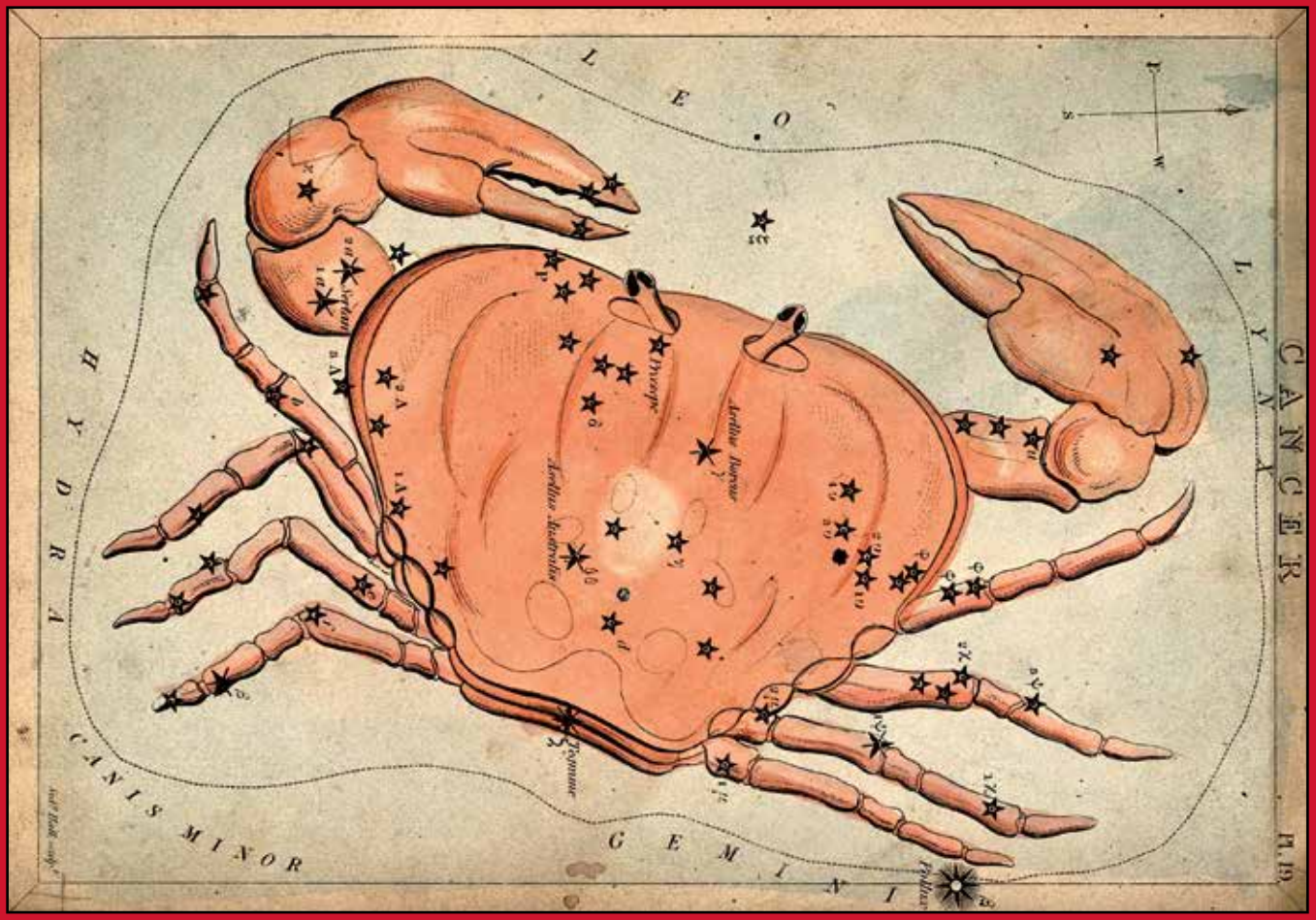
THE CANCER PUZZLE



PATTERNS, PARADOXES AND PERSONALITIES

MEDICAL HISTORY MUSEUM, UNIVERSITY OF MELBOURNE

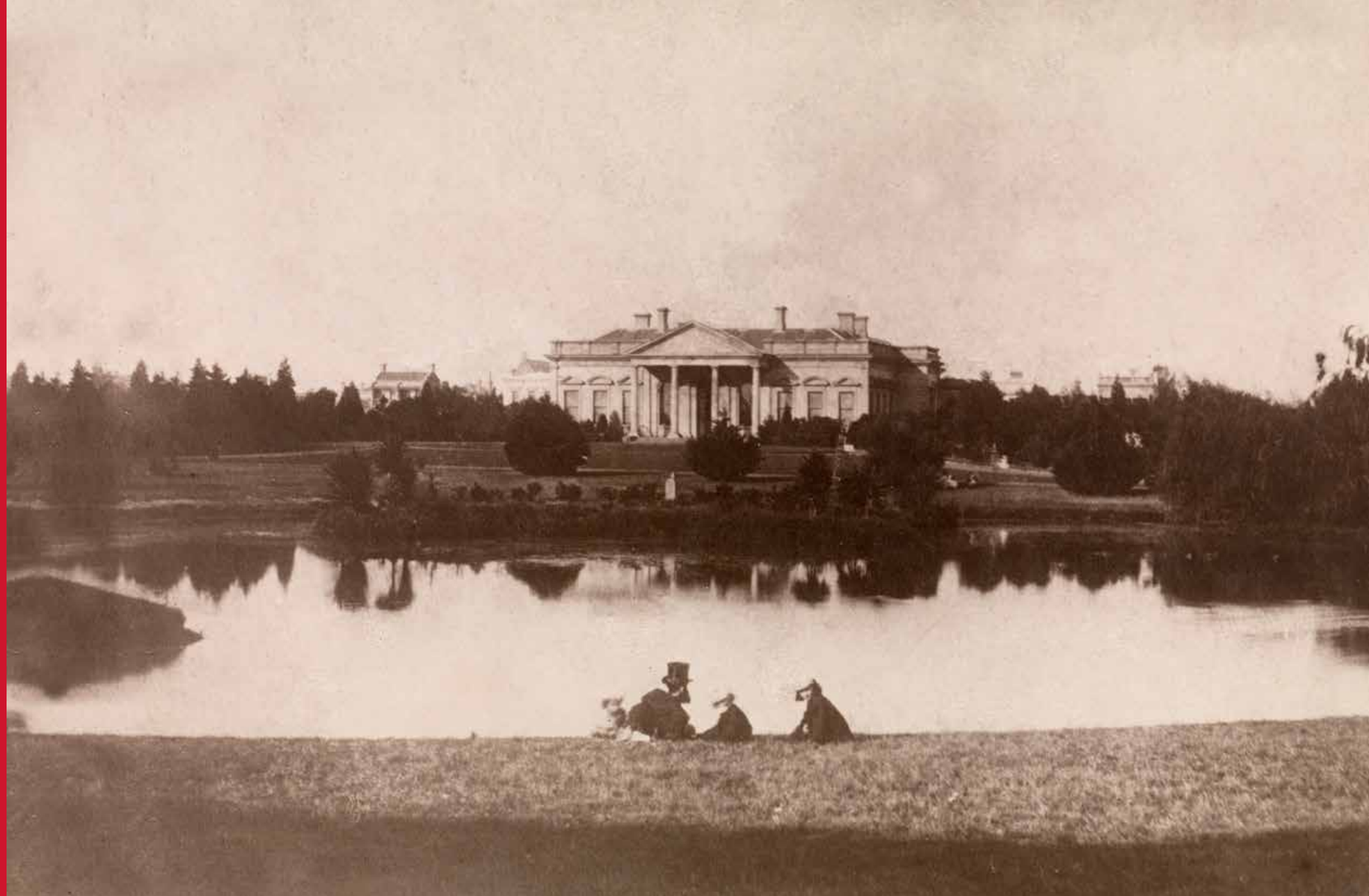
The story of cancer is complex and extremely personal. One in two Australian men and one in three Australian women will be diagnosed with cancer by the age of 85. For generations, doctors and researchers have been searching for remedies for this disease, which has long been shrouded in fear and dread. While surgery, radiotherapy and chemotherapy are still the main treatments, radically new approaches and technologies are emerging, together with a much more sophisticated understanding of the causes and very nature of cancer.

Central to the story of cancer in Victoria has been the contribution of the University of Melbourne, in undertaking fundamental and applied research, developing treatments, training clinicians and scientists, educating the public, and advocating for change. Significant figures in the Melbourne Medical School, such as Professor Peter MacCallum, have helped build the infrastructure that underpins cancer services for the Victorian community.

The cancer puzzle: Patterns, paradoxes and personalities explores the roles of individuals, public education campaigns and research efforts, as well as revealing patients' insights through the work and writings of three contemporary artists who have cancer.

FIAT LUX
Walter+Eliza Hall
Institute of Medical Research
DISCOVERIES FOR HUMANITY

THE UNIVERSITY OF
MELBOURNE



THE CANCER PUZZLE

Patterns, paradoxes and personalities

Edited by
Jacqueline Healy

Medical History Museum
University of Melbourne

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The exhibition *The cancer puzzle: Patterns, paradoxes and personalities*, curated by Dr Jacqueline Healy, was held at the Medical History Museum, University of Melbourne, from 1 August 2017 to 24 February 2018.

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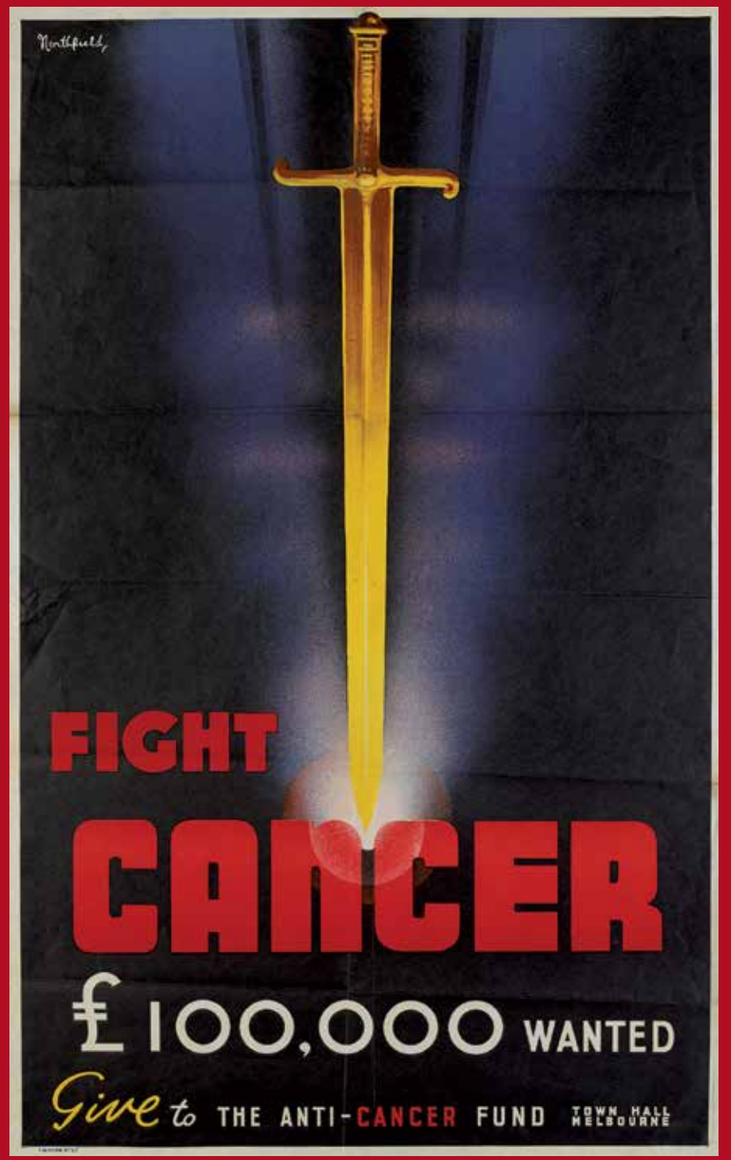
THE UNIVERSITY OF MELBOURNE

FIAT LUX Walter+Eliza Hall Institute of Medical Research
DISCOVERIES FOR HUMANITY

Contents

James Northfield (1887–1973) (artist), ***Fight cancer***, Melbourne: FW Niven Pty Ltd, 1937, lithographic printed poster, 101.2 × 62.7 cm. H81.124/393, gift of the Victorian Railways, 1939, courtesy State Library Victoria and the James Northfield Heritage Art Trust ©.



Foreword

In 2017, it is fitting that we celebrate the Medical History Museum's 50th anniversary with the opening of a refurbished museum space, generously funded by Miss Denise de Gruchy. The museum now has improved display infrastructure and is more closely integrated with student study spaces, bringing the collection closer to our students.

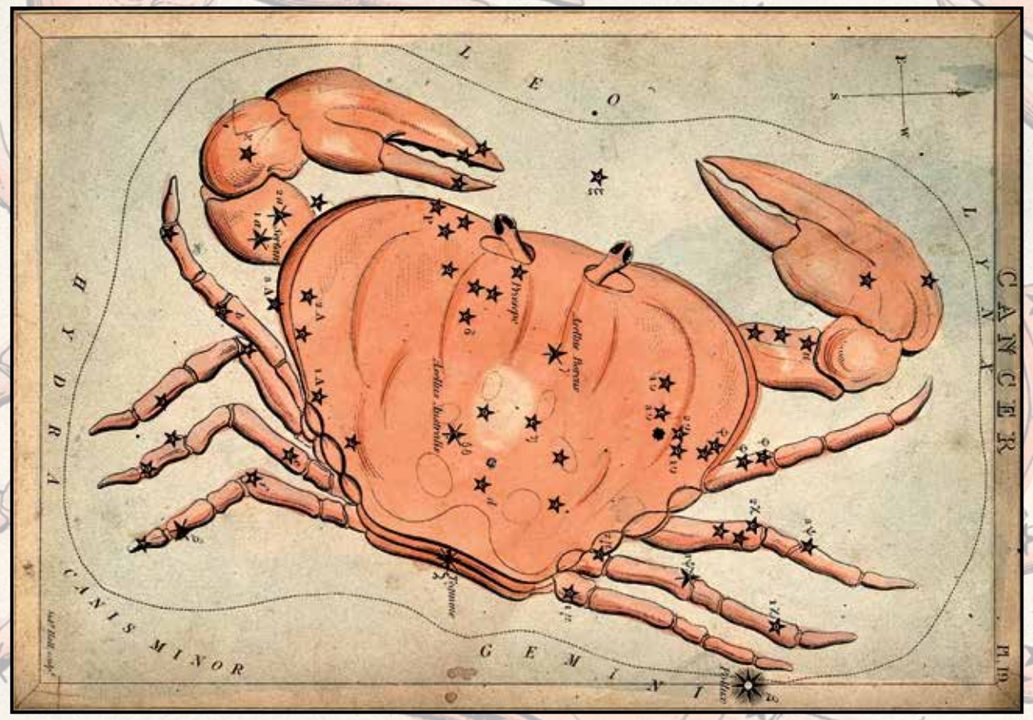
The museum was established in 1967 through a grant from the Wellcome Trust. Today, it holds more than 6000 items covering the history of the Melbourne Medical School and the broader history of medicine in Australia and internationally, in a diverse collection of documents, photographs, artefacts, ceremonial objects, and medical and scientific equipment. Over 50 years the collection has grown, due in particular to the generosity of benefactors associated with the Melbourne Medical School. Together with alumni, their families and others, they have been crucial to building this valuable historical and cultural resource. A major donation by the Wellcome Institute was the Savory and Moore pharmacy, shipped out from London in 1971. Other important gifts include the Australian Medical Association Collection of archival material about early medicine in Victoria, additions to the pharmaceutical collection from the estates of Graham Roseby and Sir Russell and Lady Grimwade, and artworks and historical items donated by Denise de Gruchy and her late brother, Dr Carl de Gruchy. Recently the museum has taken under its stewardship the Royal Women's Hospital Collection, Epilepsy Foundation Collection and Peter MacCallum Radiology Collection.

Since the Medical School's 150th anniversary year in 2012, the museum has staged a diverse exhibition program exploring the growth of medical knowledge through research, its translation and benefits to patients, and the lives of its teachers and practitioners. Highlights include *Compassion and courage: Doctors and dentists in the Great War*, *Strength of mind: 125 years of women in medicine*, and *Epilepsy: Perception, imagination and change*. The major exhibition in the museum's anniversary year is *The cancer puzzle: Patterns, paradoxes and personalities*.

In 2017 the Melbourne Poche Centre for Indigenous Health has funded the acquisition of some important works of Australian Aboriginal and Torres Strait Islander art depicting Indigenous healing practice. The university also awarded the inaugural Carl de Gruchy scholarship: to support Robyn Fahy's research on Dr Sister Mary Glowrey JMJ, Melbourne medical alumna and the second Australian to be on the official path to sainthood. I particularly thank Denise de Gruchy for the generous donation that has made this scholarship possible.

Professor Mark Cook
Chair, Medical History Museum Advisory Committee, University of Melbourne

Cat. 24 Kittey Malarvie (b. 1938; skin: Nawoola; language: Jaru; country: Sturt Creek, Western Australia), ***Goongooloong*** [Bloodwood], 2016, natural pigments on canvas, 100.0 × 45.0 cm. MHM2017.8, Medical History Museum, University of Melbourne.



Sponsor's message

The Walter and Eliza Hall Institute of Medical Research is proud to support the publication of *The cancer puzzle: Patterns, paradoxes and personalities* and to celebrate the 50th anniversary of the Medical History Museum.

The catalogue is a fascinating look at past, present and future directions in cancer research in Melbourne—a topic that is intimately linked to the Walter and Eliza Hall Institute, Australia's oldest medical research institute, founded in 1915.

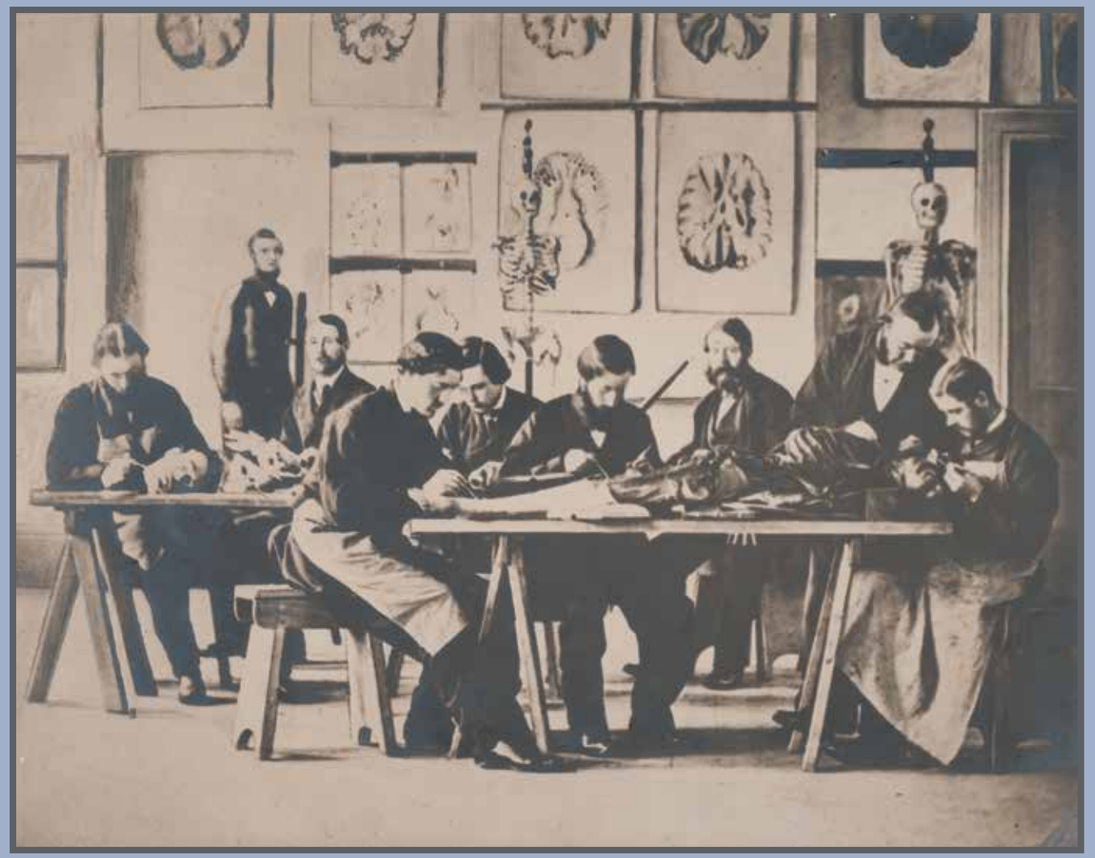
Our institute has more than 850 researchers, who are working to understand, prevent and treat diseases. The institute has a long history of cancer research and, today, our scientists are working on many types of cancer, including breast, ovarian, bowel, brain, pancreatic, blood and rare cancers.

We have a strong commitment to translating our discoveries to improve the prevention, diagnosis and treatment of disease, and proudly do this in collaboration with our precinct partners, researchers from academic organisations around the globe, philanthropists and private companies. More than 30 million cancer patients worldwide have been helped by discoveries made at the Walter and Eliza Hall Institute, notably a supportive therapy—colony-stimulating factors—that aids recovery of the immune system after chemotherapy, discovered by the late Professor Don Metcalf. More recently, our researchers identified a gene that enables cancer cells to escape cell death and, through a major collaboration, this led to a medicine now available in the clinic for treating some types of leukaemia.

These are wonderful Australian success stories, built on the back of strong collaborations. This catalogue highlights the strength of Melbourne's biomedical research community, and the power of partnerships to make great advances in cancer treatments for patients around the world.

Professor Doug Hilton, AO
Director, Walter and Eliza Hall Institute of Medical Research

Sidney Hall, ***Cancer***, hand-coloured engraving, from Richard Rouse Bloxam, *Urania's mirror, or a view of the heavens …*, London: Printed for Samuel Leigh, 1825. Courtesy Wellcome Library, London.



Preface

Cancer was described and named by Hippocrates in the fourth century BCE, after *karkinos*, the Greek word for crab. Like the crab, the search for a cure for cancer has often moved sideways as well as forwards. It is a condition that touches all aspects of medicine—from surgery to immunology, from prevention to genomics, from primary to palliative care. Recent escalation in research, treatments and community education has resulted in great advances for patients and their families.

The University of Melbourne has a remarkable history in relation to cancer treatment and research. One of the earliest images in the Medical History Museum's collection shows an anatomy dissection class. One of the students present was Thomas Ashworth, who in 1869 became the first to describe circulating tumour cells. Later, the dean of medicine, Peter MacCallum, was to be instrumental in designing the infrastructure framework that supports cancer research and community education in Victoria today. The University of Melbourne has continued to play an intrinsic role in cancer research, along with our many hospital and research institute partners, and now the Victorian Comprehensive Cancer Centre.

The exhibition *The cancer puzzle: Patterns, paradoxes and personalities*, and this accompanying catalogue, cover past, current and future endeavours in cancer research, treatment and education, exploring the roles of key individuals, public education campaigns and cutting-edge research. Importantly, the personal challenges faced by people with cancer are also revealed through the art of contemporary artists living with the disease.

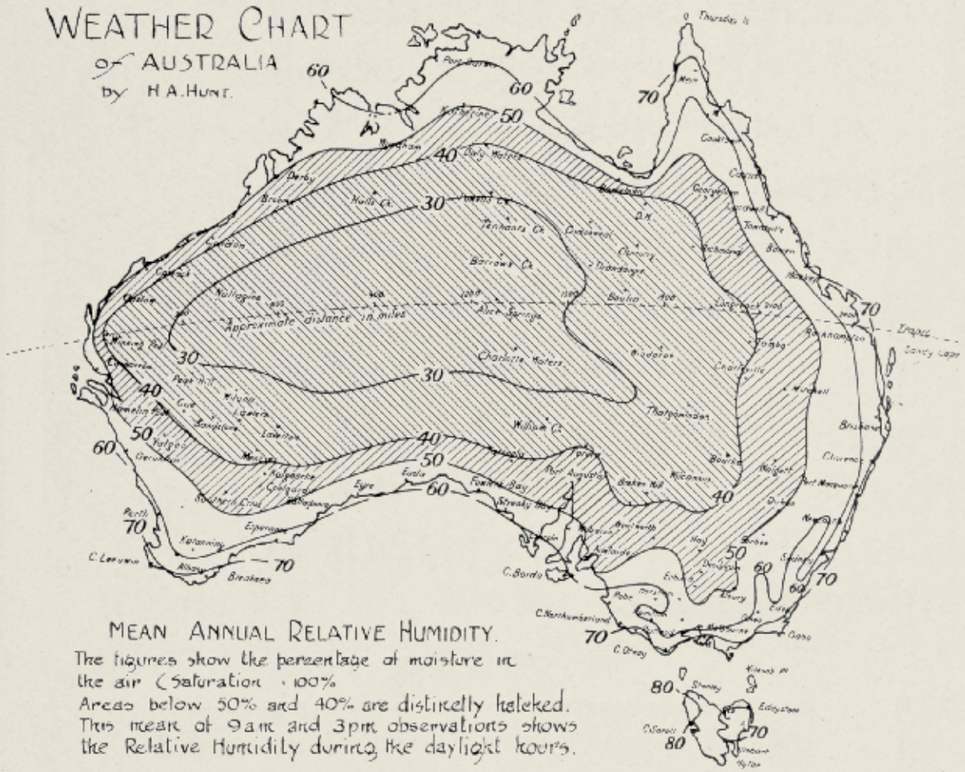
This publication brings together prominent members of the medical profession, the broader research community and important advocacy organisations such as Cancer Council Victoria. Each contributes an important part of the story of cancer from varied historical, medical and personal perspectives. I thank everyone for their contribution.

This exhibition at the Faculty's Medical History Museum marks the museum's 50th anniversary and celebrates the collaborative work of the museum. It draws on items from the important Faculty collections of the Medical History Museum (including the Peter MacCallum Radiology Collection) and the Harry Brookes Allen Museum of Anatomy and Pathology, as well as University of Melbourne Archives and Special Collections, and borrows from other key collections in organisations such as Cancer Council Victoria. I congratulate the Medical History Museum on its 50th anniversary and look forward to its ongoing contribution to the life and culture of the university and our broader community.

Professor Shitij Kapur
Dean, Faculty of Medicine, Dentistry and Health Sciences
Assistant Vice-Chancellor (Health), University of Melbourne

Cat. 3 **Dissecting room, University of Melbourne**, 1864. MHM00463, Medical History Museum, University of Melbourne. Thomas R Ashworth is second seated figure from left.

The Relative Low Humidity of the Atmosphere and Much Sunshine, as Causal Factor for the Great Prevalence of Skin Cancer in Australia.



BY

HERMAN LAWRENCE, M.R.C.P.
(Edinburgh),

Honorary Consulting Dermatologist, Saint Vincent and Queen Victoria Hospitals, Melbourne.

SYDNEY
THE AUSTRALASIAN MEDICAL PUBLISHING COMPANY, LIMITED
1928

Cancer diagnosis, treatment and prevention in Victoria

Advances in the diagnosis, treatment and prevention of cancer have paralleled the great advances in medicine, surgery and public health seen in general over the last century. While cancer survival rates have improved significantly, the disease can still have an unacceptably high death rate, and successful treatment continues to have too many side effects. The particular difficulties of cancer include its onset, often in the most productive years of a person's life; its high incidence, touching most members of our community in some way; and the high fatality rate. Historically these characteristics have made the early application of medical advances much more urgent. They have required cancer professionals and researchers to be at the forefront of innovation; as a result, many of our researchers are leading major medical advances in Victoria and internationally.

This effort has brought a substantial improvement to the outlook of cancer patients. As recently as 1980, fewer than 50 per cent of cancer patients survived an average of five years after diagnosis. Today, while the incidence of cancer in our community continues to increase, the mortality rate has fallen dramatically. Now, two-thirds of cancer patients are living at least five years, and many of them are cured. Although death rates still remain too high, many patients now live with cancer over the long term, more as a chronic disease than a life-threatening one.

Such great improvements can be directly attributed to some game-changing or substantial innovations. These include the pioneering use of curative surgery; more accurate pathology reporting; technological advances in non-invasive imaging; comprehensive tobacco control; cancer screening and awareness; and the advent of modern chemotherapy and radiotherapy. The use of chemotherapy and hormonal therapy in the early stages has a profound influence on cancer survival for selected cancers such as breast cancer and bowel cancer.

Two more recent advances, genomics and information technology, have swept through medicine over the last two decades and have already greatly influenced cancer management. Cancer researchers have made several breakthrough discoveries based on these technological innovations, leading to better diagnosis, new drugs such as targeted agents, and a better understanding of the immune system's response to cancer. Some of these are discussed by John Hopper (pp. 53–5), Richard Pestell (pp. 61–3), Joe Trapani (pp. 73–6), Sean Grimmond (pp. 69–70) and Peter Doherty (p. 106).

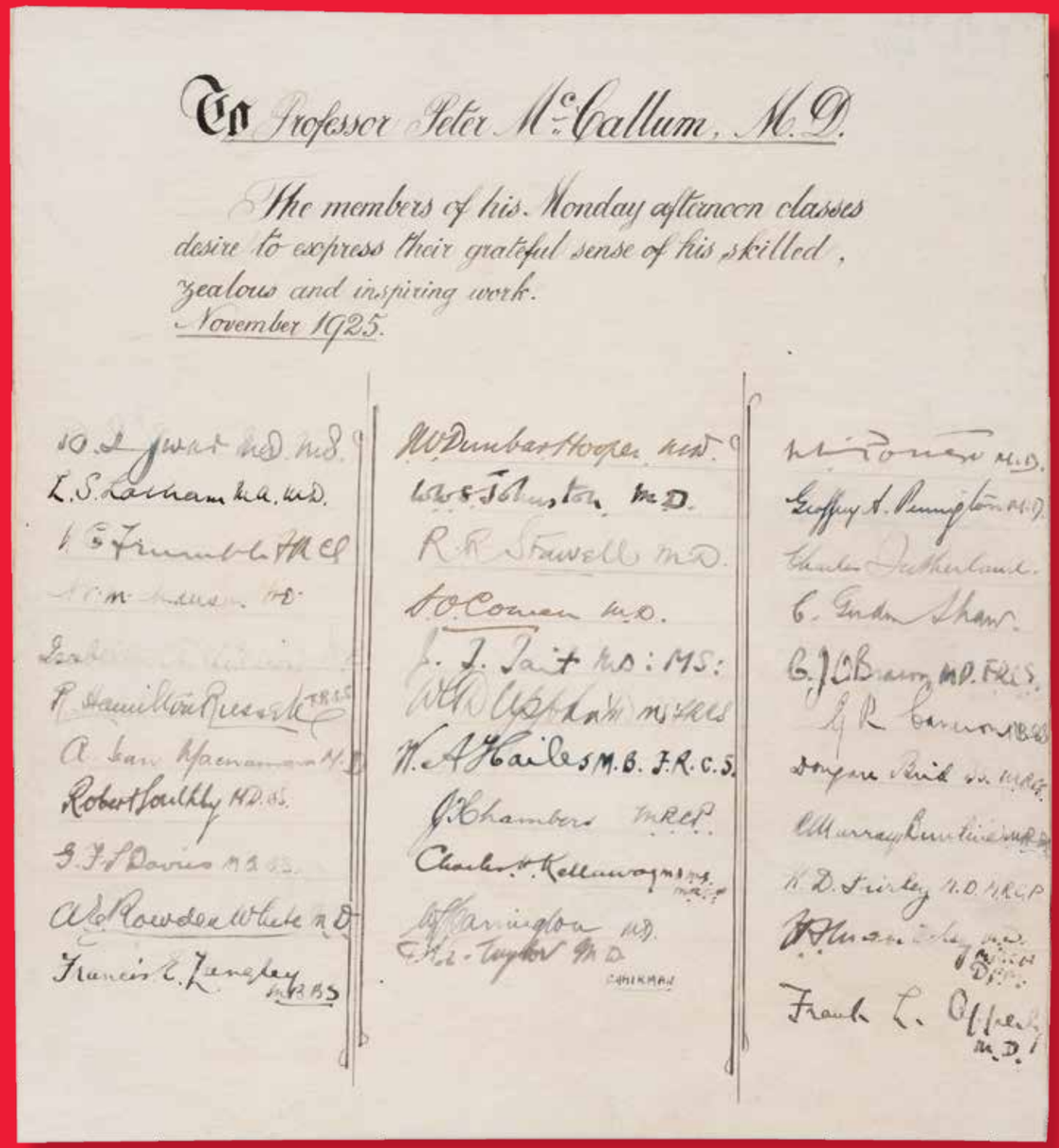
Cat. 26 Herman Fermor Lawrence (1863–1936), **'The relative low humidity of the atmosphere and much sunshine, as causal factor for the great prevalence of skin cancer in Australia'**, reprint from *Medical Journal of Australia*, 29 September 1928, Sydney: Australasian Medical Publishing Company Limited, 1928. MHMA0406, Australian Medical Association Archive, gift of AMA Victoria, 2011, Medical History Museum, University of Melbourne.
The first radium treatments in Australia were given in Melbourne by a dermatologist, Dr Herman F Lawrence, in 1903.

The strength of Melbourne's biomedical research community over the last century has been a cornerstone of the clinical successes seen in cancer control in Victoria. Our population experiences some of the best cancer survival rates anywhere in the world, equivalent to those in Canada, the United States and Sweden, and superior to most other countries—including the United Kingdom. The strength and depth of cancer research in Melbourne extends from the establishment of the Walter and Eliza Hall Institute for Medical Research at the start of the 20th century, through to the Victorian Comprehensive Cancer Centre in the 21st century. Raymond Snyder (pp. 25–6), Jonathan Cebon (pp. 13–17), Suzanne Cory (p. 100), Lili Belle Birchall (p. 86) and Richard Larkins (p. 126) outline the history of some important Victorian institutions.

Cancer pathology and diagnosis in Victoria took a major step forward with the appointment of Peter MacCallum as professor of pathology at the University of Melbourne in 1924. He joined other World War I veterans of the Australian Army Medical Corps to greatly improve the way cancer was diagnosed, characterised and managed in Melbourne in the 1920s and 1930s. Medical historian Ross Jones outlines MacCallum's many achievements on pp. 19–22.

Victoria has been at the forefront of cancer prevention since the early 1960s, when it started a dramatic reduction in tobacco consumption. Victoria often led national approaches to controlling smoking. As discussed by David Hill and Michelle Scollo on pp. 29–35 and Rob Moodie on pp. 41–4, Dr Nigel Gray and Dr David Hill from Cancer Council Victoria developed a comprehensive approach to tobacco control, with the innovation that included the active involvement of government along with careful research and documentation of success. Significant milestones included the banning of cigarette advertising in magazines, on television and billboards, and among sporting clubs, as documented by David Hill on p. 114. Progressive government legislation banning smoking in the workplace, and later in pubs and clubs, was combined with public campaigns warning of the dire health consequences of smoking. More recently, large increases in federal tobacco tax together with plain packaging of cigarettes (the latter described by Todd Harper on p. 116) have provided a comprehensive approach to tobacco control. The result is that smoking rates in Victoria are among the lowest in the developed world, at less than 13 per cent. And lung cancer rates in Victoria are now among the lowest in the developed world. Tobacco control also brings our population other substantial health benefits, as more than 30 types of cancer are attributable to tobacco, and smoking is also a major risk factor in many other diseases, including coronary artery disease and stroke. In the last few years Dr Bronwyn King has taken the battle to the world of high finance, through her campaign that urges banks, superannuation funds and other financial institutions to divest themselves of all investment in the tobacco industry (p. 118).

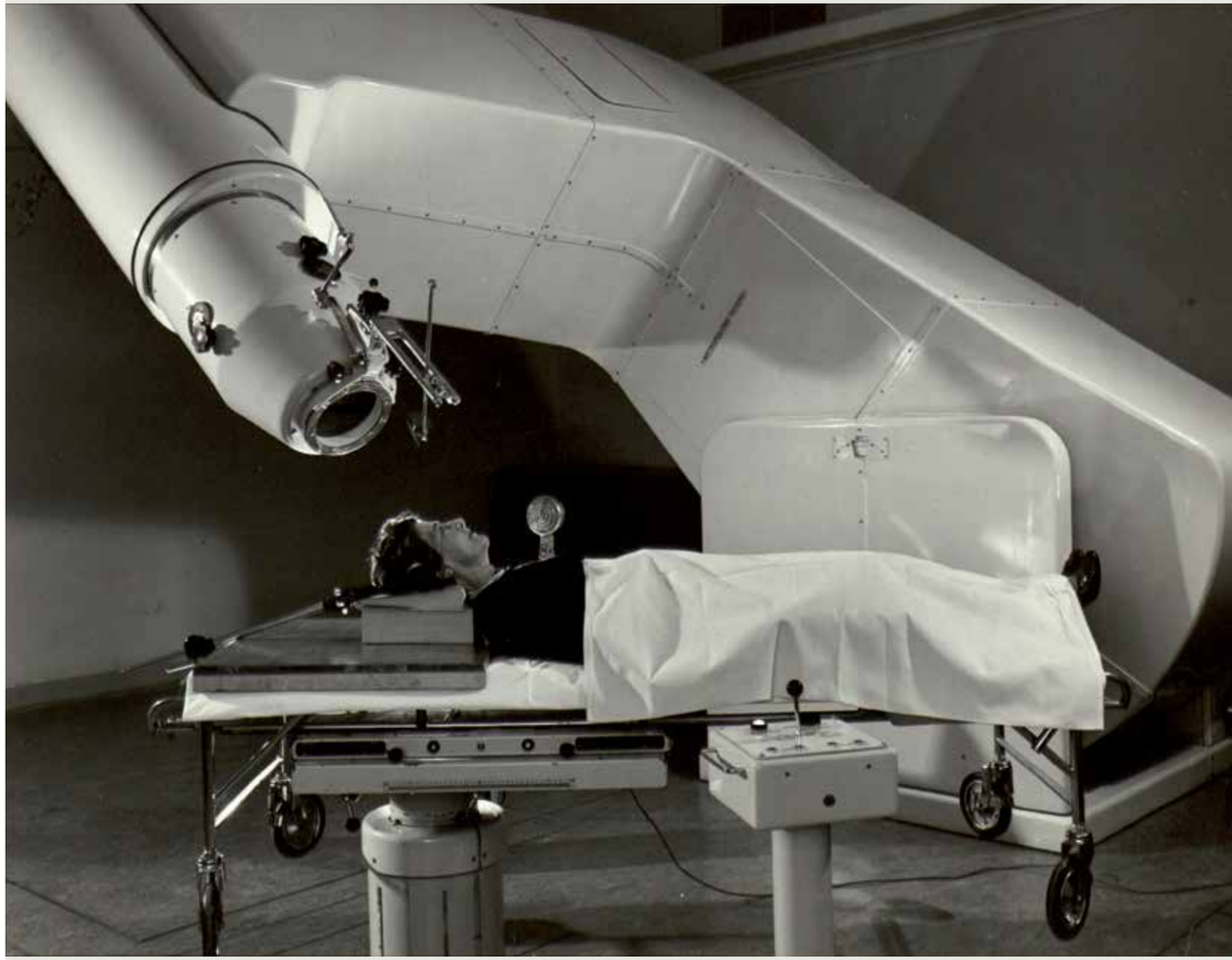
Cat. 11 Medical students, University of Melbourne, **Dedicatory epistle to Professor Peter MacCallum (1885–1974)**, November 1925, ink on paper, mounted, 35.6 × 30.4 cm. MHM01732, Medical History Museum, University of Melbourne.



Other ground-breaking innovations are also quite recent. An explosion of mustard gas in Naples Harbour in World War II and the accidental exposure of service personnel led to the recognition of these agents as potential anti-cancer drugs. Clinical trials in lymphoma and leukaemia followed, resulting in early cures and ushering in the era of modern chemotherapy. As discussed on p. 94 by Henry Ekert and pp. 25–6 by Raymond Snyder, Victorian pioneers Dr John Colebatch at the Royal Children's Hospital and Dr Ian Cooper at the Peter MacCallum Clinic conducted research on these new agents, making them quickly available to Victorian cancer patients and establishing national clinical trials groups. A rapid expansion of the specialist discipline of medical oncology in Melbourne in the 1980s led directly to the introduction of new anti-cancer drugs, early access to them through clinical trials research, and the organisation of cancer-specific national clinical trials groups. Melbourne-based researchers worked to make chemotherapy drugs less toxic by trialling new drugs or substantially mitigating their side effects. Early clinical trials were conducted in Melbourne as part of international collaborations, leading to the routine use of chemotherapy in early-stage disease in breast, bowel and lung cancer. Humanised monoclonal antibodies were a major step forward when tested in lymphoma and breast cancer. These innovations were often led by Melbourne researchers as part of major international clinical trials.

