

Newsletter of the Australian Society for History of Engineering and Technology

2013 Anniversaries

In this issue of *ASHET News* we record two important anniversaries, one that of the opening of the Sydney Opera House, in a brief article on this page; the other, the 30th anniversary of the establishment of the Warren Centre for Advanced Engineering, in a feature article commencing on page 3.

Most of our readers will know that 2013 is the 200th anniversary of the crossing of the Blue Mountains. This was a great human endeavour with tremendous consequences, but not a lot of technology was involved, so we haven't written about it in *ASHET News*. The event has been well recognised and celebrated by the Royal Australian Historical Society, with which ASHET is affiliated. For more about it go to www.rahs.org.au/.

ASHET's Lightning Ridge project

In May 2012 ASHET was awarded a grant of up to \$20,500 by the Commonwealth government to undertake a project *Lightning Ridge Opal Mining heriage – a uniquely Australian story*. The project is now due for completion in November this year. After that we are planning to publish an article on the project in *ASHET News* and on ASHET's website and to provide summaries and audio files of the oral history interviews that were an important part of the project. In the meantime, the project manager Mari Metzke has provided the following report.

ASHET's Lightning Ridge Opal Mining Heritage project has three main strands:

- A series of oral history interviews conducted in Lightning Ridge to gather information for the Principal Researcher [Rob Renew] to research and then write the stories for the display panels for the Australian Opal Centre display.
- The additional research, the writing of the stories and the gathering of supporting images, followed by the design and production of the display panels.
- The Oral History training workshop held in Lightning Ridge to train up locals to continue the work initiated by ASHET.

Our ASHET team of three [two engineers and one historian] has so far made 3 trips to Lightning Ridge and in doing that we were able to meet and record enough locals, who had been involved in the innovative "make-do" technology of the Ridge, to provide the needed material for the development of the display panels. This recorded material, in digital form, and will become a permanent resource for the Australian Opal Centre and the Lightning Ridge Historical Society.

ASHET's Principal Researcher, Rob Renew, handed over his research to the designer by the end of June. He has also sourced appropriate images for the display panels. We are very fortunate that so many locals have come forward with images that they are allowing us to use in the display.

On 21 & 22 June 2013 we were back in the Ridge with oral historian Therese Sweeney. Therese conducted a two day workshop using the equipment purchased with part of the grant funding. We had fourteen participants on the first day and nine on the second day when participants came back to practice what they had learned by interviewing each other as part of the second day's program.

In summary, the climatic constraints of Lightning Ridge did limit our window of opportunity for working there. As well, some key people we needed to deal with are not permanent residents of Lightning Ridge so we needed to work around their availability. Lightning Ridge is a ten hour

drive from Sydney and this means one day each side of a visit is taken up with travel.

Our project was to be completed by the end of August but due to work commitments of our designer, I had to apply for an extension of time to complete the work. We were granted a three month extension so now our project will need to be completed by the end of November. ■

Sydney Opera House 40th Anniversary

Queen Elizabeth opened the Sydney Opera House in 1973. It had been under construction for sixteen years. Its architect Jørn Utzon was not present at the opening having resigned amid controversy in 1966. He had lived in Sydney throughout the early parts of the construction, but after leaving at the time of his resignation, never returned to see his completed masterpiece. Peter Hall, who succeeded Utzon as architect, made a number of changes to the design, notably designing the glass walls facing the harbour. The engineers Ove Arup and Partners who worked with Utzon on the design and construction, remained with the project until its completion.

There is not space in this issue of *ASHET News* for even a summary of the fascinating history of the project, which is perhaps just as well as there are books readily available that present it in readable way. The following are suggested:

David Messent, *Opera House act one*, Balgowlah, NSW: David Messent Photography, 1997.

This is a readable and detailed account of the history of the Opera House project.

Peter Murray, *The saga of Sydney Opera House: the dramatic story of the design and construction of the icon of modern Australia*, New York: Spon Press, 2004.

This is a shorter account than Messent's and written from an architect's perspective.

Philip Drew, *Sydney Opera House : Jørn Utzon*, London : Phaidon Press, 1995

Not a history but rather a set of illustrations and plans that provide an excellent impression of the building.

There is on the ASHET website at <http://ashet.org.au/images/Opera-House.pdf>, a brochure titled *An Engineering Walk around the Sydney Opera House* that can be downloaded. It includes as well as directions for the walk, some information on the history of the Opera House. ■



Next ASHET events

Tuesday 29 October 2013

Talk by Ian Debenham

Sailing in the Ancient Mediterranean

Archaeological evidence suggests that travel on the Mediterranean Sea predates the arrival of modern humans in Europe. When modern humans arrived these Paleolithic hunter-gatherers also used the Mediterranean as a means of exploiting the resources of the numerous islands for their survival.

As time passed they began to inhabit these islands and used the Mediterranean as the most convenient “highway” to trade with the mainland and other islands. However, the Mediterranean was not a benign lake. The seafarers had to understand the ‘moods’ of this sea and develop the technology and knowledge to cope. The price of ignorance was high. They also had to understand the mood of their neighbours and sea-warfare and raiding was a hazard that had to be confronted. Sailing was a life-threatening hazard and the sailors relied on the appropriate gods to provide them with a safe journey.

The speaker, Ian Debenham, received an Honours Degree in Ancient History from Macquarie University and a Post-Graduate Diploma in Museum Studies from the University of Sydney. Ian was the Curator of Transport at the Powerhouse Museum responsible for the aviation and maritime collection from 1980 to 2010. Post-retirement in 2010 Ian became interested in the Roman shipbuilding industry and has applied to Macquarie University to research and write a PhD thesis on that topic.

Venue: History House, 133 Macquarie Street, Sydney

Time: 5.30 for 6 pm

Cost: Includes light refreshments on arrival; RAHS and ASHET members \$10, others \$12

Bookings: phone RAHS on (02) 9247 8001 or email [his-tory@rahs.org.au](mailto:history@rahs.org.au)

Thursday 28 November 2013

Talk by Chris Johnson

Meccano: what you always wanted to know

Chris Johnson will talk about what Meccano is with the accent on Meccano’s more sophisticated modelling capabilities. He will give a brief history of Meccano focussing on the reasons for its lack of appeal to today’s youth. He will talk about its redeeming educational qualities from his perspective of 27 years teaching at the tertiary level. He will also present his ideas for how it could be revitalised especially with the future use of 3D printing. This talk will be based on Chris’s personal experiences and contacts within the Australian Meccano fraternity.

About the speaker: Chris Johnson has been a Meccano “boy” since he was given his first Meccano set by his father. This set was part of his fathers’ no. 8/9 set. His father was a Meccano Club Member, Hornsby Club Member, and was awarded a “Highly Commended” certificate for a model he submitted. Chris ceased his Meccano modelling at age 17.

Following his study in Computing Science he spent four years in the UK gaining a Masters degree by research in Artificial Intelligence. On arriving back in Australia he became an academic, teaching 15,000 students over his 27 year career. Chris rejoined the Meccano fraternity in 2007 and is a member of the NSW Meccano Modellers Association. Recently Chris has been providing Meccano Sets (No. 6++) for children to play at Exhibitions and at The Sydney Powerhouse Museum.

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More on the formation of ASHET

At the time in 2003 when we formed ASHET as a completely new society we had to decide how we would communicate with our members and also reach out to attract new members and participants in our activities. Since there was no organisation with similar objectives to ASHET anywhere in Australia we saw ASHET as a national organisation. Unlike most of the historical societies affiliated with the Royal Australian Historical Society, we are not a local history society and cannot not rely on regular meetings as the main way of keeping in touch with all our members. We are a small society, with limited resources so we needed to find ways of communicating that were efficient both in terms of cost and also in the effort expended.

It happened that in 2002 *History* magazine, published by the Royal Australian Historical Society, ran an article titled *e-historical societies: The Australina Newspaper History Group* written by Rod Fitzpatrick. It described how the Australian Newspaper History Group was formed, with no constitution or officers, communicating with its members solely by email, had doubled its membership over two years and found that it had discovered a successful formula for a nation-wide organisation.

This encouraged ASHET to establish a principle that it that it would operate with a simple organisation structure and with a modest annual subscription, fixed initially at \$20 per year, and maintained at that level,

by keeping administrative simple and low in cost. Email and electronic databases provided us with the means of doing this. Initially as an incorporated society we were required by law to do certain things, such as sending voting papers and notices of annual general meetings by post. But the law has since been amended and we use email and other electronic means for communicating with over 90 per cent of our members.

We have continued our commitment to electronic communications wherever possible by publishing our quarterly newsletter and reports electronically in pdf format for all but our few non-email members, and by using our website to make information readily available and widely accessible.

We are now finding as we expand our activities with special projects, tours and visits, that we are becoming inhibited in what we can do by the inevitable increase in administration that is involved and the burden this places on our volunteer committee members. We applied this year for a federal government grant under a program that provides contributions towards administrative costs of certain non-profit organisations and are hoping that his will result in our being able to engage some modest part time paid assistance. We hope that by the time the next issue of *ASHET News* we will be able to report that our application was successful. This won’t alter our commitment to using electronic aids to communication and administration wherever we can. ■

University of Sydney's Warren Centre celebrates thirty years

Formation of the Warren Centre

In September 1979, the Vice-Chancellor of the University of Sydney, Professor Sir Bruce Williams, convened a luncheon to consider how to celebrate in 1983 the Centenary of Engineering at the University. It would mark the 100th anniversary of the first lecture by the recently appointed lecturer in engineering, William Warren. In 1884 Warren was appointed the first Professor of Engineering and went on to lead the Engineering Faculty for 42 years.

The group attending the luncheon decided to celebrate the centenary by forming an institute that would involve the University and engineering industry. In several months of meetings a committee chaired by Keith Brown, formerly Deputy General Manager of CSR, developed a unique concept for an institute that would foster 'excellence and innovation in advanced engineering in all fields of Australian engineering'. It would be named the Warren Centre for Advanced Engineering.

Peter North, chairman of the appeal committee appointed to raise funds to implement the concept, later described it in more detail:

'The Centre's role will be to bring together for short periods, under distinguished Visiting Fellows, selected groups of experienced, practising engineers from industry, experts from Australia and overseas, and research and teaching engineers. Each Project Group thus formed will be committed, by a decision

of the Centre's governing body, to focus on particular aspects in the selected fields that are important to the development of engineering skills in Australia. The duration of each Project Group's work will vary, but generally, it will be in the range of two to six months. The approach taken by each Project Group will also vary, but essentially the aims of each Group will be to:

Consolidate existing know-how from industry, research and training in their particular field, both from within Australia and from overseas;

Discuss and study advanced engineering techniques in that field;

Develop an improved understanding of the approaches that need to be taken to particular problems in engineering and technology in that field;

Disseminate the outcome of their deliberations and work, through seminars and demonstrations, open to engineers and technicians from all parts of Australian engineering and industry.'

The Centenary Committee drafted a Constitution that was approved without amendment by the Senate of the University. It provided for the Warren Centre (TWC) to be established as an independent institute affiliated with the Faculty of Engineering, with a Board having a majority of its members from industry. TWC would have sufficient capital, raised by an appeal, to cover its operating costs, and each project should raise funds to ensure its objectives were achieved. The appeal would raise \$2 million of investment capital to provide an income of \$20,000 per annum to cover operating costs. Professor Bob Bilger was appointed the first Executive Director in 1982.

The Constitution was later changed to provide that TWC would reimburse the Faculty for the services of the Executive Director who is required by the Constitution to be a professor within the faculty. The Executive Director is now a full time position, appointed as an adjunct professor in the faculty of engineering to meet the Constitution requirement. In 2008, consistent with other changes being made at the University of Sydney and to comply with changes in legislation and contemporary governance practice, the not-for-profit Company Warren Centre for Advanced Engineering was formed to conduct the activities of TWC and hold its assets other than the funds that are held in trust by the University of Sydney for the benefit of TWC. Apart from these administrative changes, TWC retains the structure that was established at the time of its formation.

On 17 May 1883 TWC was officially opened and launched its first project. This year TWC as celebrates its 30th anniversary, it has completed 23 projects, and has a further seven projects in progress or under consideration.

The first project

The first project, *Marine Works for Bulk Loading*, set a pattern that proved successful and which was followed in following projects. It addressed a pressing concern of the time, maintaining Australia's bulk commodity exports in the face of severe international competition. A Visiting Fellow, Professor Sir Alan Harris, from Britain, was appointed and a steering committee was formed under Professor Denison Campbell-Allen of the University of Sydney. At the start of the project opportunities for improvements were identified, including vessel mooring systems that would cope safely and efficiently with the increasing size of vessels, design of terminals for not only the current sizes of ships but those that could be anticipated in the future, and the employment of world best practice in the design and operation of ship bulk loading facilities.

Eighteen people contributed papers that addressed these issues, with topics including the future of coal exports, developments in shipping, planning of bulk ports and offshore terminals, slurry technology, industrial relations, and best-practice design, maintenance and operation.

The project brought together for the first time in Australia experts associated with the handling, transport and export of bulk commodities at a time of intense competition. It promoted a number of innovative



Professor William Warren

ways of berthing and mooring ships, even under extreme conditions. A survey of design and maintenance requirement produced a number of recommendations that led to more efficient and reliable structures. Leighton Holdings, one of the project sponsors, became aware of and purchased the company IPCO Marine, a specialist in pier technology, which proved to be very profitable for Leighton.



Port Hedland shipping terminal

Enduring themes

Over a succession of projects, a number of enduring themes have emerged. They include:

- **Unique Footprint.** The Centre sets out to ensure that whatever it proposes to undertake will make a unique footprint. This means in essence that the Centre specifically avoids operating in areas where the needed outcome is likely to be accomplished equally well by others.
- **Engineering perspective.** An integral part of the 'unique footprint' theme is that the Centre should seek to ensure that its initiatives and activities make a contribution from the engineering perspective.
- **National significance.** Each selected initiative or activity must deal with an issue of national significance and thus be likely to make a worthwhile contribution to technology and wealth creation.
- **Independence and objectivity.** The Centre has developed a strong reputation for independence and objectivity. This is an important asset

that enfranchises the Centre to work in many situations that might otherwise become too difficult because of the conflicting commercial and/or professional interests of those most closely associated with the issues. Hence, an essential criterion in selecting an initiative or activity is that this reputation is preserved and enhanced.

- **Self-interest.** Experience has shown that the most practical way to ensure the viability of an initiative or activity is to ensure that it is effectively supported and funded by those with a special interest in the issue and in the outcome of the Centre's work. This provides an important measure of the commercial significance of the issue and the initiative. At the same time, the approach must ensure that notwithstanding this self-interest of the participants, the initiative or activity does not compromise and preferably enhances the Centre's reputation for independence and objectivity.

- **Champions.** Every initiative or activity must have a Champion who is strongly committed to the issue and is prepared to play the necessary leadership role until the initiative or activity is well established and fully operational. A central feature of the Champion's role is to be the principal advocate of the issues involved and of the importance of exploring them. It is however equally important that the Champion be responsive to the concerns and perspectives that emerge once the 'leading edge' participants become involved.

- **Ambitious aims.** In working within a typical Warren Centre project, the 'leading edge' specialists usually bring unique individual perspectives which, when considered together, invariably lead to important advances in their shared knowledge. It is therefore important to ensure that the project scope and aims are able to respond effectively to the opportunities and potential technology advances thus presented.

Role of volunteers

A central feature of The Warren Centre's operating approach has always been the voluntary resources provided by alumni, engineers and related professionals. The Board members act in an honorary capacity, and the Centre today has several standing committees consisting almost entirely of volunteers, who advise on and become involved in operating functions such as events, communications and finance, and strategic work in areas such as energy, sustainability and technology, ICT, manufacturing and innovation.

In addition, each project attracts many volunteers and pro-bono services from the leading professionals needed to carry out its work, and to help the management team raise the funds for other purchased services and expenses, including Visiting Fellows. In the largest project to date, *Sustainable Transport in Sustainable Cities*, the project team led by volunteers worked over a three-year period and included more than 200 leading-edge professionals providing their services without fee. This project also attracted three Visiting Fellows from overseas, including the chairman of the US President's Transport Research Board.

Examples of Warren Centre projects

The projects since the first have covered a broad field. The following examples will illustrate this. The *Fire Safety and Engineering* project in 1987 provided the opportunity for TWC to make a significant contribution by proposing fundamental improvements in fire safety engineering. Visiting Fellow was Dr. Vaughan Beck of the Footscray Institute of Technology and project leader was Paul Jeans, General Manager BHP Engineering. TWC brought eight international visiting experts to Australia to contribute to specific aspects of the project. The project demonstrated for the first time that a model could be created that would give a rational assessment of fire risk, costs and losses resulting from a fire, a basis for more economical building recommendations and ways of comparing the cost-effectiveness of various combinations of fire safety measures in a particular building.

The project team made sweeping recommendations that led to substantial improvements to building fire safety. The Australian Building Code of fire engineering requirements was drafted in performance terms.

A business plan in 1993 and 1994 resulted in State and Federal support for widespread reform of fire safety practice. A Fire Reform Centre was formed with \$7 million funding to undertake essential research and implement major reform in Australian fire engineering practice. A code for fire safety design achieved recognition worldwide. Australian engineering schools now give greater focus on fire safety design using TWC reports as textbooks. The number of professional fire engineers rose 50-fold in the period 1995-2000. Australian consultants are helping to draft building codes in Hong Kong, Taiwan and China.

In 1988 TWC launched the project *Preparing Australians for a Future with Technology*, with two main aims: to improve the use of technology in Australian industry and to improve the community's understanding of, and competence in technology. At the time Australia's traditional surplus of exports over imports had disappeared, foreign debt had increased to historically high levels and a Senate Standing Committee was calling for action to revive the manufacturing sector. Visiting Fellows for the project were Professor Dame Leonie Kramer of the University of Sydney and Sir Noel Foley, company director. Steering committee chairman was Dr. Peter Miller, consulting engineer. The project report recommended that technology studies be added to the essential subject core of school curricula, and elective studies be implemented. It also recommended that the entire structure and philosophy of engineering be reconsidered with a view to maximising interaction and integration with other related disciplines, and that centres of excellence be established to promote industry/university interaction.

The project had major impacts. In NSW technology became a fundamental part of the school curriculum from kindergarten to year 12 and there are now more technology and innovation-based elective subjects in secondary schools. The Australian Technology Park was established in 1995 as a result of the project and the concept of Centres of Excellence has expanded Australia wide. The project influenced government to establish the Cooperative Research Centre program and these centres have since proliferated.

TWC initiated its project *Sustainable Transport for Sustainable Cities* in 1999 to address the perceived deteriorating trend in the ability of people and freight to move around in major cities and the growing concerns over the environmental impact of transport. The three visiting fellows were Professor Martin Wachs, from USA, Professor David Banister from UK, and Professor Carmen Has-Klau from Germany. Steering committee chairman was Hugh Ralston of Work-Out Associates and project director Ken Dobinson of Dobinson Associates. This is the largest project so far undertaken by TWC.

The project's focus was on Sydney. It published a series of reports with the key recommendations including the concept of a 'City of Cities' which would include Newcastle and Wollongong, with high speed

transport links between the centres and a mix of effective transport systems. Governments took up many of the recommendations of the reports and the NSW government's metropolitan strategy released in 2005 was named 'The City of Cities'. The TWC project's recommendations strongly influenced urban transport studies by the federal and Victorian governments.

These three completed projects are representative of the total 23 completed projects only in that they illustrate a consistent pattern of project organisation, with each project independently financed and managed, a steering committee, project manager, Visiting Fellows, and a project team consisting mostly of volunteers from the engineering profession. Between them the completed projects cover most of the fields in which engineers are involved, including design, construction, operations and maintenance, education, software, and planning. Taken all together the completed projects have involved a cast of thousands. The completed projects are listed on the TWC website <http://thewarrencentre.org.au>, where there is also a brief description of each, and references to the related published reports.

Current projects

One of the current projects, *10,000 Friends of Greater Sydney*, is different from the other projects in that it is an on-going non-profit organisation established in 2005 to help Sydneysiders make Sydney a better place to live, work, play and learn. It is an outcome of the *Sustainable Transport for Sustainable Cities* project and has a vision to create Sydney as a City of Cities. *10,000 Friends* undertakes research, holds meetings for its members and others, and produces reports.

The current project *Implementing PPIR* is a sequel to the already completed *Professional Performance, Innovation and Risk in Australian Engineering Practice* project that was launched in 2007. Its major outcome was the PPIR Protocol, that informs and guides professional engineers and stakeholders on the essentials of performance of an engineering task. The current project is undertaking the roll-out of the Protocol in Australian engineering offices and among individual engineers.

While the *Sustainable Transport for Sustainable Cities* project attracted widespread interest it has not resulted in consistent delivery of the infrastructure need to achieve the objectives set out in its major report of 2004, *Towards a City of Cities*. The current *Urban Reform* project aims to identify the barriers to successful infrastructure projects, publish an Agenda for Reform through a consensus based approach and, based on this to publish a Framework for Reform and an Action Plan. The Steering committee chairman is Richard Dinham. The project is proceeding with a series of case studies that include Victoria, Sydney and South East Queensland.



Innovation

Since 1996 TWC has presented an annual Innovation Lecture, to raise awareness of the importance of innovation in Australian industry. In the first of these lectures, John Bertram captured the essence when he said that Australians need to add another value to those we already held, namely the 'development and acceptance of an innovative culture'.

The lecturers have included some of the Australian who have established successful businesses based on innovative ideas, including Denis Hanley, founder of Memtec Limited, Catherine Livingstone, CEO of Cochlear Limited and Dr. Jim Fox, managing director of Vision Systems Limited. The lecture is presented each year in all of the Australian capital cities. This year's lecturer, Dr. Alex Zelinsky, Chief Defence Scientist, is presenting a lecture titled *Thinking big and making it happen*. The Sydney lecture was given to a capacity audience in July this year and is being repeated in the other capitals. The speaker described his engineering career, beginning at Wollongong with BHP, followed by a series of job changes, in each of which he was able to satisfy his interest in innovation, and summarised the lessons he had learned from leading innovation.

To mark its 25th birthday in 2008, TWC proposed the establishment of a chair in innovation in the engineering school at the University of Sydney. In 2012 Dr. Andy Dong, who had joined Sydney University in 2003 after completing his post-doctoral training in mechanical engineering at The University of California, Berkeley, was appointed as the first to occupy the Warren Centre Chair for Engineering Innovation within the Faculty of Engineering at the University of Sydney.

Each year TWC names and honours a group of Innovation Heroes, who have made significant and recent contributions. The 2013 heroes will be presented at the Vision30 event on 8 November.

Marking the 30th anniversary of the Warren Centre

The Vision30 Event titled *The year 2043: what might be; what can be; what should be* to mark this anniversary will be held on Friday 8 November at the Sydney Convention Centre. It is a full day event commencing at 9.30 am and ending at 7.30 pm.. The event will commence with ten speakers under 30 presenting their views of the game breakers of the next thirty years followed by presentations by a group of distinguished speakers who each have a vision for the next thirty years. Details are at <http://thewarrencentre.org.au/activities/vision30/program/>. Bookings are now open.

Conclusion

At the time of its foundation in 1983 The Warren Centre developed an innovative formula for conducting its principal activities through projects that were individually funded and managed, while conforming to a similar organisational pattern. The pattern worked brilliantly well and has survived almost unchanged. This success has enabled the Warren Centre to call on sponsors, experts and team members of the highest calibre, and for its projects to result in major changes and improvements. Over the years it has held fast to its commitment to innovation and added new activities and causes to support. Looking towards the future it is now planning to ensure that the next thirty years are as productive as the last.

Sources and further reading

All of this article is based on material on the website of the Warren Centre for Advanced Engineering at <http://thewarrencentre.org.au/> The website is the key to learning more about the Warren Centre and all of the topics mentioned in this article. It provides links to numerous reports and other publications as well as information on current activities.

Ian Arthur



*Dr. Alex Zelinski,
Warren Centre 2013 innovation lecturer*



*Dr. Nick Cerneaz,
Warren Centre Executive Director*

About ASHET

ASHET, the Australian Society for History of Engineering and Technology, is a non-profit society, incorporated in New South Wales and affiliated with the Royal Australian Historical Society. ASHET currently has just under 100 members. It was formed in Sydney in 2003. Its objects are to encourage and promote community interest and education in the history of engineering and technology in Australia.

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