ASHET News

Volume 5, number 2
April 2012

Newsletter of the Australian Society for History of Engineering and Technology

ASHET annual general meeting Tuesday 24 April 2012

ASHET's 2012 annual general meeting will be held at History House, 133 Macquarie Street, Sydney, on Thursday 28 April at 6 p.m. Light refreshments will be served at 5.30 p.m. before the meeting. The meeting, expected to be brief, will be immediately followed by a joint meeting of ASHET and the Royal Australian Historical Society, with a talk by Philip Hammon. Each member is entitled to appoint another member as proxy by notice given to ASHET's public officer no later than 24 hours before the time of the meetings. Go to ASHET's website http://ashet.org.au/ to download a proxy form. Send the form to ASHET's public officer who is the secretary, Ian Arthur. ASHET's Constitution requires that no member may hold more than five proxies.

The following business will be conducted at the annual general meeting:

Confirm the minutes of the last preceding annual general meeting.
Receive committee report on activities during 2011.
Receive and consider financial statement for the year 2011.
Elect office bearers and ordinary committee members.

In accordance with ASHET's Constitution no other business may be conducted at the annual general meeting.

Copies of the committee's report and the financial statement that will be presented to the meeting are included in this issue of *ASHET News*.

Election of office bearers and committee members

At the close of the ASHET annual general meeting on Tuesay 24 April 2012, all the present office bearers and committee members retire. Office bearers and committee members for the coming year will be elected at the annual general meeting.

Nominations are called for election to the following positions:
President,
Senior vice-president,
Vice president,
Secretary,
Treasurer,
Three ordinary committee members.

Nominations must be in writing, signed by two members of ASHET and accompanied by the written consent of the candidate. They must reach the secretary by Tuesday 17 April, seven days before the date of the meeting on 24 April. A nomination form may be downloaded from the ASHET website http://ashet.org.au/ .

Commttee changes

Maria Walsh, Chief Executive of RAHS, has accepted the committee's invitation to regularly attend ASHET committee meetings to particpate in its discussions. and contribute to planning the program of RAHS/ASHET joint activities.

Ian Arthur, who has held the positon of ASHET secretary since the society was formed, is hoping to step down from the position as soon as practicable. So ASHET is looking for a new secretary. At the same time the committee is looking at ways of reducing the secretary's duties by having other ASHET members take on specific responsibilities such as editing the newsletter and managing the website.

As part of this process the committee has recently appointed Mari Metzke to the position of membership registrar. She now has responsibility for managing the register, dealing with appliations for memberhip and managing member subscritptions.

200 years ago, dawn of the age of steam

In 1812, Henry Bells's *Comet* commenced the first commercially successful steamboat service in Europe. The same year, the Middleton Railway became the first in the world to use steam locomotives in regular service. These events occurred just 100 years after Newcomen had built his first steam engine, which was very inefficient but soon found use pumping water from mines.

James Watt's engines from around 1865 used a condenser, and were 75 per cent more efficient than Newcomen's. Watt added other innovations, a speed governor and a means of producing rotary motion. In 1885, with Matthew Boulton, Watt commercialised the steam engine which was soon in use for driving machinery. The world's oldest example of a Boulton-Watt engine is in Sydney's Powerhouse Museum. It was installed in Whitbread's brewery in London in 1885 and in use for 102 years.

Richard Trevithick demonstrated the first steam railway locomotive in 1804. Trevithick also pioneered the use of high pressure steam, which led to further improvements in efficiency. Stephenson's famous *Rocket* came much later in 1929.

The first commercial steam boat was in America. Robert Fulton built and tested an experimental boat on the Seine in 1803, and ordered an engine from Boulton and Watt which he installed in what he called the *North River Steamboat*, which entered commercial passenger service between New York and Albany in 1807.

In this issue

ASHET Events

Tuesday 24 April, 2012
Talk by Phillip Hammon
The Katoomba Aerial Ropeway

The aerial ropeway at Katoomba, 2.4 kilometres long, was built to haul coal to the railway at Katoomba from the Gladstone Colliery in the valley 300 metres below. It was opened in 1885.The ropeway was based on a patented concept that was developed in Germany a few years earlier by Adolf Bleichert, and used widely throughout the world. The Katoomba ropeway was designed by a brilliant German engineer, Oscar Schulze, who had migrated to Australia and who later was a consultant for the Hawkesbury River railway bridge.

The Gladstone mine closed after producing only a few thousand tons of coal, and the ropeway was then used for hauling oil shale from J.B.North's mine in the valley. The ropeway closed permanently in 1889 following the failure of one of the ropes.

Philip Hammon's father purchased the lease of the coal mine in 1945 and built the basis of the tourist attraction ScenicWorld at Katoomba. His son Philip, our speaker, worked there as electrician, accountant, manager and director. He was responsible for restoring the facility's buildings and lastly the rebuilding of the Skyway in 2004.

Philip has done extensive research on the aerial ropeway and is co-author with Philip Pells of the book *The Burning Mists of Time: a technological and social history of mining in Katoomba*, published in 2009.

This is a joint activity of ASHET and the Royal Australian Historical Society.

Venue: History House, 133 Macquarie Street, Sydney
Time: 5.30 for 6 pm
Cost: $8.00 Includes light refreshments on arrival
Bookings: phone RAHS on (02) 9247 8001 or email history@rahs.org.au

Thursday 24 May, 2012
Note that the date of this meeting has been changed from Tuesday 22 May
Talk by Robert Croft
Sydney to Penrith milestones

Robert and Sandra Crofts began in 2009 their self funded project to investigate and record the sandstone, concrete and timber milestones/ mileposts in Sydney and surrounds. During the course of the project they have recorded the location and photographed the remaining milestones along all the major roads out of Sydney. They are currently seeking a publisher for their book entitled *Discovering Sydney's Historical Milemarkers and Boundary Stones*. Robert brings his passion for Australian history and photography while Sandra brings research skills from her nursing background to the project.

Robert's talk will include a brief history of the milestones, and focus on the Macquarie Obelisk in the city of Sydney, and the 22 remaining milestones between Sydney and Penrith.

This is a joint activity of ASHET and the Royal Australian Historical Society.

Venue: History House, 133 Macquarie Street, Sydney
Time: 5.30 for 6 pm
Cost: $8.00 Includes light refreshments on arrival
Bookings: phone RAHS on (02) 9247 8001 or email history@rahs.org.au

Tuesday 26 June, 2012
Talk by Michael Waterhouse
The New Guinea goldfields between the wars

Michael is the author of the highly regarded book, *Not a Poor Man's Field. The New Guinea Goldfields to 1942 – An Australian Colonial History*.

His talk will provide insights into a little known period in Australia's history – its colonial experience in New Guinea, viewed through the prism of the goldfields. He will tell how they were discovered and, against all the odds, developed into the second largest gold-producing province in Australasia and why, during the 1930s, New Guinea came to lead the world in commercial aviation.

He will particularly discuss the activities of Bulolo Gold Dredging and how aviation was used to support a major mining operation for the first time on such a scale anywhere in the world. Everything required to construct and maintain eight large dredges, three hydro-electric plants and two townships was flown in, mainly on two Junkers G31 aeroplanes. The talk will be liberally illustrated with unique photos.

Michael will then show a short silent film which shows the establishment of Bulolo Gold Dredging's operations and the aviation activities that made them possible, as well as extraordinary footage of two black-white encounters. This film was shot in the 1930s and is in both black & white and colour. It includes footage rarely shown in Australia since World War 2.

Michael Waterhouse, an economist and historian, has held senior positions in government, having been a Senior Adviser in the Commonwealth Treasury in Canberra as well as to the government inquiry (the Campbell Committee) in the early 1980s whose report led to deregulation of the Australian financial system.

Michael was subsequently a senior executive in Westpac and later consulted on business strategy to many financial and non-financial businesses

Venue: History House, 133 Macquarie Street, Sydney
Time: 5.30 for 6 pm
Cost: $8.00 Includes light refreshments on arrival
Bookings: phone RAHS on (02) 9247 8001 or email history@rahs.org.au

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 86 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. It has members throughout Australia, with most in Sydney and other parts of New South Wales.

ASHET has regular program of events in Sydney, and looks forward to establishing groups with programs of activities in other centres.

ASHET meetings in Sydney are mostly held at History House, 133 Macquarie Street, Sydney, on weekday evenings, as joint meetings with the Royal Australian Historical Society. In addition ASHET arranges daytime visits to places of historical interest.

ASHET has held weekend or longer tours to the Mudgee, Lithgow and Goulburn areas, northern Tasmania, outback NSW, the Rylstone and Glen Davis area and northern NSW.

ASHET has undertaken several special projects, including digitising historic journals and digitising Australian colonial patents and patent indexes. We are currently planning a project to make oral history records of interviews with a group of people who have special knowledge and experience in the printing and newspaper publishing industries in Australia.

ASHET committee report 2011

ASHET membership

At the end of 2011, ASHET had 86 members, the same as at the end of 2010. Of the members at the end of 2011, 67 lived in the Sydney area, 7 elsewhere in NSW, 6 in Victoria, 4 in Queensland and 2 in ACT.

Meetings

ASHET held a series of meetings during 2011 at History House in Sydney jointly with the Royal Australian Historical Society:

Tuesday 22 February, 2011 Talk by Ian Jack
Oil-shale and the age of kerosene

Wednesday 23 March, 2011 Talk by Leonie Knapman
Glen Davis and shale oil

Thursday 28 April, 2011 Talks by Matthew Connell and Rob Renew
The Tote – the invention and global success of the automatic totalisator
ASHET Annual General Meeting

Wednesday 25 May, 2011 Talk by Meg Stevenson
Recording Australian decorative and fine arts

Tuesday 21 June, 2011 Talk by Robert and Bruce Wheatley
Photographing railways

Tuesday 26 July, 2011 Talk by John Pickard
Rural fences: an archive of Australian settlement history and technology

Tuesday 6 September, 2011 Talk by Anne Arthur
A sweet story: Australia's love affair with sugar

Tuesday 27 September, 2011, Joint meeting with Materials Australia
Talks by Amie Nicholas and Christophe Gerber
The history of timber as a structural material in Australia

Thursday 20 October, 2011 Talk by Rosemary Broomham
Sydney's waterfront gasworks; their development & technology

Tuesday 29 November, 2011 Talk by Ian Jack
Getting to the other side: crossings of the Parramatta River and Toongabbie Creek

ASHET tours

ASHET conducted three tours during 2011:

Saturday 12 February 2011
Tour: Kurrajong Radio Museum

Saturday 2 April–Sunday 3 April, 2011
Country tour: Glen Davis and Rylstone locality

Sunday 21–Sunday 28 August 2011
ASHET Study Tour to Northern NSW

ASHET committee

At the annual general meeting on Thursday 28 April, 2011 a new committee was elected to take office at the end of the meeting, and to serve until the end of he annual general meting in 2012. The following office bearers and committee members were elected:

President	David Craddock
Senior Vice President	Rob Renew
Vice President	Mari Metzke
Secretary	Ian Arthur
Treasurer	John Roberts
Committee Member	Ian Jack
Committee Member	Beverley Johnson
Committee Member	Neil McDonald

Income and expenditure statement for the year ended 31 December 2011

INCOME	**2011**	**2010**
Members' subscriptions	1,760	1,770
Donations	20	10
Income from meetings & activities (net of expenses)	8,068	437
Grant for Patents project		1,000
Bank interest	346	530
	10,194	3,747
Less: **EXPENDITURE**		
Insurance	385	385
Telephone & internet	168	6
Affiliation fees	119	186
Postage	48	20
Stationery & office supplies	138	106
Filing fees	48	47
Bank fees		5
Patents project	39	1189
Table of Contents project		0
Website project		1,400
Refund unexpended grant		6,000
Publications		83
	945	9,427
SURPLUS/DEFICIENCY for year		
Balance brought forward	17,332	23,012
Surplus / Excess of expenditure over receipts	9,249	-5680
Balance carried forward	26,581	17,332
Represented by:		
Cash in hand	20	
Cash at bank	9,189	287
Cash at bank – on deposit	17,392	17,065
Less Subscriptions received in advance	-20	-20

The ASHET tours of northern NSW and the Rylstone-Glen Davis areas were highlights of 2011.

Very modern history: organ and tissue transplants

By Ian Arthur

Early history

In 2011, 1041 organs from deceased donors were transplanted in Australia. More than half of these were kidneys; the rest included livers, hearts, lungs and pancreases. It is just sixty years since transplant of organs began to progress beyond the experimental stage and less than fifty since the first successful transplant from a deceased donor in Australia. During this same period there have also been remarkable developments in the transplant of other human tissues, including skin, bone, blood and parts of the eyes.

In India, as early as 1000 BC, where the noses of wrongdoers and sometimes prisoners of war were often cut off, there are reports of successful repairs by grafts of the patient's own skin and flesh. These operations were later depicted in Egyptian papyri.

The techniques were revived in the 16th century in Italy, but met with much disapproval, particularly from the church. In the 17th century blood transfusions were carried out, apparently with some success, but were forbidden in France after a well-publicised failure, and were then not carried out in England or France for more than a century.

It was the developments in the late 19th century of anasthesia and infection control that laid the foundations for successful transplant surgery in the 20th century. Lister in Glasgow introduced practices for using clean instruments and clothing, and after moving to London, performed operations in a continuous mist of antiseptic. The use of anaesthetics in surgery began a little earlier, in the middle of the 19th century, and by the end of the century, nitrous oxide (laughing gas), chloroform and ether were in widespread use.

Dogs show the way

In an experiment at the Rockefeller Institute in 1908 conducted by the French surgeon and researcher Alexis Carrel both kidneys of a dog were removed and one of them was replanted. The transplant was entirely successful, and this encouraged further experimentation, with a mixed record of success and failure. Kidney transplants were a first choice for experiments, because the surgical procedures were fairly straightforward, the restoration of kidney function occurred very quickly after transplant and could be readily observed, and the patient, usually a dog in early experiments, could survive indefinitely with one functioning kidney. However Carrel, working with the physiologist Charles Guthrie, also did experiments on the transplants of other tissues including ovary, testes, thyroid and heart. Carrel received a Nobel Prize in 1912 for his contributions to transplant surgery.

Carrel noted that most of the kidney transplants that used the animal's own tissue (*autografts*) were successful, while the ones where the donor and recipient were different members of he same species (*allografts*) performed well for a few days but then almost invariably failed. It was also observed that if an unsuccessful transplant was followed by another one to the same patient, the second transplant was rejected more quickly than the first. Overcoming this problem of rejection has been one of the major challenges in transplant surgery.

Rejection

Rejection was also being observed with skin grafts. Autografts of skin were usually successful, allografts were not. Much of the understanding of this phenomenon came from work performed during World War II by Peter Medawar and his colleagues in Britain. The British government asked Medawar early in the war to assist in overcoming the huge problems being encountered with skin grafts. He assembled a team that included the Australian, Howard Florey. Their work on tissue immunology continued after the war. Others working in this field also made important contributions. They included two Australians, Macfarlane Burnet and Frank Fenner who published an important book *The production of antibodies* in 1949 in Australia.

Dialysis, an aid to successful kidney transplant

In 1861 a Scottish professor coined the term *dialysis* to describe the ability of semi-permeable membranes to filter soluble salts out of a solution, the same process as now used in desalination plants. Around the start of World War I, researchers at Johns Hopkins University saw the possibilities of using the process to remove urea from the blood stream of a living animal, and built a device that they called an artificial kidney. They had in mind its use in humans. They needed to use an anticoagulant to prevent blood clotting and derived this from the saliva of leeches. Unfortunately the supply of leeches from Hungary dried up and the experiments were abandoned. Interest revived during World War II when a Dutch surgeon Willem Kolff built a large artifiicial kidney machine to treat a patient. This was successful. He built several more machines under the difficult conditions of Nazi occupation and treated seventeen patients. After the war, the practice quickly spread to several countries and rapid improvements were made to the equipment and procedures, with good results.

At this time surgeons were keen to try kidney transplants on patients close to death from the effects of kidney failure. The potential for dialysis to provide support while the condition of the patient stabilised was soon recognised and adopted. The first few transplants were not successful. Between 1951 and 1953 David Hume at Brigham Hospital in Boston performed nine kidney transplants. The ninth, on a young South American physician, Gregorio Woloshin, at first looked unpromising, but after a difficult post-operative period and no kidney function for nineteen days, he began to recover. He had normal kidney function at 37 days, and was discharged at 81 days, the first patient to be fully sustained by a functioning kidney transplant. He died unexpectedly of kidney failure at around six months. All the other kidney transplants during the early 1950s failed within a few days.

In 1954 Richard Herrick, aged 23, entered hospital desperately ill from the effects of kidney failure and was transferred to Brigham for dialysis. His physician, who discovered that he had an identical twin, broached the subject of transplant. His condition improved under dialysis. Records and test confirmed that the twin was identical, had two healthy kidneys, that blood groups were similar, and that skin grafts between the pair were successful. Surgeon Joseph Murray had already performed a number of successful autografts of kidneys in dogs, and performed the operation on Herrick in December 1954. The transplanted kidney produced urine immediately. Within a few days Herrick developed increasing hypertension, and it was realised that the patient's failed original kidneys might be responsible, so they were removed. The patient's blood pressure stabilised and he was discharged from hospitals in February 1955. He made a complete recovery, married his nurse and went on to father two children.

Over the next few years more identical twins received successful kidney transplants at Brigham and other hospitals and by the mid 1970s 35 twin transplants had been performed. The procedures and protocols had been systematically reviewed and refined, laying the foundation for the transplant programs being conducted in most developed countries.

For Murray the obvious next step was to extend the scope for transplants beyond identical twins. To him the best way seemed to be whole-body irradiation followed by bone marrow infusion. The results were not promising. Although the rates of rejection seemed to be less, several patients died from infections from within the patient's own bodies and not the external environment. Also there were obvious risks and uncertainties from the massive doses of radiation being used. So the search for a solution turned towards chemical agents.

Overcoming the problem of rejection

Many experiments were carried out on dogs using a variety of chemicals and doses. A few outstanding results were achieved, along with many failures. The leading surgeons and their colleagues agreed in 1960 to proceed to use the most promising drugs on human patients whose only hope of survival lay in a successful transplant. The first six patients died

within weeks. In April 1962 Melvin Doucette, 24 years old, received a transplant from a patient who had just died during open-heart surgery. The transplanted kidney functioned immediately, survived two rejection episodes at 19 and 120 days, an attack of pneumonia thought to have been a secondary effect of the immune suppression, and removal of a perforated appendix at 18 months. The graft began to fail a 21 months, and a second kidney was grafted successfully. Six months later the patient died from hepatitis.

Teams of surgeons in Britain, France and USA were soon performing allografts of kidneys, some from living donors and some from deceased donors. Thirteen teams met in 1963 to review the results of 216 recipients of allografts. They were not encouraging. 81 per cent of those receiving kidneys from unrelated donors or from a deceased donor had not survived. But 76 per cent of the identical or radiated non-identical twin recipients were still alive. The work continued. It became clear that matching tissue types between the donor and recipient was an important factor in achieving successful grafts and that rejection remained a major problem..

Heart transplants

Advances in heart surgery during the 1950s paved the way for heart transplants. A key development was the heart-lung machine, that could replace the functions of patient's heart and lungs, allowing the patient's heart-beat to be stopped during surgery. In 1953 John Gibbon in Philadelphia was able to successfully perform a repair on the stopped heart of an 18 year old girl, a feat he was never able to repeat. With a heart-lung machine, dogs had survived for up to 46 minutes with a non-beating heart. By the late 1950s Norman Shumway and Richard Lower at Harvard had been able to stop the hearts of dogs sustained on bypass for up to seven hours with cooling by ice and saline solution, and then allow them to recover. This soon led to the two surgeons performing heart transplants on dogs. Dogs with autografts of their hearts survived for up to two years. They were achieving some success with allografts using immuno-suppression with various drugs. They reported that 29 of 32 dogs had survived the operation and one had remained healthy for eight months.

Several surgeons were preparing for human heart transplants, but were caught by surprise when Christiaan Barnard in South Africa, who had been quietly and carefully working towards this, acquiring extensive experience in open-heart procedures and in heart transplants on baboons, performed the first human heart transplant in December 1967. The patient, Louis Washington, was a 53 year old diabetic suffering progressive and irreversible heart failure after a series of heart attacks. The donor was a 25 year old woman sustaining irreversible head injury from a road accident. Although her heart was still beating the neurosurgeon had declared her dead. The transplant team waited for her heart to stop before removing it.

The transplanted heart functioned correctly, the patient was talking within 24 hours, and in 11 days he was out of bed. He was treated with local radiation and immunosupressants. He experienced a rejection episode on day nine and the dose was increased. He died from pneumonia contracted on day 18.

Within a few days Norman Shumway performed his first human heart transplant on a seriously ill patient who died in two weeks. There was a flurry of activity and human heart transplants were performed in several countries. Only a handful of the recipients survived for more than six months. In 1969 the Montreal Heart Institute declared a moratorium on further transplants until the mortality rate could be improved. As the news spread, reactions were polarised; some surgeons agreed, others did not. There were some notable successes, and many failures. Overall the experience was probably comparable to that with the early kidney transplants, but the circumstances were very different. Heart surgery attracted public interest, controversy and legal action; hearts had special religious and cultural significance; there was no fall back for heart failure equivalent to dialysis for kidney failure.

The number of transplants decreased. Shumway was the only surgeon to maintain an intensive program. Within a year he had preformed 27 transplants and nine of the patients survived. The longest survivor at the time was a South African, Philip Blaiberg, who died at 18 months from coronary artery failure.

Lung transplants

Experiments with lung transplants in animals proved less successful than kidneys and hearts. Despite this there was strong interest in performing the operation on humans. In 1963 James Hardy performed a transplant on a patient, John Russell, who was terminally ill with cancer in one lung. He was transferred to the hospital from prison having been sentenced to death some years before. The donor was dying as the result of a massive heart attack. The transplanted lung performed well for 17 days until Russell developed fatal kidney failure. The grafted lung appeared normal. At this time, Russians reported having experimentally removed and reimplanted lungs in seven patients, of whom five survived. At the end of 1980, surgeons in several countries reported on a total of around 40 lung transplants. All the patients died form various complications. The closest approach to success was in Belgium where Fritz Derom transplanted a lung into a patient who lived for 10 months before dying from pneumonia. The transplanted lung had performed well.

In the burst of enthusiasm following Barnard's first heart transplant, three transplants of heart and lungs in combination were made, one by Barnard himself and two in USA. None was successful. In 1980 Bruce Reitz and associates at Stanford carried out 37 heart-lung transplants on monkeys, that lived for several months, one for several years. Soon after, Reitz and Shumway performed heart-lung transplants on four patients, and all survived for more than a year, one for four years. By 1990, 785 heart-lung transplants had been carried out worldwide, and 60 per cent of the patients survived for at least a year. Survival rates have continued to improve.

Further progress

Progress with the transplant of abdominal organs other than kidneys has been much slower and less successful. But by 2000, 80 per cent of liver transplants had survived at one year. By the mid-1990s 7,000 pancreas transplants had been carried out world wide, either alone or together with kidney transplants. Most of the recipients were diabetic. About three quarters of the combined recipients achieved insulin independence for more than a year, and half when the pancreas alone was transplanted.

In 1978 it was reported that a new immunosuppressant drug, Cyclosporin-A, later renamed ciclosporin, strikingly improved the success of transplants. It did have side effects, mostly dose-related, the most serious being interference wit kidney function. These problems have been largely overcome by reduction and careful control of dosage. Since then other promising drugs have appeared. Despite all the advances, rejection remains a major problem with organ transplant recipients.

Skin grafts

There is a long history of successful skin autografts. The commonest injury that destroys large areas of skin is a burn. If more than 30 per cent of a patient's body area is burnt, finding sufficient donor sites for autografts is a challenge, so from the late 19th century efforts have been made to treat serious burns with grafts of skin from deceased donors and from various animals. None of these grafts lasted more than a few weeks. Medawar and his colleagues were the first to undertake controlled experiments to improve understanding of these problems. They have still not been overcome.

However in recent years increasing use has been made of allografts to provide temporary cover for the damaged areas, allowing permanent repair to be progressively provided with the patient's own skin. Research is continuing on the use of drugs to overcome the problems of rejection, and on other solutions such as artificial skin have been tried.

Defining death

There have always been ethical problems associate with organ transplant. They became more pressing as soon as the successes and failures of kidney and heart transplants became highly publicised, and critical as the increasing number of transplants put pressure on the availability of suitable donors and organs.

One question was whether it was ethical to prolong the life of a

Organ donor Ben Harrison with his father Graham. In 1993, Ben, aged 10, died unexpectedly during surgery at Children's Hospital, Sydney. He was an ideal donor, with healthy organs. His kidneys, heart and lungs were successfully transplanted.

Photo taken in 2001 of David Ridoutt, who received both of Ben's kidneys, with Ben's parents Graham and Elayne Harrison. David, who was in poor health at the time of the transplant after three years on dialysis, recovered quickly and six months later was in Rome singing solos to the Pope. He died 16 years later from cancer.

For more stories of donors and information on organ donation in Australia, go to http://sharelife.org.au/

terminally ill patient solely to allow recovery of organs for transplant. It was generally accepted that organs vital for maintaining life could not be removed until after death had occurred. The definition of death became an issue for both public and professional debate.

It became accepted, and finally enshrined in the laws of many countries, including Australia, that death could occur by irreversible loss of brain function, even though the heart continued to beat. This was highly significant for transplant surgery because it had been demonstrated that the chances of successful organ transplant were much improved if the organ could be removed while the donor's heart was still beating. Once the heart stops beating the organs remain viable for only a short time if they remain warm, up to one hour for lungs and kidneys and less for other organs. Right to the present day, the major source of organs for transplant from deceased donors is from those who are brain-dead but whose heart beat continues..

There are many interesting and important aspects of transplant surgery that could not possibly be covered in a brief article like this one. Some of them are well covered in the books listed below and on web sites.

Organ transplants in Australia

In Australia, the first transplants were corneas, in the early 1940s. A successful kidney transplant from a living donor was performed at the Queen Elizabeth Hospital in Adelaide in 1965, and the first from a deceased donor in 1985 was at the same hospital. The first successful heart transplant was at St. Vincent's Hospital, Sydney in 1984. By the end of the 1980s most of the organ transplants performed worldwide had been replicated successfully in Australia.

In recent years the number of organ transplants performed has been limited by the number of suitable and available donors. The conventional international measure of organ donation rates is donors per million population (dcmp). A peak Australian rate of 14 dcmp was reached in 1989. By the early 2000s dcmp was averaging 10, and this became a matter of concern. In 2006 the Australian health ministers agreed on a national reform agenda to enable Australia to narrow the gap between the demand and the availability of tissues and organs for transplantation. Various initiatives followed and the rate of donation increased. In 2008 the Australian Government announced a National Reform Package, supported by a grant of $151 million additional funds over four years. In 1911 the rate of organ donation reached a new high level of 14.9 dcmp. This is still well below the average for EU countries of 17 dcmp, USA 24 dcmp and Spain, the world's leader, at 35 dcmp.

Organ transplant is now the best technique for treating end-stage failure of most essential organs (kidney, liver, heart and lungs). Over 1 million people worldwide have benefited from successful organ transplants. A number of recipients have survived for well over25 years and the 5 year survival rates for most programs are over 70 per cent.

The development of transplant surgery has been one of the interesting and encouraging pieces of 20th century history, and this seems likely to continue during the 21st.

Sources and further reading

Tilney, Nicholas L., *Transplant: from myth to reality*, Yale University Press, New Haven and London, 2003.

This book is a comprehensive and readable account of the history of organ transplant surgery.

Hakim, Nadey S., editor, *Introduction to organ transplantation*, Imperial College Press, London, 1997.

Hakim, Nadey S. & Papalois, Vassilios E., editors, *History of organ and cell transplantation,* Imperial College Press, London, 2003.

These two books, containing a series short papers by experts, are designed for general reading.

The New Encycopaedia Brittanica, Encycopaedia Brittanica Inc., 2010, and on line at http://www.britannica.com/.

The main article, titled *Transplant,* and several articles on related topics, provide generally up to date accounts of most aspects of the topic and provide easy reading.

Donate Life: Australian Organ & Tissue Transplantation Authority, http://www.donatelife.gov.au/,

A large website with comprehensive information, including recent reports on organ and tissue transplants in Australia and links to other sites worldwide.

ASHET News is the newsletter of the Australian Society for History of Engineering and Technology Incorporated ABN 47 874 656 639
ISSN 1835-5943

11 Heights Crescent Middle Cove NSW 2068
Phone: 02 9958 8397 Fax: 02 9967 0724
Email: sec@ashet.org.au
Website: www.ashet.org.au

ASHET