As discussed by Tomas Kron (pp. 47–51) and David Ball (p. 84), Melbourne has a long history of using radiation to treat cancer patients, which includes the establishment of a radium clinic at St Vincent's Hospital at the beginning of the 20th century and the installation of deep X-ray machines at the Royal Melbourne Hospital before World War II. In the 1950s the newly established Peter MacCallum Cancer Clinic was an early adopter of mega-voltage radiotherapy, with the ground-breaking installation of linear accelerators initiated by Dr Rutherford Kaye-Scott, Dr Roy 'Pansy' Wright and others. Innovations since that time have included the use of stereo-tactic (highly focused) radiotherapy, intensity-modulated radiotherapy, brachytherapy (especially in gynaecological cancers) and tomo-radiotherapy. The Victorian Comprehensive Cancer Centre alliance is likely to be the site of Australia's first proton-beam therapy facility, to be operated by the Peter MacCallum Cancer Centre. All these innovations make radiotherapy better tolerated, more targeted and thus more effective in the local control of cancer, with radiotherapy delivered more accurately and with fewer and less severe long-term side effects.

The early use of sophisticated, non-invasive imaging in cancer, including computed tomography (CT) scanning, magnetic resonance imaging (MRI) and positron emission tomography (PET), was led in Melbourne by Rod Hicks at the Peter MacCallum Cancer Centre and Andrew Scott at Austin Health. For the first time, these new techniques enabled medical carers to accurately diagnose the stage that a patient's cancer had reached and



Wolfgang Sievers (Germany/Australia, 1913–2007), ***4 million electron volt linear accelerator at the Peter MacCallum Clinic***, c. 1959, gelatin silver photograph, 18.9 × 24.5 cm. H88.40/989, gift of Sunbury Heritage Society 1985, courtesy State Library Victoria.

the spread or extent of their disease. This helped avoid unnecessary surgery and allowed accurate assessment of the effect of cancer treatments, including documentation of the length of remissions. The research underpinning these advances in Melbourne included the study of novel radio-pharmaceuticals, combining imaging techniques, and the use of these imaging techniques when assessing new, targeted anti-cancer agents.

New technologies hold great promise to build on Melbourne's substantial legacy of successful cancer research and its translation to new, evidence-based clinical treatment programs. As explained by Sean Grimmond (pp. 69–70), Fabienne Mackay (p. 110) and Jane Visvader (p. 124), genomics of cancer, underpinned by information technology, have already revealed that many cancers evolve with complex genetic abnormalities. Genomics will increasingly be able to identify individuals at high risk, thus giving time for early prevention. Genomics offer very important lines of inquiry that are already leading to successful new anti-cancer treatments. Melbourne researchers are again in the forefront of international collaboration on large genomic data sets. For instance, new, targeted anti-cancer drugs have been developed here following the discovery and characterisation of the Bcl-2 gene. Melbourne researchers have led international clinical trials in targeted anti-cancer agents for a range of cancers, and in the introduction into therapeutics of immune checkpoint inhibitors—a new anti-cancer drug. These latter innovations are already bringing great benefits to patients suffering from advanced cancers. Genomics offer the ability in future to fully characterise the unique features of each person's cancer and, in turn, to provide bespoke individualised therapy matched more precisely to the patient's profile. It is likely that side effects will also be much better understood in advance, to allow the most suitable therapies to be given to patients, with substantially lower treatment toxicity. Cancer nursing has also made great strides in the past few decades and, as Mei Krishnasamy tells us, is now a branch of science in its own right (pp. 57–9).

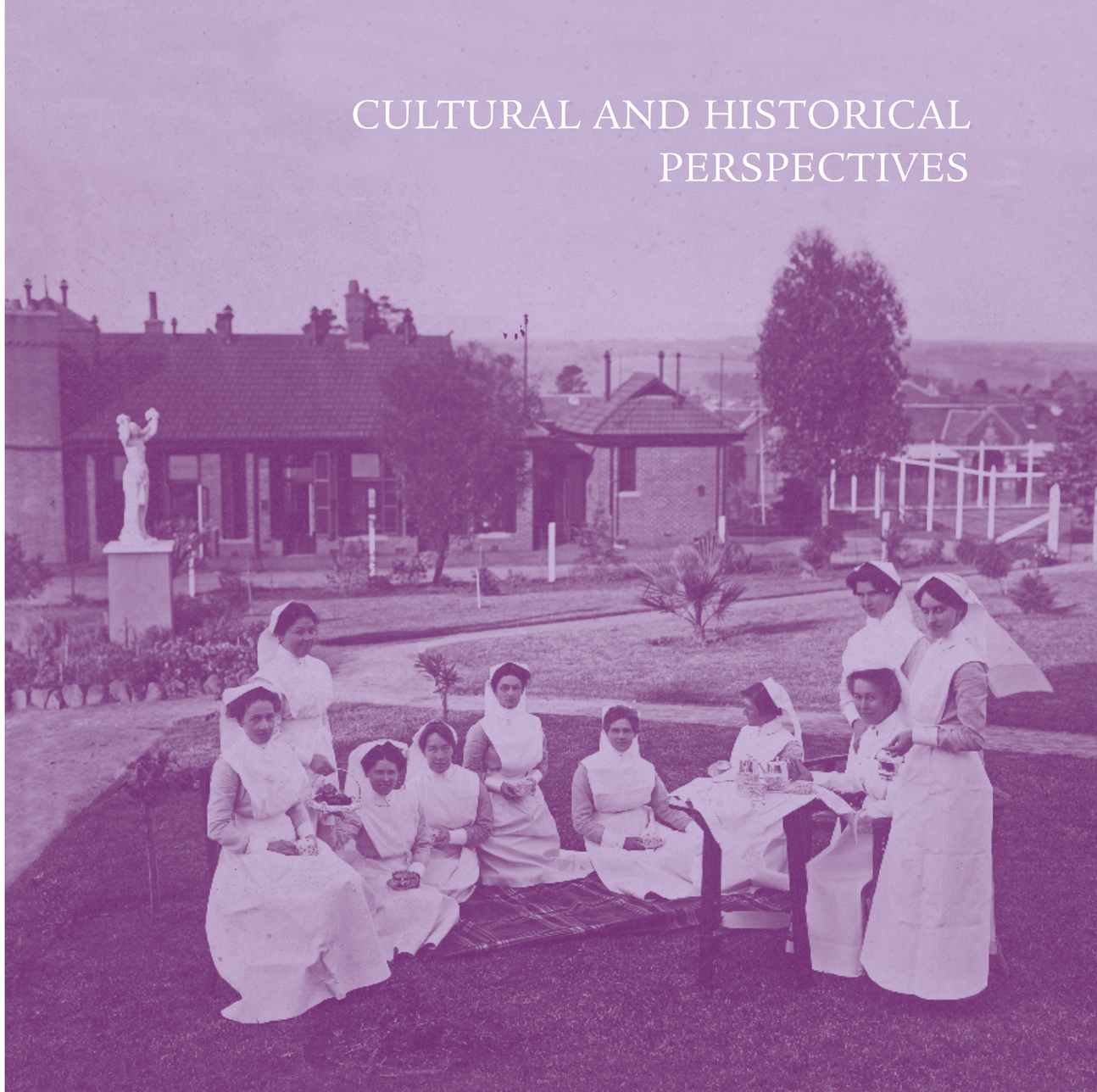
Despite these many significant advances in research, diagnosis, therapies and care, cancer treatment can still be a very difficult time for patients. The works of three Melbourne artists who have contended with this frightening disease—Polixeni Papapetrou, Kristin McFarlane and the late Leslie Morgan—tell us much about the physical, psychological, spiritual and social struggles of many cancer sufferers (pp. 128–43). Breast cancer advocate Lyn Swinburne recalls early efforts to set up support groups for patients and their families and raise community awareness of the need for more research and services (pp. 37–9).

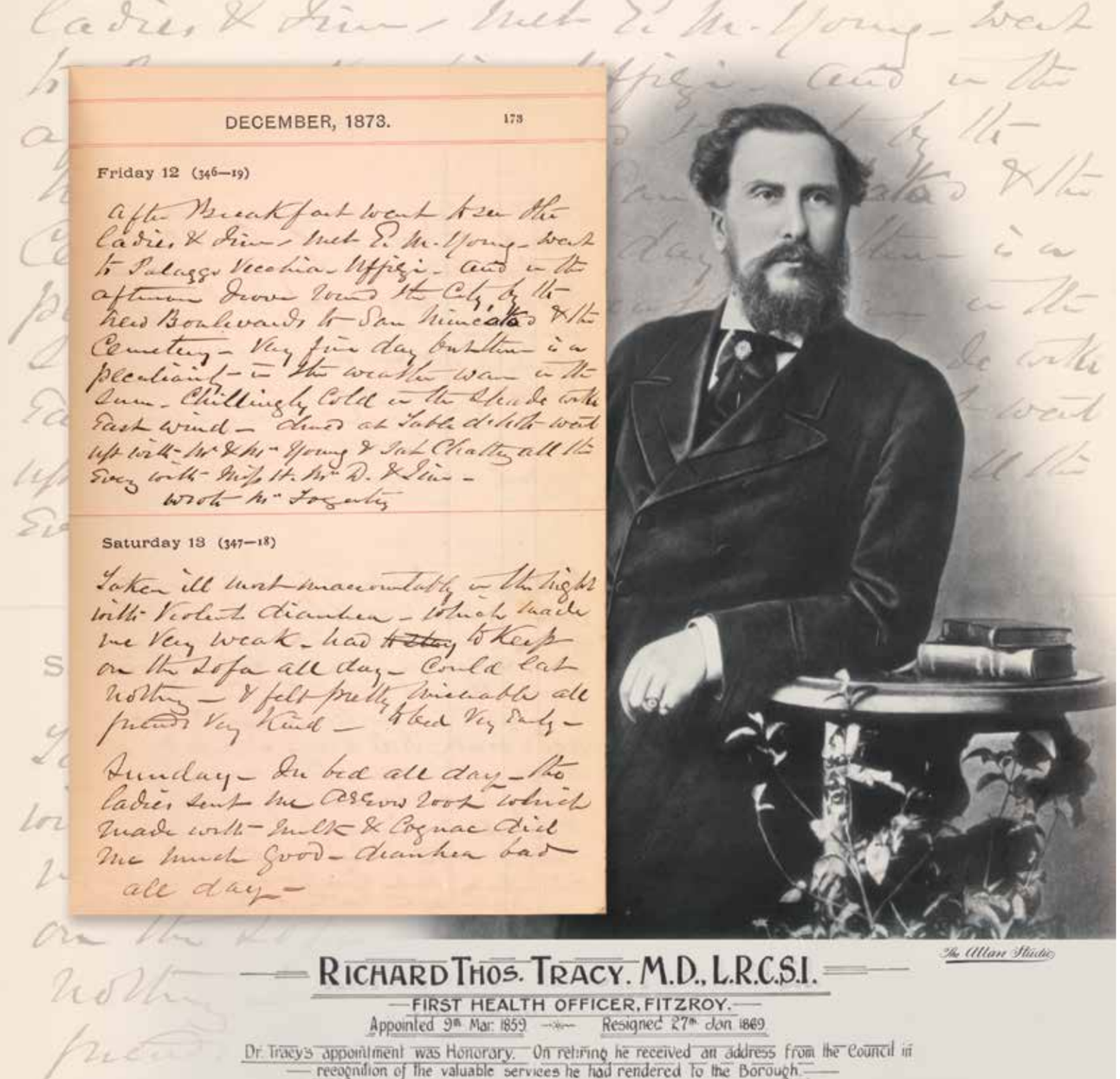
Victoria's cancer researchers, clinicians, philanthropists, carers and advocates over the past 160 years have much to be proud of. The continuing development of exciting new tests, technologies and treatments, as well as active campaigns to encourage healthy behaviour in the community, will continue to benefit people suffering from or at risk of cancer—both here and abroad.

Professor James F Bishop, AO

Cat. 105 ***Matron entertains sisters 1916–1917 to tea on the lawns***, 1917, photograph, 16.0 × 12.0 cm. Austin Hospital Collection.

CULTURAL AND HISTORICAL PERSPECTIVES





Cancer: A historical perspective

When Dr Richard Tracy, MD, aged in his early 40s, developed intermittent pain on the right side of his spine, he adopted a wait-and-see approach. The year was 1870, and the highly respected co-founder of the Melbourne Lying-In Hospital and Infirmary for Diseases of Women and Children (later the Royal Women's Hospital) had little choice. Diagnostic techniques such as X-rays had yet to be invented, and decades would pass before complex exploratory surgery of the spine was safe.

Two years later, Tracy's pain was more constant, and he had lost weight, was experiencing dyspepsia and insomnia, and felt so ill he had to spend a week in bed. His life story to that stage had been one of achievement: an elected honorary fellow of the Obstetrical Society of London, a confidant of leading British surgeons, a mover and shaker in local medical politics, and a participant in a new and hopeful story of surgery for gynaecological cancers.

But Tracy's symptoms perturbed him, so he took leave from his busy hospital and Collins Street practices and from his appointment as a lecturer and examiner at the Melbourne Medical School. He sailed for Europe in March 1873, his once robust good looks already having a frail edge. The sea air boosted his joie de vivre, but the dull, aching pain in his back persisted. He reconnected with extended family in Ireland, attended specialist lectures in centres of medical excellence across Britain, and received a second prestigious fellowship in London.

When in late 1873 he lost nearly 18 kilograms in just three months, he consulted some of England's top medicos. They gave him little cause for hope, suggesting a deep-seated, inoperable cancer.

During his hastily organised voyage home, Tracy's condition deteriorated further and, for the first time, he felt a small round lump in his abdomen. During the remaining seven months of his life, this lump and the pain that now gripped his entire being 'like a chain gradually tightened ... inside' became the subjects of a detailed medical record that included daily reports of his situation and of his desperate search for pain relief. In effect, it was a vividly told natural history of cancer.

Foreground: Cat. 64 Richard Thomas Tracy (1826–1874), **Diary**, 1873, cloth, paper, ink; 19.0 × 12.0 cm. A2000_14_001, Royal Women's Hospital Collection, Medical History Museum, University of Melbourne.

Background: The Allan Studio (Melbourne), ***Richard Thos. Tracy. M.D., L.R.C.S.I., First Health Officer, Fitzroy***, n.d., reproduced 1966, photograph (reproduction), 31.0 × 25.0 cm. H28628, courtesy State Library Victoria.

Though written nearly 150 years ago, the record of Tracy's final months of life mirrors the plight of patients today with inoperable cancers and inadequate pain control in a surprisingly large number of countries. Up to 90 per cent of pain relief from opium-derived therapeutics is consumed in countries with only 10 per cent of the world's population. And even when such products are available, pain relief may be inadequate. Tracy's travail, from becoming aware of his symptoms to experiencing a largely unmet desire for their relief, is still that of many of the world's cancer sufferers, but thankfully rarely in Victoria.

Cancer might seem like a 'modern' illness, but palaeopathologists have found evidence of it in the ancient world, preserved in a small number of desiccated mummies. The first written descriptions of cancer and its contribution to human suffering come from the Egyptian physician Imhotep in about 2600 BCE, but the word 'cancer' comes from Hippocrates (c. 450–370 BCE). He likened the long veins emanating from lumps in the breast to a crab (*karkinoma* in Greek, *cancer* in Latin), suggesting notions of both a core of abnormality and its spread.[1]

Hermann Boerhaave (1668–1738), often called the Dutch Hippocrates, postulated that cancer was caused by stagnation of body fluids such as blood, causing inflammatory tissue lesions. But by Tracy's time, understandings of cancer were shifting from a disease of abnormal tissue to a disease of abnormal cells, thanks to 19th-century advances in microscopy. Researchers and clinicians have subsequently reached a consensus on cancer's typically wayward and wild cell divisions, which manage to evade the body's immune surveillance system, enabling abnormal cells to spread into nearby tissues or to far-flung regions (metastasis). Whether a cancer remains localised or has metastasised largely determines the treatment offered to a patient—and their chances of survival.

These more recent insights have underpinned a significant boost in survival from many cancers, in many countries. In Australia in 2009–13, individuals diagnosed with cancer had a 68 per cent chance of surviving for at least five years, compared with the general population. In 1984–88, the comparable figure was 48 per cent, so the strides made have been substantial. Among the 10 most commonly diagnosed cancers, five-year survival is currently highest for prostate cancer, thyroid cancer and melanoma of the skin, and lowest for lung and pancreatic cancers. Rising survival rates seem to be due to improved protocols for, and better access to, treatments such as surgery, radiation therapy, chemotherapy and lately immunotherapy, together with supportive care and earlier detection. Nonetheless, cancer continues to take its toll—47 500 deaths in Australia estimated for 2017—and brings a hefty burden of disability and psychosocial harm.[2]

Despite a general trend towards improved cancer survival rates, the total number of people in Australia receiving cancer treatment continues to grow, as indicated by more than one million cancer-related hospitalisations in 2014–15, due largely to our ageing population. In 1874, when Tracy died, Australian life expectancy at birth was 47 years for males and 50 for females. Today, the corresponding figures are 81 and 85 years, meaning that cancer-related behaviours and habits, as well as genetic vulnerabilities and exposure to carcinogens, have more time to take effect. Predictions that this trend will continue have contributed to higher priority and more resources for cancer prevention. Public education campaigns aimed at reducing risk by changing behaviour—smoking and sunlight exposure, for example—have helped many individuals take preventive action. Information about a family history of cancer, or a genetic susceptibility to it, has also steered some at-risk individuals towards cancer screening and surveillance programs.

While the story of scientific progress in cancer research, prevention, treatment and symptom palliation has become an increasingly strong thread running through the historical record, another—and in some ways related—shift in thinking about cancer has to do with its visibility. Tracy played a role here, authorising his treating doctor to provide a full and frank account of his cancer-induced torments, which methods helped him cope (and which ones didn't), in a confronting obituary published in the *Australian Medical Journal* in 1874. At a time when much communication about cancer was couched in language designed to conceal its presence and protect 'refined' sensibilities, Tracy's medical colleagues and students were spared no detail, including his post-mortem results, which revealed 'an enormous cancerous mass ... in the abdomen, involving a considerable portion of the small intestine'. Several cancerous deposits found near the right side of his spine invited speculation about whether these were the primary site.

Increasing awareness of cancer was gradually reflected in the names of organisations dealing with the disease. By the time Tracy died, the word 'cancer' was starting to be used in Britain.[3] In many other countries, including Australia, its use in the titles of such institutions started some decades later.

Richard Tracy's story reminds us that, even when cancer oppresses those it touches, what we do with the encounter can really make a difference.

Dr Ann Westmore

1 S Mukherjee, *The emperor of all maladies: A biography of cancer*, London: Fourth Estate, 2011, pp. 47–9.
2 Ibid.
3 D Cantor, 'Cancer', in WF Bynum and R Porter (eds), *Companion encyclopedia of the history of medicine*, vol. 1, London: Routledge, 1993, pp. 547–50.

The Austin Hospital: The birth of hope

The hospital for incurables

In the late 19th century, death from cancer was grim. Surgery was primitive, with antisepsis achieved with carbolic acid: this was sprayed over operating rooms and instruments, and surgeons dipped their beards into it. There was no radium, no chemotherapy and no antibiotics. Patients could expect to die with suppurating ulcers and poorly controlled pain—sedation with opiates was the best they could hope for.

Against this background, Mrs Elizabeth Austin (1821–1910), a widow from Barwon Park at Winchelsea, donated £6000 to establish a hospital for 'incurables' (sufferers of cancer, tuberculosis or paralysis). She was motivated by the illness of her cook who, as an immigrant with an incurable disease, had as her only option the badly equipped prison hospital. The Austin Hospital for Incurables opened in 1882; its 22 cancer beds received patients from rural Victoria, as well as from the Melbourne and Alfred hospitals. It was generally seen as a brief stopping place before death.[1]

The emergence of diagnostic and therapeutic radiation

In 1895, Wilhelm Roentgen discovered X-rays; two years later, Pierre and Marie Curie discovered radium. These breakthroughs rapidly led to new industries. Early pioneers of skiagraphy (radiology) had appointments at the Austin: FJ Clendinnen was honorary skiagraphist. In 1906 a gift of X-ray therapy apparatus was received and used to treat cancer, presumably offering some value in cases of superficial tumours. FJ Clendinnen's son, LJ Clendinnen, treated Austin patients in his Collins Street rooms, using deep X-rays. This must have benefited his patients, as in 1923 funds were sought to purchase diagnostic and therapeutic X-ray apparatus. In 1924 the David and Annabelle Syme X-ray Pavilion was built at the Austin, and housed a deep X-ray plant, diathermy machine and facilities for diagnostic X-rays.

Dr Hugo Flecker was honorary radiologist at the Austin from 1923. He also practised as a radiotherapist in Collins Street. Flecker journeyed by camel to Radium Hill in South Australia, where he successfully searched for radioactive ore, using a gold-leaf electroscope. Several years later, Flecker sought permission from the hospital to buy additional radium in London. When his request was turned down, Meyer Zeltner, a member (and later president) of the hospital's committee of management arranged to personally purchase the radium.

Foreground: **Austin Hospital, Heidelberg** [elevated view with clocktower], c. 1890, watercolour and ink on cream card, 9.0 × 11.0 cm. H13945, courtesy State Library Victoria.

Background: Cat. 104 GWR Johnson, architect (1840–1898), ***Incurables Hospital, Heidelberg: Ground plan*** (detail), c. 1876, ink on paper, 78.5 × 60.5 cm. Austin Hospital Collection.

Zeltner served on the committee from 1919 and endowed Zeltner Hall in memory of his wife's mother. Now the Wellness Centre at the heart of the Olivia Newton-John Cancer Wellness and Research Centre, the hall was built as a place for entertainment and religious events. Large side doors enabled patients to be wheeled in from the wards. During the 1920s a bioscope, or travelling cinema, projected films loaned by Paramount and Majestic Pictures.

Zeltner believed that it was disgraceful to include the word 'Incurable' in the hospital's name, as it removed all hope. He lobbied to have this changed and, in 1926, the Austin became the Hospital for Incurable and Chronic Diseases. As reported in *The Argus*, 'The new title would show that in many cases there is no reason for the fear that there was no hope of recovery'.

Rupert Willis: medical superintendent and pathologist

In 1927, Dr Rupert Willis was appointed medical superintendent of the hospital; he oversaw many changes, marking the transition to a new era for the Austin. At heart, Willis was a pathologist, and he saw the Austin as a treasure trove of unexplored pathology. He performed hundreds of post-mortem examinations there, which led to his classic 1934 publication *The spread of tumours in the human body*.[2] In 1935 he was awarded the David Syme Research Prize for this work.

As medical superintendent, Willis reported that radiation treatments relieved pain and considerably prolonged life in many cases. So rather than being a place for the dying, the Austin became a hospital that could offer a measure of effective palliation. During the 1930s, additional radium was purchased, radon needles added to armamentarium, and by the mid-1930s the deep X-ray plant was reported as working to capacity. Appeals were made to get cancer patients to hospital earlier in the hope of curing them, and funds were raised to expand the hospital.

In its 1934 annual report the hospital was described as a refuge and, in many cases, one where patients were 'to be placed on the road to recovery'. The name was changed again, in 1933, to the Austin Hospital for Cancer and Chronic Diseases, which by 1935 was described as the largest cancer hospital in Australia. In 1936, during the Seventh Australian Cancer Conference, different methods for treating cancer were demonstrated there.

Radiotherapy equipment and techniques at the Austin were progressively updated so that, by 1942, 140 beds were under the care of the hospital's radiotherapist, who also treated outpatients. In 1945 Dr Rutherford Kaye-Scott was appointed radiotherapist. He had worked with LJ Clendinnen at the Melbourne Hospital and brought an approach to the treatment of cancer based on sound pathological principles. He was a member of the Anti-Cancer Council's executive committee and during the 1930s, together with Professor Peter MacCallum, had developed a plan to increase facilities for the diagnosis and treatment of cancer, institute comprehensive follow-up records, and support research.

Systemic cancer therapies

In the early years of the Austin Hospital there is an account of a patient being injected with an 'anti-cancerous fluid' that caused spreading infection and death from bleeding. This may be a description of the use of bacterial toxins, an approach developed by the New York surgeon William Coley in the 1880s, widely acclaimed as an historical forerunner to modern-day cancer immunotherapy. If so, it is an extraordinary quirk of history that the first and possibly only account of Coley's toxins being administered in Australia should have been at the hospital that many years later was to pioneer immunotherapeutics as part of the clinical trials program of the Ludwig Institute for Cancer Research.

The first reports of systemic treatment during Willis's tenure included the use of colloidal lead. This was thought to limit the invasiveness of cancer cells, based on observed similarities between cancer and placental cells, and the known abortion-inducing properties of lead salts. By all accounts it was ineffective.

In 1948 Kaye-Scott returned from the USA and introduced new forms of treatment based on nitrogen mustard, a derivative of mustard gas used in warfare. Two years earlier, Yale University pharmacologists Louis Goodman and Alfred Gilman had published their research on nitrogen mustard; first in mice, and later in a patient with lymphoma, it was found to reduce tumour masses. These were the beginnings of chemotherapy.

In the late 1940s, Kaye-Scott opened an outpatient department at the Austin. For the first time since the hospital's inception, patients referred there to die were improving sufficiently to go home.

Peter MacCallum Cancer Institute

Since cancer treatment proved so successful, discussions took place between the Anti-Cancer Council of Victoria, the Austin and the Victorian government, to establish a central radiotherapy institute. This led to the *Cancer Institute Act 1948* for the provision of radiotherapy and the establishment of the Peter MacCallum Clinic.

Two board positions were reserved for Austin representatives, in recognition of the hospital's early role, and close links were maintained between the two organisations. For instance, Sir Harold Stokes, president of the Austin, was also chair of the Cancer Institute board from 1952 until 1972. From 1963 the Cancer Institute took over the provision and staffing of radiotherapy services at the Austin.

Walter Moon and multidisciplinary care

In 1957 Dr Walter Moon was appointed as the Austin's medical superintendent. The death of his wife from cancer five years earlier had left him with five children and an abiding interest in cancer care. He was a pioneer of palliative care, which arose out of his insistence that his patients should spend as much time as possible out of hospital. Moon collaborated with FH Shaw, professor of pharmacology at the University of Melbourne, to study the use of the respiratory stimulant THA (tetrahydroaminacrine) to reduce the sedative effects of

morphine. Together with surgeon Victor Stone, Moon believed that care could be improved by coordinating resources and discussing patients together. Physicians, surgeons and radiotherapists would meet to discuss cases. Additionally, rehabilitation services provided by nurses, social workers, physiotherapists and occupational therapists enabled patients to go home on weekends. These early multidisciplinary teams were visionary for the era. Moon's skills as a clinician resulted in appointments at the Royal Melbourne Hospital in 1972, where he introduced the same concept of team management, and later at the Peter MacCallum Clinic.

Recent years

In 1965 the Austin became a teaching hospital of the University of Melbourne, establishing chairs in medicine, surgery, pathology, medical microbiology, and obstetrics and gynaecology. Cancer and immunology research were a focus of Professor Ian McKenzie and his team, initially as a University of Melbourne department and later as the Austin Research Institute, which occupied the Kronheimer Building, formerly the men's tuberculosis ward. Cancer medicine was viewed as a vestige of the Austin's past, and languished until a partnership with the international Ludwig Institute for Cancer Research was established in 1991. The Joint Austin-Ludwig Oncology Unit opened under the directorship of George Morstyn. His leadership then passed to Jonathan Cebon who, together with Andrew Scott, nurtured an innovative program of cancer trials, focusing on biologics, monoclonal antibodies, and cancer vaccines. The Austin's merger with the Repatriation General Hospital in 1995 expanded cancer services dramatically, and John Zalcberg was appointed as director of cancer services. He later became director of medical oncology at the Peter MacCallum Cancer Institute.

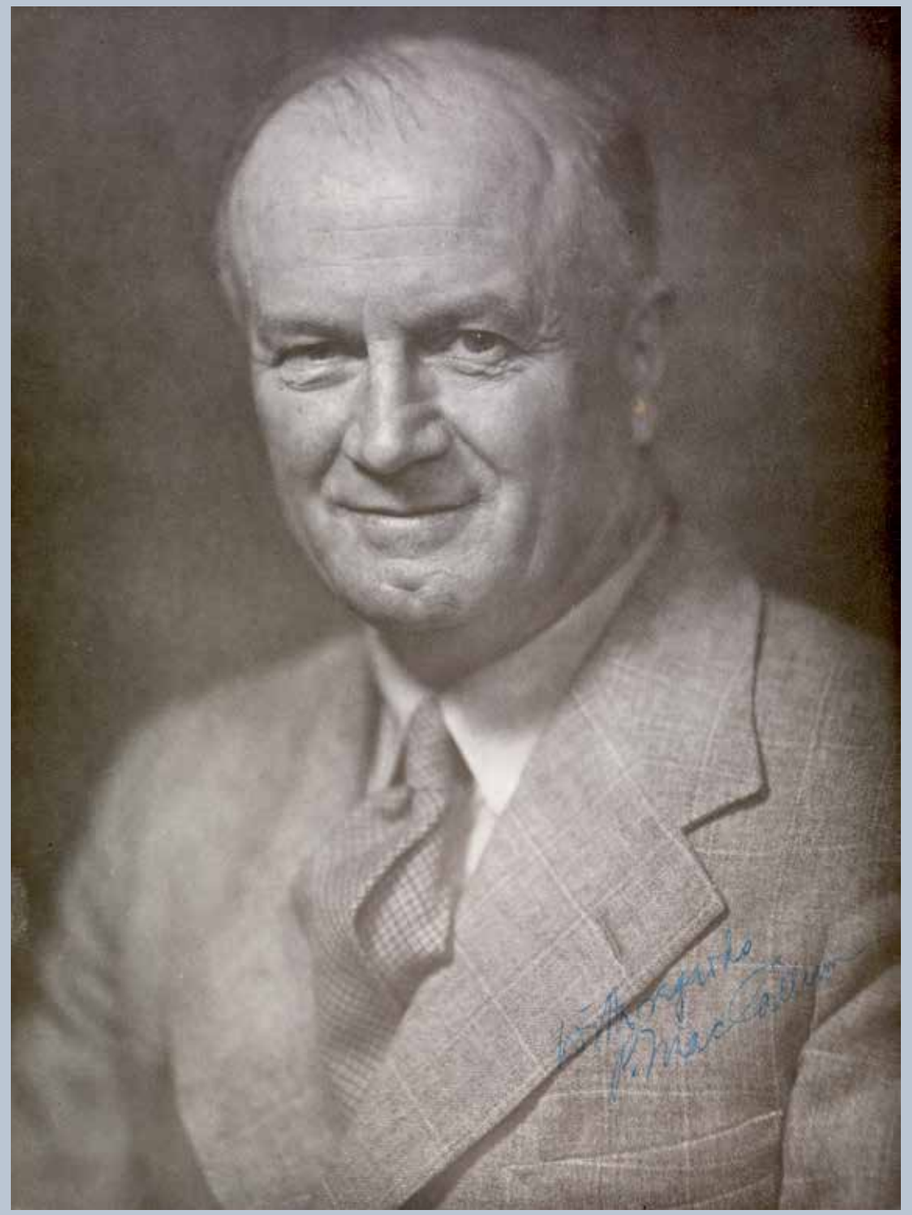
In 2003 an appeal to establish a new cancer centre at the Austin was launched with the support of entertainer Olivia Newton-John. A decade later the Olivia Newton-John Cancer Wellness and Research Centre was established. Nearly $200 million was raised from the Victorian and Australian governments and the public. The centre provides a comprehensive range of services for cancer treatment, education, training and research, including the Wellness Centre in Zeltner Hall. The inclusion of wellness reflects the centre's ethos of patient wellbeing as an essential element of cancer care.

The Olivia Newton-John Cancer Research Institute opened in 2014, upon the withdrawal of the Ludwig Institute. The strategic co-location of research laboratories and research training in a clinical environment enables clinicians and researchers to work together to integrate clinical medicine with basic and translational cancer research—all for the ultimate benefit of patients with cancer.

Professor Jonathan Cebon

1 This brief account has largely been adapted from EW Gault and A Lucas, *A century of compassion: A history of the Austin Hospital*, Melbourne: Macmillan, 1982.
2 RA Willis, *The spread of tumours in the human body*, London: J & A Churchill, 1934 (second and third editions and numerous reprints to 1990).

Cat. 106 Flora Lion (English, 1878–1958), **Mr Meyer Zeltner (1862–1950)**, c. 1940, oil on canvas, 95.0 × 85.0 cm. Austin Hospital Collection.



Peter MacCallum: Change agent and institutional architect

Sir Peter MacCallum, MC (1885–1974) is a towering figure in the history of cancer research, treatment, campaigning and support in Australia.

MacCallum was born in Glasgow, a grocer's son. Before the child's first birthday, the family emigrated to Christchurch, New Zealand, where his father became branch manager of the Singer Sewing Machine Co. Young Peter won scholarships to Christ's College and then to Canterbury College (BSc 1907; MSc 1908; MA 1909). At university he gained an exhibition in biology, and prizes in athletics and rugby.[1] His ambition was to study medicine, and in 1910 he worked his passage to England as a coal-trimmer on a cargo boat. At the University of Edinburgh (MB ChB 1914) he obtained first-class honours in most subjects, and prizes in three, as well as in athletics and rugby.

Just a few weeks before MacCallum graduated, Archduke Franz Ferdinand was assassinated. MacCallum's brief excursion into general medical practice, which involved 'a queue out to the gate to greet me, a push bike to get around the practice, a waiting list of calls, prescription writing and dispensing to do, and a diphtheria epidemic in progress',[2] was cut short when he signed up for military service. On 17 March 1915 he was appointed lieutenant, RAMC Special Reserve, and in October was promoted to captain. For bravery on the Western Front he was awarded the Military Cross and was twice mentioned in dispatches, finally being evacuated to England in 1918 after being gassed.

After taking home leave in New Zealand, MacCallum returned to Scotland with his fiancée, Bella Dytes Jennings (née Cross), a 33-year-old war widow and the first woman to receive a Doctor of Science in New Zealand.[3] They were married in Edinburgh in 1919. He became a lecturer in pathology and she in botany. Appointed clinical pathologist at the Royal Infirmary, MacCallum undertook research at the Royal College of Physicians of Edinburgh, of which he was elected a member (1934) and a fellow (1953). He also taught at Glasgow's Royal College of Physicians and Surgeons, where he obtained a diploma of public health in 1923.

In 1924, Professor Sir Harry Brookes Allen retired after 42 years as chair of pathology at the University of Melbourne. An international search ensued, and MacCallum was offered the position. He had also been offered a chair in South Africa, but chose Melbourne.

Cat. 13 Julian AR Smith (1873–1947), **Professor Peter MacCallum (1885–1974)**, 1941, photograph, 21.1 × 15.9 cm (image). MHM00331, Medical History Museum, University of Melbourne.

It must have been with curiosity and perhaps trepidation that the students of the Melbourne Medical School greeted their new professor of pathology in 1925. Since 1862, the key pre-clinical subjects of anatomy and pathology had been controlled by just three men in succession: George Halford, Harry Brookes Allen and Richard Berry. Under the title 'Pathological change', the medical students' magazine *Speculum* announced that MacCallum must have been:

> possessed of more than his fair share of that vague quality which the Americans inadequately call 'pep,' and which we, with greater erudition, but no more adequacy, call 'personality.' And this is, above all things, a requisite for a teacher in the Medical School, where personal influence and example count almost as much as learning.[4]

When he took over after Allen's long reign, MacCallum was horrified to discover that he had only £250 per annum to run the entire department, including paying for research.[5] The endless complaint of the professors in medicine during this period was of over-crowding and overwork, thus restricting opportunities for research.[6] MacCallum returned to this theme throughout his life, even in the 1950s and 1960s, during fierce debates about shortages of general practitioners and the need to expand the Medical School.[7] He tried to overcome the deficiencies in research opportunities, funding and infrastructure by forging close relationships with hospital pathology departments, particularly with Edgar King, who would later succeed him in the chair of pathology.[8] He also threw himself into re-aligning the Medical School with clinical practice and the broader community. In his first address to the Medical Students' Society, titled 'The mission of the medical man', MacCallum emphasised the need for medicine to be more than just scientific research or a means to making an income: 'Thus medicine, alone in the professions, could claim to be altruistic, inasmuch as it works for the elimination of the need for medicine'.[9]

An important early theme in MacCallum's mission was to further the work of the Anti-Cancer Council of Victoria, set up as a charitable foundation in 1936. In 1937 he spoke on the radio to urge the community to give £100 000 to the Anti-Cancer Appeal, so that:

> by providing throughout the State, increased facilities for diagnosis and treatment, and, when necessary, defraying the expenses of attendance at hospitals and clinics, to afford every opportunity for bringing the best that modern knowledge and ingenuity can devise, for the alleviation of the condition of those persons, who may be discovered to be suffering from cancer.[10]

Cat. 111 Parliament of Victoria, ***Anti-Cancer Council Act 1936***. File 95.3 B0000114111, Cancer Council Victoria Collection.

1936.

VICTORIA.

ANNO PRIMO

GEORGII SEXTI REGIS.

No. 4446.

An Act to make provision with respect to the Incorporation of an Anti-Cancer Council of Victoria and the Objects and Powers thereof and for other purposes.

[23*rd December*, 1936.]

Preamble. WHEREAS it is expedient to provide for the incorporation for the purposes of this Act of a body corporate with the corporate name of the Anti-Cancer Council of Victoria and for the constitution powers and duties thereof and of the several committees to be constituted under this Act and also to make provision with respect to the several matters hereinafter provided for: Be it therefore enacted by the King's Most Excellent Majesty by and with the advice and consent of the Legislative Council and the Legislative Assembly of Victoria in this present Parliament assembled and by the authority of the same as follows (that is to say):—

Short title. 1. This Act may be cited as the *Anti-Cancer Council Act* 1936.

Interpretation. 2. In this Act unless inconsistent with the context or subject-matter—

"Council." "Council" means the Anti-Cancer Council of Victoria incorporated by this Act.

"Committee"

15901—PRICE 1s.

The appeal raised just over half the target sum.[11]

The following years saw many lost opportunities, not least interruption by World War II. But finally, in 1943, expert advice sought from England moved the Victorian government to make a budget allocation for the work of MacCallum and his collaborators.[12]

MacCallum expended prodigious energy to bring about change. Along with Dr Rutherford Kaye-Scott, he convinced the Victorian government to set up the state's first dedicated cancer centre, the Cancer Institute, in one room at the Queen Victoria Hospital. The inaugural meeting of the board was held on 27 April 1949, with the first outpatient clinic named in his honour in 1950. In 1986 the name was changed to the Peter MacCallum Cancer Institute, which had grown to occupy 11 sites across Melbourne. These facilities were consolidated in 1990 on the site of the former St Andrew's Hospital in East Melbourne, and by 2016 had relocated to new premises in the Victorian Comprehensive Cancer Centre, near the University of Melbourne.

Peter MacCallum retired in 1951 and was knighted in 1953, but he continued his work until his death.[13]

Dr Ross Jones

1 For biographical information, see LB Cox, 'Peter MacCallum: A saga', in *The Melbourne School of Pathology: Phases and contrasts*, Department of Pathology, University of Melbourne, 1962, pp. 163–75; JS Guest, 'MacCallum, Sir Peter (1885–1974)', *Australian dictionary of biography*, vol. 15, Melbourne University Press, 2000.
2 Cox, 'Peter MacCallum: A saga', p. 166.
3 Ibid, p. 165.
4 'Pathological change', *Speculum*, no. 116, June 1925, p. 28.
5 KF Russell, *The Melbourne Medical School: 1862–1962*, Melbourne University Press, 1977, pp. 138, 155.
6 For a fascinating insight into this and MacCallum's role, see R Priestley, *The diary of a vice-chancellor: University of Melbourne, 1935–1938*, ed. R Ridley, Melbourne University Press, 2002.
7 See RL Jones, *Humanity's mirror: 150 years of anatomy in Melbourne*, Melbourne: Haddington Press, 2007, pp. 229–30; Russell, *Melbourne Medical School*, p. 193.
8 Russell, *Melbourne Medical School*, pp. 155–6.
9 P MacCallum, quoted in 'The mission of the medical man', *Speculum*, no. 116, June 1925, p. 44.
10 P MacCallum, 'Talk to be broadcast from 3 A.R. on Wednesday, 14th April, 1937, 10 p.m. to 10.10 p.m.'. Cancer Council Victoria Collection (cat. 114).
11 Peter MacCallum, Draft speech, 1950. Prepared for the opening of Melbourne's first cancer clinic. Folder 24e, 1975.0042, Peter MacCallum Collection, University of Melbourne Archives (cat. 78).
12 Ibid.
13 For example, as chairman of the Victorian Cancer Congress in 1960.

Peter MacCallum with patient and colleague and a linear accelerator, c. 1959. Courtesy Peter MacCallum Cancer Centre.

Medical oncology: A brief history, 1960–1980

The early development of medical oncology in Victoria reflects that in other parts of the world.[1] In the 1960s and 1970s, academic medicine in Victoria was dominated by haematologists. During these decades, major progress was being made in the treatment of leukaemia and lymphoma, using a small number of chemotherapeutic drugs. The most dramatic results were observed in childhood malignancies. Important paediatricians included John Colebatch, Arthur Clark and Henry Ekert.

In the early 1970s, a few clinicians—haematologists, radiotherapists, general physicians and surgeons—began treating a small number of adults who had solid tumours, especially breast and colon cancer, and sarcomas. Most patients had metastatic cancer and the goal was palliation. Drug protocols and response criteria were generally poorly developed; available drugs included cyclophosphamide, methotrexate, bleomycin and vinca alkaloids.

Later that decade, a number of physicians who had trained overseas, especially in the USA, returned to Australia filled with great optimism, and devoted themselves full-time to the management of solid tumours. As befits a developing discipline, there was a strong emphasis on clinical research and evidence-based medicine. The benefits of treatment were increased by the development of new, effective drugs, including doxorubicin, cisplatin and tamoxifen. Results of trials showing improved outcomes for women with early breast cancer receiving adjuvant systemic treatment (chemotherapy and endocrine therapy) meant that the target population benefiting from treatment increased considerably. Spurred on by breast cancer clinicians, the concepts of formal multidisciplinary conferences and clinical care were developed. This is now accepted as the standard of care for all major tumour groups.

Because of the costs and constraints on availability of drugs, treatment in the private sector was very limited. It fell to the public hospital system to develop dedicated clinics where cancer patients could be treated with chemotherapy. In this environment, specialised nurses and allied health personnel developed the skills to provide supportive care for patients.

In 1976, the organisational basis of modern cancer care was established with the launch by the Anti-Cancer Council of Victoria (now Cancer Council Victoria) of the

Cat. 109 Lynda Warner (designer) and Australia Post, ***Breast cancer***, 1997, 45 cent stamp, printed on paper, 2.60 × 3.75 cm. © Australian Postal Corporation 1997.

Victorian Chemotherapeutic Cooperative Group. The inaugural chair was Dr Doug Pearce (a radiation oncologist) and the executive secretary was Dr John Colebatch (a paediatric haematologist). In 1981 this group was renamed the Victorian Cooperative Oncology Group, to better reflect the multidisciplinary nature of cancer care. VCOG provided a neutral forum for clinicians in various disciplines to meet and try to improve cancer care.[2]

In 1978 a national specialist society representing medical oncologists was set up, which later became the Medical Oncology Group of Australia.[3] This was the basis for the development of the discipline on a national level, encompassing education, training and standards of practice. At the same time, the first group dedicated to clinical research for a specific adult cancer site, the Australia New Zealand Breast Cancer Trials Group, was established. All these organisations placed a great demand on the few medical oncologists available. This contrasts with the more than 400 trained medical oncologists working in Australia today.

During this time, the side effects of chemotherapy—especially nausea and vomiting, risk of infection, and hair loss—were poorly controlled, and were a significant burden on patients. In the 1980s, specific anti-nausea agents such as ondansetron and marrow stimulants such as filgrastim were introduced, significantly improving the patient experience. Filgrastim (G-CSF) was developed by Professor Don Metcalf at the Walter and Eliza Hall Institute.

These clinical, intellectual and organisational developments built the framework for the modern era of the biological characterisation of cancer and of targeted therapy. The institutes and hospitals associated with the University of Melbourne carry on their legacy and continue to contribute to the expansion of knowledge in many disciplines, leading to marked improvements in cancer treatment in the 21st century.

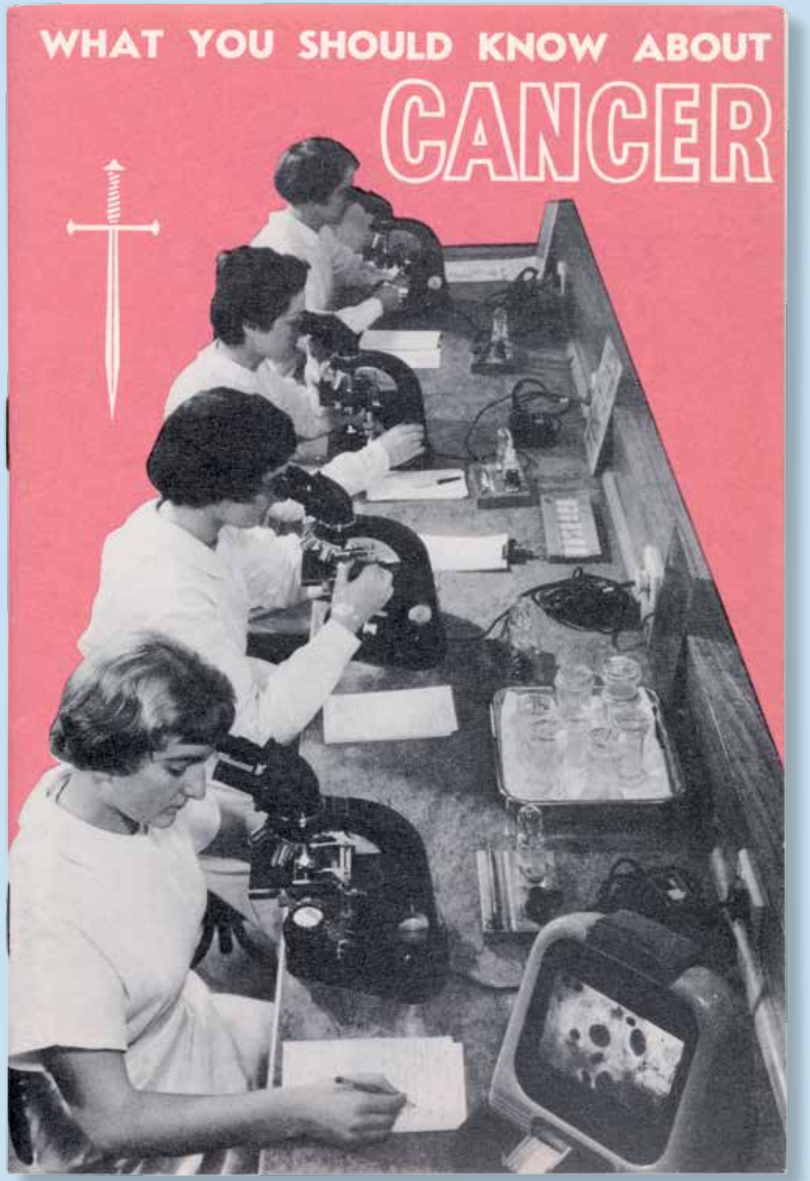
Associate Professor Raymond Snyder

1 S Mukherjee, *The emperor of all maladies: A biography of cancer*, New York: Scribner, 2011.
2 Clinical Network Overview, Cancer Council Victoria, www.cancervic.org.au/for-health-professionals/clinical-network/clinical-overview, 2016.
3 History of Medical Oncology Group of Australia (MOGA), www.moga.org.au/about-moga/history-moga, 2009.

Cat. 43 Cancer Institute (Melbourne, est. 1949), ***Report of the proceedings of the Cancer Institute Board from 29th March, 1949 to 30th June, 1952***, Melbourne: Cancer Institute Board, 1952. R110, Peter MacCallum Radiology Collection, Medical History Museum, University of Melbourne.

Cat. 49 Cancer Institute (Melbourne, est. 1949), ***Report of the proceedings of the Cancer Institute Board 1957–1959***, Melbourne: Cancer Institute Board, 1959. R111, Peter MacCallum Radiology Collection, Medical History Museum, University of Melbourne.

LEADING THE WAY: PUBLIC HEALTH MOVEMENTS



Prevent cancer—look at the evidence

Australia, and Victoria in particular, has led the world on many public health prevention initiatives, including cancer. Visionary professional leadership and bold government actions have convinced the public of the value of taxpayer-funded programs, and even of legal restraints on personal 'freedoms'.

Reducing or eliminating exposure to carcinogens (cancer-causing agents) can achieve primary prevention of cancers that would otherwise have developed. Secondary prevention is also possible, as in screening for hidden signals of cancer when treatment will prevent cancer deaths. The two kinds of evidence base for cancer prevention are evidence on carcinogenicity of an agent (from toxicological or epidemiological studies) and evidence on reducing people's exposure to risk (usually from behavioural studies).

From its inception, the Anti-Cancer Council of Victoria (ACCV, later Cancer Council Victoria or CCV), guided initially by its medical advisor Dr EV Keogh, recognised the need for evidence-based cancer prevention. The ACCV's first grant for psychological research into behaviour and public attitudes towards cancer was awarded in 1959 to the University of Melbourne. By 1985, epidemiology and behavioural science were considered so central to controlling cancer that the ACCV set up two dedicated in-house research centres: the Cancer Epidemiology Centre (including the Victorian Cancer Registry) and the Centre for Behavioural Research in Cancer.

Primary prevention

In 1939, government statistics comparing rates of tongue cancer between men and women (men being much more likely to be pipe smokers) provided the basis for the ACCV to include a recommendation against excessive use of pipes in its first-ever public educational brochure: *What every adult should know about cancer*. In 1957, a British report reviewed ground-breaking epidemiological studies of smoking and disease among doctors. Keogh (himself then a smoker) issued a public statement on smoking and lung cancer, marking the beginning of the ACCV's campaign for government action against tobacco. Over the following three decades, the ACCV took Australian and Victorian governments to task for tardiness in acting on the National Health and Medical Research Council's evidence-based calls for a national campaign on the risks of smoking and for controlling cigarette advertising directed at children. Reports on smoking and health by England's Royal College of Physicians (1962) and the US Surgeon-General (1964) added still more authority to the evidence.

Cat. 132 Anti-Cancer Council of Victoria, ***What you should know about cancer***, 1960, printed booklet, 17.5 × 11.7 cm. B0000113868, Cancer Council Victoria Collection.

As well as distributing Commonwealth and state government brochures on smoking, early anti-smoking efforts initiated by the ACCV's education officer, David Hill, included posters on railway stations and trams (1966), the ACCV's first-ever brochure aimed at helping smokers quit (1969), and an education campaign quoting famous Australian Rules football players (1968). From 1968 to 1995, the ACCV was led by a tobacco-control visionary: Dr Nigel Gray. The ACCV's anti-smoking programs focused on educating young people, so that they could make informed choices before becoming addicted to tobacco. Although awareness of the health consequences of smoking did rise, messages were severely undermined by tobacco industry denial and pro-smoking advertising and promotion.

Following calls from public health authorities for policies such as tobacco advertising controls, in 1965 the tobacco companies agreed to a voluntary but unenforceable code that purportedly limited its advertising's appeal among the young. But a 1968 survey found that, during Melbourne evening television, a cigarette advertisement was screened every 12 minutes, and the code did nothing to limit the ads' seductive effects. Advocacy to control television advertising gathered momentum and in 1971 the ACCV ran its own satirical campaign, which helped prompt federal legislation to phase out broadcast advertising of cigarettes between 1972 and 1976. Meanwhile, other forms of tobacco advertising went largely unchecked, until in 1992 the Commonwealth *Tobacco Advertising Prohibition Act* banned tobacco advertising and promotion in all media.

The National Warning Against Smoking, a public communication campaign, was initiated by the Commonwealth in 1972 with a national budget of $500 000, but was discontinued after its first phase, and from the mid-1970s tobacco control was left largely to the states. The ACCV ran Victoria's anti-smoking educational programs with official (but little financial) support from the state government. Programs included novel ideas such as the film *Leave it to the chimneys*; the cigarette tar testing kit, which showed schoolchildren the amount of 'tar' produced from a single cigarette; the play *Supersmoke*, performed in schools by the Australian Performing Group (Pram Factory); the film *Dags with fags*; teaching resources such as *Puff, puff, who's dead?*, written by educationists Lorna and Bill Hannan; and *Jack the Dancer*, a short-lived television campaign for teenagers.

Regular paid anti-smoking advertising began in 1984, when Victoria's health minister Tom Roper funded the ACCV's *No Butts* campaign, which included the *Sponge* television advertisement and public relations activities adapted from a campaign devised in Western Australia. By comparing smoking prevalence in Victoria and New South Wales, it was shown, possibly for the first time, that mass media can influence smoking rates.[1] Dorothy Reading formalised the *Quit* campaign as a joint initiative of the Victorian Health Commission, the ACCV and the National Heart Foundation, organising annual *Quit Weeks* and establishing the first-known health organisation sponsorship of a major-league football team. Reading worked closely with the Centre for Behavioural Research to produce and evaluate anti-smoking advertising, using behavioural theory and research methods. Behind the scenes, her collaboration with Nigel Gray and Action on Smoking and Health's Stephen Woodward was crucial in achieving bipartisan political support for tobacco control and the *Victorian Tobacco Act 1987*. This established the Victorian Health Promotion Foundation, whose chief executive, Rhonda Galbally, quickly set about using funds raised from an innovative state tax on tobacco to replace tobacco sponsorships of sports and arts across Victoria. Quit became sponsor of 14 sporting groups, including the Fitzroy Football Club.

From 1988, VicHealth funding to Quit Victoria also enabled more costly approaches to be devised and evaluated. Quit director Michelle Scollo oversaw an expansion of Quit's budget, staff and work, which included the design and evaluation of educational materials and mass media campaigns for smokers from various demographic groups at various stages of change. While early attempts depicting the healthy, happy lives of non-smokers proved relatively ineffective, hard-hitting approaches were later shown to be more promising. From 1985, Quit Victoria became recognised internationally for the quality of its evidence-based programs.

Significant Commonwealth involvement in anti-tobacco programs was resumed in 1997, when federal health minister Michael Wooldridge invited David Hill, by then director of the Centre for Behavioural Research in Cancer, to lead his Ministerial Tobacco Advisory Group and develop a national tobacco campaign. Quit's director, Judith Watt, also played a leading role here. Psychological principles were the foundation of the well-funded campaign *Every Cigarette is Doing You Damage*. It quickly gained international fame and was exported to the USA and more than 30 other countries. Research showed it to be both effective and cost-effective in reducing smoking prevalence. With active support from all the states, the national tobacco campaign has continued. Analysis of smoking trends has shown that intense mass media campaigns, together with higher tobacco taxes, are effective tools for tobacco control.[2]

In 1999, under the leadership of Rob Moodie, VicHealth funded a VicHealth Centre for Tobacco Control at ACCV, to extend its activities into legal, economic and social aspects. Ron Borland, Michelle Scollo and Jonathan Liberman were appointed to develop new research and policy analysis programs, working closely with the director of Quit Victoria, Todd Harper. Harper also worked with behavioural scientist Melanie Wakefield to create an evidence base for a number of policy advances, including smoke-free pubs and clubs, and bans on display of tobacco products at point of sale.

Early conclusions from evidence are not always confirmed by subsequent evidence, as the following story shows. The ACCV first published results of testing machine-smoked cigarettes, and advised smokers that low-tar brands were less risky. Later, it was mandated that every pack should display the tar content. However, because smokers unconsciously inhale low-tar cigarettes more deeply and frequently to get a greater nicotine 'hit', this measure was dropped under a legal settlement between CCV and the major tobacco companies in 2006.

The Victorian Parliament was the first in Australia (in 1969) to pass any form of tobacco labelling legislation, when a bipartisan vote mandated printing health warnings and tar content on all cigarette packs. That initiative was obviated when in 1972 all states and the Commonwealth agreed on uniform legislation requiring cigarette packs to print the message 'Health Authority Warning: Smoking is a Health Hazard'. Warnings on tobacco packs continue to be a federal responsibility. Several iterations of increasingly strong warnings were implemented on the basis of research that included studies by David Hill, Ron Borland and others in the Centre for Behavioural Research in Cancer, until plain packaging legislation was championed by health minister Nicola Roxon in 2012. This eliminated all distinctive brand imagery and colours, and increased the size of graphic health warnings to 75 per cent of the front of the pack. Victorian researchers, in particular Melanie Wakefield, have played a major role in research supporting this world's-first policy and in its evaluation, as well as defending it against legal attacks by the tobacco industry.[3]

In a curious twist, the march towards smoke-free spaces was started by public demand rather than medical evidence, which came later. In 1972, airlines TAA and Ansett began offering seats in non-smoking areas of aircraft. Restrictions on smoking in public transport, workplaces, school grounds, restaurants and bars followed in due course. This helped de-normalise smoking, and presumably contributed to reductions in smoking, although it has been difficult to pinpoint such effects in population studies.

From the early 1960s, warnings about the risk of skin cancer from excessive sun exposure were included in public information about cancer. From then on, awareness grew, sunscreen formulations improved rapidly, and in 1981 the ACCV launched the *Slip! Slop! Slap!* campaign. Scientific expertise and much of the drive came from leading Victorian dermatologist Robin Marks, while creative work was provided *pro bono* by copywriter Phillip Adams, animator Alex Stitt and composer Peter Best. This resulted in the light-hearted but informative advertisement, with its memorable jingle which is used to this day. Over many summers, Victorian television stations screened the ads free of charge.

In 1988 the nascent VicHealth provided a greatly increased budget for a re-badged program called *SunSmart*, extending education into schools and workplaces, and conducting a mass media campaign with paid advertising and thorough evaluation. Since *SunSmart* commenced, VicHealth and the Victorian government have continued with strong support. Led by CCV's Craig Sinclair, the program is recognised by the World Health Organization (WHO) as a designated collaborating centre. Long-term epidemiological trend analysis has shown behavioural changes in the population,[4] and reduced incidence of various forms of skin cancer, including melanoma.

Although the search for specific dietary factors that might cause cancer has been inconclusive, countless studies have shown that being overweight or obese contributes to several types of cancer. In 2006 CCV, Diabetes Victoria and the WHO Collaborating

Cat. 185 British American Tobacco Australia Ltd, ***Dunhill essence, King Size Superslims, 20***, c. 1980s, cigarette container, metal, 9.0 × 8.0 × 1.5 cm. Cancer Council Victoria Collection.

Centre for Obesity Prevention at Deakin University established the Obesity Policy Coalition. Led by Jane Martin, it advocates for policy and regulatory reform to prevent overweight and obesity and to improve diets. It targets marketing of unhealthy food to children, tax and pricing measures, and labelling—including a tax on sugary drinks and interpretive front-of-pack labelling. In 2014 CCV and the Heart Foundation received state government funding for the *Live Lighter* social marketing campaign. It focused on reducing consumption of sugar-sweetened beverages, through a new 'sugary drink' campaign and by supporting local services and medical professionals across Victoria to extend the campaign's reach. Survey evidence indicated a significant reduction in consumption of sugary drinks in Victoria.

Evidence that alcohol is carcinogenic, with a dose–response relationship between levels of use and the risk of a number of cancers, prompted CCV to enter the arena of alcohol policy, with a particular interest in preventing the marketing of alcohol to young people. The Alcohol Policy Coalition, formed in 2007 by the Australian Drug Foundation, CCV and VicHealth, continues today as a much-expanded group of agencies, united to create a safer alcohol culture for Victoria.

Secondary prevention

In the 1950s, the ACCV began to involve the general public in prevention, by advertising the *Seven Warning Signs of Cancer* in booklets, posters, newspaper articles and, from 1962, television public service announcements. The idea, copied from the American Cancer Society, rests on the assumption that several common tumours go through stages indicated by 'warning signs', before the appearance of clinical symptoms that lead the person to seek medical advice. Diagnosis and treatment at an early stage can improve the prospects for cure. Soon after USA research had proved the idea's worth, the seeds of the first screening program were sown when the ACCV provided a grant in 1959 to the Royal Women's Hospital to do cytology (the Pap test) on cells from the cervix of women without any symptoms of disease. By 1963, some 30 000 smears had been examined at the government-funded Victorian Cytology (Gynaecological) Service, under the direction of pathologist Michael Drake. The service thrived for 40 years, and was strongly supported by the ACCV's public education programs to achieve high participation rates and consequent reductions in mortality from cancer of the cervix. Recently, cytological screening has been largely superseded by even more effective interventions: human papilloma virus (HPV) vaccinations of schoolchildren, and screening older women for HPV (rather than for cellular changes) as the earliest sign of risk.

For breast cancer, breast self-examination was widely promoted from 1960, to achieve the earliest possible diagnosis. By 1988, large overseas trials had shown that mammographic screening reduces mortality, and the state government was lobbied to introduce it. With a grant from VicHealth, a pilot service was set up at the Essendon and District Hospital, where screening and recruitment procedures were tested, and the results then published. The transition to BreastScreen, a free statewide service, now with 34 dedicated mammographic centres plus two mobile facilities, took place over several years under the leadership of Onella Stagoll. By calling up all women aged 50 to 69 from the electoral roll, remarkably high participation rates were achieved, with reductions in breast cancer mortality shown for this joint state–federal program.

The advent of a blood test to monitor prostate-specific antigen (PSA) in men diagnosed with prostate cancer led in the 1980s to its widespread use as a screening test in asymptomatic men. Regrettably, this trend to 'PSA screening' began before credible trials had shown its effect (if any) on mortality. There is still little evidence of its value as a screening test, and it is not endorsed by any of the expert bodies that have examined the evidence from population studies now available.

While it had long been understood that early detection and treatment of bowel (colo-rectal) cancer gives survival advantage, it was not until this century that the public was offered an effective screening test. Royal Melbourne Hospital researchers James St John and trainees Graeme Young and Finlay Macrae were at the forefront of research leading to population screening. Their early studies were facilitated by collaboration with legendary surgeon Sir Edward Hughes and data from his extensive personal files of bowel cancer patients. Underpinning the resulting immunochemical tests is the fact that most bowel cancers bleed at a very slow rate long before they cause other symptoms. Hence blood detected in faeces can be a sign of covert tumours in the bowel, which need to be confirmed (or not) by colonoscopy. Not only did St John's team conduct technical studies proving that 'occult' blood could be reliably detected in faeces of asymptomatic people, but they realised early that to reach the target population at average risk required an understanding of behavioural responses to offers of screening. In 2002, Victoria hosted one of the pilot sites for what in 2020 will become the National Bowel Cancer Screening Program. With an achievable 70 per cent participation rate among those aged 50 to 74, this is expected to reduce mortality by 60 per cent.

These examples demonstrate the need to evaluate all cancer prevention and screening programs with the greatest scientific rigour, and to apply the results as we develop new ways to tackle all types of cancers and their many and varied causes.

Professor David Hill, AO, and Dr Michelle Scollo

1 JP Pierce, P Macaskill & D Hill, 'Long-term effectiveness of mass media led anti-smoking campaigns in Australia', *American Journal of Public Health*, vol. 80, no. 5, May 1990, pp. 565–9.
2 M Wakefield et al., 'Impact of tobacco control policies and mass media campaigns on monthly adult smoking prevalence: Time series analysis', *American Journal of Public Health*, vol. 98, no. 8, August 2008, pp. 1443–50.
3 *Tobacco Control*, vol. 24, supplement 2, April 2015: *Implementation and evaluation of the Australian tobacco plain packaging policy*.
4 D Hill et al., 'Changes in sun-related attitudes and behaviours and reduced sunburn prevalence in a population at high risk of melanoma', *European Journal of Cancer Prevention*, vol. 2, November 1993, pp. 447–56.

Advocacy: Patients find their voices

Much medical progress is made through steady steps by individuals and small teams, leading to modest increments of discovery and knowledge. But in the 1990s a major, and unexpected, leap was made by those people with the deepest vested interest in cancer progress—patients. Their motivation was different from those previously leading the cancer charge, based on personal experiences and born of frustration with a system that paid little attention to them as individual people.

This new movement is now known as consumer advocacy. It was led by women who had experienced breast cancer, and it had its Australian roots in Melbourne.

Only 25 years ago, the word 'cancer' was rarely spoken aloud outside the clinical world. The disease was often referred to by the person in the street as 'The Big C'—a concept of terror and loathing that brought with it a sense of shame. Oncology, with its strange terminology, was a world controlled by doctors, and surgeons especially were often considered god-like. Women frequently kept their diagnoses very private; some didn't even share the news with close friends or family.

This was to change as women with breast cancer found their voice and each other, and together formed a strong, united force that would alter the course of breast cancer policy and management, as well as the way the public viewed breast cancer.

The time was ripe for change. In November 1993 the federal minister for health, Senator Graham Richardson, established a House of Representatives inquiry into the management and treatment of breast cancer. Its report in February 1995 included some very moving, poignant submissions and testimonials from a small number of courageous women with breast cancer. They described their experiences where all the emphasis was on the tumour, with little or no thought given to their individual needs or social circumstances. They had no sense of informed choice, let alone joint decision-making, no reliable and relevant information geared to their needs, and felt a general lack of respect from their treating clinicians.

As a result of the inquiry, the Commonwealth government established the National Breast Cancer Centre in Sydney, which in 1996 gave seed funding towards establishing a national consumer voice, one capable of representing the views and experiences of women across Australia who'd been diagnosed with breast cancer: women in rural as well as urban areas, women with early and advanced disease. Melbourne woman Lyn Swinburne, who had been diagnosed in 1993, was appointed to potentially develop such a group.

Cat. 103 Breast Cancer Network Australia, ***11,500 Field of Women, Melbourne Cricket Ground, May 6, 2005***, Melbourne: Herald Sun, 2005, photograph on paper, 23.0 × 17.5 cm. Private collection.

With modest funding and working initially from her home, Lyn established *The Beacon* magazine, which offered women a forum for discussing their concerns. She also led public meetings across the country. These were often standing-room only events; women were angry with their healthcare management and began to demand improvement. The stories that emerged were often horrifying, and women wanted a much better deal for those who would follow.

The floodgates were open.

This Australian movement reflected a global push by women to become active participants in their own healthcare, in shaping public policy, demanding more money for research, and improving the system of care. Australian women learned vital lessons from their US counterparts and from the success of the HIV/AIDS lobby.

In October 1997 Australia's first Breast Cancer Conference for Women was held in Canberra. Unlike at other conferences, all 350 delegates were women who had experienced breast cancer. The conference's themes were drawn from the issues raised by women at the public meetings held around Australia, and delegates spoke out with clarity, passion and determination. The subsequent report, *Making a difference*, and its action plan raised community expectations and set the agenda for change.

The final conference day saw the women undertake a silent walk amid the *Field of women* display in the grounds of Canberra's Parliament House, to announce the independent formation of Breast Cancer Network Australia—the national voice for women with breast cancer. *The field of women* comprised 10 000 bright-pink silhouettes of women, representing Australia's annual breast cancer statistics, and 2500 white silhouettes representing the women who would lose their lives that year. This very public and powerful display, which attracted enormous media and community attention, was to become BCNA's signature statement. The silhouette displays were planted across the country, accompanied by moving silent walks that closed main streets in capital cities. Later, *The field of women* morphed into major public events in high-profile venues such as the Melbourne Cricket Ground, with thousands of people standing in pink ponchos as a show of determination, strength and support for those personally affected. The colour pink became the symbol for breast cancer.

At that first *Field of women*, Olympian and breast cancer survivor Raelene Boyle stood among the silhouettes and became the first of many high-profile Australians to become actively involved in the cause. No longer did women speak about breast cancer in hushed tones; this became a disease discussed openly in the media as women and their supporters became better organised and more sophisticated in their strategies.

A vital aim of this advocacy movement was to get women's voices directly influencing state and national decision-making. Clinical practice guidelines and policies were being developed, new information and services planned, and consumer representatives, trained and supported by BCNA, were appointed to help ensure the best results.

At first, the women representatives were viewed with suspicion—what could they possibly contribute to clinical practice recommendations? But in a short time, and as a result of the active involvement of dedicated, informed consumers, the clinical committees and their leaders were won over. They could clearly see the real benefit in consumer input. Simply asking the question 'What does this mean for women?' brought deliberations back to their major focus: the woman with breast cancer. BCNA's *A Seat at the Table* program linked working parties, project teams, policy makers and research teams with women acting as consumer representatives.

In 2001, BCNA confirmed its powerful influence via its successful campaign to have the expensive drug Herceptin made accessible to women with advanced breast cancer. The 'pink army' was on the march, and its grass roots and national lobbying brought unprecedented success.

There followed numerous other successful advocacy campaigns, such as Medicare rebates for breast prostheses, and it became clear that women could bring change and improvement. The development of psychosocial clinical practice guidelines responded to many of the women's original issues, as did the appointment of breast-care nurses. Yet another example of how 'ordinary' people could improve the care of others was Prime Minister John Howard's announcement in 2005 of $13 million for Jane and Glenn McGrath's dream of breast-care nurses across Australia, providing support and helping women and families navigate the system.

Australian women and men diagnosed with breast cancer continue to be very actively involved in efforts to make things better for those who follow. They share their stories; run support groups; conduct university tutorials for medical students; sit on boards, committees and research studies; participate in online social networks; work in partnership with those providing treatment and care; promote research and clinical trials; and actively fundraise. They lobby and give advice to governments, and provide a human face to the breast cancer statistics. They offer hope to others, and demonstrate what can be achieved with a united, committed voice that meets a real need.

Anthropologist Margaret Mead once said: 'Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has'.

Lyn Swinburne, AM

Nigel Gray: Pioneer of tobacco control

The most effective means of reducing death and suffering from cancer is, of course, to prevent the disease, and tobacco control stands at the apex of preventive measures. Smoking rates have dropped precipitously since the 1950s, when 75 per cent of Australian men smoked, to fewer than 13 per cent today. For this exceptional result we owe an enormous debt to Dr Nigel Gray, AO (1928–2014), who led the battle against tobacco smoking as director of the Anti-Cancer Council of Victoria for more than 27 years.

If we use the most widely quoted definition of public health, 'the science and art of preventing disease, prolonging life and promoting health', Nigel Gray was not only a scientist of great rigour and constant inquiry, but also a consummate artist. Sir Gustav Nossal has described him as the 'dominant cancer politician of his era. His pursuit of the tobacco industry was relentless, his use of the media superbly professional, his influence in the corridors of power enormous, belying his quiet, methodical, almost low-key approach'.

Not only did Gray lead cancer prevention in Australia, he was 'the unequivocal father of global tobacco control', according to the University of Sydney's Professor Simon Chapman. Gray started the Union for International Cancer Control's tobacco program, which in the mid-1970s brought together a small group of medical doctors and academics to start a coordinated and international tobacco control effort.

Gray was the driving force behind the first programs to promote global action on tobacco, including in low- and middle-income countries, where the ravages of tobacco smoking are now being seen in epidemic proportions. Later, as president of the Union for International Cancer Control, he brought together cancer societies and many other health organisations from across the globe to battle the financial and political muscle of the tobacco industry, now known as Big Tobacco.

To lead and manage an organisation as successful as the Anti-Cancer Council of Victoria (ACCV) for more than 27 years is an extraordinary feat in itself. Very few people would have the persistence, originality, tenacity and skill to do this. Under Gray's leadership the ACCV became the pre-eminent non-government health organisation in Australia, and a global leader in tobacco control. Some of the key elements of this success were the development and implementation of highly regarded epidemiological and

Dr Nigel Gray, AO (1928–2014) with Victorian minister for health David White, Parliament House, Melbourne, 1987. Courtesy Cancer Council Victoria.

behavioural research in both cancer and smoking; the regular monitoring of tobacco use; and a relentless commitment to evaluation of intervention programs and policy initiatives. Gray also led the introduction of skin cancer prevention—the *Slip! Slop! Slap!* campaign—as well as Pap smear and breast cancer screening.

Nigel Gray was a generous mentor. As his protégé and successor, Professor David Hill, says: 'I and many of my public health counterparts have been the beneficiary of Dr Gray's generosity and willingness to encourage and mentor those working in public health and advocacy'. Hill also acknowledges Gray as an 'extraordinary mix of establishment persona and radical thinker', who had an 'ability to bring out the best in those working with him'—an ability that has 'created a blueprint for creating change that will be used for many decades to come'.

In 1947 Nigel Gray began his medical studies at the University of Melbourne, graduating in 1953. His postgraduate career included roles at the Walter and Eliza Hall Institute in 1957, research fellow in paediatrics at the Case Western Reserve University, USA, and Cleveland Fellow at the Royal Melbourne Hospital 1959–60. He then worked as deputy superintendent of the Fairfield Infectious Diseases Hospital for four years, followed by four years as assistant medical director at the Royal Children's Hospital in Melbourne, before becoming director of the Anti-Cancer Council of Victoria in 1968.

Knowing that rigorous evidence was essential, but not sufficient in itself, to bring about tobacco control, Gray elevated the 'artistry' of public health to new heights. He pioneered forceful anti-smoking advertisements, in addition to using the humour of comedians Warren Mitchell, Fred Parslow and Miriam Karlin in the early 1970s, and John Clarke much later on. Along with other leaders such as Cotter Harvey, founder of the Australian Council on Smoking and Health, Gray played a crucial role in the banning of tobacco advertising, which he knew by the late 1960s had to get onto the political agenda. He learned how to generate influence in the corridors of power, and repeatedly met with state and national government ministers. Never one to give up, over the following 20 years he wrote to 14 different ministers for communication under seven different governments, to convince them of the need to ban tobacco advertising.

The story of Gray meeting with eight Victorian health ministers over many years before he found one (David White) sympathetic to the notion of levying a dedicated tax on tobacco to replace tobacco industry sponsorship of sports and the arts has become the stuff of public health legend. It was at the end of a meeting to lobby White about the need for mammography that the opportunity arose. As Gray was about to leave, it was the minister who said, 'Now, what more can we do about tobacco?'

Cat. 154 Stuart Penberthy Pty Ltd (Melbourne), **Woman reading billboard stating *Lung cancer deaths up again***, 1966, silver gelatin photograph, 25.5 × 20.7 cm. Cancer Council Victoria Collection.

As a result of White's query, Gray went into overdrive, leading the campaign for the *Victorian Tobacco Act 1987*, which banned all forms of outdoor advertising of tobacco products and created a dedicated tax on tobacco to establish the Victorian Health Promotion Foundation (VicHealth)—a world first—which would fund major health promotion initiatives and replace tobacco sponsorships in sports and the arts. In a stroke of genius, Gray tracked down Gus Nossal in Tokyo to gauge his interest in being the founding chair of VicHealth. Nossal agreed, and today considers his decade in the role as 'one of the best things I have done'.

Following his retirement from Cancer Council Victoria in 1995, Gray remained remarkably active. He spent eight years working with Scottish epidemiologist Peter Boyle at the European Institute of Oncology in Milan, and later at the International Agency for Research on Cancer in Lyon, researching the constituents of tobacco smoke, and tobacco regulation to modify the risk.

Gray never believed that he had done enough, and was publishing and researching well into his ninth decade. He was always searching for new answers. At the beginning of 2014, the year he died, he sent an email to researchers across the globe, asking them to select their best, most interesting and useful publications, as he was interested in looking at the nexus between 'what we knew, when we knew it, what the industry knew, when they knew it'—all arising from his frustration over the slow rate 'at which important research work gets into the arena of public health policy and is put to good use'.

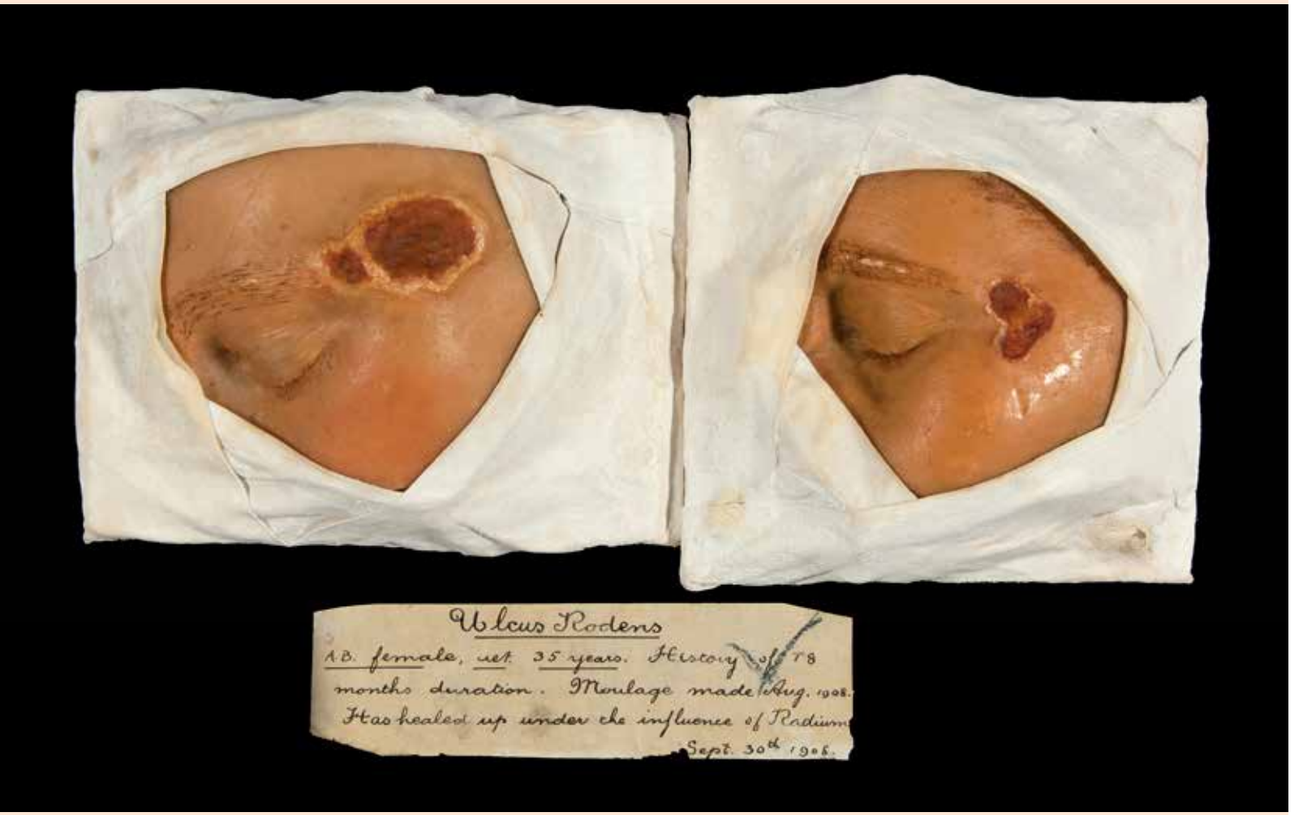
Gray and his colleagues brought the world huge benefits through their work in tobacco control: a recent study estimated that, over the last 50 years, 8 million premature deaths have been averted in the USA alone. We believe that progress of similar proportions has been made in Australia.

Tobacco control is one of the most important health and medical successes of the last 50 years. Nigel Gray's work deserves a Nobel Prize, as I have no doubt that, in the words of Alfred Nobel's will, it has 'conferred the greatest benefit on mankind'.

Professor Rob Moodie, AM

PhD student Rebecca Delconte at the Walter and Eliza Hall Institute of Medical Research. Courtesy Walter and Eliza Hall Institute of Medical Research.

NEW APPROACHES AND TREATMENTS



Radiology and radiotherapy now: A medical radiation physicist's perspective

Radiology and radiotherapy are disciplines that have benefited from the rapid development of technology. Radiology is used to create images that help diagnose cancer and accurately deliver treatment, while radiotherapy stops cancer cells from dividing and growing, thus slowing or stopping tumour growth. In many cases, radiotherapy can kill all of the cancer cells, thus shrinking or eliminating tumours. Here I highlight some of the most important developments since Wilhelm Conrad Roentgen's discovery of X-rays in 1895, and provide a brief sketch of modern radiology and radiotherapy, while noting that it is not always easy to identify which aspects of any rapid scientific and technical progress are most important. Clinical practice must develop cautiously, particularly where the results of interventions are known only after a considerable time. Cancer treatment using radiotherapy is a good example of this: treatment success and lack of long-term side effects can often be established only after many years, when technology has moved on to new and potentially better approaches.

Another important consideration is the attitude of patients, the public, and politicians towards radiation technology. Unlike in the first half of the 20th century, when radiation was seen as part of an exciting future, the mention of radiation nowadays typically evokes fear. This is not lost on manufacturers who, for example, call the latest developments in radiotherapy 'cyberknife' (a robotic radiotherapy unit) or 'tomotherapy' (radiotherapy slice-by-slice, similar to CT scanning), while the N (standing for 'nuclear') has vanished from magnetic resonance imaging (MRI). This aims to restore trust in technology to radiology and radiotherapy; most patients (and often also clinicians) would like to be diagnosed and treated with the latest technologies and techniques—even if there is at times only emerging evidence supporting their use.

The University of Melbourne has been an integral part of the development of radiology and radiotherapy in Australia. In March 1896, less than six months after the announcement of Roentgen's discovery, Professor Thomas Ranken Lyle took an X-ray image of a colleague's foot, using X-ray equipment he had built himself. Interestingly—and perhaps typically for Australia—two other pioneers from completely different backgrounds are also credited with taking the first medical X-ray 'Down Under': Walter Drowley Filmer, a railway engineer in Newcastle, and Father Joseph Slattery, a Catholic priest in Bathurst. There was huge excitement about getting information from inside a person without the need to cut. This

Cat. 66 Herman Fermor Lawrence (1863–1936), **Moulages of the face, before and after radium treatment**, 1908, painted wax, plaster; 20.0 × 32.0 × 9.0 cm. 531-002350, Harry Brookes Allen Museum of Anatomy and Pathology, University of Melbourne.

feature of radiation—being non-invasive—is still one of the most important attributes that make radiology and radiotherapy attractive to patients. Importantly, even patients who are medically unfit for surgery can undergo radiology or radiotherapy procedures. Acute side effects from imaging are non-existent, and in radiotherapy any side effects can be controlled through the use of modern approaches.

In order to appreciate modern radiation medicine fully, two eras featuring particularly important changes to radiology and radiotherapy are worth mentioning: the 1950s and the 1980s.

In the 1950s, radiation-producing equipment changed, particularly with the introduction of medical linear accelerators, in which radio-waves accelerate electrons in order to produce X-rays. This process allows the generation of radiation with significantly higher energies than was possible before. The increased penetration and skin-sparing afforded by this mega-voltage radiation allowed radiotherapy to be used for many more types of cancer, including deep-seated tumours.

In the 1980s, computers became more widely available and they have revolutionised radiology and radiotherapy. While the concepts of tomography and magnetic resonance imaging were known for many years, it was computing power that made them useful for medicine. Computed tomography (CT) and MRI are integral parts of modern radiology. Advanced nuclear medicine imaging techniques such as single-photon emission computed tomography (SPECT) and positron emission tomography (PET) also rely on computer-driven image reconstructions. Unlike X-ray CT, these nuclear medicine techniques rely on radioactive materials that are administered in small quantities to patients, where they follow physiological processes. The radiation emitted by these radioactive isotopes can be detected and enables identification of the magnitude and location of the process in the body.

Most modern medical imaging methods yield three-dimensional images, in which every point in the patient can be uniquely identified. This is the perfect starting-point for therapy; in the 1980s, radiotherapy moved to three-dimensional conformal treatments, where the delivery of radiation can be planned in a computer using the three-dimensional image of the patient and a model of the radiation beams available in the clinic. The introduction of this ‘virtual patient’ allows much better and more efficient treatment, leading to smaller volumes of normal tissues being irradiated. It also allows documentation of the radiotherapy given to each target and normal structure in a patient, which is essential to understanding the effects of radiation and to improving future treatment techniques.

Cat. 56 Peter MacCallum Clinic (Melbourne, est. 1950), **Head shield**, c. 1960–69, plastic, metal; 29.0 × 28.0 × 33.0 cm. R90, gift of Peter MacCallum Cancer Centre, 2017, Peter MacCallum Radiology Collection, Medical History Museum, University of Melbourne.

Nowadays, 30 years later, the revolution introduced by advanced computing continues. From the perspective of a physicist working in radiology, four developments need to be watched with particular interest.

The first is multimodality imaging, where information obtained through different imaging techniques is combined. Combining information pertaining to anatomy, physiology and pathology provides a more detailed characterisation of a disease. This is often facilitated by combining more than one imaging method in a single machine (for example, PET/CT, PET/MRI or SPECT/CT), or by using computer algorithms to fuse separately generated images. In this context, emerging 'deformable registration' algorithms are useful, as they can account for differences in patient positioning at the time the original images were created.

This brings us to the second important development: the consideration of patient changes or organ movement during imaging. We can use regular motion traces from cardiac or breathing cycles to create three-dimensional images of the same patient in different phases of the cycle. This technique is now also increasingly incorporated into PET or MRI, leading to four-dimensional imaging (the fourth dimension being time).

The third development is the reduction of dose, and thus risk to the patient. In the United States, dose from medical imaging has overtaken natural radiation as the largest contribution to population dose. Computers can improve image reconstruction by using, for example, iterative algorithms in CT to get better images with a lower dose. In addition, more efficient detectors reduce the required dose; this has been particularly important in paediatrics, where the 'image gently' campaign has helped to substantially reduce dose and risk to children.

Finally, automatic and computer-assisted image evaluation helps radiologists identify pathological changes. It allows the automation of mundane tasks and may even identify new features, such as the texture of structures, through a method called radiomics.[1] Most importantly, with computer assistance we can create databases that support research by linking clinically relevant endpoints with radiological findings.

Modern radiotherapy has also benefited significantly from faster and more powerful computing. Computer optimisation allows the splitting of every radiation field into many segments. By assigning each segment a different weight, we can conform a dose delivery more tightly to the target region identified by the clinician. This process is called intensity-modulated radiation therapy (IMRT) and computers are essential to optimise the many different beam directions with many segments each. However, this subdivision of beams increases the treatment delivery time, so several methods are currently being introduced to speed up treatment. These advanced approaches include combining the segments into a continuous rotational delivery—a process called volumetric modulated arc therapy (VMAT)—and the use of beams with extremely high dose rate (flattening filter free or FFF beams).

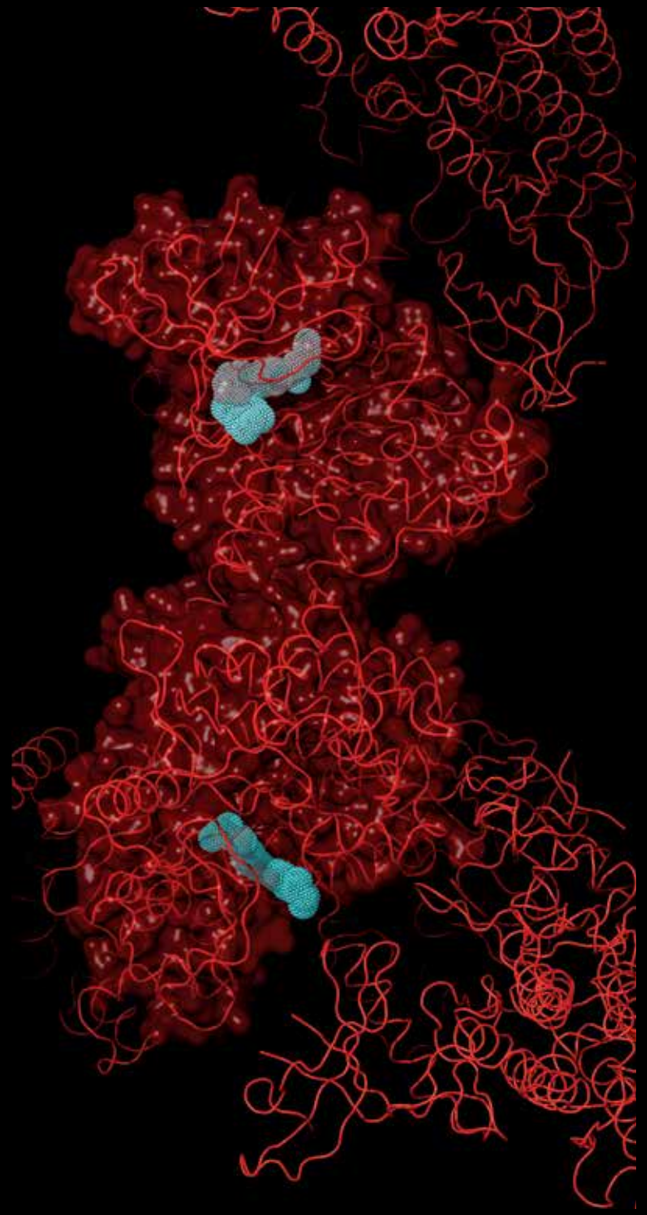
Movement by the patient is a major problem when targeting localised therapy. Many of the methods to manage such motion during imaging are also used when delivering radiotherapy. They include gated deliveries, where the beam is only on when the patient is in a specified phase of the breathing cycle (exhale or inhale); breath-hold techniques; and radiation beams that can follow a target as it moves. While most of these approaches require specialised treatment machines, a method for motion-adaptive radiotherapy using the multi-leaf collimators available on most treatment units has recently been pioneered by an Australian group of researchers.[2]

One of the most important innovations in radiotherapy could well be the incorporation of imaging into the delivery process.[3] Radiology can help doctors identify the tumour and the radiotherapy target region when planning a particular patient's treatment. However, humans are not rigid, so imaging is also needed during treatment to ensure accurate delivery of the dose. Here the development of cone-beam computed tomography (CBCT), which uses a diagnostic imaging system integrated into the treatment unit, has proven particularly valuable, because it provides a three-dimensional picture of the patient that can be readily compared with the three-dimensional image used when planning treatment. Other imaging methods, such as ultrasound and even MRI, are also under development for image-guided radiotherapy (IGRT).

Finally, multidisciplinary cancer treatment—combining chemotherapy, immune therapy, surgery and radiation—is probably the most important reason for excitement. In this context, the non-invasive nature of radiotherapy combined with the highly localised damage to targets remains attractive, in particular if good imaging can be used to direct the therapeutic radiation to exactly the right spot. Technical advances in radiology and radiotherapy combine to bring patients the best possible cancer treatment. Even today, the full promise of radiation is yet to be realised.

Professor Tomas Kron, OAM

1 HJ Aerts et al., 'Decoding tumour phenotype by noninvasive imaging using a quantitative radiomics approach', *Nature Communications*, vol. 5, 2014, p. 4006.
2 JT Booth et al., 'The first patient treatment of electromagnetic-guided real time adaptive radiotherapy using MLC tracking for lung SABR', *Radiotherapy and Oncology*, vol. 121, no. 1, October 2016, pp. 19–25.
3 T Kron, 'New developments for image guidance in radiotherapy', *Cancer Forum*, vol. 36, no. 2, July 2012, pp. 82–7.



Harnessing the genome revolution

By the early 1990s, technological advances presaged a 'genome revolution' that would make it possible to measure people on a massive scale for genetic factors implicated in disease. Previous large-scale research studies of disease risk had relied on relatively blunt instruments: questionnaires on lifestyle and demographic factors, or expensive genetic assays that groped forward towards susceptibility genes. The prospect of a head-to-head battle between genes and environment beckoned, but more important was the prospect that people at higher genetic risk could be identified, and ways found to mitigate that risk. But how to do this?

A group of visionaries at the University of Melbourne, the cancer councils of Victoria (Graham Giles) and New South Wales (Margaret McCredie), with critical support from Peter Boyle—then at the World Health Organization's International Agency for Research in Cancer in Lyon—began to establish the critical infrastructure and resources. Giles led the Melbourne Collaborative Cohort Study (MCCS) of more than 40 000 Melburnians, enriched for Italian and Greek immigrant families. Director Nigel Gray sought advice from epidemiological gurus Sir Richard Doll and Bruce Armstrong, and ensured Cancer Council Victoria's long-term commitment to this ambitious project. Giles, McCredie and I led the initial studies that developed into the Australian Breast Cancer Family Registry (ABCFR) and the Australasian Colorectal Cancer Family Registry (ACCFR, now led by the University of Melbourne's Mark Jenkins), which today involve more than 25 000 Australians, from more than 10 000 families. These were large, population-based studies of families recruited from the general population, clinics and specific communities, including twin pairs recruited through the Australian Twin Registry.

Novel components included the involvement of families, including spouse pairs, and the emphasis on twin and twin-family studies. We also emphasised population-based sampling, making the results applicable to the broader population. And we focused on people diagnosed with cancer at a young age, because with their relatives they are a group at greater genetic risk. Thus the combined studies comprised people across the full spectrum of risk, enriched for those at higher risk, who would otherwise be only a small part of a study sample.

Isabelle Lucet, ***Bloody JAK***, 2014. Courtesy Walter and Eliza Hall Institute of Medical Research.
Blood cancers such as leukaemia can result when normal cell development goes awry. The transition of a blood cell from normal to cancerous can be linked in some instances to the aberrant activity of a signalling molecule called JAK2. Drugs that can specifically block JAK2 could be the key to preventing cancer growth, and are already in development. This eerie image shows JAK2 (red) bound to a blocking compound (blue). This compound is currently used in the clinic for treating blood cancers.

Another strength was our commitment 'to measuring everything on everyone in the same way'. This served two main purposes: to facilitate comparison of findings from the cohort and family studies, and to permit future pooling of data across studies for greatest statistical power. For example, because the ABCFR did not involve face-to-face interviews, unlike the MCCS, adhering to this protocol required mailing out tape measures with instructions to measure waist and hip circumferences in a standardised way. The ACCFR questionnaire was built on the ABCFR questionnaire, and these became the basis for the international Breast and Colon Cancer Family Registry questionnaires.

We took blood samples, extracted DNA, stored serum and plasma, and—for some—created cell lines, as a potentially unlimited resource of genomic material for future research. Little did we think that we would develop one of Australia's largest research bio-repositories: more than 2 million bio-specimens from almost 100 000 people in 20 000 families, ably led by Melissa Southey at the University of Melbourne.

There were many advantages from doing this work in Australia. Proof was our funding from the US National Institutes of Health since the mid-1990s. Our collaborations were built upon the population-complete cancer registries in all Australian states and territories, which enabled population-based recruitment of cases and families, and follow-up of new cancers through national record linkage. The studies were also built around Australia's compulsory voter registration, and ready access to electoral rolls for medical research (sadly, no longer the case, due to bureaucratic complications). Because of this, plus our findings that Australian families are generally connected, and hold health and medical research in high regard, we could study a highly representative sample of the population that remains committed to the cause. By studying multiple relatives within a family we can better trace and monitor participants.

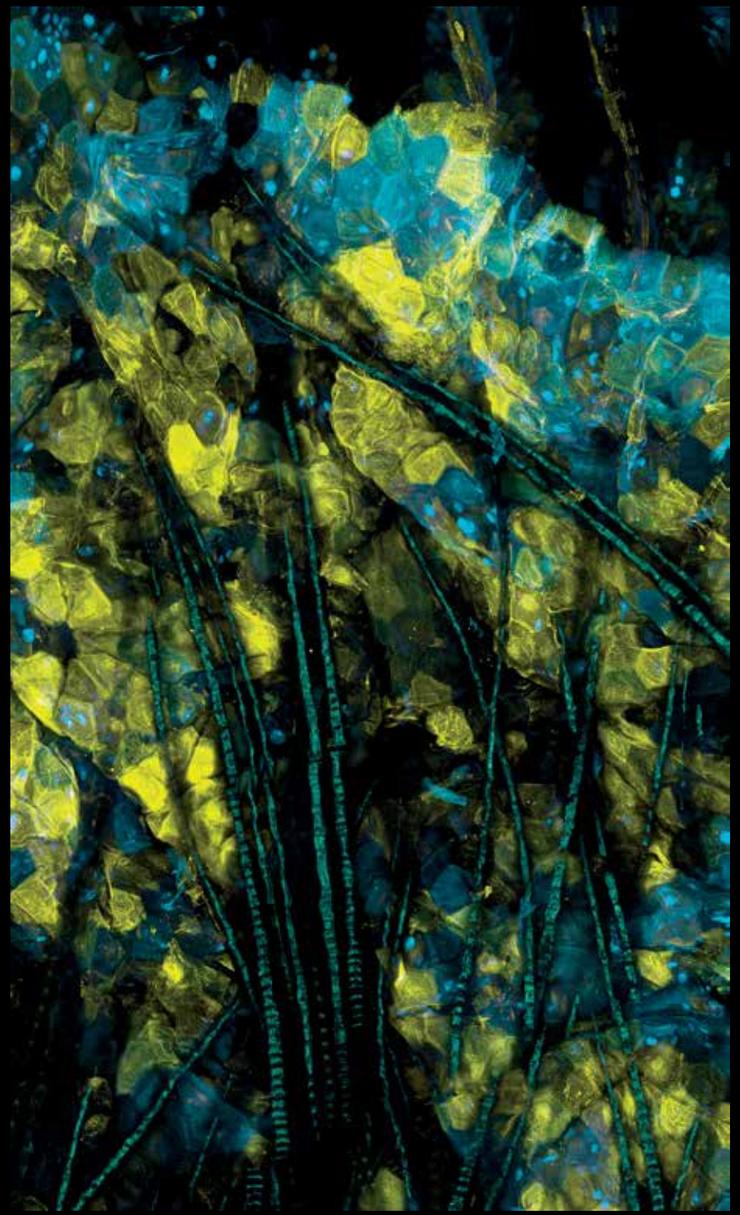
This work led to the creation in 2005 of the university's Centre for Molecular, Environmental, Genetic and Analytic (MEGA) Epidemiology. This aspirational title reflects the need to work on a grand scale (mega = one million) and to combine molecular, environmental and genetic research with state-of-the-art analytics, which now involves high-performance computing and 'big data' such as genome-wide assays of genomics, epigenomics and other omics. The totality of these resources is captured by the acronym PEDIGREE: Pathology, Epidemiology, DNA, Informatics, and Genetics Research Enabling Enterprise. More than 500 publications have resulted, and numerous early-career researchers who cut their teeth on PEDIGREE are now forming the next generation of leaders.

Many novel and often surprising insights have arisen. We showed that the estimated breast cancer risk for carriers of a BRCA1 or BRCA2 mutation had been greatly exaggerated in some early research reports from people wanting the gene to be as nasty as possible, so as to glorify their own careers. Our finding has now been thoroughly vindicated. We demonstrated that the best way to identify people with mutations in DNA mismatch repair genes that put them at high lifetime risk of colo-rectal and other cancers is by immuno-histochemical studies of bowel tumours diagnosed at a young age, irrespective of their family's cancer history. This became known as the Melbourne criteria, and is now used worldwide. We produced the best estimates of colo-rectal cancer risk for carriers: about 50 per cent. But we also found something astonishing: this was the least, not most, likely risk. Most carriers appear to be divided into two groups: those with a risk of almost 100 per cent by age 50 years, and those with a modestly increased lifetime risk of 30 per cent or less. There do exist carriers with intermediate lifetime risks of around 50 per cent, but they are only a minority. This wide variation in risk means there is enormous scope for finding factors that change risk for carriers, bringing the potential to save lives—something we are working on right now. We are discovering that environment is *not* irrelevant for people at high genetic risk, as 'genetic determinism' has proposed; rather the contrary: the environment is even *more* important.

The MCCS produced a series of papers that showed the important role of obesity in many cancers, and led to a new direction for cancer control worldwide, led by Cancer Council Victoria (as it had previously led the fight against tobacco). Studies revealed that men who had a greater ejaculatory frequency, especially in young adult life, were less likely to develop prostate cancer, a controversial finding, since replicated in the USA. The MCCS has been a major source of information for clarifying the roles of different mammographic density measures in predicting different types of breast cancer.

The University of Melbourne has nurtured key researchers and hosted many of these studies, but the vast majority of costs were covered externally, especially by the US National Institutes of Health. More than $80 million has been awarded over the last two decades, a period of great generosity by the USA government in recognition that Americans can benefit from research done by, and of, non-citizens in ways not easily achievable at home—a situation now at peril following that country's change of presidency in 2017.

Professor John L Hopper, AM



Leaps and bounds in cancer nursing

Thirty years ago, people diagnosed with cancer had very different experiences and outcomes from what we see today. In just a short period of time, we've come a long way.

In the early 1970s, cancer nurses focused on managing the complex symptoms of cancer, and the side effects of treatments that were unsophisticated in comparison with today's therapies. Cancer nursing was perceived to be—and for many patients was—about providing palliative and end-of-life care. But with changes in cancer therapies, particularly in haematology and medical oncology, more and more patients required acute nursing care. In response, early leaders in cancer nursing research recognised the need to establish an evidence base for our practice, and propelled cancer nursing into one of the most sought-after and highly recognised areas of nursing. Americans Ruth McCorkle and Marilyn Dodd are just two examples of visionary cancer nurse-researchers, with Dodd publishing a paper on the theoretical basis of immunology in cancer in 1979![1]

Game-changing care

The 1980s and 1990s saw a huge growth in our knowledge of, and ability to treat, many cancers. An explosion of cancer clinical trials and laboratory breakthroughs resulted in rapid advances in our fundamental understanding of cancer biology and in the potential of surgery, radiation and medical oncology to prolong life and even deliver cures. But with these advances came side effects—whether acute, late or long-term—that presented cancer nurses with new challenges. The acuity of patients rapidly outpaced the profession's ability to provide the evidence-based management of symptoms and side effects and the psychosocial care that patients and their families needed to cope with the physical, functional, emotional, social and spiritual effects of cancer and its treatments. The profession responded by developing a generation of cancer nurse-researchers who transformed the way in which cancer nurses thought, practised and advocated for patients' quality of life. Jessica Corner, Carol Tishelman, Linda Sarna, Patsy Yates, Sanchia Aranda, Maryl Winningham, Barbara Piper, Alison Richardson, Patricia Grocott and many others turned their attention to developing and testing nurse-led interventions to minimise symptoms and side effects such

Caleb Dawson, ***Let hair be light***, 2015. Courtesy Walter and Eliza Hall Institute of Medical Research.
Fluorescent marking can be used to trace how a single rogue cell can give rise to the many cells in a tumour. When cells are fluorescently marked, unexpected structures frequently light up. While studying the development of breast cancer, researchers were surprised to find these spectacular fluorescent hairs. The hairs appear to form luminous roads across the image—which one will lead to a cure?

as pain, wounds, fatigue, breathlessness, weight loss, infection and nausea, and the distress they can cause.

Advances in treatments offered patients more possibilities for therapeutic approaches and, importantly, opportunities to participate in clinical trials. Nurses required a better understanding of how patients and family members could best be informed, supported and enabled to make decisions about their treatment. Cancer nurses responded by developing a body of practice-oriented research that focused on helping patients understand their illness, their treatments and the consequences. Work by Lesley Degner, Kinta Beaver and Karen Luker led the way in an international program of nurse-led research that went on to give cancer nurses effective information-intervention skills. As cancer care has become increasingly complex, the knowledge generated from these nursing studies becomes ever more important to the patients and families we care for.

Survivors, early detection and advocacy

With the growing success of cancer treatments, cancer survivorship is the next great research frontier for cancer nurse-researchers, educators and clinicians. Working in multidisciplinary teams, cancer nurses hope to generate and apply new knowledge, interventions and strategies that will enable people to live well, both during and after their cancer experience, irrespective of their prognosis. In 2017 there are more than one million cancer survivors in Australia. Nurses must know how to anticipate and recognise, and educate and enable patients to manage and minimise, the consequences of cancer treatments in the short, medium and long term. To do this, nurses need to be fully conversant with, and active in adopting, new technologies and agents. From explaining how new therapies work, their side effects, or what robotic surgery or stereotactic radiotherapy means, to discussing whether a patient should consider a clinical trial, cancer nurses need relevant and applicable knowledge to fully contribute to world-class cancer care. Breaking new ground, Theresa Wiseman, Stella Bialous, Isabel White, Donna Milne, Jo Armes, Mei Krishnasamy, Ray Chan, Roma Maguire, Margaret Barton-Burke, Mary Wells, Sara Faithfull and many others are engaged not only with what nurses do, but—critically—with where and how cancer nurses are working, to deliver care that is informed by evidence and centred on each patient as a unique individual.

Moving the lens

The 21st century has seen leaps in medical research and cancer control previously only dreamed of. These advances have created a remarkably dynamic field for cancer nurses. As sub-specialisation increases across all cancer fields, it is the role of cancer nurses to bring it all together, understanding the specific effects of each treatment and their implications for a patient. Nurses are the 'translational enablers' of the multidisciplinary team, interpreting complex information for patients and their families, and supporting them as they make difficult decisions. They also communicate patients' and families' fears, concerns and problems back to the multidisciplinary team and to community healthcare providers.

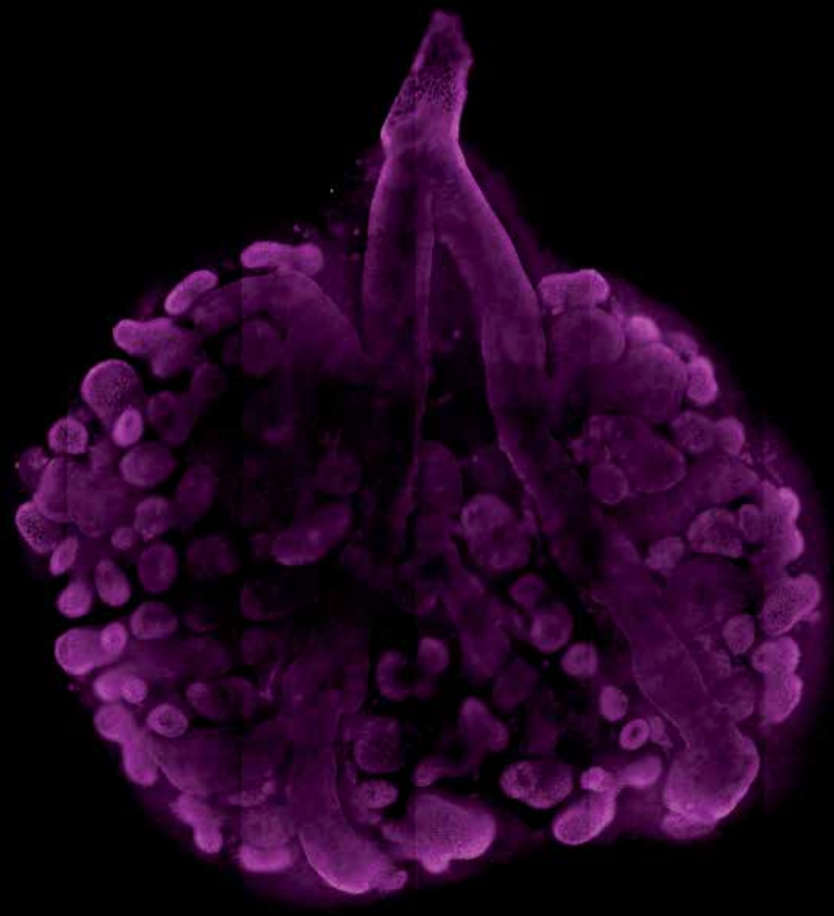
The rapidity of advances in science, particularly the advent of immunotherapy and targeted therapies, has created the need for increasingly specialised cancer nursing knowledge and expertise. Cancer nurses are everywhere: in hospitals, the community, and specialist clinics, and are among the leaders in developing healthcare policy. In 2017, our roles are diverse and ever advancing.

There are expert nurses in all areas of cancer, and our practice is based on scientific evidence. We are Masters- and PhD-prepared practitioners, working as clinical nurse specialists, nurse practitioners, consultants, educators and researchers. We have defined our place and continue to broaden our scope of practice to deliver the best possible patient care. The patient is at the centre of all we do. Our next areas for critical attention are cancer prevention, and ensuring equal access to the best cancer care for all Australians.

In the 1970s, we cared for patients who were dying, and celebrated those who lived beyond an expectation of their prognosis. In the 1980s and 1990s we established ourselves as critical players in improving patients' quality of life, and began to forge a comprehensive body of cancer nursing knowledge. In the 21st century we are essential members of the cancer multidisciplinary team, recognised in international cancer experience surveys as the most significant factor in patients reporting an excellent experience of care. But as we continue to carry out research to inform and advance our practice, there will always be one constant: that our patients and their families leave our care feeling respected, understood, valued, and intact as human beings.

Professor Mei Krishnasamy

1 MJ Dodd, 'BCG in cancer therapy: Theoretical bases of immunotherapy', *American Journal of Nursing*, vol. 79, no. 2, February 1979, pp. 310–14.



Medical therapies: Unveiling the secrets of cancer

The evolution of cancer treatment has closely followed our understanding of the disease, based on advances in medical research. Like the image crafted on the Nobel Prize, showing Science unveiling Nature, so our understanding of cancer—and thereby its therapy—has progressed in lock-step with new technologies developed to unveil its secrets. As tissue-culture systems became available to grow cancer cells, so the molecular mechanisms and signalling pathways were discerned.

In tissue culture, genetic causes of human cancers were studied in an attempt to restrain the growth of human cancers. Aberrant tumour proliferation was initially targeted by DNA-damaging agents (including chemotherapy and radiation), but these have the undesirable effect of also killing the patient's normal proliferating cells. Targeted therapies evolved from the concept that genes drive the tumour process. Oncogenes (genes that have the potential to cause cancer) were discussed by Boveri in 1914, and the first oncogene, Src, was discovered in 1970. As oncogenes included growth factors, receptor tyrosine kinases (Her2, EGFR, VEGF), cytoplasmic tyrosine kinases (Src, BTK, Abl), cytoplasmic serine threonine kinases (Raf, cdk), regulatory GTPases (Ras), transcription factors (Myc), and cell-cycle control proteins (cyclin/cdk4/6), strategies were developed to target these signalling pathways for specific cancers.

One example of an activated cytoplasmic tyrosine kinase that has been successfully targeted for human cancer therapy is the genetic fusion between the Abelson (Abl) tyrosine kinase gene at chromosome 9 and the break-point cluster (Bcr) gene at chromosome 22, resulting in a chimeric oncogene (Bcr-Abl). This fusion protein, which constitutively activates Bcr-Abl tyrosine kinase, plays a part in causing chronic myeloid leukaemia (CML). Compounds have been developed to selectively inhibit the tyrosine kinase. Bcr-Abl tyrosine kinase inhibitors (TKI) are now the first-line therapy for most patients with CML, and Imatinib is an effective treatment.

Another example of targeted therapy takes aim at the receptor tyrosine kinase ErbB2. The drug Herceptin, which aims to stop ErbB2 from over-expressing (making too many copies), is effective in treating metastatic breast cancer, although side effects occur due to the expression of Her2 in normal tissues such as the heart and skin. More effective variants

Laura Galvis, ***Lungberry***, 2013. Courtesy Walter and Eliza Hall Institute of Medical Research.
Early in its development, the lung undergoes repetitive rounds of branching to create the area required for alveoli formation and breathing. Although the process is quite well understood, the molecules that regulate it are still unknown. This is an image of an embryonic mouse lung that has been cultured on top of a membrane for two days. *Ex vivo* cultures like this allow us to study the effect of chemicals or gene manipulations on the process of branching, making it a useful technique to identify possible developmental regulators at this stage.

of Her2-based therapy use Her2 to deliver cytotoxic agents (substances that destroy rapidly growing cancer cells) directly to the breast cancer, for example using a linker to join trastuzumab to the cytotoxic agent emtansine in the drug known as TDM1 or Kadcyla.

Based on tissue-culture experiments, aberrant cell-cycle control was thought to cause proliferation and thereby tumour growth, an insight that has led to the development of cdk inhibitors for cancer therapy.[1] Inactivation of cyclin D1 itself in breast cancer was shown to block the growth of breast cancer in mice. Surprisingly, although cdk inhibitors effectively reduced the phosphorylation (an essential process in cells) of target proteins, when these compounds were used to treat human breast cancer, only a subset of patients responded to therapy: women who were post-menopausal, oestrogen-receptor positive, and concurrently taking fulvestrant. This limited response may be due in part to the kinase-independent functions of the cyclins that are thought to contribute to tumorigenesis (the production of new tumours).

The world's largest and most ambitious collaborative biological project—the sequencing of the human genome—and then a parallel effort by American corporation Celera Genomics, brought about a revolution in our understanding of cancer biology. A variety of human tumours were then sequenced, providing data that has enabled the global research community to undertake hypothesis-driven research into candidate genes or clusters of genes that cause cancer in specific tumour subtypes. Gene mutations such as the BRCA1 gene, when identified in a patient's tumour, provided the rational basis for specific types of therapies. For BRCA1-mutant breast cancer, the addition of poly ADP-ribose polymerase (PARP) inhibitors has been an effective treatment.

The development of single-cell sequencing technologies has demonstrated the widely diverse nature of tumours that look identical at the histological (broader microscopic or cellular) level. Such studies have provided additional support for the hypothesis that cancer stem cells contribute to tumorigenesis. In this model, stem cells have a unique gene-expression profile, a unique capacity to give rise to multiple cell lineages, and the unique ability to cause metastasis (the spread of cancer to other parts of the body) and resistance to treatment. Curiously, these cancer stem cells appear to be sensitive to mitochondrial-toxic drugs, including antibiotics such as tetracyclines.

Over the last decade, myriad studies in culture dishes have furthered our earlier understanding of cancer as a 'seed': we now believe that the 'soil' surrounding the seed may have a dominant influence on the tumour. The advent of reconstitution experiments, which include the soil (called the local tumour stroma, and made up of fibroblasts, fat cells and immune cells), and the use of transgenic mice whose tumours more closely resemble the human disease, has strengthened our understanding of cancer. By thus considering the tumour in its local or systemic environment, scientists have shown that the stroma and the tumour are in an elaborate, co-dependent relationship: the stroma provides the tumour with metabolic substrates (lactate acetate, amino acids, lipids, and tricarboxylic acid (TCA) cycle intermediates), while maintenance and progression of the disease (and the success or otherwise of treatment) depend on the immune system.[2] Remarkably, some proteins expressed in breast cancer, such as caveolin-1, are excellent predictors of a patient's likely resistance to the drug tamoxifen.

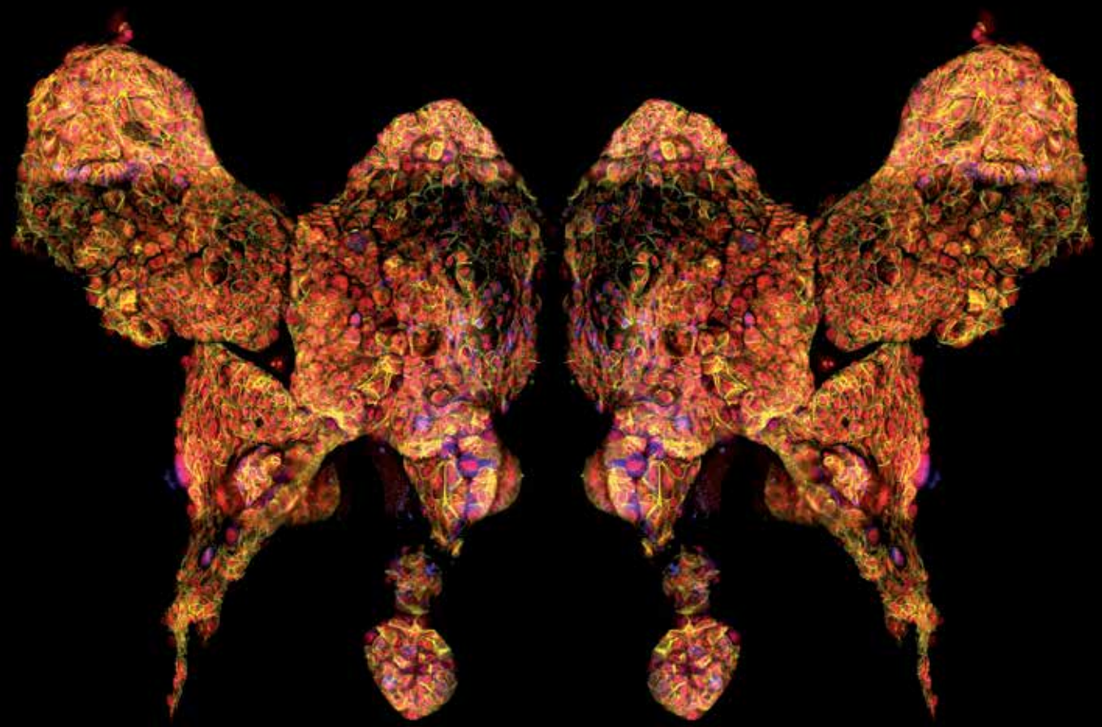
The growing understanding that the stroma, including the immune system, collaborates in tumour growth and therapy resistance, has led to new cancer therapies that target the immune system. Programmed death-ligand 1 (PD-L1), also known as cluster of differentiation 274 (CD274) or B7 homolog 1 (B7-H1), is a protein that in humans is encoded by the CD274 gene. PD-L1 binds to its receptor, PD-1, which is found on activated T-cells, B-cells and myeloid cells, to modulate activation or inhibition. Up-regulation of PD-L1 may allow cancers to evade the host immune system. Clinical trials have shown that PD-L1 inhibitors including atezolizumab and avelumab are useful therapies for such cancers.

Targeted therapies have been an important outcome of the molecular genetic revolution, and the increased sensitivity of sequencing has allowed scientists to detect candidate targets of much lower abundance. We have learned that tumours express proteins that are not normally expressed in the tissue, and these proteins are ideal targets for therapy. CCR5, for example, is not expressed in the normal breast or prostate, but is mis-expressed in breast and prostate cancers and other therapy-resistant tumours, albeit at a low level. CCR5 is expressed at a radically lower level than Her2 (at a mere one-hundredth the abundance), yet CCR5 inhibitors are very effective at blocking breast or prostate cancer metastasis in mice.[3] Because CCR5 inhibitors are safe in humans, ways of using these compounds for cancer therapy are being actively pursued.

Through the genetic analysis of tumours, and subsequent sequencing of tumour genomes, rate-limiting therapeutic targets have been identified that are often specific to the tumour of a particular patient. Furthermore, tumour sequencing allows us to detect new mutations that may make a patient resistant to a particular therapy. The advent of non-toxic drugs that inhibit metastasis may eventually result in the most radical transformation of all: we look forward to the day when cancer may no long be a lethal disease in humans, but rather a chronic one, of the order of diabetes mellitus.

Professor Richard Pestell

1 MC Casimiro et al., 'Overview of cyclins D1 function in cancer and the CDK inhibitor landscape: Past and present', *Expert Opinion on Investigational Drugs*, vol. 23, no. 3, March 2014, pp. 295–304.
2 UE Martinez-Outschoorn et al., 'Cancer metabolism: A therapeutic perspective', *Nature Reviews: Clinical Oncology*, vol. 14, no. 2, February 2017, p. 113.
3 D Sicoli et al., 'CCR5 receptor antagonists block metastasis to bone of v-Src oncogene-transformed metastatic prostate cancer cell lines', *Cancer Research*, vol. 74, no. 23, 1 December 2014, pp. 7103–14.



Future directions

Rapid advances in knowledge about the biology of cancer over the last six decades have revealed that cancer is an inherent part of the human condition. For this reason, it seems inevitable that we will be grappling with this disease for generations to come. But how cancer manifests, the types of cancers that most challenge us, and the nature of cancer control will evolve substantially in coming decades.

Advancing age is a powerful risk factor for developing cancer. As Australians live to greater ages than previous generations, and as the proportion of the population over 75 years of age steadily rises, the proportion of the population experiencing cancer will continue to increase. So, we should anticipate increasing numbers of people diagnosed with cancer in their later years. Some of these diagnoses will be of progressive and rapidly fatal cancers, while many will be diagnoses of indolent cancers that either require no treatment or that behave as chronic diseases, responding to non-curative therapy, perhaps diminishing the quality of life, but not its duration. Modern medicine will need to find better ways to fully integrate the management of cancer into the overall care of elderly people with several co-morbid conditions. Cancer clinicians will be required to predict the likely outcomes of either monitoring or actively treating a person's cancer more precisely than ever before, so that holistic personalised care of individual patients can be crafted by multidisciplinary teams with expertise well beyond cancer.

In parallel, increasing attention is likely to focus on cancers for which primary treatments are currently minimally effective—for instance, high-grade gliomas and inoperable adenocarcinoma of the pancreas. For such cancers, there is an imperative to learn more about their causation and their biology, to underpin new approaches to treatment. A key that is likely to unlock the secrets about causation and biology will be the continuing integration of large data sets of epidemiologic, genomic, transcriptomic (RNA produced by the genome), proteomic (proteins) and phenotypic (appearance, behaviour and other observable properties) information. Major current efforts to build large cohorts

Clare Weeden, ***Butterfly wings***, 2016. Courtesy Walter and Eliza Hall Institute of Medical Research.
The lung is a complex structure consisting of airways and alveoli—little saccular structures that exchange carbon dioxide for oxygen and allow us to breathe. We isolated a single alveolar stem cell, which grew into a beautiful and complex structure; each red 'spot' is a single cell. The yellow colour illustrates where each cell is touching another and the blue colour is a protein that allows us to breathe. We isolated this stem cell from a patient with lung cancer who had never smoked cigarettes. Hopefully this image will help raise awareness of lung cancer—Australia's number-one cause of cancer death—and encourage more research into the disease.

of patients with precisely diagnosed cancer subtypes will need to be expanded. Deep clinical annotation linked to research data sets arising from 'omic' analyses of biosamples, and to treatment outcome, are needed, and this will require focused investment as well as global collaboration. Increasingly, broad descriptors such as 'lung cancer' will be subdivided into not just a few histopathological subtypes, but tens of subtypes defined by both molecular and other phenotypic characteristics. This will further enable us to develop specific therapies for specific cancer subtypes.

Cancer treatments will continue to improve through the development of new, targeted therapies and their interleaving with conventional surgery, radiation, and cytotoxic chemotherapy. New treatments may seek to target the cancer cell directly, or to alter the cellular environment that permits and sustains the cancer. We are now at the beginning of a welcome golden age of advances in immunotherapy. In the next few years, we should see the unveiling of the full potential of therapy directed at relieving checkpoint inhibition of T-cells. Research will then focus on how to augment any immunotherapy effect in cancers where the patient's maximal endogenous immune response is insufficient to eradicate the disease. Similarly, CAR T-cell therapy (engineering patients' own immune cells to recognise and attack their tumours) will likely become routine for a select group of cancers where cure is frequent, but will not be an advance for cancer types where long-term benefits do not outweigh the high initial toxicity and cost.

More complex, combination targeted therapy protocols will become routine, as previously incurable primary and metastatic cancers become curable. Made possible by the surge in development of small-molecule and monoclonal-antibody targeted therapies, this logical trend will place major pressures on the clinical trials and regulatory frameworks that govern the availability of new therapies for standard use. Pharmaceutical and biotechnology companies, academia and regulatory authorities must develop ways to rapidly identify combinations of new therapies that are both safe and sufficiently incrementally effective to warrant rapid introduction. In turn, society will be challenged to accept that *all* new treatments carry both short- and long-term risks, and that the faster a new drug, surgical technique or radiation therapy protocol becomes available, the less will be known about its toxicities—both immediate and delayed. For example, the randomised Phase III trial of new versus standard therapy is today's gold-standard way of assessing the worth of the new therapy, measuring long-term outcomes such as survival and disease-free survival. But we will need new benchmarks when assessing treatments used by small populations of patients with rare cancers. Surrogate indicators of success, such as response rates, progression-free survival after one or two years, and patient-reported outcomes, will likely become primary objectives in trials. More rapid access to novel therapies may also mean that some patients are exposed to new and unexpected toxicities that are only fully revealed once the new approach has become widely used.

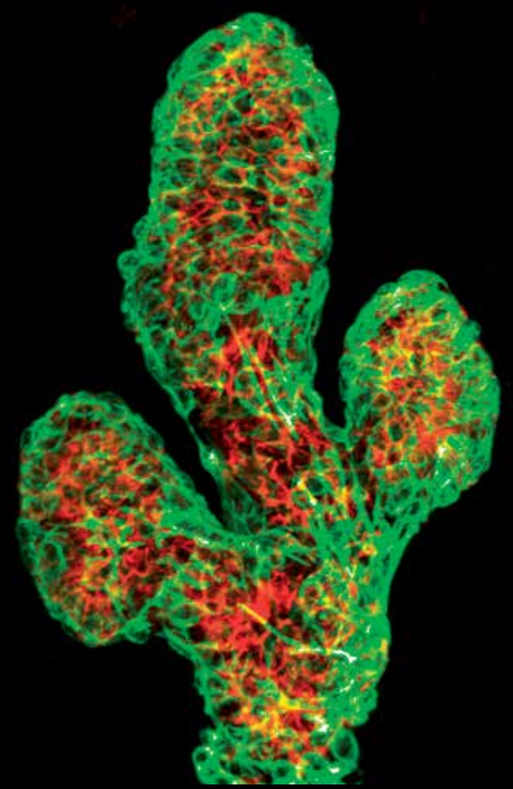
Enormous strains on healthcare budgets are inevitable as new early-detection strategies and technologies for diagnosis and therapy are introduced. Consequently, there will probably be closer analysis of the incremental costs—as well as the incremental effectiveness—of new interventions. High-quality primary research and rigorous evaluation of data will continue to be required if governments, third-party payers (such as health insurance companies) and individuals are to have sufficient evidence on which to base reasonable choices between new and existing treatments.

In future, we should focus our attention on preventing cancer. A long time can pass between generating convincing evidence for a prevention strategy and its implementation by individuals, communities and governments. We must invest in public education campaigns to reduce exposure to carcinogens, such as sun, tobacco and alcohol. We need more research on how to change behaviours that lead to more insidious conditions that predispose people to cancer, such as obesity. We must advocate strongly for implementing proven prevention strategies and cost-effective, targeted, early-detection strategies. The high and recurring costs of these public health measures can discourage government support, even though they eventually help to reduce health budgets and other costs, as fewer people develop life-threatening cancers.

Society expects the threat of cancer to diminish over time, as the fruits of ongoing research improve prevention, diagnosis and therapy. These expectations will be met, in part, through increasing five-year survival rates (from date of diagnosis)—continuing a trend of the last 30 years. In Australia, we should see fewer cases of preventable cancers across all age groups in adults. New treatments should improve the success rates of primary therapies for common cancers, and bring better control of metastatic cancers. Perhaps the biggest advances in survival will come for rare types of cancers, once we fully understand their biology and can introduce novel, targeted agents in a precision-oncology approach. Also welcome will be reductions in acute and long-term toxicity for patients with some cancers, as surgery becomes less invasive, radiation more targeted and dose-modulated, and DNA-damaging chemotherapy is selectively replaced.

Collectively, these advances will help us confront cancer with ever-growing optimism, even as the disease remains an inherent part of the human condition.

Professor Andrew Roberts



Genome-based cancer therapeutics

Over the past 30 years, the biggest change in oncology has been the rate of survival for those people with cancer. Current research is poised not only to increase this rate of survival but to do so faster, and with less suffering for patients.

In the 1970s, patients had to undergo many treatments before they found one that worked. These treatments often had very serious side effects, which meant the experience was lengthy and often distressing, and predicting the prospect of success was difficult.

In response, cancer researchers looked at large cohorts of patients, investigated what worked for most people, and developed a hierarchy of medicine for the largest numbers, thus creating a 'rule book' that clinicians could use to decide which treatment was likely to be most effective for a particular kind of cancer.

This new standard of care tripled survival, but was still fairly inefficient, particularly for the most rare cancers. In Australia, 20 000 people die each year from rare blood cancers—cancers that don't occur in sufficient numbers to enable us to build up a rule book.

Developing ever-wider cohorts for these rare cancers has been a global effort. For example, take pancreatic cancer, where survival rates five years after diagnosis are lower than 5 per cent. In 2017, researchers across Australia, the United States and Canada have come together to create an extended atlas of 1000 patients with pancreatic cancers, closely analysing and identifying the root cause, understanding how the cancer was formed, and—from all of this—identifying potential drugs.

We have known for several decades that cancer arises through the accumulation of genetic damage. With the rapid growth of genomics, we can now decode a patient's genome to understand the root causes of their specific cancer. We have also discovered valuable information about predisposition: that some families, for example, are more vulnerable to certain cancers, and that some people who have cancer once are more likely to get it again.

Foundation research and technology have come together and are being followed by clinical practice. The great value of researchers and clinicians working side by side, such as happens in a comprehensive cancer centre, is that the flow of information between the bench and the bedside is expedited. We can make changes to clinical practice and

Cactus, 2012. Courtesy Walter and Eliza Hall Institute of Medical Research.
This image shows the microscopic architecture of the developing mammary gland. In this three-dimensional reconstruction, the hollow, branching duct is lined with red-stained precursors of epithelial cells. The green stain marks the surrounding support layer of basal cells.

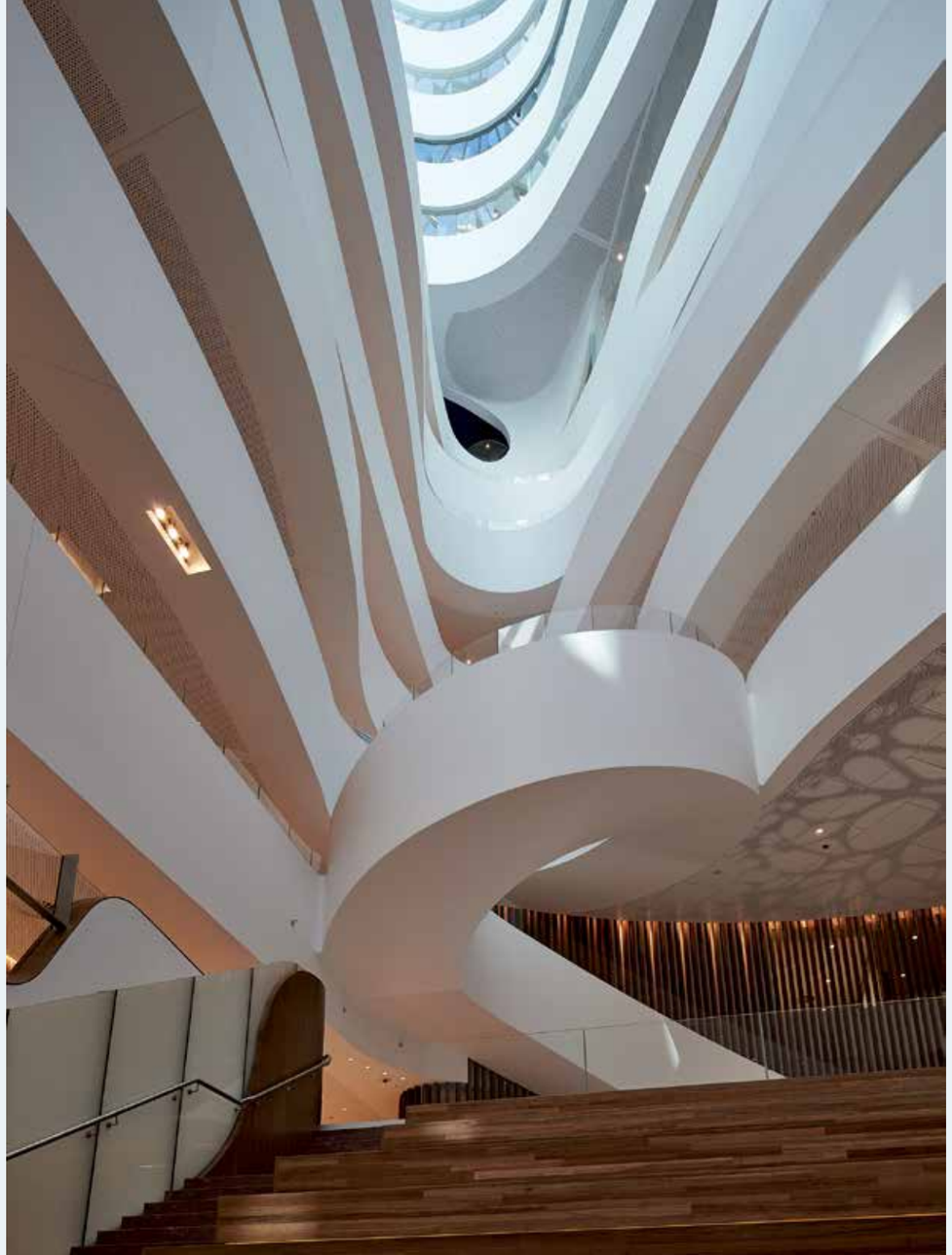
treatment faster, and also modify what we are doing in the laboratory according to patients' responses to their treatments.

Genomics is changing the face of patient care. It has given us a powerful screening process. We are identifying people at risk earlier and have a much better understanding of what pre-malignant stages of certain cancers look like, making it possible for us to act more quickly in high-risk patients. The newest work is to look at how we can take a biopsy from a tumour and screen it, growing the cells and targeting treatments *in vitro*, so that we can know exactly what will create the best reaction in the cancer before we actually treat the patient.

Rapid changes in technology will soon allow us to sequence the DNA for as many as 4000 patients a year, bringing us to a tipping point in the treatment of cancer. Teams of specialists, from pathologists to clinicians, will bring together huge and ever-growing sets of data from across the world, combining this information with our ability to decode a patient's genome and to identify which genes were damaged to cause a cancer. We will then be able to use this knowledge to select the best treatments for a specific cancer in an individual person.

Professor Sean Grimmond

Anne Rios, ***The tree of life***, 2015. Courtesy Walter and Eliza Hall Institute of Medical Research.
The breast is a dynamic organ that undergoes extensive expansion and remodelling throughout pregnancy and lactation. Understanding how this process is controlled is providing clues about how breast cancer arises. This vivid image shows the tree-like arrangement of the milk-producing cells during pregnancy, which will produce milk during lactation. With this image, our researchers are tracing how the cells in the breast change during pregnancy. This information is also shedding light on which cells contribute to breast cancer formation.



Immunotherapy: New hope and much promise

Recent decades have seen some remarkable improvements in treatment results for many types of cancer. Patients are not only living longer, but their quality of life during and after treatment is far superior, and most can once again contribute to their communities in meaningful and fulfilling ways. I frequently reflect on my time as a medical undergraduate in the 1970s, when barely 30 per cent of newly diagnosed cancer patients were alive five years later, and a cancer diagnosis was often a death sentence. Nowadays, long-term survival exceeds 70 per cent and the upward trend is, if anything, accelerating, not slowing. For many types of cancer, newly diagnosed patients now expect nothing less than cure.

Many factors underlie this remarkable progress, but most trace their roots to an extraordinary initiative of otherwise oft-maligned US president Richard Nixon, who 'declared war' on cancer in 1971 and kicked off a massive new research program with $1 billion, a huge injection of funds at the time. A similar amount of money had been sufficient a decade earlier to get humankind to the Moon, but cancer turned out to be a much tougher nut to crack! Countless more billions and an intricate network of relentless worldwide collaboration were ultimately needed, and the problem is still far from fully solved. But the continuing revolution in our understanding of cancer's environmental, genetic, molecular and cellular causes has spawned entirely new, 'rational', approaches to diagnosis and therapy that mark the beginning of the end for cancer.

New, rational therapies

'Rational' cancer therapies arise from our detailed knowledge of cancer biology. Until the 1990s, all cancer therapies, even the most effective, had originated empirically (from observed phenomena), not rationally (from understanding of cause and effect). Even today, removing a tumour (Latin for 'lump') or applying ionising radiation remain the two likeliest ways to cure cancer. With surgery, a primary cancer is removed before it has spread, while radiation kills cancer cells through mechanisms that also harm normal cells. The latter is true of all forms of chemotherapy devised from its inception in the 1940s until the late 1990s: they could 'poison' cancer cells, but also damaged rapidly dividing normal cells. The resulting death of cells in bone marrow, the gastro-intestinal tract, and hair follicles was manifested as anaemia, a low white cell count (predisposing to severe infection), severe nausea, diarrhoea and hair loss.

Peter Bennetts, **Victorian Comprehensive Cancer Centre: Interior**, 2016. Courtesy University of Melbourne and Victorian Comprehensive Cancer Centre.

This essay briefly discusses two rational cancer treatments: targeted anti-cancer drugs, and immunotherapy.

Unlike conventional chemotherapy, targeted drugs capitalise on our understanding of what makes a cancer cell tick, enabling us to target that cancer's particular weakness, or Achilles' heel. Cancer cells exhibit rogue behaviour because they develop defects (mutations) in the genetic material (DNA) that controls them. Key mutations make possible two potentially lethal properties: the cells divide and accumulate uncontrollably at that site (forming a tumour), and they can break free of their local environment and seed into other organs to form more nodules. Based on a deep understanding of the 'driver' mutations for each type of cancer, drugs that specifically block these processes can sometimes be developed; because the mutation does not occur in normal cells, the drug affects only cancer cells, bringing fewer side effects.

The first-ever targeted therapy was directed against an enzyme (a kinase) that is expressed at very high levels and causes uncontrolled cell proliferation in chronic myeloid leukaemia (CML). The drug Gleevec significantly extends the life expectancy of many patients with advanced CML, as was celebrated on the cover of *Time* magazine on 28 May 2001. More recently, a separate mutation-driven process that activates the B-Raf kinase in advanced melanoma was targeted by the drug vemurafenib (and now many similar compounds), with similarly startling clinical benefit. Although many cancers eventually develop further mutations that enable them to escape this control, hundreds of targeted therapies, for many cancer types, are now available or are in clinical trial.

Immune-based therapies

Immunotherapy is the second form of rational cancer therapy to emerge—and even more recently. Remarkably, attempts to harness a patient's own immune system to treat their cancer go back more than a century, to the time of Pasteur, many decades before we had even a rudimentary understanding of how cancer is caused or how the immune system works. Small wonder, then, that significant progress was not achieved until just a few years ago. But the wait was well worthwhile!

Scientists became aware some decades ago that around 20 per cent of human cancers are caused directly by viruses. Major advances in cancer prevention came with the development of vaccines against hepatitis B (a major cause of primary liver cancer) and, more recently, those strains of papilloma virus that lead to human cervical cancer. Gardasil, a vaccine developed by Professor Ian Frazer and Dr Jian Zhou in Brisbane in the 1990s, is now used in mass-immunisation campaigns around the world and has markedly reduced the number of new cases of cervical cancer in Australia. However, because vaccines against viruses work by preventing infection, they cannot treat an established cancer, or prevent a future cancer if the infection is already established.

The real excitement of the last five years has been that a rational understanding of how the immune system responds to cancer has led to immune-based therapies that can eradicate established cancers of many kinds, sometimes even very advanced ones. Australians have made major contributions to the knowledge base on which modern immunotherapies are being built, the most important and far-reaching being the cancer immune surveillance theory of Nobel laureate Professor Macfarlane Burnet, who advanced the highly controversial idea that a key function of the human immune system, and specifically of cells known as lymphocytes, is to detect and kill cancer cells before we are even aware of their presence, let alone notice any symptoms.

The corollary to Burnet's argument is that failure of this immune surveillance mechanism is necessary for clinical cancer to occur, and re-establishing immune control might cure cancer that has previously 'escaped'. It took until the last decade for these views to be widely agreed and adopted. Reassuringly, Burnet's views also translate into highly original and effective ways of controlling cancer.

So, what are immune-based therapies like, and how do they work? Many forms are emerging, but two have brought massive benefits to patients over the past five years. The first, known as 'checkpoint blockade', can be described as taking the brake off an immune response to cancer cells. To explain how, let's think firstly about what happens when our immune system responds to a common viral infection, such as tonsillitis. We are all aware of the painful, swollen lymph glands that can easily be felt under the jawbone when we contract a throat infection; in children, the glands can swell to several centimetres in a couple of days! These swellings are normal, and are made up of billions of lymphocytes responding to the virus, some of which—the 'killer cells'—develop the ability to specifically kill virus-infected cells.

Within days, when the virus has been defeated, the neck swellings rapidly settle, because a brake or 'checkpoint' is applied to limit the immune response. A major discovery was the realisation that cancer cells can keep immune killer cells at bay by imposing the very same brakes that limit normal immune responses. Revolutionary new cancer therapies capitalise on this by turning the brake off once more, allowing the killer cells to have their lethal effect on cancer cells. This has brought some remarkable responses in many forms of cancer, most notably advanced melanoma, lung cancer, some forms of breast cancer, and bladder and kidney cancers.

The second form of immunotherapy sounds rather futuristic, requires some high-powered technology, but has proven amazingly effective in the commonest form of childhood leukaemia: acute lymphocytic leukaemia (ALL). In a widely publicised case, five-year-old Emily Whitehead, for whom all forms of conventional therapy for highly aggressive ALL had failed, is alive and well six years after receiving a form of killer cell therapy known as adoptive immunotherapy. Here, a vaccine of killer cells is developed from the patient's

own lymphocytes: these cells are harvested from a vein, grown up and stimulated in a high-tech 'clean room' for 12 days, then re-infused back into the patient. These chimeric antigen receptor T-cells (CAR T-cells) can home in on cancer cells and destroy them, using mechanisms similar to those that kill virus-infected cells. Intense research is now under way to develop similar CAR T-cells to treat more common cancers, including lung, colo-rectal and prostate cancers.

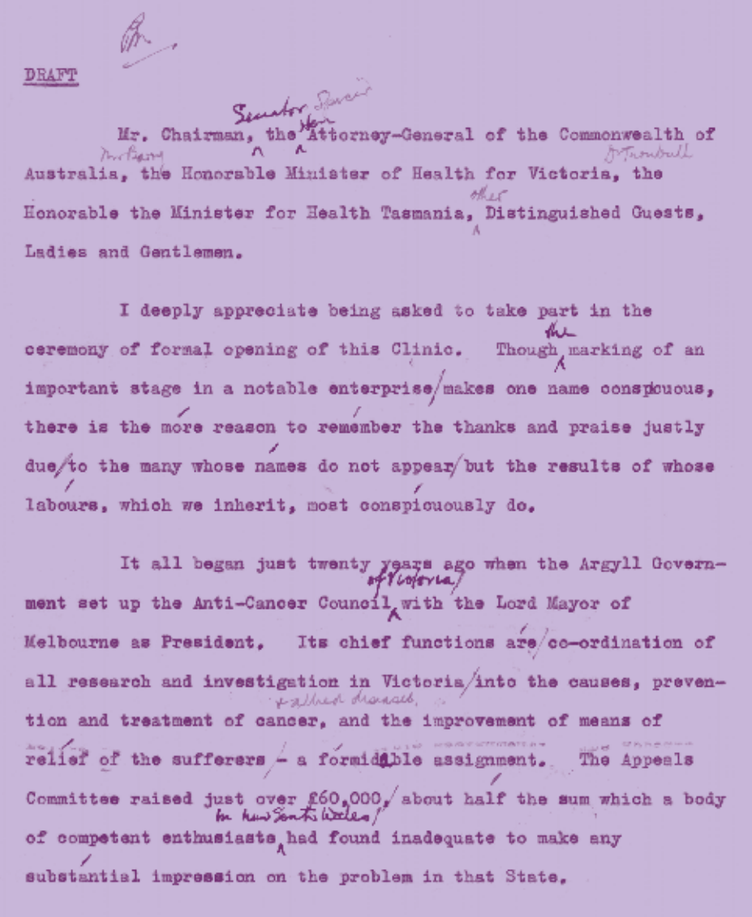
The coming years are full of promise, as we are in only the early stages of learning how best to apply these powerful new approaches, and to combine them with established treatments such as radiation therapy and targeted drugs, or with each other. There is enormous potential to offer patients with cancers that still have a very poor prognosis (for instance, brain, ovarian and pancreatic) a new chance at life.

The very face of cancer, and the way it is perceived in our community, is changing in ways we could not have imagined even at the turn of this century. If this research momentum is maintained for just one or two more decades, long-term survival from all cancers will top 90 per cent, and most cancers will be managed more as chronic (but still potentially serious) conditions such as hypertension, diabetes or arthritis, rather than as the grim killer diseases they once were. After decades of promise, it is a privilege to be just a small part of the worldwide collaborative research network making such great strides in cancer control.

Professor Joseph A Trapani

Cat. 78 Peter MacCallum (1885–1974), **Draft speech** (detail), 1950, typescript with handwritten annotations, 33.8 × 21.0 cm, prepared for the opening of Melbourne's first cancer clinic. Folder 24e, 1975.0042, Peter MacCallum Collection, University of Melbourne Archives.

TURNING POINTS



DRAFT

Mr. Chairman, the Attorney-General of the Commonwealth of Australia, the Honorable Minister of Health for Victoria, the Honorable the Minister for Health Tasmania, Distinguished Guests, Ladies and Gentlemen.

I deeply appreciate being asked to take part in the ceremony of formal opening of this Clinic. Though marking of an important stage in a notable enterprise makes one name conspicuous, there is the more reason to remember the thanks and praise justly due to the many whose names do not appear but the results of whose labours, which we inherit, most conspicuously do.

It all began just twenty years ago when the Argyll Government set up the Anti-Cancer Council with the Lord Mayor of Melbourne as President. Its chief functions are co-ordination of all research and investigation in Victoria into the causes, prevention and treatment of cancer, and the improvement of means of relief of the sufferers – a formidable assignment. The Appeals Committee raised just over £60,000, about half the sum which a body of competent enthusiasts had found inadequate to make any substantial impression on the problem in that State.

Dr William Gillbee: Surgeon and art patron

Two of Australia's most iconic history paintings were funded by a bequest from a Melbourne surgeon, William Gillbee: Emanuel Phillips Fox's *Landing of Captain Cook at Botany Bay* and John Longstaff's *Arrival of Burke and Wills at the deserted camp at Cooper's Creek*. Remarkably, Gillbee's own life is echoed in their subject matter. Like many early Australian doctors, Gillbee (1825–1885) came here as a ship's surgeon; he arrived in Hobart on the *Windermere* in 1849, seeking new lands and adventure. He then travelled back to Scotland via the Californian goldfields, only to return to Victoria in 1852 on the *Georgiana*, narrowly escaping death from a mutinous crew.

Through his medical career in Victoria, Dr Gillbee was to have an important role in the country that Cook claimed for the British Empire. He helped establish the Melbourne Medical School, and served as vice-president of the Royal Society of Victoria, in which role he was instrumental in setting up the Burke and Wills expedition. It is an extraordinary coincidence that Gillbee's bequest funded a painting of Burke and Wills' fate.

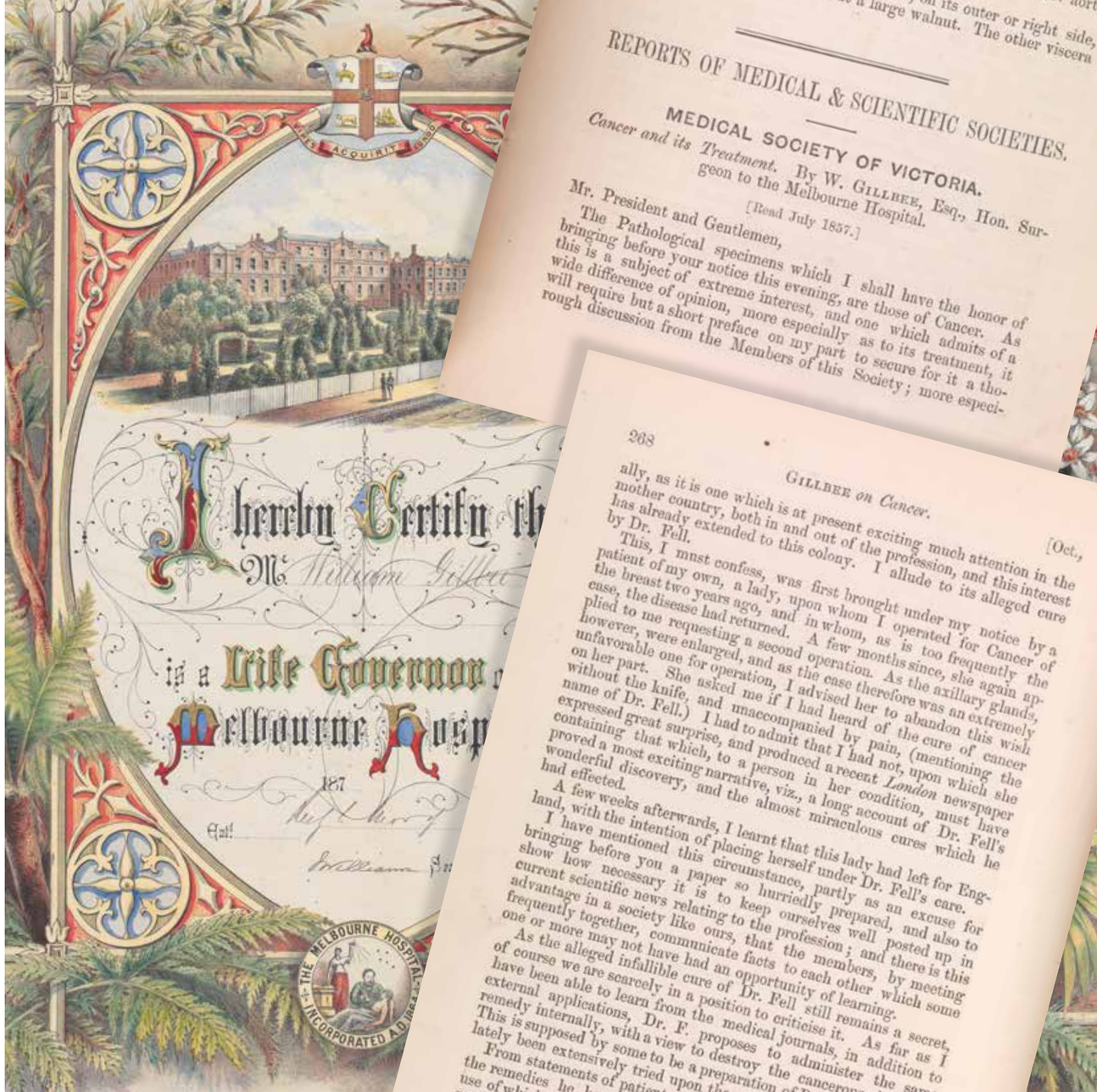
Gillbee was active in the Medical Society of Victoria, whose members included the colony's most influential doctors, and was progressive for his time, later becoming the first surgeon in Australia to encourage antiseptic surgery as outlined by Joseph Lister in 1867. In October 1857 Gillbee, honorary surgeon at the Melbourne Hospital, presented to the Medical Society his report 'Cancer and its treatment'—the first paper on cancer published in Australia. This commenced by surveying differing views of the causes of cancer, 'to speak of the nature and origin of this terrible malady', encompassing opinions of leading British medical practitioners such as James Paget (who advised on the curriculum for the Melbourne Medical School) and Sir Astley Cooper. Other causes proposed included insufficient food, intemperance, and climate changes.

Various cases and pathology specimens were presented, including one of Gillbee's patients who, after he declined to operate further on her breast cancer, travelled to London, to seek from a Dr Fells a remedy of bromine, which was to gain prominence in Europe. Surgery was commonly used to treat cancer, but there was also debate about its value in all instances; other treatments involved corrosive chemicals: chloride of zinc paste, sulphuric acid with saffron, arsenious acid with cinnabar, and tannic acid. The purpose of Gillbee's paper was 'to promote discussion and to evoke the expression of your own views on this subject'.

Dr Jacqueline Healy

Foreground: Cat. 67 William Gillbee (1825–1885), **'Cancer and its treatment'**, *Australian Medical Journal*, vol. 2, October 1857, pp. 267–76. SpC/Med AUST v.2 (1857). Special Collections, Baillieu Library, University of Melbourne.

Background: Hamel & Ferguson (Melbourne), **Certificate conferring on William Gillbee a life governorship of the Melbourne Hospital**, c. 1870–79, lithography with handwritten ink inscription, 48.0 × 38.0 cm. H2005.6/2, courtesy State Library Victoria.



The contribution of the individual: Then and now

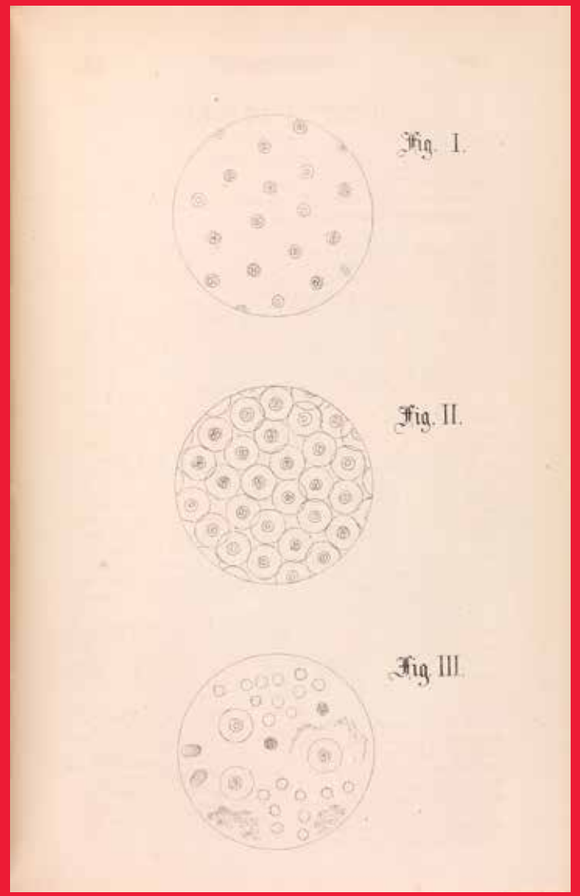
As I read this hospital report by Thomas Ramsden Ashworth, I reflect on the extraordinary amount one can learn from an individual and the expression of their disease—even after death.

Ashworth describes a young patient admitted to the Melbourne Hospital in October 1868 with rheumatism and disability, who dies within 24 hours, of marasmus (severe malnutrition). The manuscript eloquently describes the post-mortem findings of this unfortunate man, including the presence of about 30 subcutaneous tumours. Further investigation of these tumours reveals a jelly-like substance, in which are found multinucleate (presumably malignant) cells. The author continues by examining the patient's blood and finding the same multinucleate cells. The hand-drawn figures illustrating the microscopic findings are a simplistic but effective way of demonstrating the key findings of the case. The author, after consulting with Professor Halford, then postulates that the multiple subcutaneous tumours may have been seeded from the cells in the blood. Thus begins a discussion of how cancer spreads in the body.

So, how is this report relevant today? Cancer remains a substantial cause of morbidity and mortality, despite 150 years of research and advances in diagnosis and therapeutics. A young man with disseminated melanoma may still be admitted to the Royal Melbourne Hospital and die as a result of an incurable tumour. The 21st-century version of Ashworth's scholarly dissection of a clinical case has, however, moved from the microscopic level to the molecular. The next revolution in helping patients with cancer will involve a critical examination of their cancer at the level of DNA or proteins. The age of personalised care is well under way—a new era in which the detailed characterisation of a patient's cancer will result in decisions about the best treatment, and provide clear prognostic information. The question of how cancer spreads is just as topical today as when Dr Ashworth wrote this case report in 1868; the difference is that the tools we have at our disposal are much more sophisticated and will result in better outcomes for patients.

Professor Geoff McColl

Cat. 70 Thomas Ramsden Ashworth (1864–1935), **'A case of cancer in which cells similar to those in the tumours were seen in the blood after death'**, *Australian Medical Journal*, vol. 14, no. 3, May 1869, pp. 146–7. SpC/Med AUST v.14 (1869), Special Collections, Baillieu Library, University of Melbourne.



HOSPITAL REPORTS.

MELBOURNE HOSPITAL.

A case of Cancer in which cells similar to those in the Tumours were seen in the blood after death. Reported by THOMAS RAMSDEN ASHWORTH, Resident Physician.

Preserving cancers for the doctors of tomorrow

In the early 20th century, pathologists grappled to understand the causes of the diversity and increased incidence of the cancers they were observing in patients. Likewise, the challenges of explaining these biological processes to students meant that early medical professors needed to outline the many populist hypotheses of the time. Writing in his lecture notes at the University of Melbourne in 1903, the renowned pathologist and professor of descriptive and surgical anatomy and pathology Sir Harry Brookes Allen (1854–1926) described the impossibility of defining tumours, and postulated that cancer might be a parasitic disease: 'Cancer represents the greatest degree of abrogation of the federal life of tissues, the revolting elements resembling embryonic cells in their power to multiply, and in the freedom with which they may be transplanted'.

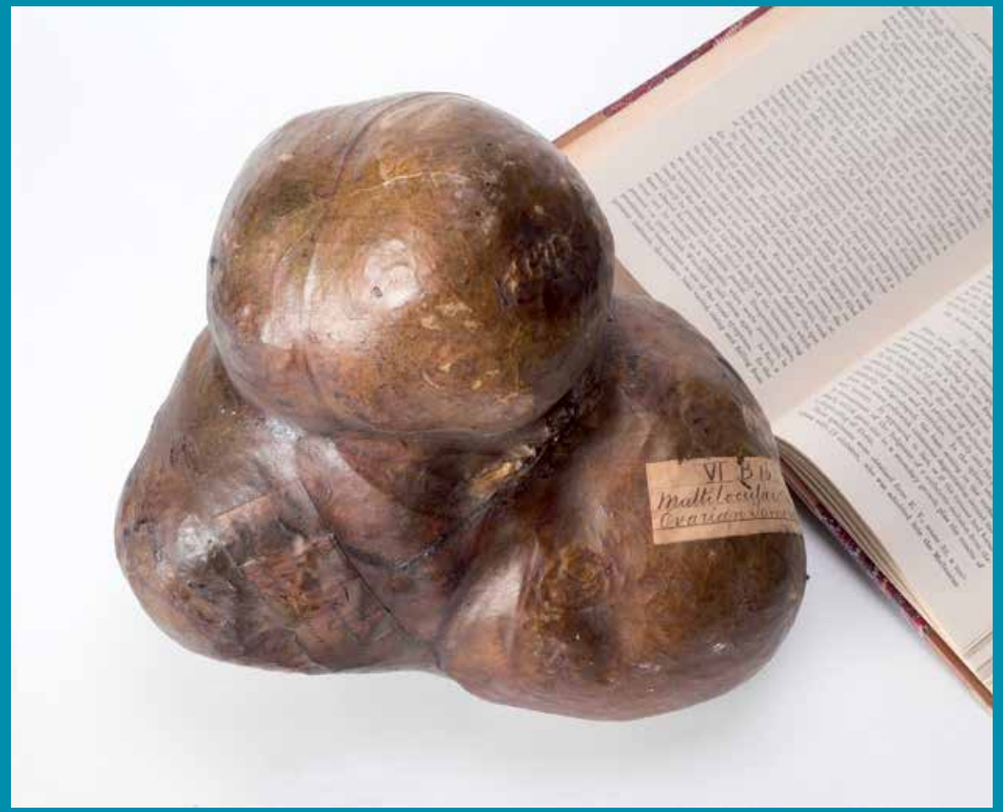
Allen believed that observing pathology *in situ* within dissected organs was crucial to student learning; thanks to advances in human tissue preservation techniques, he arranged for specimens to be carefully preserved in formaldehyde and displayed for teaching purposes. Each specimen was dissected from a hospitalised patient during surgery or from an autopsy, and was used extensively for medical education. The 10 000 morbid anatomy specimens he amassed and intricately catalogued formed Allen's world-class museum of pathology (now the Harry Brookes Allen Museum of Anatomy and Pathology) and allowed students to deepen their knowledge of the processes of disease. Rows of potted specimens revealed the diversity of tumours and neoplasms that could develop in almost any part of the body. Grouped together by their diagnostic characteristics, some were described as 'innocent' tumours and others as 'malignant'.

Many tumour specimens preserved by Allen remain in the museum today, including this one: a multilocular ovarian tumour, or cystadenoma, which was labelled by Allen as 'innocent', or what is now described as benign. Ovarian cystadenomas can grow to an enormous size and weigh many kilograms. This specimen measures approximately 26 centimetres in diameter, and was dried and filled with plant fibre by Allen himself.

Dr Ryan Jefferies

Cat. 65 Harry Brookes Allen (1854–1926) (preparator), **Ovarian tumour specimen**, c. 1900, human tissue, plant fibre, paper; 15.0 × 26.0 × 21.0 cm. 531-001076, Harry Brookes Allen Museum of Anatomy and Pathology, University of Melbourne.

Cat. 74 Harry Brookes Allen (1854–1926), **'Melanoid tumours of many organs'**, *Australian Medical Journal*, vol. 2, no. 11, 15 November 1880, pp. 507–11. SpC/Med AUST ns v.2 (1880), Special Collections, Baillieu Library, University of Melbourne.



Early radiation therapy: Coolidge tube

Radiation therapy is one of the three cornerstones of modern cancer therapy. Some 50 per cent of patients should have radiation therapy as part of their treatment, and it contributes to 40 per cent of cures.

The most common method for delivering radiation therapy is using X-rays, with energies starting around 100 000 volts (100 kV). X-rays were discovered in late 1895 by Wilhelm Roentgen, who demonstrated their use to image bone. Remarkably, by early 1896 X-rays were also being used to treat cancer, with little scientific rationale other than the observation that prolonged exposure produced reddening and ulceration of the skin.

An early apparatus for producing X-rays to treat cancer was the Coolidge tube, invented by William Coolidge in 1913 to improve the reliability of previous X-ray-generating equipment by introducing a heated cathode as the electron source. The Coolidge tube consists of an evacuated glass envelope containing at one end a cathode and at the other a tungsten anode. When a high voltage is applied across the ends of the tube, the electrons are accelerated into the anode, and the interaction produces X-rays, their maximum energy determined by the magnitude of the voltage. The X-rays are transmitted through the glass envelope, which in the example pictured here has become discoloured as a result.

Although adequate for imaging bone, 100 kV X-rays have limited penetration. They can treat skin cancers, but cannot deliver effective doses to deep-seated cancers without causing significant skin damage. Higher energies (around 200 to 400 kV) are more useful for internal cancers (hence the term ‘deep’ X-ray therapy or DXRT), but skin damage remains a limitation. Energies beyond this range are not possible with the Coolidge tube, because of the very high voltages involved and the amount of insulation required to make it safe. Nevertheless, DXRT was the mainstay of radiation therapy for the first half of the 20th century. In 1956 the Peter Mac installed its first linear accelerator, capable of producing X-rays with energies up to 4 million volts, treating the most deeply seated tumours with negligible skin toxicity. This revolutionary technology—mega-voltage radiation therapy—quickly replaced DXRT.

Professor David Ball

Cat. 36 William Coolidge (1873–1975) (inventor), manufactured by Victor X-Ray Corporation for General Electric (USA, 1892–present), **Coolidge X-ray tube**, 1917, glass, metal; 22.0 × 36.0 × 22.0 cm. R39, gift of Peter MacCallum Cancer Centre, 2017, Peter MacCallum Radiology Collection, Medical History Museum, University of Melbourne.

Australia's first cancer registry

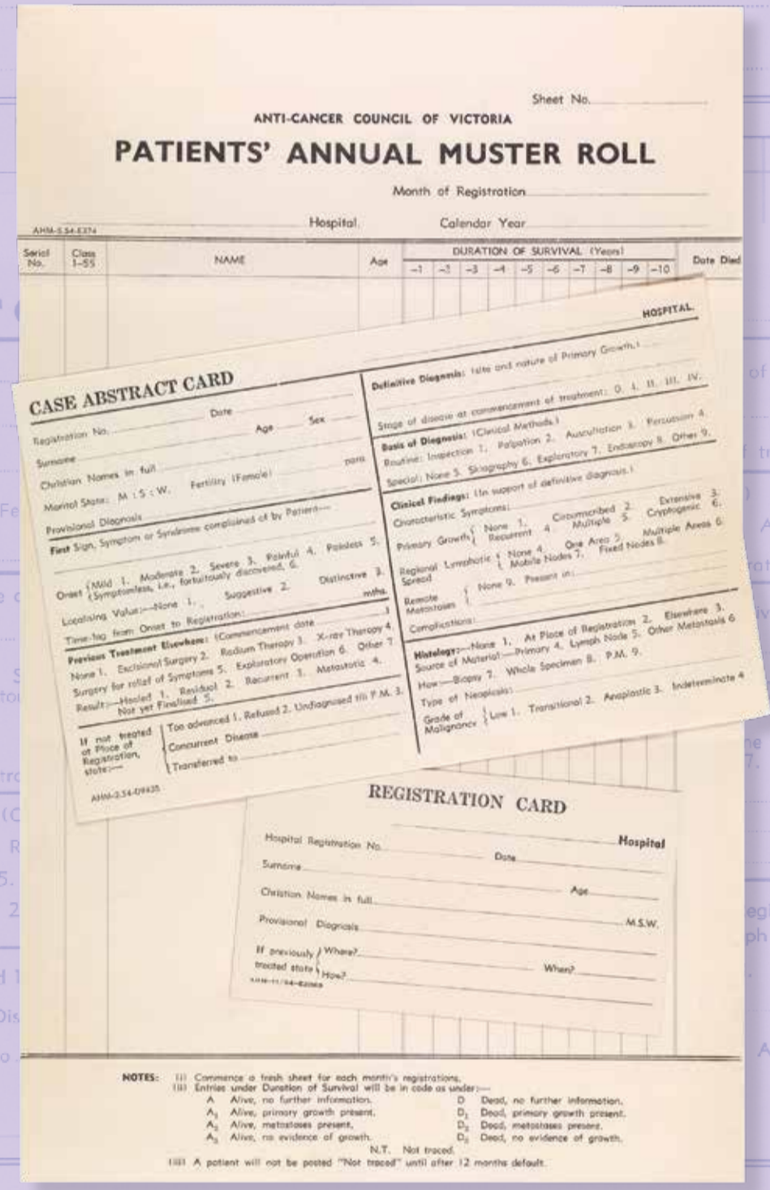
In 1938 the Anti-Cancer Council of Victoria (ACCV) accepted a proposal from a leading cancer surgeon, Dr Robert Fowler, to form a Central Cancer Registry in Melbourne. Following a successful six-month trial at the Royal Melbourne Hospital, Australia's first cancer registry came into operation on 1 January 1940.

Financed by the ACCV and supported by the Victorian Health Department, the registry began with six major teaching hospitals—Royal Melbourne, Alfred, St Vincent's, Prince Henry's, Women's and Austin—who agreed to adopt the same methods of data collection when treating cancer patients. The ACCV supplied each hospital with the same admission and discharge book, registration cards, abstract cards, follow-up cards and annual muster roll, for recording information on the number of patients being treated for cancer, their symptoms and onset, treatment methods and outcomes. Led by Dr Fowler, who described it as a 'planned experiment in statistical medicine', the registry was a much-needed and important resource for clinicians, researchers, statisticians and epidemiologists. One of the earliest and most ground-breaking research papers to stem from the registry was Dr Fowler's article in the 1955 *Medical Journal of Australia*, in which he used registry statistics to show the positive association between tobacco smoking and lung cancer.

By the 1960s the registry was gathering statistics from nine public hospitals, representing some 40 per cent of cancer cases in Victoria. By 1961 it had gathered the case histories of more than 40 000 patients, rising to more than 120 000 in 1975. As cancer rates grew across Victoria, large masses of data were recorded manually onto punch cards, which from 1971 began to be digitised. In the 1980s the Central Cancer Registry underwent a number of changes under its director, Dr Graham Giles, who transformed it from a data-collecting agency to one focused on cancer control. In 1986 it changed its name and direction to become the Cancer Epidemiology Centre. Although the registry no longer exists in its original guise, it played a significant role as Australia's first cancer registry, recording and assessing cancer statistics, patterns and treatment options in the mid- to late 20th century.

Lili Belle Birchall

Cat. 90 Central Cancer Registry (Melbourne), **Cancer registration templates**, c. 1960, printed cards; included are a case abstract card, registration card, and patients' annual muster roll, in Appendix 'A' envelope. Folder 24a, 1975.0042, Peter MacCallum Collection, University of Melbourne Archives.



An early warning on smoking and lung cancer

This 1955 paper from the *Medical Journal of Australia* is today regarded as one of the most important exposés of the link between tobacco smoking and lung cancer. It was written by Dr Robert Fowler, a respected Melbourne surgeon interested in gynaecological cancer, who in 1939 had helped the Anti-Cancer Council of Victoria set up a central registry to collate data on cancer diagnoses from six public hospitals.

The elegance of language, logical progression and simplicity of presentation of the graphs would give pleasure to any reader—not only one with a medical background. Fowler's recognition of the contribution of Miss C McCall for her mathematical computations and charts, citing her as his co-author, could serve today as a model for acknowledging the assistance of others.

After presenting his understanding of the public's fear of cancer diagnosis, 'a sense of threat to health, happiness and efficiency of organized society', then the role of epidemiology, 'the discipline that links medicine with demography', Fowler moves through a series of statistics to reveal opportunities for gathering further demographic information from, for instance, the tuberculosis chest X-ray survey, through which cancer cases were being identified by chance.

Fowler presents information from Britain and the United States on the link between smoking and lung cancer, to join his own evidence, and observes: 'first, there is some kind of causal connexion; secondly, the risk increases with the amount smoked'. With remarkable prescience, he foreshadows conflict between financial interests and public health, and identifies that both doctors and members of the public are 'unaccustomed to think in terms of preventibility'. He states: 'it seems a ministerial warning on the cigarette menace would be wise'. No wonder this paper is deemed so important.

Perhaps Fowler's statements in a medical journal were at first not widely promulgated, and the evidence dismissed by some. We can only assume that, as the Central Cancer Registry continued to amass the statistics that became further evidence, Robert Fowler was there for the next 10 years, eloquently and steadfastly supporting its work, and advocating for the value of epidemiology in informing public health interventions, in order to contain disease and reduce prevalence.

Dr Lorraine Baker

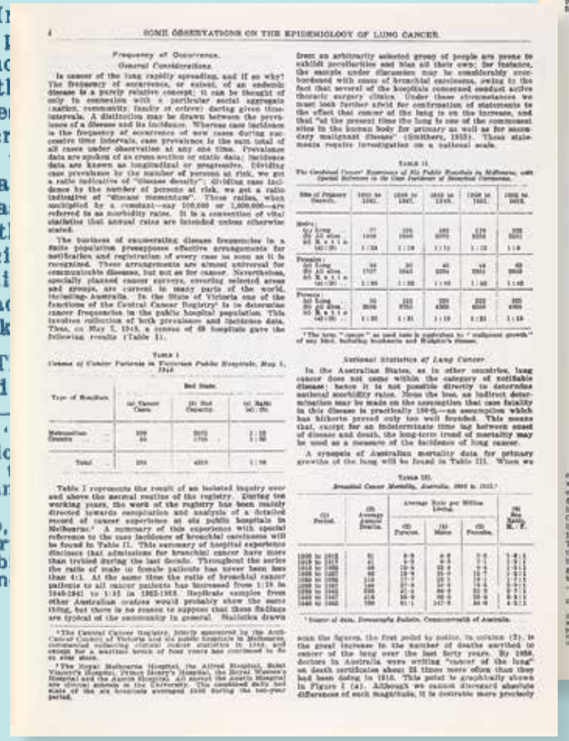
Cat. 120 Robert Fowler (1888–1965), **'Some observations on the epidemiology of lung cancer'**, reprint from *Medical Journal of Australia*, 2 April 1955, Sydney: Australasian Medical Publishing Company. File 171, B0000114100, Cancer Council Victoria Collection.

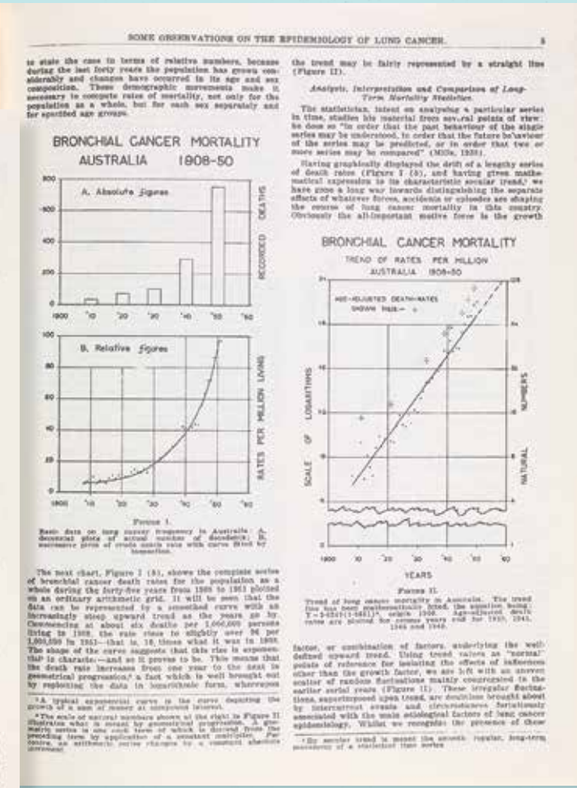
Reprinted from *The Medical Journal of Australia*, April 2, 1955, page 485.

SOME OBSERVATIONS ON THE EPIDEMIOLOGY OF LUNG CANCER

By ROBERT FOWLER,
From the Central Cancer Registry, Anti-Cancer Council of Victoria.

Epidemiology is the study of disease—any as a mass phenomenon.—GREENWOOD.





A champion of many cancer-related causes

Esmond Venner Keogh (1895–1970) was director of the Anti-Cancer Council of Victoria (ACCV) in the 1950s. He greatly expanded its funding, research programs and outreach to the community, at a time when a cancer diagnosis carried enormous social stigma, and was frequently a death sentence.

In academia and in life generally, Keogh blazed his own trail, and was a man of paradox. Coming from a broken family, as a child he was taught by the Sisters of Mercy, then at Melbourne Grammar, later joined the Unitarian church, and ultimately became a fervent atheist (while retaining 'Christian' ideals). In World War I he was heavily decorated for gallantry; in World War II he drew upon his experience working at the Commonwealth Serum Laboratories (CSL) in the 1920s to help solve critical problems of serum storage, and worked to prevent and treat malaria in the North African and Pacific campaigns. Despite his extensive military involvement, Keogh became an ardent and outspoken pacifist.

Keogh's medical studies were delayed by World War I and he graduated in 1927, aged 32. He then took the highly unusual career path of becoming a pathologist 'trained at the bench' in bacteriology and biochemistry, as well as in anatomical pathology. In addition to championing many cancer-related causes, he was instrumental in public campaigns to control tuberculosis and polio, and was a member of several expert committees for the fledgling National Health and Medical Research Council.

As a virologist and medical researcher at the Walter and Eliza Hall Institute and CSL, Keogh collaborated extensively with, and was greatly admired by, luminaries including Macfarlane Burnet. He was highly productive, publishing many papers in major journals. One notable protégé during his early days at the ACCV was Don Metcalf, who would be Carden Fellow of the ACCV for more than half a century. Clearly, Keogh had a keen eye for emerging scientific excellence.

A remarkably private and modest man, Keogh eschewed all public and professional recognition, even insisting that his memory not be celebrated after his death. His many colleagues and admirers denied him that last wish, with a modest but convivial send-off.

Professor Joseph A Trapani

Cat. 147 **Dr Esmond Venner Keogh (1895–1970)**, c. 1962, photograph, 13.5 × 11.0 cm. Cancer Council Victoria Collection.

A builder of institutions

Roy Wright was the ninth of 10 children raised in a farming family in northern Tasmania. After a year at the University of Tasmania, he took up scholarships in 1925 to the University of Melbourne and Queen's College, to study medicine. His fellow students began to call him 'Pansy' after he had played the role in a skit about the university policeman known for his unkempt appearance. This antithetical nickname suited Wright: a short, powerful man with a gravelly voice.

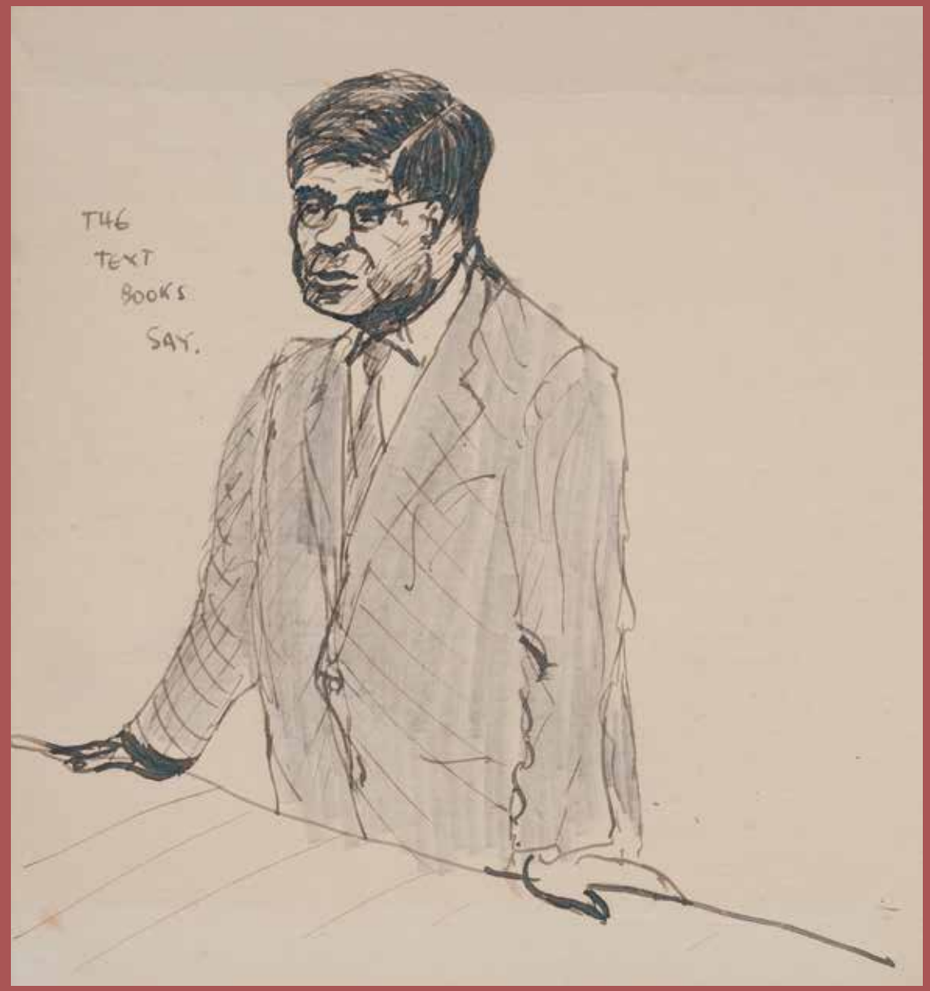
Wright was a brilliant student. After graduating first in his class, he was appointed in 1931 to be an assistant in Thomas Cherry's foundational research into links between tuberculosis and cancer. He won the David Syme Prize for his own pathology research in 1937. He was then invited by Howard Florey to work with him at Oxford University, whence in 1939, aged 32, he was appointed professor of physiology at Melbourne, a position he held until 1971.

Wright was a builder of institutions. He campaigned for the Chifley Labor government to establish a national university in Canberra, then was for 30 years a council member of the Australian National University. In Melbourne, from 1948 he played a pivotal role in encouraging the work of Dick Denton, Victor Wynn and others, the beginnings of the Howard Florey Institute of Experimental Physiology and Medicine, and its new building in 1963—named by Wright to acknowledge his great mentor. He was instrumental in establishing the Cancer Institute in 1948 (and was its executive chairman 1948–71) and the Peter MacCallum Clinic, of which he was medical director 1971–75. MacCallum had made a profound impression on Wright since teaching him in 1928, and Wright pushed hard for his mentor to be recognised.

'Pansy' Wright was a controversial figure. His pedagogy and vision of a medical education sharply polarised students, but were highly influential. His lectures were often rambling, studded with witticisms, and deliberately challenging rather than instructive. The student artist's quip in this sketch captures Wright's determination to go beyond merely dictating examination notes.

Sir Roy Douglas Wright (1907–1990) was chancellor of the University of Melbourne from 1980 to 1989.

Emeritus Professor Peter McPhee, AM



Cat. 15 James Milne (b. 1924), ***The text books say***, c. 1948, ink and pencil on paper, 19.2 × 20.3 cm. Caricature sketch of Sir Roy Douglas 'Pansy' Wright (1907–1990), from collection of drawings *Some characters seen in the course of a medical education*. MHM02712, gift of Dr James Milne, 1987, Medical History Museum, University of Melbourne.

Father of clinical trials in oncology

Dr John Houghton Colebatch, AO (1909–2005), known among his colleagues as JHC, was inspired by Sidney Farber's publication in 1948 of a successful induction of remission in acute lymphocytic leukaemia (ALL) with an anti-folate, aminopterin. As a result, Colebatch visited Boston Children's Hospital and meet with Farber. From that experience he became a true believer in the importance of clinical trials and the futility of offering only palliative care for childhood leukaemia and other cancers—then the common practice in paediatrics in Australia and overseas. To change these attitudes he had to convince his colleagues to refer their patients to him for treatment, and then he had to demonstrate to them that he was achieving remission and prolongation of life with acceptable quality. Thanks in large part to the first successful treatment of Wilms tumour (a cancer of the kidney, most common in children), he gradually achieved his aim.

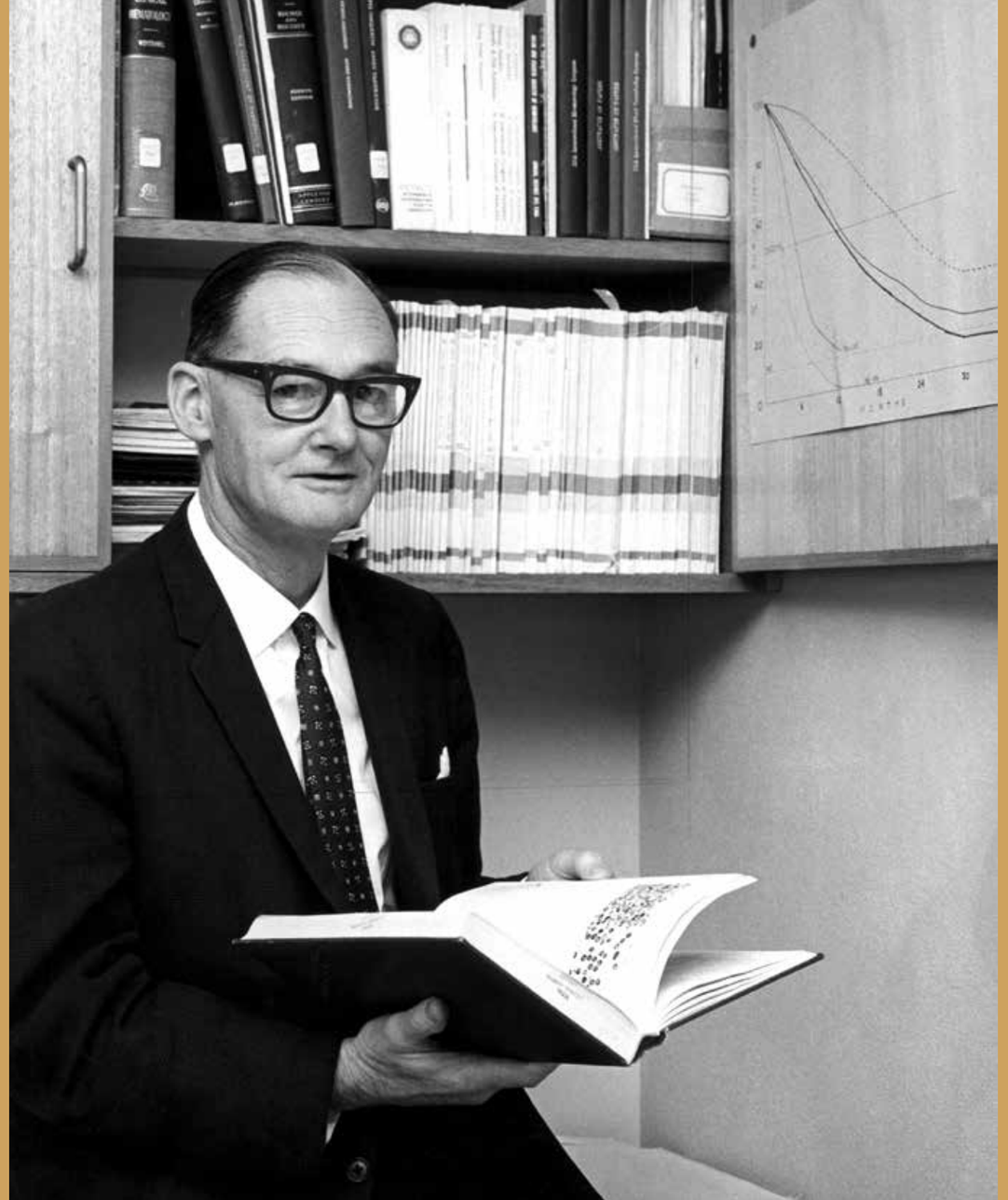
As increasing numbers of new chemotherapeutic agents began to appear, Colebatch began Australia's first clinical trial of cyclical versus longitudinal treatment of ALL, and was among the first in the world to conduct and publish a randomised clinical trial of chemotherapy in childhood ALL. To accomplish this, he recruited like-minded paediatricians in other cities, who agreed to use his study protocol. He practised and taught the discipline of adherence to the protocol with almost bulldog-like tenacity.

Colebatch also introduced the concept of a 'tumour board' of oncologists, surgeons, pathologists, radiation oncologists and various allied professionals, to plan the treatment of other childhood cancers. These boards came to be widely accepted in all major children's hospitals, and continue to this day.

At the end of his career at the Royal Children's Hospital, Colebatch joined the Anti-Cancer Council of Victoria, which had previously supported him, and he used his position to spread the gospel of the importance of clinical trials into the newly developing discipline of adult oncology. In this endeavour he was manifestly successful.

John Colebatch can truly be regarded as the father of clinical trials in oncology in Australia. Only somebody with his strength of character and determination could have succeeded.

Professor Henry Ekert, AM



Dr John Colebatch (1909–2005), 1949. Courtesy Royal Children's Hospital Archive.

An inspirational doctor

I watched incredulously as, throwing his box of matches to the floor, the doctor quietly instructed, 'Pick it up, Bill', a trail of cigarette smoke spiralling skywards from his pursed lips.

'But I can't walk', Bill responded.

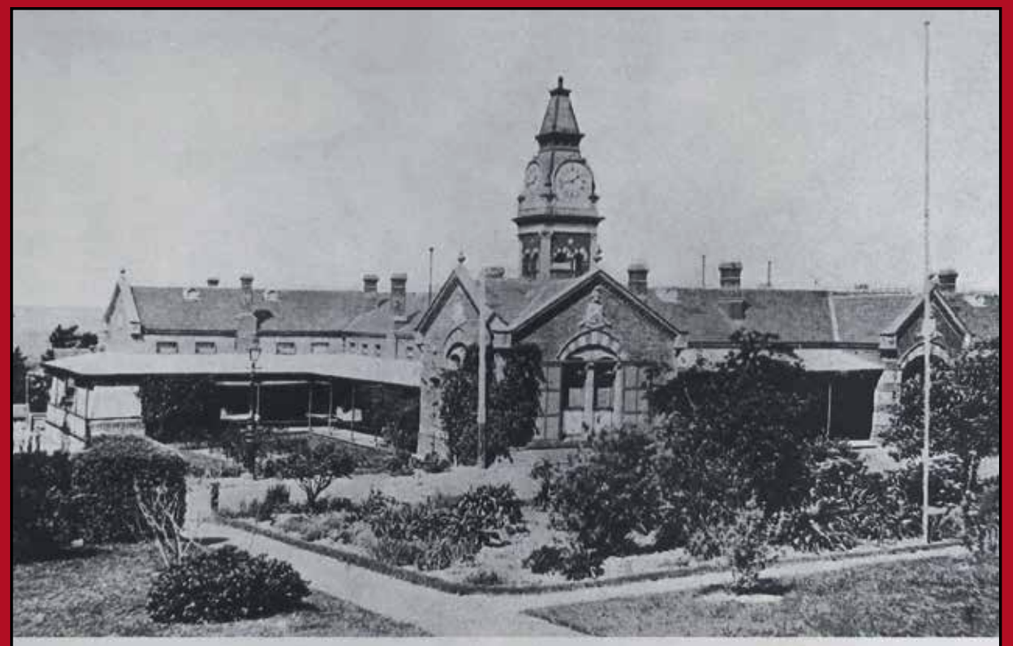
Dr Wally Moon stared back at the patient slouching in the weary old wheelchair. 'Pick it up, Bill', Dr Moon echoed. Slowly, the elderly gentleman in the faded, tattered dressing gown raised himself and took a few faltering steps forward.

'I told you, you would walk again, didn't I?' said Dr Moon, expertly lighting his next cigarette from the dying butt.

Dr Walter 'Wally' Moon (1919–1999) was an inspirational doctor who looked after terminally ill patients in the old cancer wards at the Austin Hospital in the 1960s and early 1970s. He was overweight and smoked like a chimney, but was held in awe by his students and, I sensed, by his colleagues. As an aspiring doctor in my third year of undergraduate training, I witnessed his compassion and wisdom. Although the title was yet to be coined, Dr Moon was essentially a palliative care physician, but in those days he was simply known as a wise and caring doctor who provided much-needed pain relief, sometimes through intravenous infusions of heroin, helping care for some of the incurables.

For that's how the Austin Hospital was known: as a home for incurables. Like a scene from a Dickens novel, the old Ward 17, far removed from the hospital mainstream, was home to innumerable terminally ill patients, many with end-stage cancer. They were cared for by doctors and nurses who, busy trying to alleviate suffering, were immune to the dilapidated buildings, dim lights and tired curtains, and humbled by the sounds of pain and the silence of despair. Wally Moon had championed the use of intravenous heroin to help relieve the severe pain experienced by both young and old and, under his tutelage in those old wards in a proud hospital, we learned about suffering and the ravages of uncontrolled pain. Through those of us who were inspired to try to understand this mysterious and cruel illness, the legacy of Wally Moon lives on.

Professor John R Zalcberg, OAM



"THE ELIZABETH AUSTIN MEMORIAL No. 1."
The Surgical, Tuberculosis and the Cancer Wards and Administration Offices.
(88 beds)

Cat. 9 ***The Elizabeth Austin Memorial No. 1. The surgical, tuberculosis and the cancer wards and administration offices (88 beds)***, c. 1920s, reprinted c. 1980, photograph (reproduction), 11.1 × 14.7 cm. MHM02935, Medical History Museum, University of Melbourne.

You are not alone

You are not alone is an 18-minute Technicolor film made for the Anti-Cancer Council of Victoria in 1961 by husband and wife filmmakers Adrian Boddington (1911–1970) and Jennie Blackwood (1922–2015). It deals with what was then a taboo subject: breast cancer.

The film starts with 'Mrs Barton' talking on the telephone to her daughter Helen about babysitting her granddaughter. After Mrs Barton hangs up, she recalls that five years ago she discovered a small lump in her breast.

Flashback: after seeing an Anti-Cancer Council poster on a tram, Mrs Barton tells her husband about the lump. He urges her to see their family doctor.

The GP recommends she see a surgeon as soon as possible. 'You'll be alright', the GP assures her—thanks to modern techniques and early treatment. Mrs Barton is worried about the cost, and whether they'll be able to pay for Helen's wedding and their other two children's education if she has cancer. But the GP explains that the surgeon is at a public hospital.

Mrs Barton meets the surgeon, 'Mr Whitlam' (who looks like Paul Keating), and the radiotherapist, 'Dr Baines'. They explain what has to be done, and book her in for tests. Meanwhile, she tries to get on with daily life, although the elephant in the room is her impending diagnosis.

Cut to the hospital one week later. Doctors in white masks and gowns. Bright lights. A ticking clock. Dramatic music. The lump in Mrs Barton's breast is biopsied and tested. 'It's a definite cancer. I've confirmed it microscopically', says the lab man. Mr Whitlam operates straight away.

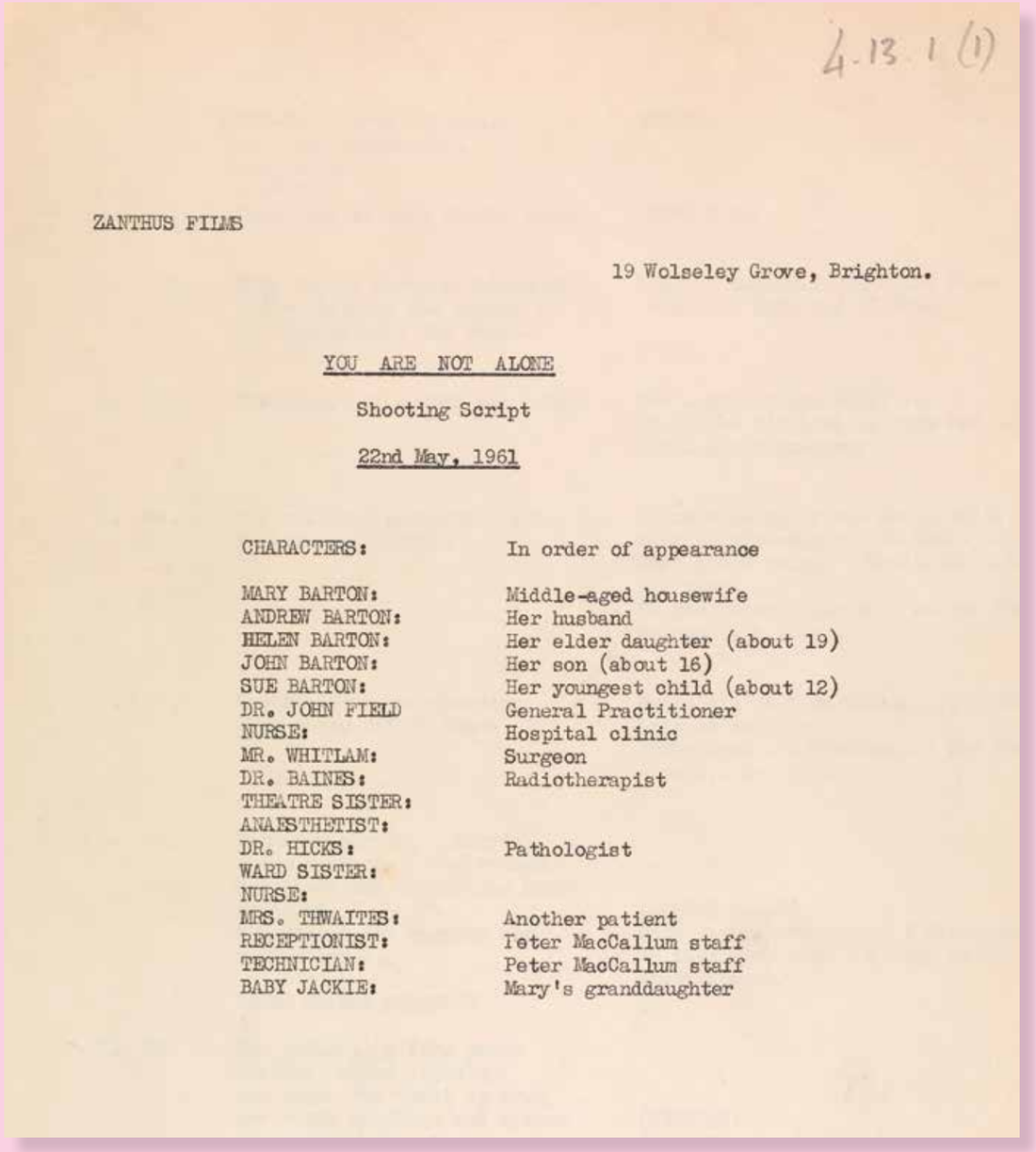
A week later, Mrs Barton goes home. After five more days, she visits a radiotherapy clinic. As she is trolleyed into a room containing a fearsome-looking linear accelerator, she recalls Mr Whitlam's comforting words: 'Remember, you're not alone'. 'I'm not frightened any more', Mrs Barton tells the radiologists. A month later, she visits her GP for the first of many monthly check-ups.

Fast-forward five years: Mrs Barton's GP gives her the all-clear, and she counts her blessings.

Jump to the present: the doorbell rings. It's Helen and her baby.

Dr Derham Groves

Cat. 139 Zanthus Films (Brighton, Melbourne), ***You are not alone*: shooting script**, 1961, typescript, 33.6 × 20.7 cm. Folder 4.13, B0000114366, Cancer Council Victoria Collection.



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ZANTHUS FILMS

19 Wolseley Grove, Brighton.

YOU ARE NOT ALONE

Shooting Script

22nd May, 1961

CHARACTERS:	In order of appearance
MARY BARTON:	Middle-aged housewife
ANDREW BARTON:	Her husband
HELEN BARTON:	Her elder daughter (about 19)
JOHN BARTON:	Her son (about 16)
SUE BARTON:	Her youngest child (about 12)
DR. JOHN FIELD	General Practitioner
NURSE:	Hospital clinic
MR. WHITLAM:	Surgeon
DR. BAINES:	Radiotherapist
THEATRE SISTER:	
ANAESTHETIST:	
DR. HICKS:	Pathologist
WARD SISTER:	
NURSE:	
MRS. THWAITES:	Another patient
RECEPTIONIST:	Peter MacCallum staff
TECHNICIAN:	Peter MacCallum staff
BABY JACKIE:	Mary's granddaughter

Sir Gustav Nossal, AC, CBE: Leading advances in cancer research

Gus Nossal took over the reins of the Walter and Eliza Hall Institute of Medical Research (WEHI) in 1965, replacing his eminent mentor Sir Macfarlane Burnet as director at the 'ridiculously young age of 34'. Two of his first actions were to bring huge advances in cancer research, one immediately and the other in decades to come: he appointed Donald Metcalf to head a new cancer research unit, and Jacques Miller to head up a new immunology unit.

Metcalf had been at WEHI since 1954, but his relationship with Burnet had been problematic, Burnet opining that cancer was an 'inevitable disease' and that 'anyone who wants to do cancer research [is] either a fool or a rogue'. Through the inspired leadership of Esmond Venner Keogh, director of the Anti-Cancer Council of Victoria, Metcalf was appointed as the ACCV's Carden Fellow at WEHI, a position he was to hold until his death in late 2014. As discussed on p. 102 by Antony Burgess, Metcalf and Ray Bradley discovered colony-stimulating factors, eventually helping some 20 million patients overcome the major side effect of cancer therapy: destruction of the bone marrow.

Jacques Miller had shot to international fame through his 1961 discovery in London of the function of the thymus in immunity. At WEHI, he and student Graham Mitchell discovered that lymphocytes are of two main types: T-cells (produced in the thymus) and B-cells (produced in the bone marrow), which interact in producing immune responses. Miller's fundamental discoveries increased understanding of cancer, auto-immunity and HIV/AIDS, and helped lay the foundation for clinical immunotherapy.

In 1971, Nossal introduced molecular biology to WEHI by appointing Suzanne Cory and Jerry Adams, who in the early 1980s discovered that the chromosome translocations found in Burkitt's lymphoma activate a known oncogene called Myc, which promotes cell proliferation. In 1988 they and student David Vaux found that a newly discovered oncogene (Bcl-2) blocks cells from dying when they should, and synergises with Myc in promoting malignancy. Thirty years of WEHI research into the mechanism of cell death contributed to the development of BH3 mimetics, an exciting new class of anti-cancer drug.

Professor Suzanne Cory, AC

Cat. 211 **Professor Gustav Nossal (b. 1931) at work in the laboratory**, 1969, photograph, 20.0 × 15.0 cm. 01203DIP, Walter and Eliza Hall Institute Archive.

Don Metcalf and the white blood cell regulator

Professor Donald Metcalf, AC, FRS, FAA (1929–2014) was a medical researcher at the Walter and Eliza Hall Institute from 1954 to 1996. He and his colleagues discovered the CSFs (colony-stimulating factors)—a major breakthrough in cancer medicine, helping patients recover from side effects of their treatments.

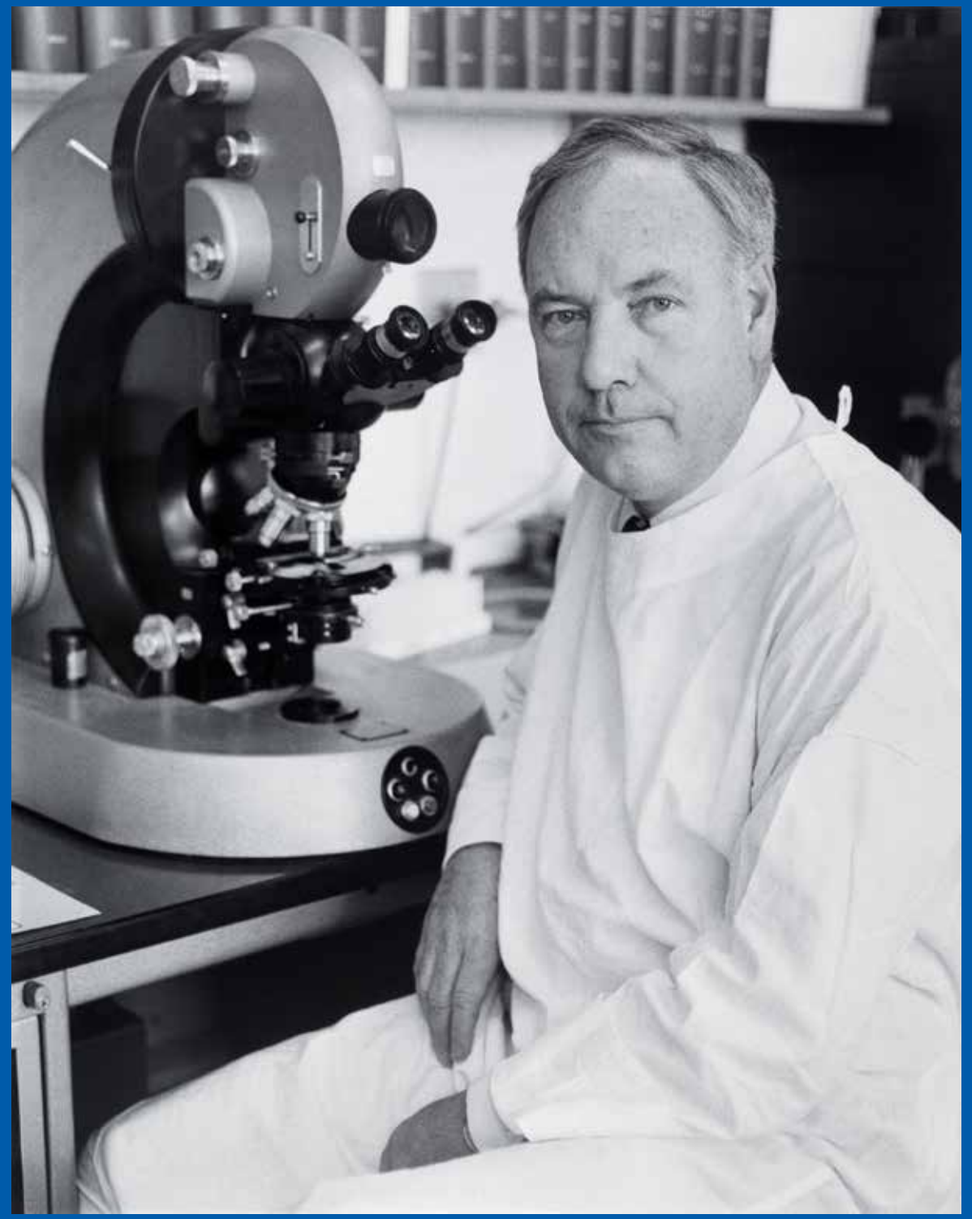
In 1966 the CSFs were discovered simultaneously in Israel and Melbourne; both laboratory teams were studying the growth of bone marrow cells. The Melbourne discovery was initiated by Dr Ray Bradley; he brought some intriguing soft-agar cultures of bone marrow and leukaemia cells to Don Metcalf for advice. Ray was trying to grow leukaemia cells, but Don realised that in Ray's cultures it was not leukaemia cells that were growing; rather, the normal bone marrow had produced colonies of mature white blood cells—this was the first time anyone had ever produced normal white blood cells in a laboratory. Over the next few years Ray and Don discovered that it was a protein that stimulated the bone marrow cells to produce more white blood cells, and they called the protein colony-stimulating factor.

The Australian and Israeli findings were received with considerable scepticism, dismissed by some scientists as artefacts of an imperfect culture system, but Don was determined to show that his discovery reflected the normal processes controlling the production of white blood cells in animals and humans. It took another ten years, but by 1977 he and his colleagues had purified and characterised two different CSFs: one that produced macrophages (M-CSF) and another that produced both granulocytes and macrophages (GM-CSF). In the next three years Metcalf discovered two more CSFs—one by himself, eventually termed interleukin-3, and the other with Tony Burgess (G-CSF), which induced the generation and activation of neutrophils.

During early clinical trials of the CSFs at the Royal Melbourne Hospital, Dr George Morstyn discovered that injections of either G-CSF or GM-CSF induced stem cells to leave the bone marrow and circulate in the blood. These stems cells can be harvested from the blood and are still used in hospitals today for restoring blood cell production in cancer patients with damaged bone marrow. The CSFs have now helped millions of cancer patients around the world.

Professor Antony Burgess, AC

Cat. 179 John Keesing and Associates (Melbourne), **Dr Don Metcalf (1929–2014), Carden Fellow (1954–2014)**, 1985, silver gelatin photograph, 25.4 × 20.4 cm. 820812A–15, Cancer Council Victoria Collection.



A pioneer in cytogenetic research

Dr Margaret Garson, AO (b. 1927) pioneered the field of cancer cytogenetics in Australia. She graduated from medicine at the University of Melbourne in 1951 with the ambition of becoming an obstetrician. However, this was not easy for a woman in 1950s Melbourne. So she trained instead as a haematologist and, during her training, met and married John Barnett, a surgeon. In 1961, Margaret and their children accompanied John to Texas, where he was undertaking further surgical training.

It was in Galveston, Texas, that Margaret learned about the new field of cytogenetics—the study of chromosomes. The Philadelphia chromosome, a small abnormal chromosome found in the bone marrow of patients with chronic myeloid leukaemia, had been identified the year before, and haematologists were excited by the prospect of finding other genetic markers of cancer. Margaret studied what little was then known about chromosome abnormalities in cancers and, on her return to Melbourne in 1964, was invited to join Carl de Gruchy's Department of Medicine at St Vincent's Hospital.

Margaret, together with Albert Baikie (who subsequently became the inaugural professor of medicine at the University of Tasmania), established the Department of Cytogenetics at St Vincent's. Initially, the work of the department was considered to be of research interest only. Margaret had to work hard to convince her haematology colleagues to send bone marrow samples from their patients. However, gradually the importance of these studies was recognised. Collaborative international groups of cytogeneticists got together to correlate patients' clinical features with the chromosome abnormalities seen in their leukaemia cells. Margaret was the sole Australian representative at these workshops and played an integral part in convincing clinicians worldwide that chromosome studies could help them diagnose cancers and provide vital information regarding outcome.

Margaret headed the Department of Cytogenetics at St Vincent's Hospital until her retirement in 1992. The department is now known as the Victorian Cancer Cytogenetics Service and continues to serve the people of Victoria as a state reference centre for cancer cytogenetics.

Associate Professor Lynda Campbell

Cat. 171 John Keesing and Associates (Melbourne), **Dr Margaret Garson (b. 1927) at St Vincent's Hospital**, 1982, photograph, 25.4 × 20.4 cm. 820810A–7, Cancer Council Victoria Collection.

Immune surveillance and beyond

Some 50 years ago, Sir Macfarlane Burnet and Lewis Thomas speculated that the primary role of the highly specific, adaptive immune response was immune surveillance to prevent the emergence of spontaneous cancers. The concurrently evolving science of transplant rejection (pioneered by Peter Medawar and George Snell) caused Burnet to further argue that the strong transplantation antigens, or class I major histocompatibility complex (MHC1) glycoproteins, had evolved to prevent cancers being readily transmitted from one individual to another. Recently, support has emerged for that hitherto unfashionable idea with the rapid spread (by biting) of the terrible tumour that has been killing our highly inbred Tasmanian Devil populations.

Then Rolf Zinkernagel and I discovered the basis of immune surveillance, when we found that virus-specific 'killer T-cells' recognise 'altered self' defined by an individual's MHC1 molecules. These cytotoxic T-lymphocytes (CTLs) terminate infections by eliminating virus-producing cellular factories and, within a decade, we knew that 'altered self' was an 8-10 amino acid viral peptide bound to a 'self' MHC1 glycoprotein. That understanding was first exploited for cancer treatment by Cliona Rooney, Helen Heslop and Malcolm Brenner at St Jude's Children's Research Hospital in Memphis, USA, who showed that Epstein Barr virus (EBV) specific CTLs can be used both to suppress the emergence of, and to treat, EBV-induced lymphomas arising in massively immunosuppressed (for cancer treatment) children.

Now, with the discovery of the immune checkpoint inhibitors by American Jim Allison and others, along with the development of monoclonal antibodies (mAbs) to block their action, we understand that many of the apparently 'switched-off' CTLs (specific, such as aberrant 'oncofetal' peptides) that we have long known to be present in some solid tumours can be turned back on again. This research still has a way to go, but these mAbs are now saving about 20 per cent of people (including Melbourne businessman Ron Walker and President Jimmy Carter) who would otherwise have died from melanoma. Immune surveillance is back and, though current thinking is that it has evolved more to deal with infection than with cancer, it is abundantly clear that we will become increasingly adept at exploiting (perhaps in combination with cancer vaccines) cancer immunotherapy.

Professor Peter Doherty, AC

Sir Peter Brian Medawar (1915–1987) and Sir Frank Macfarlane Burnet (1899–1985), 1960. Courtesy Walter and Eliza Hall Institute Archive.

Peter Doherty: Contributions to immunology and cancer

The Nobel Prize in Physiology or Medicine for 1996 was awarded jointly to Peter Doherty (pictured) and Rolf Zinkernagel, 'for their discoveries concerning the specificity of the cell mediated immune defence'. The pair made their Nobel-winning discovery while working at the Australian National University (ANU) in Canberra in the early 1970s.

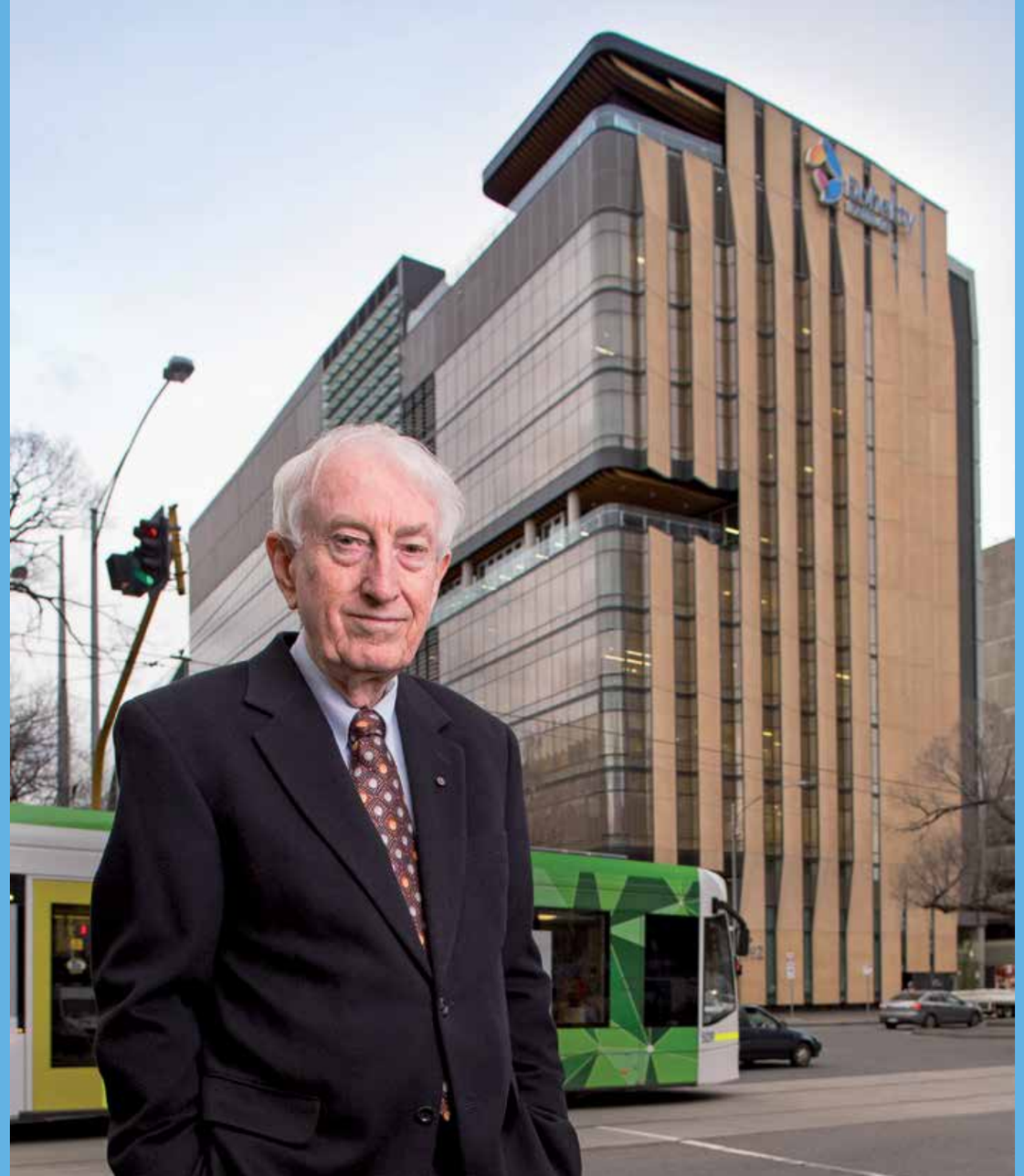
Doherty and Zinkernagel discovered how one critical part of the immune system, the T-cell, recognises and kills virus-infected cells. These killer T-cells patrol our bodies, looking for foreign enemies—such as infections or cancer cells—and then move in to attack. What Doherty and Zinkernagel discovered was the exquisite elegance with which the killer T-cells recognise the enemy. They proved a radical new idea of how T-cells work by recognising 'altered self': that the enemy (for example a virus) can only be recognised when it is presented in combination with part of the body's own machinery.

At the time, Doherty and Zinkernagel were studying mice infected with a virus called LCMV, but they and others went on to demonstrate that exactly the same process is used to tackle diseases as diverse as influenza, HIV and cancer. The implications of their findings have been spectacular and far-reaching. The revolution in cancer treatment today using immunotherapy or drugs that target T-cell exhaustion stems from this ground-breaking work.

After leaving ANU, Doherty spent 14 years in the USA, working at St Jude's Children's Research Hospital in Memphis, returning to Australia in 2002 to spend most of each year at the University of Melbourne. He has trained and mentored generations of brilliant scientists, many of whom continue to study killer T-cells and how they tackle viruses such as influenza, or foreign proteins in cancer cells.

In 2014, the Doherty Institute was opened, with Peter Doherty the patron. A joint venture between the University of Melbourne and the Royal Melbourne Hospital, the institute has more than 700 staff, all working on infection and immunity. Through basic discovery research, as well as clinical and translational research and public health efforts, the Doherty Institute aims to improve health globally, by the prevention, treatment and cure of infectious diseases.

Professor Sharon Lewin



Peter Casamento (Melbourne), **Professor Peter Doherty, AC (b. 1940)**, 2015. Courtesy Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne.

Telomerase: Fountain of youth, with a dark side

The chromosomes are like coiled shoelaces within the cell nucleus, and in young cells, like a new shoelace they have caps at the ends, called telomeres. To regenerate tissues, cells must proliferate and divide, which involves uncoiling and recoiling the chromosomes each time. Over time, similar to tying up shoes over and over, the cap of the chromosome becomes frayed and the telomere shortens with age. Once telomeres have reached a critical minimum size, division stops and the cell will die. The role of telomeres in life and death remains fascinating, as their biology holds many secrets to the programming of ageing, and also to the development of mammalian life.

Professor Elizabeth Blackburn made the extraordinary discovery that the caps of telomeres can be repaired with an enzyme called telomerase. The role of telomerase is to detect the frayed caps or telomeres, and fill the gaps. Expression of telomerase is vital for life; its absence rapidly threatens the life of many cells in many tissues and even the survival of a species. However, telomerase is not expressed in all cells in the body. It is expressed strongly in stem cells, which during development must divide many times in order to form tissues and organs. In this case, it is important to have a lot of telomerase, to prevent premature shortening of the ends of chromosomes during multiple cell divisions, and ensure the survival of cells. In all other tissues, telomerase is barely detectable in healthy individuals.

Clearly, telomerase is tightly regulated; this control is critical, as too much telomerase disturbs cells, which then proliferate uncontrollably and turn into cancers. Indeed, abnormal expression of telomerase is a feature of many cancers. The field of telomerase continues to be studied extensively in order to develop targeted cancer therapies.

The Nobel Prize for Physiology or Medicine 2009 was awarded jointly to Elizabeth H Blackburn, Carol W Greider and Jack W Szostak, ‘for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase’. This discovery remains one of the most fascinating in biology, as it demonstrated that the ends of our chromosomes hold the secrets of longevity. The holy grail for some would be to harness the functions of telomeres to preserve youth without causing cancers—a quest for solving a fascinating enigma that brings with it ethical dilemmas.

Professor Fabienne Mackay

Florienne Loder (Melbourne), **Professor Elizabeth Blackburn, AC (b. 1948) visiting the Elizabeth Blackburn School of Sciences**, 2015. Courtesy Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne.

Preventing skin cancer: An Australian success story

Skin cancer is a significant public health problem in Australia. This country has one of the highest rates of skin cancer in the world; two out of three Australians will be treated for this disease before the age of 70.

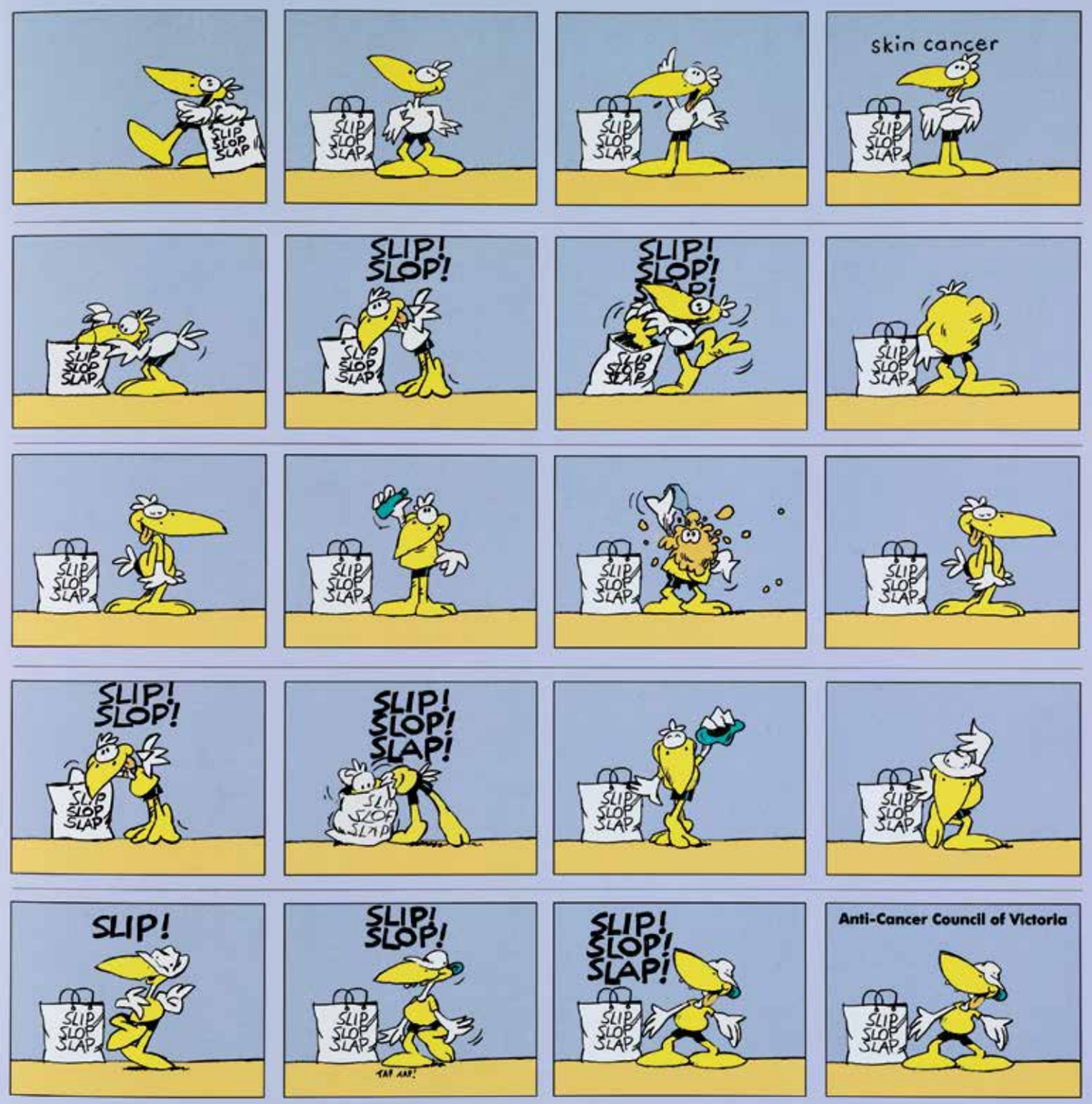
Since the 1980s, extensive public health programs aimed at preventing over-exposure to ultraviolet (UV) radiation, like *Slip! Slop! Slap!* and *SunSmart*, developed by the Anti-Cancer Council of Victoria in 1980 and 1987 respectively, have been implemented across Australia by cancer organisations and government agencies.

The focus of our skin cancer prevention programs has been to reduce the harms caused by prolonged exposure to UV radiation, by reminding Australians to Slip on a shirt, Slop on sunscreen and Slap on a hat. More recently the *Slip! Slop! Slap!* slogan has been extended to include Seek shade and Slide on sunglasses. The *SunSmart* program is underpinned by extensive research, mass media, and community-wide interventions, particularly in schools and workplaces across the country.

The evaluation of our work has demonstrated that these campaigns not only change behaviour by reducing sunburn rates and people's preference for a tan, but also drive down melanoma rates in younger age groups. As a result of *SunSmart* campaign efforts, significant changes in behaviour are noticeable everywhere. In Victoria for example, more than 90 per cent of primary schools enforce hat wearing through 'no hat, play in the shade' policies, and extensive shade structures can be seen over toddler pools and playground equipment across the state.

Our efforts to reduce the very high human and financial burden of skin cancer on our community have made our prevention campaigns an international public health success story. But there is still a lot to do: a new generation of young people has grown up without the *Slip! Slop! Slap!* mantra and, while good habits are developed in primary schools, much more needs to be done to engage young people and ensure they stay a part of our *SunSmart* generation.

Adjunct Associate Professor Craig Sinclair



Cat. 22 Alex Stitt (1937–2016), ***Slip! Slop! Slap!*** (Anti-Cancer Council campaign), 1981, from *STITT: 50 years of the graphic design work of Alexander Stitt*, p. 166–7. Melbourne: Hardie Grant Books, 2011. Copyright © Alex and Paddy Stitt. MHM2017.9, Medical History Museum, University of Melbourne.

Victorian Tobacco Act, Quit Victoria and VicHealth

Since its creation in 1936, the (then) Anti-Cancer Council of Victoria (ACCV) has always had the ear of government, although it initially had no statutory powers or state funding. When evidence of the association between smoking tobacco and lung cancer began emerging in the 1950s, the ACCV was quick to advise government and seek measures to counter this threat to public health.

In 1985 the Cain Labor government funded the first *Quit* campaign, to be run by the ACCV. This pioneering project was later transformed by the *Victorian Tobacco Act 1987*. As the director of the ACCV, Dr Nigel Gray, told it, the train of events leading to the Act began in a meeting with the new health minister, David White. Although Gray at first sought the minister's support to introduce screening mammography, Mr White surprised Dr Gray by asking: 'And what about tobacco, Nigel?'

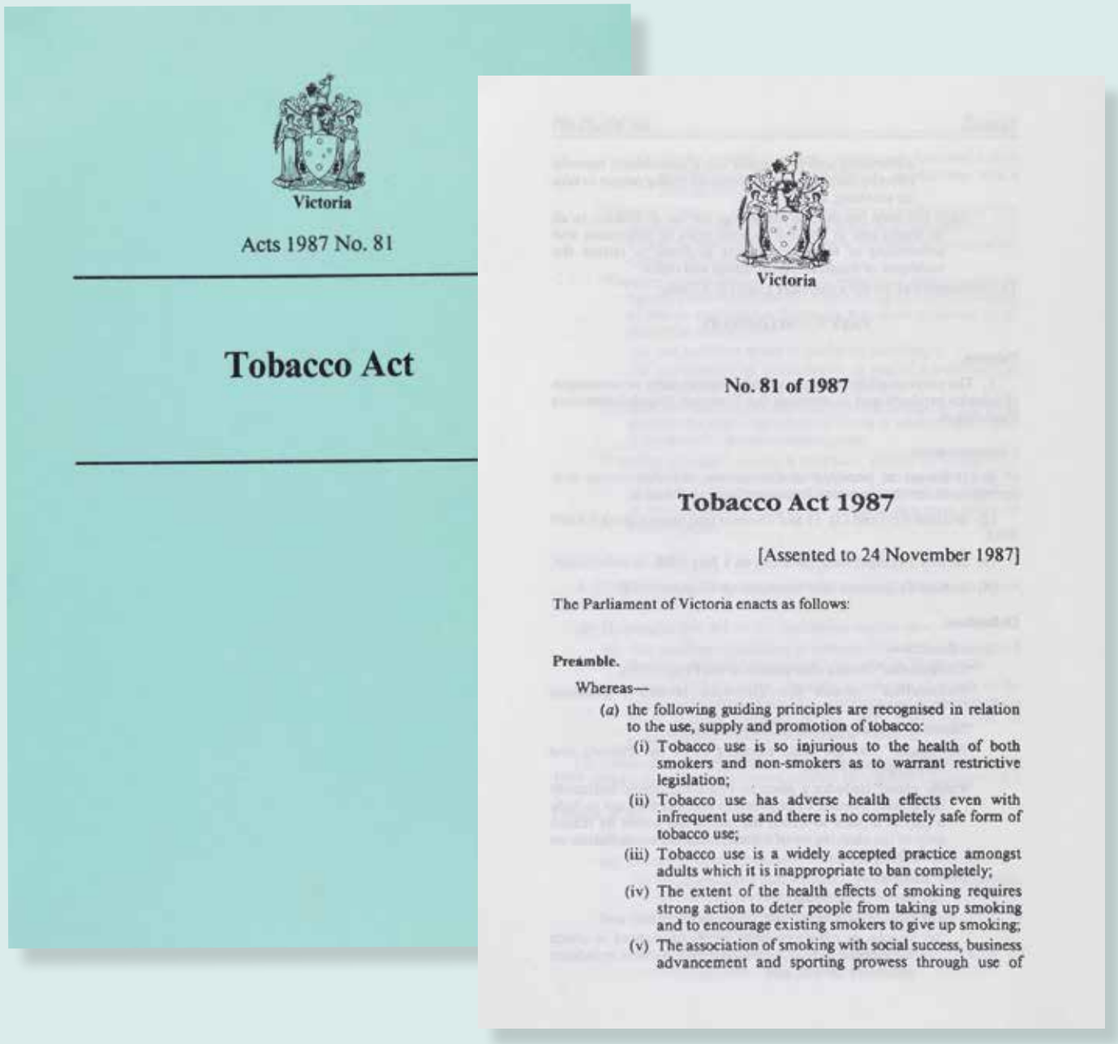
Thus began an extraordinary collaboration that eventually involved politicians of all major parties, political advisors, newspaper editors, bureaucrats, medical researchers, doctors, public health activists, and even the churches. Gray's vision, together with his renowned networking and persuasive skills, was integral to the efforts that led, in less than nine months, to legislation that:

- mandated a comprehensive set of policies and programs to reduce the prevalence of smoking in Victoria
- raised revenue from a tobacco retailer licensing levy, of which a portion was allocated for 'health promotion' through the Victorian Health Promotion Foundation (VHPF, later trading as VicHealth)
- required the VHPF to fund the promotion of good health, safety and the prevention and early detection of disease, and to allocate at least 30 per cent of its budget to sporting and arts organisations, to raise awareness and to replace tobacco sponsorship.

The Quit Victoria campaign remained at the ACCV, and its funding increased significantly, with an initial $3 million annual grant from VicHealth, settling to about $2.2 million in the early 1990s. For the first time, comprehensive programs such as the Quitline and powerful paid mass-media campaigns were possible. Between 1983 and 1993, the prevalence of adult smoking in Victoria fell from 33 per cent to 25 per cent.

Professor David Hill, AO

Cat. 180 Parliament of Victoria, ***Tobacco Act 1987***, 24 November 1987, print on paper, 25.0 × 17.0 cm. Cancer Council Victoria Collection.


Victoria

Acts 1987 No. 81

Tobacco Act

Victoria

No. 81 of 1987

Tobacco Act 1987

[Assented to 24 November 1987]

The Parliament of Victoria enacts as follows:

Preamble.

Whereas—

(*a*) the following guiding principles are recognised in relation to the use, supply and promotion of tobacco:

(i) Tobacco use is so injurious to the health of both smokers and non-smokers as to warrant restrictive legislation;

(ii) Tobacco use has adverse health effects even with infrequent use and there is no completely safe form of tobacco use;

(iii) Tobacco use is a widely accepted practice amongst adults which it is inappropriate to ban completely;

(iv) The extent of the health effects of smoking requires strong action to deter people from taking up smoking and to encourage existing smokers to give up smoking;

(v) The association of smoking with social success, business advancement and sporting prowess through use of

The power of the packet

What consumer information should be printed on the packaging of a product that addicts, and kills two out of three of its users? And what should a responsible manufacturer do if it is selling a product that causes such devastation and human misery?

Perhaps the most remarkable thing about the fight for plain packaging and health warnings on tobacco products is that this battle was necessary at all.

Big Tobacco is an industry that has been killing its customers for more than 50 years, and has opposed all efforts to reduce the harms to consumers, including opposing Australia's ground-breaking packaging reforms. Graphic health warnings started appearing on packs in 2006, and in December 2012 Australia became the first jurisdiction in the world to legislate plain packaging for tobacco products. That same year, the High Court of Australia announced that the tobacco industry's case against the Australian government's plain packaging legislation had failed, clearing the way for the new-look packets to hit Australian shelves.

Requiring such warnings on *every* package ensures that smokers and potential smokers see a warning every time they buy or handle a tobacco product. A 20-per-day smoker is exposed to a health warning about 7000 times each year. Researchers have found that plain packaging has achieved its aim of reducing the appeal of packs, and new, larger health warnings on packs have also increased adult smokers' attempts to quit. A 2017 Cochrane Review found that tobacco plain packaging may reduce smoking prevalence. Between 2011 and 2013, approval for plain packaging was high and unchanged at about 70 per cent among former smokers, and at around 50 per cent among current smokers, while disapproval of the new laws fell.

Australia's success has inspired confidence globally: Ireland, the United Kingdom, New Zealand, Norway, Hungary, Slovenia and France have all passed plain packaging legislation, while Malaysia and Canada have announced their intentions to do so. If those countries can emulate Australia's experience, where we saw some 100 000 fewer smokers in the first three years of plain packaging, then countless lives will be saved, and heartbreak prevented for millions of families.

Todd Harper

Cat. 200, 186, 201, 198, 207 and 192, **Various cigarette packets with health warnings, 1990s–2012**. Cancer Council Victoria Collection.

Taking on Big Tobacco

Radiation oncologist Dr Bronwyn King is distressingly familiar with caring for patients suffering from tobacco-related illness. She knows the devastating harm that tobacco causes to human health.

In 2010 Dr King discovered that her superannuation fund had investments in the tobacco industry, and she felt compelled to act. Australia is one of the world's most progressive countries on tobacco regulation and policy, yet Dr King's enquiries revealed a profound disjunct between the health and finance sectors: Australian health practitioners were unwittingly investing their own money in the cause of a problem that many had dedicated their working lives to fix.

So in 2012 Dr King founded Tobacco Free Portfolios, to work collaboratively with the finance sector to encourage tobacco-free investment. She was shocked to learn that Australia's superannuation and finance sectors were completely misaligned with both our federal government and health sectors on the issue of tobacco. But, through discussions, she soon found that finance leaders shared her alarm when faced with the facts. In 2016–17, the work of Dr King and Tobacco Free Portfolios has encouraged financial institutions in seven countries to divest themselves of more than $4 billion of tobacco industry assets.

Australians are relatively well protected from the tobacco industry via government regulation, but this is not the case all around the world. Every day, an estimated 100 000 children start smoking, most of them in the poorest countries. With almost 50 per cent of Australian superannuation funds now tobacco-free, it looks like Australia will also become a global leader in tobacco divestment. Dr King says: 'There is no sound reason why pension funds, insurers or banks should be lending money to tobacco companies or investing in them. If a new product was invented today that caused six million deaths over the next 12 months, we wouldn't dream of investing in it! We need to apply 2017 thinking to tobacco.'

Global momentum is starting to build. Notable companies recently implementing tobacco-free policies include insurance giant AXA (which divested 1.8 billion Euro in tobacco industry assets in May 2016); Sweden's leading pension fund (AP4); France's largest pension fund (Fonds de Réserve pour les Retraites); Ireland's Sovereign Investment Fund; CalPERS (the USA's largest pension fund); AMP Capital; and Bank of New Zealand.

***Chiron*, 2017**

Dr Bronwyn King. Courtesy *Chiron*, Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne.

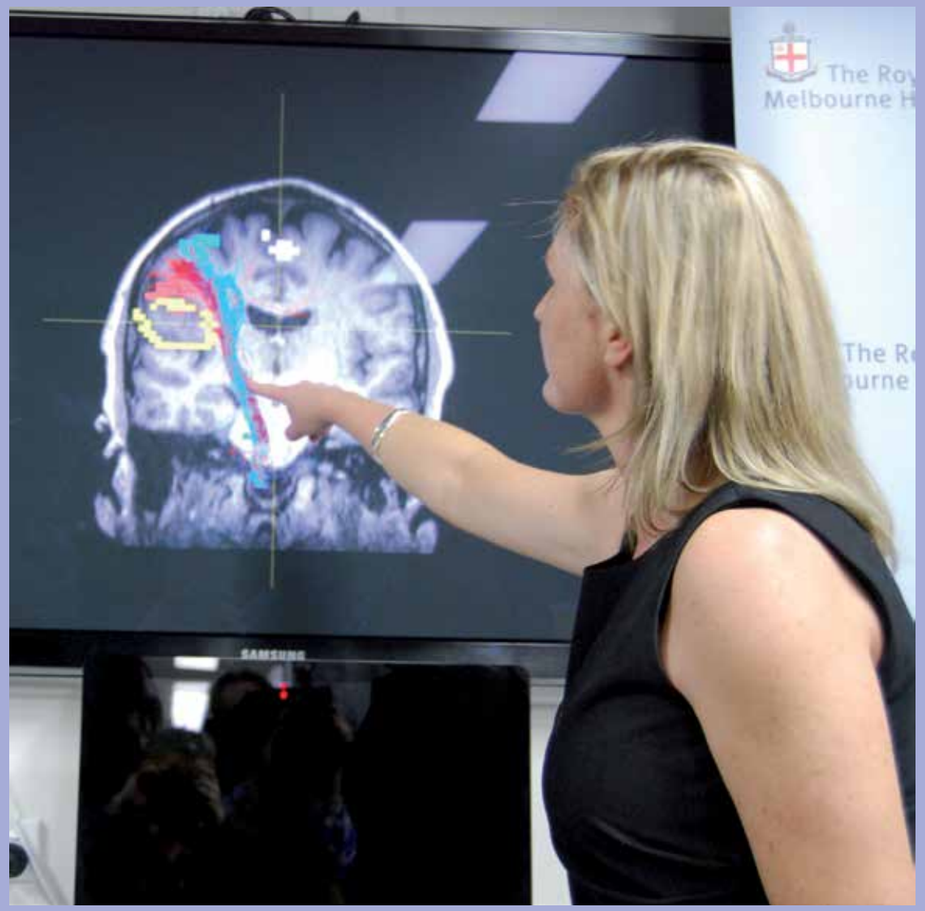
Shedding blue light on a serious brain tumour

Glioblastoma multiforme is a virulent, currently incurable brain cancer, and the most common form of brain tumour in middle-aged to older adults. Survival for these unfortunate patients is measured in months to just a few years. The most extended survival can be achieved with removal of as much of the tumour as is safely possible without damaging the normal functioning brain, followed by a combination of chemotherapy and radiotherapy and then various new clinical trial agents.

Over the last few decades, technological advances in neurosurgery have increased the amount of tumour that can be removed safely and have improved survival for these patients, although they have certainly not afforded them a cure. One of these advances, 5-aminolevulenic acid (Gliolan), is a true bench-to-bedside success story, thanks to Walter Stummer, a German neurosurgeon. During his neurosurgical training, Stummer began experimenting with this compound and found that it was taken up by tumour cells and metabolised to protoporphyrin IX. Elevated protoporphyrin IX production inside tumour cells allows violet-red fluorescence of the tumour after excitation with 405-nanometre blue light. After the early *in vitro* and animal studies, the first use in patients was described in 1998. Since that time, extensive research, culminating in a 2006 randomised controlled Phase III study, confirmed that the use of Gliolan to identify malignant tumour cells under a surgical microscope fitted with a blue-light filter achieved a more complete resection of the tumour, with no increase in post-operative complications or neurological deficits, and improving patients' six-month progression-free survival.

Since that time, the use of Gliolan for resection of glioblastoma multiforme has become the standard of care across Europe and the United Kingdom, and is increasingly used in Australia and the United States. The first case in Victoria of what has now become known as fluorescence-assisted resection of a glioblastoma multiforme was performed on 16 September 2011 by Dr Kate Drummond at the Royal Melbourne Hospital. Subsequent to this, the use of Gliolan has become common in brain tumour centres across Australia, offering hope of prolonged survival for our patients with this devastating disease.

Associate Professor Kate Drummond



Associate Professor Kate Drummond, neurosurgeon, pointing at Gliolan brain scan, 2011. Courtesy Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne.

Robotic surgery

Robotic-assisted surgery allows complex operations to be performed through small keyhole (laparoscopic) incisions in the patient's body, thereby reducing morbidity and length of hospital stay compared to conventional open surgery. Although robotic surgery is widely available in Australia's private hospitals, Peter MacCallum Cancer Centre, where it was introduced in 2010, is one of the few public hospitals in the country to offer this technology.

Commonly referred to as a 'robot', the da Vinci® Xi Surgical System used at Peter Mac is not capable of independent movement; rather, it responds to the surgeon's commands via an advanced remote-control system. The robot is positioned over the patient, its telescope and instruments deployed deep inside the patient's body. The surgeon sits at a console in the corner of the operating theatre, viewing live, three-dimensional images of the patient's inner organs. Using hand and foot controls, the surgeon manipulates the camera system and miniature instruments, allowing extremely precise and delicate surgery to be performed through tiny incisions. Peter Mac has the most advanced surgical system anywhere in Australia, including a dual-console da Vinci® Xi Surgical robot with integrated table.

Robotic surgery is reserved for complex procedures; for this reason, its most common applications are in cancer surgery. The most frequently performed robotic surgery procedure worldwide is robotic-assisted radical prostatectomy (robotic prostatectomy)—now the most popular surgical treatment for men with localised prostate cancer in much of the Western world. Peter Mac performs the highest number of radical prostatectomies in the public hospital system in Australia.

Other procedures that can be performed using robotic-assisted surgery include the removal of small kidney cancers, surgery for colo-rectal cancer, hysterectomy, removal of the urinary bladder for bladder cancer, head and neck cancer surgery (trans-oral robotic surgery), removal of chest tumours, and surgery for stomach and oesophageal cancers.

Associate Professor Declan G Murphy

Rob Grant, **Associate Professor Declan Murphy and robotic-assisted surgery**, 2010. Courtesy Royal Children's Hospital Educational Resource Centre.

Breast cancer: Genetics research

Breast cancer is the most common cancer in Australian women, and the second most commonly diagnosed cancer overall. It is estimated that more than 17 700 new cases will be diagnosed in this country in 2017 alone.

Most breast cancers arise 'spontaneously', with no identifiable cause. Around 5 per cent of Australian breast cancer cases occur in people who carry an inherited breast cancer risk gene, such as BRCA1 or BRCA2. Research is bringing greater understanding of the causes and ways of treating this disease, such as revealing the link between breast stem cells, breast development and breast cancer; discovering how the female hormones oestrogen and progesterone are linked to increased breast cancer risk; testing the effectiveness of new medications using patient samples and laboratory models; holding clinical trials to improve treatments and prevention; and developing new ways to identify the best treatment for each individual patient.

The Walter and Eliza Hall Institute of Medical Research is a leader in breast cancer research. Over the past 10 years, the laboratory headed by Professors Jane Visvader and Geoff Lindeman has made important contributions, such as identifying breast stem cells (which give rise to normal breast tissue); defining how normal breast growth is regulated and how errors can lead to breast cancer; and identifying those breast cells that are predisposed to becoming cancerous in women with BRCA1 gene mutations.

The laboratory has established a large bank of patient-derived xenograft models (created by implanting tissue from a patient's primary tumour into an immunodeficient mouse). These represent the various subtypes of breast cancer and recapitulate the primary tumour in the patient. They serve as powerful pre-clinical models for testing new therapies, and for understanding metastasis and cancer stem cells. This work has potential for identifying new biomarkers and therapeutic targets for breast cancer.

Professor Jane Visvader

Professor Jane Visvader at the Walter and Eliza Hall Institute of Medical Research, 2014. Courtesy Walter and Eliza Hall Institute of Medical Research.

Victorian Comprehensive Cancer Centre

The advantages of moving the Peter MacCallum Cancer Centre close to the Royal Melbourne Hospital (RMH) and the University of Melbourne were widely canvassed in the 1980s. In the event, at that time the Victorian government decided to move the Peter Mac to a recently vacated private hospital in East Melbourne. The move of the Royal Dental Hospital of Melbourne to a new site in 2003, vacating its previous premises adjoining the RMH, created a new opportunity. It was realised that the East Melbourne site was no longer adequate for the Peter Mac, and that cancer care for patients would be greatly improved by combining the expertise and facilities of a specialist cancer hospital and a large tertiary hospital such as RMH.

With major financial contributions from both the Victorian and Commonwealth governments, a new state-of-the-art hospital, research and education facility was completed in 2016. Not only were the cancer services of the Peter Mac, RMH and Women's Hospital combined, but the new building served as the hub of a powerful partnership between 10 organisations providing cancer clinical services, education and research. In addition to the Peter Mac, RMH and Women's Hospital, the Victorian Comprehensive Cancer Centre (VCCC) partnership now comprises the University of Melbourne, the Walter and Eliza Hall Institute, the Royal Children's Hospital, the Murdoch Children's Research Institute, the Western Hospital, St Vincent's Hospital and its associated research institutes, and the Austin Hospital (including the Olivia Newton-John Cancer Wellness and Research Centre).

With these partners, the VCCC is the most powerful cancer centre in Australia, and one of the leading comprehensive cancer centres in the world. It will play a leading role in clinical care and clinical trials, and in translational, public health, health services and basic research in cancer. It will provide education for cancer clinicians and researchers, and for primary care practitioners and the general community. The Victorian Comprehensive Cancer Centre represents a wonderful example of collaboration for the benefit of patients and the advancement of knowledge.

Professor Richard Larkins, AO

Victorian Comprehensive Cancer Centre (VCCC), 2016. Courtesy Victorian Comprehensive Cancer Centre.

PERSONAL PERSPECTIVES: ART AND CANCER

Patients' perspectives, revealed through art

The story of cancer is complex and extremely personal, although very common: one in two Australian men and one in three Australian women will be diagnosed with cancer by the age of 85. Cancer is a disease that goes to the heart of our community, affecting our family, friends and colleagues.

The cancer puzzle: Patterns, paradoxes and personalities includes an exposition of the personal experiences of cancer through the work of three artists: Leslie Morgan, Kristin McFarlane and Polixeni Papapetrou. In their respective fields of painting, glass and photography, each has had a distinguished and award-winning career. Their art is diverse and varied, but the artists are personally linked by the fact that they have cancer. Each has distinctly examined and represented the repercussions of this disease on their work and lives.

Leslie Morgan in his statement does not pull any punches when talking about cancer. He brutally describes the emotional burden imposed on those in 'the cancer club' by the obligation to deal with well-meaning family and friends who constantly need to be updated. Leslie also describes himself as a difficult patient, resenting 'the word "journey" to describe the process of cancer diagnosis and treatment'. He notes that although it is a handy euphemism, this word 'seems wholly inadequate, given the horror and the shit of dealing with colo-rectal cancer'. Morgan's paintings reveal the plight of the patient in fear for his life, often attached to intimidating machinery and bombarded with drugs while battling to survive physically and emotionally. It is his rage and anger at this imposition of intrusive treatment that confront the viewer in these heavily impasto oils. The power of the brushstrokes echoes this fury. This is not a sanitised interpretation of treatment—quite the reverse. Leslie intimately reveals to us his pain, fear and resilience. These works represent his refusal to submit graciously to his diagnosis and the treatment regime.

I spoke with Leslie shortly before he died. As an artist he did not want to be solely defined by his work about cancer, but he also acknowledged that this is part of his legacy. The artworks that expose his personal experience of this often fatal disease brought him international recognition and a chance to give a voice to the patient.

Page 128: Cat. 98 Polixeni Papapetrou (Australian, b. 1960), ***Blinded***, 2016, from series *Eden*, pigment print, 127.3 × 85.0 cm. Collection of the artist.

Left: Cat. 94 Leslie Morgan (English/Australian, 1955–2017), ***Hazardous yellow***, 2013, oil on canvas, 56.0 × 40.0 cm. Private collection.

Kristin McFarlane's statement shares the intimate details of the roller-coaster ride of diagnosis and treatment and their emotional aftermath. It begins with her response to hearing the Simon and Garfunkel song *Feelin' groovy* as she lies on the treatment table to receive radiation therapy, a description that epitomises the vulnerability of the patient in the alien environment of the hospital. This is also true of Kristin's personal account of an accidental meeting with a cancer sufferer at Bunnings. This chance encounter, which was the catalyst to having a mammogram, brought both the life-saving consequences of a swift diagnosis and treatment but also subsequent shock and trauma, thus underlining the unpredictability and vulnerability of our lives. Kristin shares with us her experience of how isolating it can feel to be coping with breast cancer, leading to depression, and eventually her road to recovery. Yet Kristin's work focuses not on the depths of her despair, but on the deep emotional support she received from family and friends.

Frequent themes in McFarlane's work are memory, fragility and longing; her work in the 2013 Ranamok Glass Prize, for example, evoked the lost art of letter writing through fragments of postcards preserved in glass capsules. Now, her artistic interpretations of personal and historical narratives encompass her own circumstances. The delicacy and intimacy of Kristin's work share with us the love she felt all around her while she was ill. *Reflection 1: Fragile strength* is truly inspired, individually enshrining in optical glass some of the petals from bouquets of flowers given to Kristin by her friends and family when she was diagnosed with cancer. This artwork belies the ephemeral nature of flowers, transforming a fragile petal into an everlasting symbol of support. It captures the power of gifts of love given unreservedly during the most difficult times.

Polixeni Papapetrou refuses to have her art or life defined by cancer. She titles her statement 'I am not cancer'. Her work is not about her condition; it is created *despite* her condition. It is an affirmation of life and of not letting a disease take control of who you are, no matter how emotionally and physically consuming dealing with that condition may be. The *Eden* series takes us into the realm to which Polixeni refers in her statement, where we are only biology, connecting us to the cycle of life through the powerful symbolism of flowers. The works in this exhibition—*Blinded*, *Heart*, *Flora*, *Amaranthine* and *Delphi*—are images of young women immersed in a vision of flowers, each with its own distinct meaning and purpose. These sentiments are reflected in the word 'amaranthine', which means undying flower, and is derived from the Greek words *amarantos*, meaning immortal or unfading, and *anthos*, meaning flower.

Polixeni's works have for many years revolved around the photography of children, often depicting her own children and their friends, and examining concepts that shroud perceptions of childhood. Since 2008 she has used masks to conceal the identity of her subjects, in order to emphasise the image of the child in her work as a universal symbol of childhood, not as a particular individual. But in the *Eden* series these subjects' faces are again revealed, like the moment when a bud blossoms into a full bloom. These works are a celebration of life, and of where life inevitably leads us. Death is not the end, but a completion of a cycle, echoing the Indigenous concept of time as circular rather than linear.

Polixeni's works are beautiful and painful at the same time. We feel the growing pains of these girls as they become young women, and the loss of childhood, but we also feel the joy of their accomplishment. The wreath-like floral arrangements remind us that this is a moment of transition, while the patterning of the wallpaper reinforces the beauty of that moment.

Papapetrou believed that the *Eden* series would be her last. That has proved not to be the case, and she has recently produced a new body of work based on negatives from her archives. In the tradition of an artist's 'late style' as described by Edward Said, Polixeni in the final stage of her life has changed her narrative and style. She is now telling her own story through early images of herself and her daughter Olympia, using new techniques such as silk-screening on linen. This new work demonstrates Papapetrou's extraordinary determination and desire to continue to create.

What do the works of these three artists have in common? They are created by artists whose lives have been affected by the disease of cancer. Their creators have faced the challenge or imposition of cancer in their own ways. They share with us the range of emotions that confront people with cancer and their family and friends—the community of people that cancer envelops. But these artworks also transcend this particular realm, by interpreting broader themes of resilience and fulfilment. Like the lives of the artists who created them, they are not defined by cancer.

Dr Jacqueline Healy

I am not cancer

I am not cancer

I cannot think of a subtle or poetic way to say that I have terminal cancer. To date, there is no cure for stage 4 cancer, and I am aware that I am dying. 'Everyone has to die sooner or later', I am occasionally reminded by someone embarrassed about what to say to me. But while it is true, not many healthy people would swap places with me.

Summing up stage 4 cancer in one word, it means 'loss'. On a biological level, it is about the loss of healthy cells overtaken by aberrant cells or otherwise destroyed by the various treatments I undergo in an attempt to slow down the illness. You can lose your hair, your figure—which can become bloated from the medication—and both the energy and the ability to exercise. On a psychological level, I am confronted by innumerable losses, such as the loss of my life, the loss of my imagined future, letting go of professions and networks, the loss of my career and even identity—given that we define ourselves so much by what we can do. The hardest loss to come to terms with is knowing that I will lose my family, a retirement with my husband and the prospects that my children might fulfil, whose own children (if they're forthcoming) I will never experience. As I become sicker I witness the loss of my mobility and independence; and in the gap where my life stops, I envisage what may become of my family, where my husband can travel without me, but takes me with him in his imagination, where we are all still together but I only exist in their thoughts.

Cancer is no battle, but an illness without a cure. Once the body ceases to respond to treatment, there is nothing else to do but to come to terms with the awful and painful process of dying. So, what good can come out of cancer and loss? For me, nothing at all. I have not had an epiphany; I cannot say that having cancer has made me a nicer person who is more compassionate, loving, or attentive to pleasures that I may otherwise have missed. I have not experienced a sudden rush of creativity or gained a new vein of profundity, and am no more insightful than I was when I was healthy. I did not need an imminent death to contemplate the ontology of the human condition. My work has focused on the idea of identity and being, and how we are constantly shedding skins, replacing one for another as we move through life's stages from infancy to old age.

When I began working on the series *Eden* (2016), I had a prescient feeling that this may be my last work. As such, I asked myself: what would I have to say about my life and

Cat. 100 Polixeni Papapetrou (Australian, b. 1960), ***Flora***, 2016, from series *Eden*, pigment print, 127.3 × 85.0 cm. Collection of the artist.

work? I didn't want to talk about cancer in any literal or depressing way, or in a way that defined my life. Rather, I was interested to create work about how we are nature and how we are embedded in cycles of life: the seasons of growth, blossoming, and wilting. These life cycles are visibly and beautifully demonstrated in plants, nature generally, and the planetary rhythm of dawn and dusk. I decided to use the language of flowers to explore this idea. I photographed my daughter and her friends adorned with floral arrangements to reflect on transience, their shape-shifting from child to adolescent and adolescent to adult, and a oneness with the world, fertility and the cycles of this miraculous thing we call life.

I am privileged to have lived this life, cut short as it will be. Cancer can never subtract from my work or the way that my life has intersected with others. Cancer will not negate my integrity nor define who I am. If there is one spark of intuition that has arisen through knowing that I will soon die, it is only to reinforce suppressed knowledge that we are biology—admittedly inflected with consciousness that makes us believe that we transcend the life of our cells—and when all is said and done we are nothing but biology. It is hard to fathom, and I am not the person, and this is not the moment, to make art of it.

Dr Polixeni Papapetrou

Cat. 101 Polixeni Papapetrou (Australian, b. 1960), ***Amaranthine***, 2016, from series *Eden*, pigment print, 127.3 × 85.0 cm. Collection of the artist.

A BLACKBIRD AND THE BLACK DOG

Slow down, you move too fast
You got to make the morning last
Just kicking down the cobblestones
Looking for fun and feelin' groovy
Ba da da da da da da, feelin' groovy

Feelin' groovy by Simon and Garfunkel played as I received my first session of radiation. Lying on the treatment table, I felt completely alone and utterly terrified as the bell chimed and the radiation oncologists left. That bell and the whirring of the machine would dominate my life for the next six weeks.

I certainly wasn't feeling groovy.

My journey with cancer started three months prior, oddly enough in aisle 27 of Bunnings Bayswater. I was searching for rose food and noticed a lady who looked like she knew what she was doing. Something told me to go and ask her for advice. She divulged her gardening secrets and we talked for almost two hours. It was her first day out in six weeks after surgery. She'd had breast cancer years earlier and we cried and hugged in the garden-care aisle as she recounted her story. I'd had a mammogram request sitting on my desk for weeks and my new friend urged me to use it. I made an appointment the next day.

What followed was what can only be described as a roller-coaster. I did, as it turned out, have a suspicious growth in my right breast. I hadn't felt it and didn't feel unwell. I was just tired, which I put down to working flat out on the Australian of the Year Award trophies. On 27 November, between running my five-year-old to kinder and ballet, and working on the awards, my doctor said the words that stopped me in my tracks: 'The results of the core biopsy have come back and I'm sorry to tell you ... *you have cancer*.'

Appointments with doctors and surgeons began at the worst possible time, with four trophies to be made, fired and polished on an extremely tight deadline. I pushed ahead, aiming to fire two awards and reload the kiln the night before the operation. On the day before surgery I had an urgent ultrasound, as a radiographer had found something else in my scans. Later, I opened the kiln to find the awards had failed—for the first time in nine years—turning green instead of blue. I just sat with my head in my hands,

Left and p. 141: Cat. 91 Kristin McFarlane (Australian, b. 1968), ***Reflection 1: Fragile strength*** (details), 2016, glass lenses, botanical specimens, mirror, copper; 70.0 × 70.0 × 2.0 cm. Collection of the artist.

numb with disbelief. My neighbour worked at Peter MacCallum and I was admitted there instead. Surgery was the day after my daughter was Mary in the kinder nativity play.

Following surgery I collaborated with another glass artist to redesign the trophies, and we met the deadline.

I was swamped with flowers, phone calls, home-cooked meals and offers of help. A blackbird came and sang outside my window each day and I looked forward to his visits. I wanted to capture the best moments people were sharing with me—the healing thoughts, the heartfelt embraces—and to bottle their tears. I decided to press the flowers so I could keep something tangible from this outpouring of love.

In hindsight, the awards actually kept me going; it was after this that things really started to fall apart. Radiation commenced three days after my daughter started primary school; for six weeks I drove the same path to the hospital for my daily dose. The trophy design was sent out for tender. After radiation, injections and aromatase inhibitors shut down my ovaries and catapulted me into chemical menopause. My ovaries and tubes were removed later.

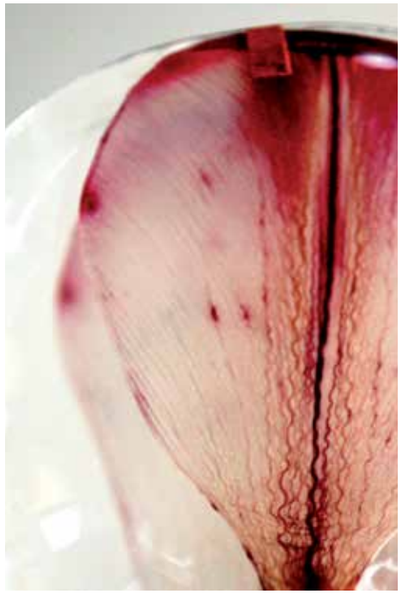
I've battled depression since I was young, and the new medications caused chaos, throwing me into weeks of inertia and unfathomable sadness. Weeks turned into months as my doctors tried a cocktail of different drugs to see if there was anything I could tolerate. Some were okay initially but then caused debilitating pain in my hands and knees.

At the same time, I was applying for exhibitions, competitions and grants, trying to regain some footing through my art work. I received rejection letters for the entire year. The ongoing medication battle left me exhausted; my constant rejections left me shattered. I hit rock bottom and decided to go back to my previous profession as a graphic designer—but with no luck. I decided I was unemployable and useless.

I had discovered a place of emptiness, and from there started again by writing about what I loved about art. My blackbird came back and sang outside the window. The sun came out after a bleak winter and I found solace in nurturing my roses. I had an overwhelming desire to help others and to appreciate beautiful things. I volunteered for a special-needs ceramic class and created a community glass installation for a council. I finally got my medication sorted out, and saw an arts mentor.

My body survived cancer but my mind didn't. I learned a lot about the strength and love of my husband, daughter, family and friends. I discovered how intertwined art is with my life. I started playing music again and cleared the clutter from my home. The lady I met in Bunnings became a dear friend. I'm still sitting in my studio and working out where I want to go, but this time it's different. I've been at the bottom of the well and I've climbed out. After three years, I've finally got my strength back.

Kristin McFarlane



The cancer club

A nurse in radiology gave me a plastic bag containing a bulky white robe, and asked me to put it on; it was then that I realised I was a member of the cancer club. I mouthed Groucho Marx's wise words: 'I don't want to belong to any club that would have me as a member'. I duly complied with her request, and even partook of some of the light-hearted banter (bad jokes included) among fellow inmates. Much worse indignities were to follow, and I'm still shocked by these experiences. Dealing with family and friends is also a burden for those in the cancer club. These cheerleaders want constant 'updates' and, while I understand their concern, it is exhausting for Lynda and me to comply. For my deplorable behaviour to a mainly cheery crew of health professionals, and to my friends and family, I apologise.

I am impatient by nature, so I'm a difficult patient. The oncology nurse I argued with about nothing much said I should accept my diagnosis, argue less and make her life easier. I thought of Samuel Beckett: 'I can't go on, you must go on, I will go on'. I remain angry and argumentative five years later. The title of the series of paintings, *Self-opening*, refers to a sign on a surgery door at the Austin Hospital that amused me. It also represents my experience of psychotherapy, where it is necessary to open up one's sense of self to reveal an authentic self.

The word 'journey' to describe the process of cancer diagnosis and treatment, while a handy euphemism, seems wholly inadequate, given the horror and the shit of dealing with colo-rectal cancer, and this is what my paintings seek to address. The aspect of being a (black) body under scrutiny is the subject of some of the works that depict me on the table surrounded by those ready to measure and assess me (the measure of a man?). To be defined by illness felt like surrendering my identity as an artist. However, I have produced my best work in the past few years, and achieved international recognition for it. I can't say I'm grateful for having cancer, but it's become part of my legacy.

Leslie Morgan (1955–2017)

Cat. 96 Leslie Morgan (English/Australian, 1955–2017), ***View from above and below***, 2013, oil on canvas, 122.0 × 91.0 cm. Private collection.

Works in the exhibition

All measurements are expressed height before width before depth.

COLLECTIONS OF THE FACULTY OF MEDICINE, DENTISTRY AND HEALTH SCIENCES, UNIVERSITY OF MELBOURNE

MEDICAL HISTORY MUSEUM

1 **Six bottles for poisons**, c. 1850
glass, cork, wood, paint
each 12.3 × 4.5 cm diameter
labelled *P: JACOBI.*, *P: CANTHAR:*, *STRYCH: ACET:*, *ANT: POT: TART:*, *POT: ARSEN:* and *CANTHARIDIN. POT: ARSEN* stands for potassium arsenite, commonly known as Fowler's solution. In 1865 the uses of potassium arsenite expanded as Fowler's solution was used as the first chemotherapeutic agent to treat leukaemia, although its benefits were only temporary. Surprisingly, this specific use was inspired by potassium arsenite's role in improving digestion and producing a smoother coat in horses.
MHM01198
(see p. 147)

2 **Melbourne Medical School**, 1864
photograph, mounted
14.1 × 20.0 cm (image)
inscribed verso, in pencil *OLD MEDICAL SCHOOL*
MHM00394
(see inside front cover)

3 **Dissecting room, University of Melbourne**, 1864
photograph, ink and watercolour, mounted and framed
49.3 × 55.8 × 4.0 cm (frame)
Thomas R Ashworth (second seated figure from left), Dr GH Fetherston (demonstrator, third figure from right) and Professor George Britton Halford (standing, second figure from right), with first- and second-year students (and medical porter standing in background). Ashworth (arr. Australia 1860s, d. 1876) was the first person to document the existence of circulating tumour cells (CTCs), in the *Australian Medical Journal* in 1869, the year he graduated from the University of Melbourne.
MHM00463
(see p. x)

4 Wm & Henry Hutchinson & Co. (est. c. 1781)
Godson's uterine tumour forceps, c. 1866–1900
nickel-plated steel
25.1 cm (length)
MHM03471

5 Young (Edinburgh and England, c. 1871 – c. 1900), and Evans & Co. (London)
Presentation set of surgical instruments, c. 1873
steel, ebony, brass, wood, leather, velvet
19.5 × 4.8 × 2.9 cm (case)
Awarded to student W Watson Cheyne (1852–1932) at the University of Edinburgh, 1873.
Gift of Joan Martin
MHM03450

6 Arnold & Sons (London, c. 1848–1950)
Surgical kit, c. 1900–20
metal, ivory, silk, wood, velveteen, paper, ink
23.2 × 11.5 × 6.0 cm (case)
Presented to the Medical Society of Victoria by Mr W Ramsay, 1939
Gift of AMA Victoria, 2011
MHM04006
(see p. 149)

7 **Dr Esmond Venner Keogh (1895–1970)**, 1915
photograph (reproduction)
8.5 × 7.1 cm
Gift of Miss Pat Keogh
MHM00376

8 Down Bros (est. 1879) and Mayer & Phelps Ltd (London, est. 1863), (merged 1946, now Down Surgical Ltd)
Set of amputation knives, c. 1920
steel, wood, brass
36.0 × 10.2 × 4.2 cm (box)
MHM02079

9 ***The Elizabeth Austin Memorial No. 1. The surgical, tuberculosis and the cancer wards and administration offices (88 beds)***, c. 1920s, reprinted c. 1980
photograph (reproduction)
11.1 × 14.7 cm
MHM02935
(see p. 97)

10 Edmund Cowdry (ed.)
General cytology: A textbook of cellular structure and function for students of biology and medicine
University of Chicago Press, 1924
inscribed in pencil *P. MacCallum*
Gift of Professor James F Bishop, AO, 2017
MHM2017.6

11 Medical students, University of Melbourne
Dedicatory epistle to Professor Peter MacCallum (1885–1974), November 1925
ink on paper, mounted
35.6 × 30.4 cm
MHM01732
(see p. 3)

12 Edgar Samuel John King (1900–1966)
'A contribution to the pathology of carcinoma of the ovary by E. S. J. King, Melbourne'
Journal of the College of Surgeons of Australasia, vol. 2, no. 1, July 1929, p. 62–72
MHM2015.241

13 Julian AR Smith (1873–1947)
Professor Peter MacCallum (1885–1974), 1941
photograph
21.1 × 15.9 cm (image)
signed in blue ink *With regards / P. MacCallum*
MHM00331
(see p. 18)

14 Austin Hospital for Cancer and Chronic Diseases, Heidelberg, Victoria (est. 1882)
Nurse's certificate, presented to Joyce Olive Young by Training School for Nurses, 1944
paper, ink, cardboard, leatherette
22.8 × 16.0 × 0.9 cm
Gift of Mrs Jo Frances, 1997
MHM04243
(see p. 163)

15 James Milne (b. 1924)
The text books say, c. 1948
ink and pencil on paper
19.2 × 20.3 cm
Caricature sketch of Sir Roy Douglas 'Pansy' Wright (1907–1990), from collection of drawings *Some characters seen in the course of a medical education*.
Gift of Dr James Milne, 1987
MHM02712
(see p. 93)

16 Edgar Samuel John King (1900–1966), Thomas Edward Lowe (1908–1990) and Leonard Bell Cox (1894–1976) (eds)
Studies in pathology, presented to Peter MacCallum
Melbourne University Press, 1950
Gift of Professor James F Bishop, AO, 2017
MHM2017.5

17 Charles V MacKay (1880–1953)
'Draft of memorandum of principles governing professional relationships of the Peter MacCallum Clinic ...', and covering letter, 2 February 1951 and 28 December 1951
typescripts
33.0 × 21.0 cm (memorandum)
20.6 × 13.0 cm (letter)
MHM00641

18 ***Lady MacCallum Memorial contributors***, 13 July 1954
ink, paper, leather, gold paint
20.8 × 19.1 × 1.7 cm
Gift of Professor James F Bishop, AO, 2017
MHM2017.4

19 **Professors Edgar SJ King (1900–1966), Peter MacCallum (1885–1974) and Roy Douglas Wright (1907–1990)**, c. 1955–59
photograph, mounted
25.0 × 22.7 cm
MHM03676

20 Queensberry Photography (Melbourne)
Unveiling of portraits and plaques honouring Professors Sir Sydney Sunderland (1910–1993) and Sir Roy Douglas Wright (1907–1990), c. 1971
photograph
15.4 × 20.7 cm
Left to right: Sunderland, Professor David Penington, Wright.
MHM02799

21 **Professor Sir Peter MacCallum (1885–1974) in academic dress**
photograph of a painting, mounted
25.0 × 16.0 cm (image)
MHM01770

22 Alex Stitt (1937–2016)
Slip! Slop! Slap! (Anti-Cancer Council campaign), 1981
from *STITT: 50 years of the graphic design work of Alexander Stitt*, p. 166–7
Melbourne: Hardie Grant Books, 2011
Copyright © Alex and Paddy Stitt
MHM2017.9
(see p. 113)

23 **Professor Sir Roy Douglas 'Pansy' Wright (1907–1990)**, c. 1985–89
photograph
40.5 × 50.8 cm
MHM03716

24 Kittey Malarvie (b. 1938; skin: Nawoola; language: Jaru; country: Sturt Creek, Western Australia)
Goongooloong [Bloodwood], 2016
natural pigments on canvas
100.0 × 45.0 cm
Kittey Malarvie has depicted the sap of the bloodwood gum tree, an important form of bush medicine. The artist writes: 'Goongooloong is blood tonic. I collect it out bush then boil it up and drink it. Some people use it for cancer too.'
Purchased with support from the Melbourne Poche Centre for Indigenous Health, 2017
MHM2017.8
(see p. vi)

Australian Medical Association Archive, Medical History Museum (Gift of AMA Victoria, 2011)

25 MJ Holmes, and Commonwealth Department of Health
Cancer mortality in Australia: A statistical study
Melbourne: Government Printer, 1925
MHMA0862

26 Herman Fermor Lawrence (1863–1936)
'The relative low humidity of the atmosphere and much sunshine, as causal factor for the great prevalence of skin cancer in Australia'
reprint from *Medical Journal of Australia*, 29 September 1928
Sydney: Australasian Medical Publishing Company Limited, 1928
The first radium treatments in Australia were given in Melbourne by a dermatologist, Dr Herman F Lawrence, in 1903.
MHMA0406
(see p. xii)

27 David Arthur Welsh (1865–1948)
'The Halford Oration: Chapters in the life history of cancer'
Medical Journal of Australia, vol. 1, no. 17, 26 April 1930, pp. 540–9
MHMA2093

28 Peter MacCallum (1885–1974)
'Rhabdomyoma of the extremities'
Australian and New Zealand Journal of Surgery, vol. 2, no. 3, January 1933, pp. 296–308
MHMA0635

29 General Electric X-Ray Corporation (USA, est. 1929)
Product manual for Model KX-10, 60 to 140 Kv. P. X-ray therapy apparatus for superficial and intermediate therapy stationary and mobile types, c. 1940–49
printed booklet
27.9 × 21.6 cm
In 1926, General Electric (est. 1892) bought the Chicago-based Victor X-Ray Corporation. For a few years, the latter made X-ray tubes for General Electric. Victor was fully absorbed in around 1929 when General Electric changed its name to General Electric X-Ray Corporation.
MHMA1543.1

30 Machlett Laboratories (USA)
The Machletter, vol. 1, no. 6, August 1940
MHMA1543.2

31 Charities Board of Victoria
The Hospital Magazine, March 1944
'A medical centre where all modern facilities are concentrated, Professor MacCallum visualises future services', p. 6
MHMA2076

32 Charles V MacKay (1880–1953)
'The Cancer Institute, historical review by Charles MacKay MD, FRACP, acting secretary to the Cancer Institute Board'
Health Bulletin, nos 97 & 98, January–June 1949, pp. 2614–28
Melbourne: Department of Health, Victoria; Commission of Public Health, Victoria
MHMA0206

33 **Alfred Hospital registrars and residents**, 1952
(includes Margaret Garson in second row)
photograph (reproduction)
13.3 × 21.2 cm
Back row: David Fearon, James Byers, Frank Buchanan, Douglas McCutcheon, Wallace Hobart, Peter Broughton, Jack Trembath.
Middle row: John Tucker, Kenneth Leversha, Hugh Melville, Raymond Lake, Alex Goldman, Margaret Garson, Geoffrey Wigley, Geoffrey Wicks, Willoughby Sewell, Ross Anderson, Max Swan.
Front row: Nan Bell, Keith Robertson, George Westlake, Donald Collie, David Gunter, Richard Smibert (medical superintendent), Robert Fraser, Robert Fowler, Robert Gray, George Stirling, Mary Morland.
MHMA1435

34 Adrian Mackey Johnson (1916–1988)
'A note on the early use of radiotherapy in skin diseases in Australia'
Australian Journal of Dermatology, vol. 2, no. 3, June 1954, pp. 149–52
MHMA0101

Peter MacCallum Radiology Collection, Medical History Museum (Gift of Peter MacCallum Cancer Centre, 2017)

35 R Sabouraud (1864–1938) and H Noire (1878–1937)
Pastilles for *Le radiomètre X*, c. 1904–27
metal, barium platinocyanide
17.0 × 12.5 cm (open)
R103
These small yellow disks containing barium platinocyanide were placed on the patient's skin before radiotherapy. The disks would change from yellow to brown when exposed to X-rays and were used to measure radiation dose.

36 William Coolidge (1873–1975) (inventor), manufactured by Victor X-Ray Corporation for General Electric (USA, 1892–present)
Coolidge X-ray tube, 1917
glass, metal
22.0 × 36.0 × 22.0 cm
R39
(see p. 85)

37 Herbert John Gray (1882–1963)
Radium slide, c. 1920–25
glass, paper, ink
7.5 × 2.5 cm
R102

38 The Victoreen Instrument Co. (Cleveland, Ohio, 1928–2004)
Dosimeter in case (used to measure the absolute dosage of ionising radiation), 1928
metal, leather, velvet, paper, ink
39.0 × 14.0 × 5.0 cm
R68
(see p. 155)

39 Siemens Reiniger Werke A.G. (Erlangen, Germany, 1932–66; merged into Siemens A.G., still in operation)
X-ray tube, c. 1930–39
glass, metal
53.0 × 19.0 × 19.0 cm
R40

40 **Cone** (to define the shape of a beam from a deep-therapy applicator), c. 1930–39
wood, plastic, metal
24.0 × 20.0 × 20.0 cm
R52

Cat. 1 **Six bottles for poisons**, c. 1850, glass, cork, wood, paint; each 12.3 × 4.5 cm diameter, labelled *P: JACOBI.*, *P: CANTHAR:*, *STRYCH: ACET:*, *ANT: POT: TART:*, *POT: ARSEN:* and *CANTHARIDIN*. MHM01198, Medical History Museum, University of Melbourne.
POT: ARSEN stands for potassium arsenite, commonly known as Fowler's solution. In 1865 the uses of potassium arsenite expanded as Fowler's solution was used as the first chemotherapeutic agent to treat leukaemia, although its benefits were only temporary. Surprisingly, this specific use was inspired by potassium arsenite's role in improving digestion and producing a smoother coat in horses.

41 **Cone** (to define the shape of a beam from a deep-therapy applicator), c. 1940–49
metal
15.0 × 26.0 × 26.0 cm
R53

42 **X-ray tube**, c. 1940–49
glass, wood
177.5 × 48.0 × 42.0 cm
R41

43 Cancer Institute (Melbourne, est. 1949)
Report of the proceedings of the Cancer Institute Board from 29th March, 1949 to 30th June, 1952
Melbourne: Cancer Institute Board, 1952
R110
(see p. 27)

44 Charles V MacKay (1880–1953)
'The Cancer Institute historical review', 1950
typescript
24.0 × 15.0 cm
R113

45 English Electric Valve Co. (Chelmsford, England, 1947–99)
Magnetron, type M5015, c. 1950–59
glass, metal
33.0 × 20.0 × 23.0 cm
R1

46 **Wedge** (used for deep orthovoltage radiotherapy), c. 1950–59
metal, plastic
7.5 × 5.0 cm
R29

47 E.K. Cole Ltd Electronics Division (England, 1924–60)
Radiation monitor (used to measure exposure rate and intensity of ionising radiation in surrounding treatment areas), c. 1950–59
metal
25.0 × 15.0 × 28.0 cm
R61

48 Nuclear Enterprises Ltd (Edinburgh, 1956–76)
Dosimeter with manual (used to measure the absolute dosage of ionising radiation), c. 1956–59
wood, metal, leather, paper, ink
28.0 × 24.0 × 19.0 cm
R67

49 Cancer Institute (Melbourne, est. 1949)
Report of the proceedings of the Cancer Institute Board 1957–1959
Melbourne: Cancer Institute Board, 1959
R111
(see p. 27)

50 EMI Electronics (London, 1931–2012)
Survey meter (to measure exposure rate and intensity of ionising radiation in surrounding treatment areas), c. 1960–69
metal analogue meter reader with metal detector
28.0 × 11.0 × 28.0 cm
R56

51 Aimec Ltd (Buckinghamshire, England, 1942–69)
Radiation monitor with manual (used to measure exposure rate and intensity of ionising radiation in surrounding treatment areas), c. 1960–69
30.5 × 15.0 × 23.0 cm
R59

52 White & Gillespie (W&G) (Melbourne, 1910–present)
Dual face comprehensive slide rule, c. 1960–69
wood
35.0 × 5.0 × 1.0 cm
R81

53 Peter MacCallum Clinic (Melbourne, est. 1950)
Face mould, c. 1960–69
metal, clay
14.0 × 12.5 × 9.0 cm
R86

54 Peter MacCallum Clinic (Melbourne, est. 1950)
Face mould, c. 1960–69
clay
9.0 × 14.0 × 13.0 cm
R87

55 Peter MacCallum Clinic (Melbourne, est. 1950)
Face mould, c. 1960–69
clay, wax
16.5 × 16.5 × 10.0 cm
R88

56 Peter MacCallum Clinic (Melbourne, est. 1950)
Head shield, c. 1960–69
plastic, metal
29.0 × 28.0 × 33.0 cm
R90
(see p. 49)

57 Peter MacCallum Clinic, Physics Department (Melbourne, est. 1950)
Storage for radioactive material, c. 1965–69
metal, plastic, leather
7.0 × 10.5 × 8.0 cm plus leather strap
R97

58 Peter MacCallum Clinic (Melbourne, est. 1950)
Shield, 1968
lead, paper
14.0 × 20.0 × 2.5 cm
R91

59 **Wedge** (used with the Philips 6 mV linear accelerator), c. 1970–79
metal
25.0 × 30.5 × 4.0 cm
R31

60 **Grid** (used during deep-therapy treatment to disperse X-ray beams across the skin), c. 1970–79
metal, wax
11.0 × 11.0 × 5.0 cm
R80

Cat. 6 Arnold & Sons (London, c. 1848–1950), **Surgical kit**, c. 1900–20, metal, ivory, silk, wood, velveteen, paper, ink; 23.2 × 11.5 × 6.0 cm (case). MHM04006, presented to the Medical Society of Victoria by Mr W Ramsay, 1939, gift of AMA Victoria, 2011, Medical History Museum, University of Melbourne.

61 Sharp (Japan, 1912–present)
Computer and cassette interface, c. 1973–76
plastic, metal
21.5 × 47.0 × 6.5 cm
R105

62 Apple Inc. (California, 1976–present)
Flexi-disk and case, c. 1980–85
plastic, paper
14.0 × 14.0 cm
R108

63 **Linear accelerator part**, c. 1985–89
metal
16.0 × 155.0 × 5.0 cm
R21

Royal Women's Hospital Collection, Medical History Museum

64 Richard Thomas Tracy (1826–1874)
book made by T.J. & J. Smith, 83–84 Queen Street, Cheapside, London
Diary, 1873
cloth, paper, ink
19.0 × 12.0 cm
embossed in gold *Diary 1873*
signed *Richard T. Tracy*
A2000_14_001
(see p. 8)

HARRY BROOKES ALLEN MUSEUM OF ANATOMY AND PATHOLOGY

65 Harry Brookes Allen (1854–1926) (preparator)
Ovarian tumour specimen, c. 1900
human tissue, plant fibre, paper
15.0 × 26.0 × 21.0 cm
label inscribed *VI B 16 / Multiocular Ovarian Tumour*
531-001076
(see p. 83)

66 Herman Fermor Lawrence (1863–1936)
Moulages of the face, before and after radium treatment, 1908
painted wax, plaster
20.0 × 32.0 × 9.0 cm
inscribed *Ulcus Rodens / A.B. female, uet. 35 years. History of 18 months duration ... Has healed up under the influence of Radium.*
531-002350
(see p. 46)

COLLECTIONS OF THE UNIVERSITY OF MELBOURNE LIBRARY

Special Collections, Baillieu Library

67 William Gillbee (1825–1885)
'Cancer and its treatment'
Australian Medical Journal, vol. 2, October 1857, pp. 267–76
SpC/Med AUST v.2 (1857)
(see p. 79)

68 George Britton Halford (1824–1910)
'On the use of "Magenta" as an aid to investigation and diagnosis'
Australian Medical Journal, vol. 9, July 1864, pp. 196–8
SpC/MED AUST v.9 (1864)

69 Thomas Shearman Ralph (1813–1891)
'Observations and experiments with the microscope on the effects of various chemical agents on the blood'
Australian Medical Journal, vol. 11, August 1866, pp. 230–41
SpC/Med AUST v.11 (1866)

70 Thomas Ramsden Ashworth (1864–1935)
'A case of cancer in which cells similar to those in the tumours were seen in the blood after death'
Australian Medical Journal, vol. 14, no. 3, May 1869, pp. 146–7
SpC/Med AUST v.14 (1869)
(see p. 81)

71 James Roxburgh Wylie (1843–1876)
'A strange tumour and its cure'
Australian Medical Journal, vol. 16, 1871, pp. 36–7
SpC/Med AUST v.16 (1871)

72 Tharp Mountain Girdlestone (1823–1899)
'Two cases of epithelial cancer of the tongue'
Australian Medical Journal, vol. 19, February 1874, pp. 34–7
SpC/Med AUST v.19 (1874)

73 William Haig (1823–1893)
'On a case of tumour in the neck'
Australian Medical Journal, vol. 19, February 1874, pp. 53–4 (with illustration)
SpC/Med AUST v.19 (1874)

74 Harry Brookes Allen (1854–1926)
'Melanoid tumours of many organs'
Australian Medical Journal, vol. 2, no. 11, 15 November 1880, pp. 507–11
SpC/Med AUST ns v.2 (1880)
(see p. 83)

University of Melbourne Archives

75 James Ralston Kennedy Paterson (1897–1981)
'The centralisation of cancer treatment'
reprint from *Acta Radiologica*, vol. 28, nos 5–6, 1 September 1947, pp. 451–60
Folder 5/9, 1968.0003, Roy Douglas Wright Collection

76 Robert Fowler and Anti-Cancer Council of Victoria
'The results of surgical and radiological treatment in primary carcinoma of the uterus, by Robert Fowler', 1949
typescript
33.2 × 20.3 cm
Folder 5/6, 1968.0003, Roy Douglas Wright Collection

77 Executive Committee of the Cancer Institute Board (Melbourne)
'Report to the Cancer Institute Board', 1949
typescript
33.0 × 21.3 cm
Report to the Cancer Institute Board for its meeting on 18 May 1949, on the proceedings of the Executive Committee of the Board.
Folder 5/2, 1968.0003, Roy Douglas Wright Collection

78 Peter MacCallum (1885–1974)
Draft speech, 1950
typescript with handwritten annotations
33.8 × 21.0 cm
Prepared for the opening of Melbourne's first cancer clinic.
Folder 24e, 1975.0042, Peter MacCallum Collection
(see p. 77)

79 Edgar Samuel John King (1900–1966)
'The contribution of pathology to biology'
reprint of chapter from book *Studies in pathology, presented to Peter MacCallum*
Melbourne University Press, 1950
signed upper right *P. MacCallum*
signed centre *ES J King*
Folder 2, 1975.0042, Peter MacCallum Collection

80 Cancer Institute Board (Melbourne)
Extract from board minutes and transcript, 26 June 1951
typescript
33.3 × 20.3 cm
Discusses purchase of XT-1 250 kV deep-therapy units.
Folder 5/3, 1968.0003, