffe Library to 1872, 1877 (Shelf 1-4)
- List of Birds, Rockingham Bay*, Northeast Queensland, E.P. Ramsay 1875 (Shelf 1-4)
- Electric Movement in Air and Water with Theoretical Inferences*, Lord Armstrong 1897 (Shelf 1-5)
- Maps of Land Subdivisions of NSW, NSW Dept of Lands (Shelf 1-6)

APPENDIX 2

Liversidge Collection

These cover the subjects of chemistry, mainly inorganic, mineralogy, and geology (1875–1904), see for instance six titles at shelf 4-2, and 31 similar reprints bound individually at Shelf 2-1.

Proposed Chemical Laboratory, Sydney University, A. Liversidge, 1888 (Shelf 4-5)

Minerals of New South Wales, A. Liversidge (1888) (Shelf 5-1)

Palaeontology Course of Demonstrations, (handwritten notes, Royal School of Mines, London 1870) (Shelf 5-1)

Notes of a Course of Lectures on Mining by W. Warrington Smyth (handwritten notes, the Royal School of Mines, London 1869-1870) (Shelf 5-1)

Two bound volumes: *Scientific Tracts* vol. 1 (various reprints) & *Tracts Scientific* vol/ 1, both from the 1820s, probably owned by A. Liversidge

Significant Volumes Listed According to Scientific Discipline

Items listed in Table 1 have been omitted from this list.

Chemistry

Accum's System of Theoretical and Practical Chemistry by Frederick Accum (1807) (Shelf 4-3)

Biology

Natural History of the Mammalia, Natural History of the Marsupialia, and Natural History of the Rodentia by G.R. Waterhouse, 1846 & 1848 (Shelf 4-2)

Animal Chemistry, Physiology and Pathology of Man by Simon Franz (ed. G.E. Day), 1846 (Shelf 4-3)

Index perfectus ad Caroli linnaei species Plantarum nempe eorum Prima Editionem, (Anno 1753) collatore Ferdinando de Mueller, Baron F. von Mueller, 1880 (Shelf 3-6)

Fragmenta Phytographiae Australiae, vols. 1–11 [missing vol. 7?], Baron F. von Mueller, 1858–1881, (Shelf 3-1)

Flora Australiensis: A Description of the Plants of the Australian Territory, vols. 1–7. George Bentham, 1863–1878 [note: assisted by F. von Mueller] (Shelf 3-1)

Handbook of the New Zealand Flora, J.D. Hooker, 1867 (Shelf 1-3)

The Birds of Eastern North America, Charles B. Cory 1899 [Well Illustrated] (Shelf 4-2) (Shelf 2-1)

Prodromus Systematis Naturalis (Regni Vegetalis), De Candolle 1824–49 (Shelf 3-5)

Physics

Précis Élémentaire de Physique Expérimentale (second edition, two volumes, 1821) by J-B. Biot (Shelf 1-2)

Geography and Related Areas

A Complete System of Geography, being a description of the known world, Emanuel Bowen (Geographer to his Majesty), 2 vols. 1747 (Shelf 2-6)

Lippincott's Gazetteer of the World: A Complete pronouncing Gazetteer or Geographical Dictionary of the World, J.B. Lippincott, 1880 (Shelf 1-4)

Cyclopaedia: or an Universal Dictionary of Arts and Sciences, vols. 1–4, 1786 (1-6)

Cosmos, Sketch of a Physical Description of the Universe . . . Alexander Humboldt. There are two English translations of the first and second volumes (first published in German in 1845 and 1847), one in two volumes transl. by Otte (1849) and in four volumes transl. by Edward Sabine (1847) (Shelf 4-4)

True Theory of the Earth and the Philosophy of the Predicted End by 'Research' (anon, Scottish) 1869 (Shelf 5-1)

Elements of Natural History, J.F. Blumenbach 1825 (Shelf 4-1)

Technology

Operative Mechanic & British Machinist, being a practical display of the Manufactories and Mechanical Arts (2nd edn) by John Nicholson (Civil Engineer), 1825 (Shelf 4-4)

Australia Commonwealth: Information, conditions and particulars for guidance in preparation of competitive designs for the Federal Capital city of the Commonwealth of Australia (Shelf 6-1)

The Australian Flora in Applied Art: The Waratah, R.T. Baker 1915 (Shelf 2-3)

Wine making in hot climates, L. Ross 1900 (Shelf 1-5)

Aeronautics

Aeronautical Society of Great Britain Annual Reports, 1866–1893 (2-6)

Aeronautics [supplement to *Knowledge and Illustrated Science News*] Issues 1–12, (January to November 1908 + loose sheets October–November 1913, and article (obituary) of Wilbur Wright) B. Baden-Powell & J.H. Ledebor, 1908 & 1913, (Shelf 1-5)

Astronomy

The Achromatic Telescope and its various mountings, especially the Equatorial ..., William Simms, 1852 (Shelf 4-5)

Meteorological Observations, Windsor, NSW (1863–1915), together with *Astronomical Memoirs* (1853–1907), John Tebbutt (several volumes & dates to 1915) (Shelf 4-5)

The Astronomical Register: A medium of communication for amateur observers and all others interested in the Science of Astronomy (vols. 1-24) bound in two volumes (1–12 & 13–24), 1863–1886, (Shelf 1-2)

Geology

Transactions of the Geological Society of Australasia, parts 1-4 (1886–1890 + List of members 1887) Robert Litton, ed. (Shelf 5-1)

The Southern Goldfields, W.B. Clarke 1860 (Shelf 5-1)

Remarks on the Sedimentary Formations of New South Wales, 1878 (Shelf 5-2)

Geological Observations in South Australia, J.E. (Tenison) Woods, 1862 (Shelf 5-1) Note also Woods's bound papers 1876–1889, (Shelf 4-5)

Elements of Chemical and Physical Geology, [Karl] Gustav Bischof (trans Benjamin H. Paul), 1853, 1855, 1859. First published (in

German) 1846–47 it is regarded as founding the science of geochemistry (Sarjeant, 1980). (Shelf 5-2)

Report on the Geology and Goldfields of Otago, F. Hutton and G.H. Ulrich (1875) (Shelf 5-2)

Geology of Queensland (text) and Geological Map of Queensland (six sheets), J.R.L. Jack & R. Etheridge Jnr, (1892) (Shelf 5-2)

Geology of Sydney and the Blue Mountains, J. Milne Curran, (1898 ?First Edition), (Shelf 5-2)

Systematic Account of the Geology of Tasmania, Robert Johnston 1888 (Shelf 5-6)

Materialien zur Geologie von Turkestan (3 vols, two in Russian, one German, 1880, 1884, 1890), Romanowski, G. (Shelf 5-6)

Conversations on Geology, Granville Penn 1828 (Shelf 5-2)

British Petrography with special reference to the igneous rocks, J.J. Harris Teall, 1888. First part issued February 1886, completed March 1888 (Shelf 2-4)

The Eruption of Krakatoa and subsequent phenomena: Report of the Krakatoa Committee of the Royal Society, ed. G.J. Symons, 1888 (Shelf 2-5)

Les premiers Nouvelles concernant L'éruption du Krakatau en 1883, M. Dietrich, 1884 (Shelf 1-3)

Exhibition Catalogues

Official Catalogue of the Natural and Industrial Products of New South Wales forwarded to the International Exhibition of 1876 at Philadelphia 1876 (contains the first Australian work of T.W. Edgeworth David, later a President of the Society) (Shelf 5-1)

Official Record of the Intercolonial Exhibition of Australasia, 1866-67 [J.G. Knight, Secretary] (Shelf 1-4)

Exploration, Expeditions

Dissertation and Letters by Don Joseph Rodriguez, the Chevalier Delambre, Baron de Zack, Dr. Thomas Thomson, Dr. Olinthus Gregory and others, either to impugn or to defend the Trigonometrical Survey of England and Wales by Col. Mudge and Capt. Colby, 1815 (Shelf 4-4)

- Challenger Expedition: *Briefe von Willemoes-Suhm* 1877 (Shelf 5-3)
- Dr Leichhardt's Briefe an seine Angehörigen*, G. Neumayer & O. Leichhardt, 1881 (Shelf 5-3)
- The History of New Holland from its first discovery* (introduction by The Hon. William Eden) [printed for John Stockdale] 1787 (Shelf 6-3)
- Voyages of the Adventure and Beagle, 1826-1836*, King, P.P. & Fitzroy, R., 2 vols & appendix (with charts) 1839 (Shelf 6-4)
- Voyage of H.M.S. Fly*, 2 vols J.B. Jukes, 1847. (Shelf 6-4)
- Journal of the Elder Scientific Exploring Expedition, 1891-2* (with maps) (under the command of) D. Lindsay, 1893 (Shelf 6-4)
- Horn Expedition* (3 vols) W. Baldwin Spencer (ed.), 1896. (Shelf 6-4)
- Journal of the Horn Expedition*, 2 vols includes printed letters, and Report of the Physical Geography of Central Australia, Maps & Plans, Charles Winnecke, 1897. (Shelf 6-4)
- Victoria Late Australia Felix - Port Phillip District*, William Westgarth, 1853 (Shelf 6-4)
- Report of the 1873 Expedition of the Colorado of the West and its tributaries*, Prof. J.W. Powell, under the direction of the Smithsonian Institution (pamphlet, 36 pp.), 1874. (Shelf 6-4)
- "Aurora" Relief Expedition, 20 December 1916 to 9 February 1917, J.K. Davis, 1917 (Shelf 2-3)
- Exploration Internationale des Régions Polaires* 1882-3 & 1883-84
- Report of the Natural History Results of the Pamir Boundary Commission* (with a list of the plants by J.F. Dultice and a notice of the rock specimens by T.H. Holland), A.W. Alcock, 1890 (Shelf 6-5)
- Last Cruise of the "Wanderer"*, John Webster (1877), (Shelf 1-5)
- Australien (und) Ozeanien*, W. Geisler, 1930 [also contains considerable Ethnography] (Shelf 1-4)
- Report of a Reconnaissance of the Black Hills of Dakota . . .* [Engineering Dept, US Army], W. Ludlow, 1875 (Shelf 1-5)
- Reconnaissance from Carroll, Montana Terri-*

tory, to Yellowstone National Park 1874, W. Ludlow, 1875. (Shelf 1-5)

Contributions to the Natural History of Labuan and the adjacent coasts of Borneo [part 1, all published] James Motley & Lewis L. Dillwyn, 1855 (Shelf 1-3)

Biography & History

Tadataka Ino, the Japanese Land-Surveyor, Ryokichi Otani (Trans K. Sugimura) 1932 (Shelf 5-3)

The Life of the Honorable Henry Cavendish, including abstracts from his writings, George Wilson 1854 (Shelf 5-3)

Memorials, scientific and literary of Andrew Crosse the electrician, Cornelia Crosse 1857 (Shelf 5-3)

Ethnography etc

The Ancient Stone Implements, Weapons and Ornaments of Great Britain, John Evans 1872 (Shelf 5-3)

A Maori - English Lexicon being a Comprehensive Dictionary of the New Zealand Tongue . . . (part 1 Maori-English), William Colenso, 1898 (Shelf 2-1)

An Account of the Polynesian Race, its origin and migrations, 3 vols, (one is second edition 1890), A. Fornander, 1880, 1885, 1890 (Shelf 2-1)

Myths and Songs of the South Pacific, W. Wyatt Gill 1876 (Shelf 2-1)

Historical Sketches of Savage life in Polynesia with illustrative clan songs, [lyrics only], W. Wyatt Gill 1880 (Shelf 2-1)

At Home in Fiji, C.F. Gordon Cumming, 1882 [Liversidge had an association with Cumming, collecting hot spring water in Fiji for analysis] (Shelf 2-1)

New Hebrides Linguistics (Three New Hebrides Languages), The Rev. D. McDonald, 1889 (Shelf 2-1)

Supplement to Thesaurus Craniorum: Catalogue of the Skulls of the Various Races of Man in the Collection of Joseph Barnard Davis, 1875 (Shelf 2-3)

Ethnological Studies among the North-West-Central Queensland Aborigines, W.E. Roth 1897 (Shelf 2-1)

Report of Edo-speaking Peoples, N.W. Thomas, 1910 (Shelf 2-1)

Institutions

Commemorative Exercises of the 50th Anniversary of the Franklin Institute 1824-74, Franklin Institute 1874 (5-3)

Reports & Transactions of the Natural History Society of Queensland, 1892-94 (Shelf 6-1)

Final Report (9 months to 30/4/1884) South Australian Institute, 1884 (Shelf 6-1)

History of the Royal Society of London, Sprat 1734 (Shelf 6-1)

History of the Royal Society of London, 2 vols, C.R. Weld, 1848 (Shelf 6-1)

Charter & Statutes of the Royal Irish Academy, 1837 (Shelf 2-3)

Natural History Journals etc.

The Intellectual Observer: Review of Natural History, Microscopic Research and Recreative Science (vols 1-12, 1862-1868) (Shelf 5-4)

The Quarterly Journal of Science 1864-1870. Then named *The Quarterly Journal of Science New Series* 1871-1878. Then named *Journal of Science & Annals of Biology* 1879-1885. These contain many fine illustrations. Edited J. Samuelson & W. Crookes to 1870, then W. Crookes alone (Shelf 6-3)

Southern Science Record & Magazine of Natural History, (new series), possibly incomplete 1880-82 & 1885. J. Wing (publisher, Melbourne) (Shelf 6-3)

Environment: A Magazine of Science, vols 1 to 3 (lacks issue no. 1) Science Teachers' Association (E.G. Booth), 1934-36 (Shelf 2-2)

Technics: The Journal of the Stawell Technical College and School of Mines (six issues, 1892) (Shelf 2-3)

Geelong Naturalist, Second Series complete from March 1904 - June 1913, also July 1922, Geelong Field Naturalists Club (established 1880) (Shelf 1-3)

Sydney Magazine of Science and Art, 2 vols in one, 1858-59, [two copies, one rebound, contents of other copy perhaps in better condition], (1-3)

Sydney University Review, Nov. 1881 - July '83 [issues nos 1,2 4 & 5] (1-3)

The Naturalist: A Popular Monthly Magazine, illustrative of the Animal, Vegetable and Mineral Kingdoms, vols 1-8, bound in four volumes, Beverley R. Morris 1851-58. (Shelf 1-2)

Medical

Manual of Medical Jurisprudence and State Medicine, Michael Ryan 1836 (Shelf 5-4)

The Medical Assistant or Jamaica Practice of Physic etc, Thomas Dancer 1819 (third edition) (Shelf 2-4)

Traité des applications de l'Électricité Thérapeutique Médicale et Chirurgicale, A. Becquerel, 1857 (Shelf 2-3)

The Lancet vol. 2, 1837 Presentation to the Medical Society of New South Wales (Shelf 2-5)

Duncan's Edinburgh Dispensary, A. Duncan 1830, (Shelf 5-3)

Palaeontology

Pithecanthropus Erectus, Eine menschenähnliche Uebergangsform aus Java, E. Dubois 1894 (Shelf 5-6)

Fossil Remains of the extinct Mammals of Australia (text and plates) Richard Owen, 1877 (Shelf 5-6)

Fossiles Palaeozoiques de la Nouvelle Galles du Sud (Australia), Text & Plates, & Atlas L.G. De Koninck 1876-77 (Shelf 5-6)

Memoirs on the Extinct Wingless Birds of New Zealand with an appendix (2 vols, including plates), Richard Owen 1879 (Shelf 2-5)

Faune du Calcaire Carbonifere de la Belgique, Text and Plates, 9 vols, L. de Koninck, 1878-1885 (Shelf 2-6)

Miscellaneous

Broken Hill Proprietary Reports (and Statements of Accounts), 1885-1911 (two bound volumes 1885 - 1896), and set of individual reports unbound, 1896-1911 (Shelf 1-3)

Philosophical Transactions of the Royal Society of London (from vol 1) [in storage at Prestons]

Maps of Land Divisions in 1887 (Shelf 1-6)

Facsimile of the Minutes of the Philosophical Society of Australasia 1821-22 (Shelf 1-6)

APPENDIX 3

Sample list of material in commercial storage at Prestons.

Cosmos. Revue Encycloped.- Hebdomadaire (Fortnightly) des Progres des Sciences. M. Br de Montfort Redigée par M. L'Abbe Moigne, Tome Septieme Paris: A. Trambly 4 Juillet 1855 [4th year]. Illust; h'back paper on card, red leather spine & cnrs with gold titling, small Royal Soc logo on spine.

The Chemical Gazette or Journal of Practical Chemistry in all its applications to Pharmacy, Arts & Manufactures conducted by W. Francis PhD, FLS, FRAS, FCS, vol. XIII 1855; London: Taylor & Francis; red h'back, br leather spine & cnrs, rubbed; no logos.

The Journal of the Society of Arts and of the Institutions in Union, vol. XIII 1865; London: Bell & Daly; h'back green ornamental paper on card, br. leather spine & cnrs.

Notes and Queries: A medium of inter-communication for Literary men, Artists, Antiquarians, Genealogists etc (1 to 6) 1852. London: Geo Bell; yellow paper on card, br. leather spine & cnrs.

Proceedings of the Philosophical Society of Glasgow, vols XXIX – XXX; h'back 'earthquake' paper on card, black & br leather spine & cnrs, rubbed; small Roy Soc logo on spine, lge logo on cover.

The Popular Science Review: A quarterly miscellany of entertaining and instructive articles on scientific subjects, ed. By Henry Lawson M.D. 1872; London: Robert Hardwicked, P'dilly. vol. XI h'back purplish b'cloth, dk br, leather on spine & cnrs, some rubbing, illustr (papers include Henry Woodward, Prestwich, & plate relating British & French geology), Ganoid fish (*Ceratodus*) from Qld.

The Popular Science Review [same title as above], Jan–Dec 1877, now edited by W.S. Dallas FLS (Asst. Sec Geol Soc), New Series vol. 1 (vol. XVI of whole series); fleur-de-lys on spine. Printer Hardwicke & Bogue.

Tyneside Naturalists Field Club vols IV (1858–60) & V (1860–62); h'back mottled dk green & yellow paper on card, dk br leather spine & cnrs, elaborate fleur de lys on spine & title; Newcastle-upon-Tyne: F. & W. Dodsworth.

Memoirs of the Wernerian Society of Edinburgh, H'back 'earthquake' paper on card cover, br & black spine & cnrs, rubbed, vol. 1 spine edge loose, vol. 1 (for the three years 1808–10) with 15 engravings, folded plates, vol. 2 cover loose [?8 vols in all]; Edinburgh: ?Bell; Dr McKnight 'on the Highlands' publ. 1811; (on end paper £4.4 ?8 vols).

T. Huxley, 6 vols from different publishers, diff. Sizes, 5 bound. H'back black b'cloth, bl leather spine & cnrs, with small Roy Soc logo at top of spine, one small logo at base. Note Roy Soc decision to bind as group.

Sets of volumes of Reports of the: Geological Survey of Tasmania; Geological Survey of W.A.; Geological Survey of NSW (includes bound Records & Mineral Resources Series); Geological Survey of Victoria; Geological Survey of Queensland; Victorian Naturalists; Aust. Academy of Science; ANZAAS (1892 Hobart Report has loose cover);

W.A. [Astronomical] Observatory, Reports by W.E. Cooke from the 1890s.

University of Sydney Reprints from the various Scientific Departments, c. 1900; Australian Museum Reports to c. 1940; Geologists' Association (G.B.) journal.

Not seen but *The Philosophical Transactions of the Royal Society of London* from its beginning (Series began about 1650?) are stored with these volumes listed above.

APPENDIX 4

A small, but valuable collection of maps and other 'flat' items is held in the Society's rooms. There are essentially three sources: the US Geological Survey mostly 19th century; the Dutch East Indies (now Indonesia) also mostly 19th century and a more recent collection from Romania, when under Communist rule, giving a comprehensive outline of Romanian folk life and culture.

Author	Title	Volume	Year
Stemler C.F.	Topographische en Geologische Beschrijving Sumatra's Westkust	Atlas	1883
Becker, G.F.	Atlas to accompany a monograph ... geology ... The Quicksilver Deposits of the Pacific Slope		1887
Observatoire Royale de Belgique	Photometric Atlases, Records and Graphs		?
Royal Society of London	Signatures in the First Journal-Book and the Charter-Book of the Royal Society: Facsimile of signatures from 1660		1912
Hague, Arnold	Geology of the Yellowstone National Park to accompany Monograph 32	Atlas	1904
Accompanying atlas	Jaerboek van het Mijnqwezen	Atlas V34	1905
Accompanying atlas	Jaerboek van het Mijnqwezen	Atlas V37	1908
Verbeek, R.D.M. & Fennema, R.	Carte Geologique de Java et Madoura et Feuilles Annexes	Atlas	1896
van Hise, Bayley, Smyth	Marquette Iron-Bearing District of Michigan: atlas to accompany monograph 28	Atlas	1896
Becker, G.F.	Geology of the Comstock Lode	Atlas	1882
Dutton	Tertiary History of the Grand Canyon District	Atlas	1882
Spurr	Geology of the Aspen District, Colorado	Atlas	1898
Romanian Communist Party	Atlas of the Socialist Republic of Romania	Atlas V5	1979
Romanian Communist Party	Atlas of the Socialist Republic of Romania	Atlas V3	1976
Morgan Clements J	The Vermillion Iron-bearing District of Minnesota to accompany monograph 45	Atlas	1903
Dana, James D.	Atlas: Crustacea; The Wilkes US Exploring Expedition 1838-42	Atlas	1855

REFERENCES

- Anon., *A Century of Scientific Progress*. Sydney, The Royal Society of New South Wales, 1968.
- Branagan, D.F., Words, Actions, People: 150 years of the scientific societies in Australia, *Journal and Proceedings of the Royal Society of New South Wales*, vol. 104, 1972, pp. 123–141.
- Branagan, D.F., *T.W. Edgeworth David: A Life*. National Library of Australia, 2005.
- Darragh, T.A., Day, A.A. & Day, J.A.F., A biographical register of members of the Australian Philosophical Society (1850-55) and the Philosophical Society of New South Wales (1856-66), *Journal and Proceedings of the Royal Society of New South Wales*, Part I, vol.117, 1984, pp. 119–127, Part II, vol. 129, 1996, pp. 123–132.
- Elkin, A.P. *A Goodly Heritage, ANZAAS Jubilee: Science in New South Wales*. Sydney, The Association, 1962.
- Eyles, Joan M., Georgius Agricola (1494–1555). *Nature* vol. 176, 949–950.
- Gilbert, Lionel., *The Little Giant: The Life and Work of Joseph Henry Maiden 1859–1925*. Armidale: Kardoorair Press, 2001.
- Inglis, A., Trials of an Inventor in Australia: The Case of Lawrence Hargrave. *Records of the Australian Academy of Science*, vol. 1 no. 1, 18–41.g
- Inkster, Ian and Todd, Jan., Support for the scientific enterprise, 1850–1900. in R.W. Home (ed.). *Australian Science in the Making*. Cambridge University Press, 1988, Chap. 5, 102–132.
- Macleod, Roy., Biography of Archibald Liversidge. Manuscript completed (not yet published).
- Mellor, D.P., Liversidge, Archibald (1846–1927), in Douglas Pike (General Editor), *Australian Dictionary of Biography*, vol. 5 1851–1890, K-Q, Melbourne University Press, 1974, 93–94.
- Mozley, Ann. *A Guide to the Manuscript Records of Australian Science*. Canberra, Australian Academy of Science with ANU Press, 1966.
- Sarjeant, W.A.S., *Geologists and the History of Geology: An International Bibliography from the Origins to 1978*. Arno Press, New York, 1980, vol. 2, 559–560

ACKNOWLEDGEMENTS

The author extends his appreciation to the Royal Society of New South Wales for the opportunity to participate in this project. Special thanks are due to individual Society members who provided assistance and advice: Robyn Stutchbury, Alan Buttenshaw, Edric Chaffer, John Hardie, Jak and Irene Kelly, Clive Wilmot, Alan Day and Maren Krysko. Also thanks to historian and co-assessor, Peter Tyler.

Dr David Branagan, MSc, PhD, FGS,
Hon Life Member, Geol. Soc. Aust.,
Member of the Bassett Library Committee,
Australian Academy of Sciences

© David Branagan
June 1, 2006

Thesis Abstract: Esterase Activity as a Sublethal Indicator of Copper Toxicity to Marine and Estuarine Microalgae

MELANIE L. BLANCHETTE

Abstract of a Thesis submitted for the degree of Master of Science
James Cook University, Townsville, Queensland, 2006

Copper is widely used in North Queensland, Australia as a component of agricultural chemicals and antifouling paints, and high levels of Cu have been measured in some near-shore marine environments. Because of its potential toxicity, there is a need for early detection of Cu pollution in marine microalgae. Fluorescein diacetate (FDA) is a substrate commonly used in esterase activity assays as a measure of cellular activity. Intracellular cleavage of FDA by esterases results in free fluorescein, which can be quantified fluorometrically as a sublethal endpoint.

The purpose of this research was to: 1. determine the effects of experimental design on esterase activity bioassay outcome in *Tetraselmis* sp. (Chlorophyta) and *Chaetoceros gracilis* (Heterokontophyta) in response to the lack of protocol standardisation in the literature 2. evaluate the use of esterase activity as a bioassay endpoint for Cu toxicity in *Symbiodinium microadriaticum* (Dinophyta), and 3. determine the effects of pH, salinity, temperature, and culture on esterase activity in *Tetraselmis* sp.

The effect of experimental design on Cu toxicity to esterase activity (fluorescence) in *Tetraselmis* sp. and *C. gracilis* was determined by two different protocols. In the 'flask' protocol, microalgae were incubated with Cu in culture flasks (a common technique in earlier research papers), followed by manually pipetted sample transfer and FDA incubation in microtitre plates for analysis. The 'microtitre plate' protocol exposed microalgae directly to copper in microtitre plates without manual sample transfer, followed by quantification of Cu toxicity to esterase activity (percent inhibition of fluorescence). The flask protocol showed high within culture variability and was

laborious, whereas the microtitre plate protocol displayed a significant, replicable, and rapidly quantifiable effect of Cu on percent inhibition of fluorescence. The difference between the protocols was not due to binding of Cu ions to the Erlenmeyer flasks as confirmed by analysis of bioavailable Cu using inductively coupled plasma optical emission spectrometry (ICP-OES). Therefore, differences were likely due to stagnation of esterase activity upon transfer from the flasks to the microtitre plates or differential adhesion of the organisms to the glassware, despite methodological uniformity.

Working with established cultures of zooxanthellae (*Symbiodinium microadriaticum*) is extremely challenging due to the cells' strongly adhesive nature, which presents difficulties when attempting to standardise initial inoculation density (a necessity in microalgal bioassays). Increasing the challenge is the lack of published literature using established cultures of zooxanthellae, and the tendency of authors to "pool" their data, burying the independent culture specific dose-response relationships within large standard errors. The purpose of this research was to quantify *S. microadriaticum* culture density using protein content, chlorophyll a autofluorescence, and direct cell count. The suitability of these estimates for standardising initial inoculation density was evaluated in independent experiments using Cu toxicity to esterase activity in the microtitre plate bioassay. The results of the bioassays showed irreproducible Cu dose response curves and base esterase activities between independent cultures of *S. microadriaticum*, indicating that all three procedures for estimating culture density were unsuitable for standardising initial inoculation density. This research also illustrated the effect

of culture and data pooling on bioassay outcome, and recommended data handling protocols for future ecotoxicological research.

The third aim of this research was to quantify the effects of pH, salinity, and temperature on esterase activity and Cu toxicity in *Tetraselmis* sp. within the context of two different protocols: one that examined the effects of pH, salinity, and temperature within three independent cultures (WIC), and another that examined the effects of these parameters between 15 independent cultures (BIC), both using the aforementioned microtitre plate protocol. It is necessary to determine the effect of pH and salinity on metal toxicity due to their effects on metal speciation, which may alter overall toxicity. Temperature can influence cellular membrane permeability, which in turn may also affect toxicity. In general, pH and temperature had significant positively increasing effects on both esterase activity and Cu toxicity in both protocols, indicating that the microtitre plate bioassay for Cu toxicity should be performed at stable (and explicitly stated) pH and tempera-

ture levels. Salinity did not consistently affect fluorescence or Cu toxicity. The effect of culture did not have a significant effect on either fluorescence or Cu toxicity for all three environmental parameters in the WIC protocol.

In conclusion, experimental design significantly impacted esterase activity bioassay outcome in *Tetraselmis* sp. and *C. gracilis*. The microtitre plate protocol is a rapid, cost-effective method to determine Cu toxicity on esterase activity in microalgae under stable pH and temperatures. Additionally, some organisms (such as *S. microadriaticum*) are unsuitable for use in this bioassay due to their unique physical properties. Through this research, it became apparent that *Tetraselmis* sp. may be a suitable candidate for bioremediation of copper in marine and estuarine waters due to its esterase activities persisting at high levels of Cu and in changing pH, salinity, and temperature regimes. Future studies should focus on the bioremediation of polluted waters using this estuarine microalga.

Melanie Blanchette

Melanie.Blanchette@nrw.qld.gov.au

The Clarke and Edgeworth David Medals

The Clarke Medal for 2005 was awarded to Professor Mark Westoby, of Macquarie University. The medal was awarded for botany. The Medal presentations took place at the Annual Dinner on Friday 10th March 2006 at the Darlington Centre, University of Sydney. Professor Mark Westoby was unfortunately not able to be present on the night and was subsequently awarded the medal at the April general meeting.

The Clarke Medal for 2006 was presented to Professor Anthony Hulbert of the University of Wollongong and the Edgeworth David Medal went to Professor Barry Brook of Charles Darwin University. This year the Clarke Medal was awarded for zoology. The Medal presentations took place at the Annual Dinner on Friday 9th March 2007 in the Darlington Centre at the University of Sydney. The Citations, given below, were read by the President and the medals were presented by Professor Gavin Brown, Vice-Chancellor of the University of Sydney.

Information about the awards can be found on the Society's web site at:
<http://nsw.royalsoc.org.au/awards.html>

The Clarke Medal 2005

PROFESSOR MARK WESTOBY

The Clarke Medal is considered for award annually for distinguished work in the natural sciences. It was first awarded in 1878. The work must be performed predominantly in Australia or its territories. It remains a highly prized award among Australian scientists.

Professor Mark Westoby holds a personal chair in the School of Biological Sciences at Macquarie University. He received his BSc Honours from Edinburgh University in 1970, and his PhD from Utah State University in 1973. He joined Macquarie in 1975 and has been based there ever since, becoming Professor in 1991.

His record of achievement includes publication of 225 journal articles, including papers in the prestigious journals *Nature* and *Science*. He has been on the editorial boards of 5 scientific journals. He has regularly received funding from the Australian Research Council, and is currently convenor of the ARC and NZ Research Network for Vegetation Function. He has supervised 30 PhD and Masters students, and 18 of his students or post-docs have won faculty positions. In 2003, the Ecological Society of Australia recognized his achievements by awarding him its Gold Medal.

Professor Westoby has undertaken research on Botany over a thirty year period in Australia. In the last 15 years he has focussed on ecological strategies of plants. His research includes manipulative experiments in glasshouses and field sites. He has also described hundreds

of species of Australian plants in several different regions. He has developed international networks to generalize patterns worldwide, and he has used mathematics to confer rigour on his hypotheses. These strategies have not only made a strong contribution to knowledge of Australian flora, but they have also strengthened the role of Australia in world ecology. His 2005 paper in *Science* is called 'A brief history of seed size'. The paper interprets the observed co-existence of a wide range of seed size strategies. His 2004 paper in *Nature* is based on a global plant network co-ordinated from Macquarie University. The paper is on the economics of plant leaves, and demonstrates that most variation in leaf characteristics can be accounted for by 6 important traits. Since its publication in 2004, this paper has been so highly cited, that it has been recognized as a fast-breaking paper in the field of Ecology and Environment.

The judging committee was unanimous in its view that Mark Westoby is a highly deserving recipient of the Clarke Medal of the Royal Society of NSW.

Jak Kelly

The Clarke Medal 2006

PROFESSOR ANTHONY JOHN HULBERT

The Clark Medal is considered for award annually for distinguished work in the natural sciences. It was first awarded in 1878. The work must be performed predominantly in Australia or its territories.

Anthony John Hulbert has a first class honours degree in Zoology from UNSW and a PhD and DSc from the same university. As an undergraduate he made the notable discovery that the metabolic rate of marsupial mammals was only about two thirds that of eutherian mammals of similar size and published the results in *Nature*. He extended this work, as a postgraduate, to study the environmental physiology of bandicoots (*Peramelidae*). Little previous work had been done on these animals, although they were spread widely throughout Australia in many different environments. He was the first to breed in captivity the rabbit-eared bandicoot or bilbie (*Macrotis lagotis*) from central Australia. His capture of a spiny haired bandicoot (*Echymipera rufescens*) in Cape York was the first such since 1932. His PhD publications on water metabolism and thermoregulation remain the standard works on the physiology of these marsupials.

After postdoctoral work at Cornell, he joined the academic staff of the University of Wollongong where he is now a professor in the school of biological sciences. He continued his comparative studies, this time with Australian desert lizards, the Central-netted dragon (*Amphibolurus nuchalis*) and the bearded dragon (*Pogona vitticeps*) which are the same size as rodents. They were found to have a much lower metabolic rate, by a factor of seven, than similar sized rodents. The publication of these results in the *American Journal of Physiology* inspired a two page editorial praising his 'splendid com-

parative physiology'. He has extended his endothermy work to other lizards, tortoises and crocodiles.

At a more basic level he has come to address the question of why these significant differences occur between species. He has found there are characteristic differences between the cell membranes of different species which has led to the membrane pacemaker theory of metabolism.

There is considerable international interest in the implications of these membrane results for aging and obesity. Those of us confronted by either or both of these issues can but wish him well and hope for speedy results which may be applied to primates. He is also to be commended for finding a use for blowflies. He uses golden-haired blowflies (*Calliphora stygia*) to study the process of aging and what may determine an animal's lifespan.

Professor Hulbert's work well illustrates the way science makes progress. Starting with a vast diversity; small reptiles to crocodiles, tiny dasyurid marsupials to large kangaroos, zebra finches to emus, their characteristic metabolic differences come down to a simple principle; what is the cell membrane doing? The answers to this question will have implications for all life forms.

We are pleased to welcome Anthony John Hulbert to the distinguished list of Clarke Medal winners.

Jak Kelly

Edgeworth David Medal 2006

PROFESSOR BARRY WILLIAM BROOK

The Edgeworth David Medal was first awarded in 1949 and is for distinguished contributions by a scientist under the age of 35, for work in Australia or which assists the advancement of Australian science.

After a first class science degree from Macquarie University Barry William Brook obtained his PhD in 1999 from the same university for a thesis entitled 'Evaluating population viability analysis', the major results of which were published in Nature. Seven other publications resulted from this postgraduate work. He has since produced some 75 publications in a variety of fields, which include palaeoecology, wildlife management, landscape ecology, ecological economics, ecosystem modelling and conservation genetics and achieved a very high citation rating for most of them. Most of his work relates to Australian ecology with other results arising from a Fellowship at Kyoto University and a collaboration with the National University of Singapore.

Soon after graduation he joined the ARC Key Centre for Tropical Wildlife Management in Darwin. and rose to Senior Research Fellow. In 2006 he received a Personal Chair in the School of Environmental Research at Charles Darwin University, the youngest person ever to be so recognised at this university. Much of his research has been funded by grants awarded to Professor Brook and his collaborators, more than three million dollars from the ARC alone. In 2007 he was appointed Foundation Chair of Climate Change at the University of Adelaide and Director of the newly formed Research Institute for Climate Change and Sustainability

which is funded by the South Australian Department of the Premier.

His work is particularly relevant at the present time of climate change and its implications for the changing ecology of the world. Some of the basic ecological data for our region is more limited and fragmented than for much of the rest of the world. His work on collating different sources of information and on data mining should make maximum use of the material that is available and so foster an evidence-based and proactive approach to future environmental management.

Professor Brook has another valuable attribute for these times. He is a skilled public communicator and has made many contributions to the print and electronic media. We need such scientists, who have the ability and the energy and the patience to persistently argue the case for rational thought and scientific methods over economic dogma and rich lobby groups. It is clear that they have already convinced a sufficient number of voters so that our political leaders are now showing signs of following.

We are pleased to welcome Barry William Brook to the distinguished roll of Edgeworth David Medal Winners.

Jak Kelly

Southern Highlands Branch Annual Report, April 2005 to March 2006

Meeting No. 101, 28th April 2005

This meeting was held in the School Hall, Gib Gate School, Mittagong. The opportunity was taken to commemorate the Centenary of the publication of Einstein's Special Theory of Relativity.

The speaker was Dr Ken McCracken. In his lecture, entitled 'Einstein's Inspirations: Simply Stated', he was able to present a complex subject in a very understandable manner. Starting first with the development of the laws of physics as known in Newton's time he explained how these laws gradually became to be questioned especially after some phenomena were discovered which could not be explained until Einstein produced his theory. He concluded by describing how predictions of the theory of Relativity were proved by Rutherford's experiments and from astronomical observations.

In spite of some confusion about the date of this meeting caused by some conflicting publicity information 72 people attended, including 16 students. Sixteen stayed for dinner after the meeting.

Meeting No. 102, 16th May 2005

This meeting of the Branch was held in the school hall at Gib Gate School, Mittagong. The subject of Longwall Mining for coal had been in the news in the Illawarra District for some weeks with the opening of a new mine and the environmental issues making the headlines. In view of this some of our audience members asked if we could arrange a lecture to explain how Longwall mining works. The management of B.H.P. Biliton agreed to provide qualified speakers for the occasion.

Two speakers attended our meeting, Ms Zena Ainsworth, Community Relations Coordinator for Illawarra Coal and Mr Steve Bow, one of the company's mining engineers. Illawarra Coal is a subsidiary of B.H.P. Biliton.

The meeting commenced with a short film of a South Coast mine, its history and the mining methods used from the early days to the present time and the Longwall machine. Ms Ainsworth described briefly the structure of the company and the extent of its mining operations in the Illawarra region and something of the environmental problems faced.

Mr Bow described the coal mines, both working and proposed in more detail showing several maps which depicted their extent in relation to various towns, rivers, dams, roads and railways in this district. He included a map showing where dozens of bore holes have been drilled to test the extent and quality of the coal seams. We were told of the working of the Longwall machine and how the extracted coal is transported from the coal face to the surface and then delivered to the ships or steelworks at Port Kembla. Thirty nine people were in the audience and 19 went on to dinner.

Meeting No. 103, 16th June 2005

This lecture, held in the School Hall of Gib Gate School Mittagong, was to commemorate the 150th year Anniversary of Railways in N.S.W. Dr Robert Lee, Associate Professor of History at the University of Western Sydney, was the speaker.

In his lecture entitled, 'Building N.S.W. Railways in the 19th Century' he discussed the career of the Chief Engineer, John Whitton under whose guidance the railway network reached many of the most distant parts of the state, in spite of many engineering and financial difficulties encountered along the way. Many of his achievements in bridge building still exist today, such as the two Zig Zags on the Blue Mountains and the Picton viaduct which is still in use. The lecture was very well illustrated with fascinating slides of many facets of the early railway scene.

Thirty nine people braved a very cold and blustery evening to attend the meeting and 11 went to dinner with Dr Lee.

Meeting No. 104, 21st July 2005

The lecture was held in the School Hall of Gib Gate School Mittagong.

The advertised speaker, Dr Paul Willis, was unfortunately unable to attend this meeting and his place was taken by Dr Alex Ritchie. His topic was 'Famous Fossil Sites Around the World.'

Dr Ritchie chose to present the many sites discussed in the order of their Geological age, beginning with the oldest, Ediacara, in South Australia to some in the USA Using this method Dr Ritchie was also able to explain very clearly the relationships between those species which lived at the same time, for instance which was predator and which was prey and the evolution of many of the life forms. He discussed in detail the evidence which shows the evolution of dinosaurs to modern birds.

He also mentioned the theory of 'Tas Walker's Biblical Geology' and the efforts he and his followers are making to have this alternate 'Science' taught in Schools.

There were 53 people at this meeting, 20 of whom went to dinner afterwards.

Meeting No. 105, 18th August 2005

This month the Branch was asked to participate in the Science Week activities at the Bowral High School by providing a judge for a section of the entries in a Science Project Competition on Monday, 15th August. The Branch Representative undertook this very enjoyable task. It was very encouraging to see the high standard of the entries and to meet the enthusiastic young people who had put so much effort into them. As usual the monthly lecture was held in the School Hall of Gib Gate School Mittagong.

Our speaker for the meeting was Dr Brett Neilan, Associate Professor of Environmental Health and Microbiology at the University of NSW. The title of his talk, 'Water Quality, Water Supply and Terrorism', devised by this Branch for the Newsletter, was criticised by Dr Neilan for including the word 'Terrorism' as being outside the scope of his lecture.

Dr Neilan described blue algae from four sites in Australia, their different environments and properties and the microbacteria they produce. Most non-ribosomal peptides from microorganisms are classified as secondary metabolites. Cyanobacteria produce an enormous number of these as well as alkaloids and polyketides some being potent toxins. Those which are products of complex biosynthesis were discussed, especially microcistin, a potent liver toxin. Microbacteria can have a disastrous effect on water supplies. He ended his lecture with an encouraging description of ways metabolic processes are being used to create 'good toxins' and some of the environments being used to discover these drugs. This lecture concluded with a lively question time.

Forty three people attended this meeting and 13 went on to dinner.

Meeting No. 106, 22nd September 2005

This meeting was held in the school hall at Gib Gate School, Mittagong.

The speaker for the evening was Dr David Mills, Chairman of the Company, 'Solar Heat and Power'. In his talk Dr Mills discussed the sources and relative costs of energy production available today, for instance oil, gas, wind, geothermal, solar & coal, their projected importance in future years and the forecast world requirement for energy. He then compared techniques for using sunlight to produce electrical energy, such as direct conversion to electricity by means of solar cells and the production of steam for use in conventional power stations. His talk was illustrated with many interesting charts and pictures, in particular the equipment used by his company to produce and store steam and how it is connected to an existing power station to supplement the use of coal and can eventually replace the need for coal altogether.

A total of 63 people including 4 students attended this meeting. At the dinner, with 16 people from the meeting and the staff of Fitzroy Inn in attendance, a framed letter of appreciation of the contribution this establishment has made to the success and enjoyment of our meetings for several years was made to the management.

Meeting No. 107, 20th October 2005

This meeting was held in the School Hall at Gib Gate School, Mittagong.

Professor Tony Hulbert, from the School of Biological Science at the University of Wollongong, was the speaker on this occasion. Although the title of his talk, 'Life, Death and the Membrane Pacemaker Theory', was intended mainly to attract attention, according to Professor Hulbert, it gave a good overall idea of the scope of his lecture.

The distribution of the metabolic rates of different animals (including humans), reptiles and birds according to size and species was presented and compared with that of the rates of their heartbeats and average life expectancies. All these showed similar trends. He then pointed out that these results are a cellular phenomenon and described how the transfer of some ions across cell membranes could be the cause of these observed effects.

Professor Hulbert concluded by discussing the effects of diet on these results and whether different foods are or are not good for us, particularly in relation to the proportions of Omega 3 and Omega 6 fats they contain. Maybe an excess of Omega 6 is causing our metabolism rates to slow down which in turn could make us more insulin resistant. This could perhaps explain the increase in the incidence in diabetes and obesity being experienced in the Western world at present.

Forty one people were present at the meeting and 16 at the dinner afterwards.

Meeting No. 108, 25th November 2005

This meeting of the Branch was held in the school hall at Gib Gate School, Mittagong.

'The Thylacine and Beyond' was the title of the evening's lecture given by Dr Karen Firestone, Conservation Biologist, Director of the Australasian Conservation Genetics Centre of the Zoological Parks Board of New South Wales. In her talk she briefly described the Thylacine project of the Australian Museum and some of the problems associated with it.

The main part of her presentation concerned the present extensive studies being undertaken by her team into the various species of the marsupial, the Quoll. The team is applying some

of the genetic techniques that were used in the Thylacine project to obtain genetic information about Quolls which, it is hoped, will enable the researchers to assist in their conservation. The habitats of quolls in Australia and New Guinea have been greatly reduced over the years and the remaining quolls are encountering many difficulties in surviving including loss of habitat, disease and predators such as cats, foxes and cane toads.

Fifty people were present for the lecture and 18 members of the audience went to dinner with Dr Firestone at the end of the meeting.

Meeting No. 109, 9th February 2006

The meeting was held in the School Hall of Gib Gate School Mittagong.

'What's happening to gravity?' was the title of the lecture given by Dr Fred Watson, Astronomer in Charge at the Anglo-Australian Telescope, Coonabarabran.

Starting from observations of Aristotle, Dr Watson began with a brief history of the development of our understanding of 'Gravity' mentioning on the way contributions by Newton, Descartes and Einstein. Over the years theories were put forward to try to explain observed astronomical phenomena but as observing techniques became more sophisticated in more recent times discrepancies appeared which required their amendment or replacement. Predictions of the effects of Gravity on astronomical bodies made with Einstein's theories of Relativity have been able to be successfully verified. However, it is now being realised that there may be something else happening in the Universe.

At the other end of the scale at the quantum scale however, the theories don't seem to work. Dr Watson concluded by describing some of the experiments being conducted to try to find out just what is happening at this level. His talk was illustrated throughout with fascinating pictures and diagrams.

On this occasion there was a record attendance of 144 people, including 15 students and 23 went on to dinner afterwards.

Meeting No. 110, 16th March 2006

This, the Annual General Meeting, was held in the School Hall of Gib Gate School Mittagong. All Committee positions were declared

vacant. As there were no nominations to fill these positions there is now no Committee operating in the Branch.

Dr James Wailman, Senior Lecturer in the School of Biological Sciences at the University of Wollongong was the speaker for the evening, the title of his talk being 'Bugs and Bodies: Insects as Decomposers and Forensic Detectives.'

Dr Wailman described many species of Australian flies, their life cycles and the subtle differences between them which enable accurate identification of specific types possible. Also he described how certain types of maggots which only feed on dead flesh can have a role in medicine in cleaning ulcers which have not responded to other treatments. The talk was well illustrated with beautiful pictures of the flies, their maggots and the maggots cleaning up flesh in a very short time as was shown in a brief movie.

Dr Wailman, who is a forensic consultant to the Police, finished by describing some murder

cases where examination of the insects present in and around dead bodies made it possible to estimate the time of death and whether the bodies had been moved since the murder. It is in this work that the accurate identification of these insects is essential. There was a number of questions put to the speaker at the end of the talk which indicated the interest it had generated.

There were 51 present for the lecture and 21 at the dinner afterwards.

As usual I would like to thank all those whose support and hard work made any success the Branch has had throughout this year. These include Ms Gillic and her people from Winifred West Schools for the use of the School Hall at Gib Gate and on several occasions the loan of lecture aids, the members of the Committee and of course those eminent speakers who gave us their time in coming to Mittagong to tell us of their researches and finally our loyal audiences who make all this effort worth while.

RP

NOTICE TO AUTHORS

Manuscripts should be addressed to The Honorary Secretary, Royal Society of New South Wales, Building H47 University of Sydney NSW 2006.

Manuscripts will be reviewed by the Hon. Editor, in consultation with the Editorial Board, to decide whether the paper will be considered for publication in the Journal. Manuscripts are subjected to peer review by an independent referee. In the event of initial rejection, manuscripts may be sent to two other referees.

Papers, other than those specially invited by the Editorial Board on behalf of Council, will only be considered if the content is substantially new material which has not been published previously, has not been submitted concurrently elsewhere nor is likely to be published substantially in the same form elsewhere. Well-known work and experimental procedure should be referred to only briefly, and extensive reviews and historical surveys should, as a rule, be avoided. Letters to the Editor and short notes may also be submitted for publication.

Three, single sided, typed copies of the manuscript (double spacing) should be submitted on A4 paper.

Spelling should conform with "The Concise Oxford Dictionary" or "The Macquarie Dictionary". The Syst me International d'Unites (SI) is to be used, with the abbreviations and symbols set out in Australian Standard AS1000.

All stratigraphic names must conform with the International Stratigraphic Guide and new names must first be cleared with the Central Register of Australian Stratigraphic Names, Australian Geological Survey Organisation, Canberra, ACT 2601, Australia. The codes of Botanical and Zoological Nomenclature must also be adhered to as necessary.

The Abstract should be brief and informative.

Tables and Illustrations should be in the form

and size intended for insertion in the master manuscript - 150 mm x 200 mm. If this is not readily possible then an indication of the required reduction (such as 'reduce to 1/2 size') must be clearly stated. Tables and illustrations should be numbered consecutively with Arabic numerals in a single sequence and each must have a caption.

Half-tone illustrations (photographs) should be included only when essential and should be presented on glossy paper.

Maps, diagrams and graphs should generally not be larger than a single page. However, larger figures may be split and printed across two opposite pages. The scale of maps or diagrams must be given in bar form.

References are to be cited in the text by giving the author's name and year of publication. References in the Reference List should be listed alphabetically by author and then chronologically by date. Titles of journals should be cited in full - not abbreviated.

Details of submission guidelines can be found in the on-line Style Guide for Authors at <http://nsw.royalsoc.org.au/>

MASTER MANUSCRIPT FOR PRINTING

The journal is printed from master pages prepared by the L^AT_EX 2_ε typesetting program. When a paper has been accepted for publication, the author(s) will be required to submit the paper in a suitable electronic format. Details can be found in the on-line Style Guide. Galley proofs will be provided to authors for final checking prior to publication.

REPRINTS

An author who is a member of the Society will receive a number of reprints of their paper free. Authors who are not a members of the Society may purchase reprints.

CONTENTS

Vol. 139 Parts 3 and 4

STUTCHBURY, R.		
The Royal Society of New South Wales, Community Heritage Grant		71
TYLER, P.		
The Royal Society of New South Wales, Report on Historical Significance		75
BRANNAGAN, D.		
The Royal Society of New South Wales, Report on the Cultural, Historical and Scientific Significance of the Society's Library and its State of Preservation		101
ABSTRACTS OF THESES		
BLANCHETTE, M.L. Esterase Activity as a Sublethal Indicator of Copper Toxicity to Marine and Estuarine Microalgae		125
AWARDS		
The Clarke Medal 2005		127
The Clarke Medal 2006		128
Edgeworth David Medal 2006		129
SOUTHERN HIGHLANDS BRANCH		
Southern Highlands Branch Annual Report		131

ADDRESS Royal Society of New South Wales,
 Building H47 University of Sydney NSW 2006, Australia
 <http://nsw.royalsoc.org.au>

DATE OF PUBLICATION December 2006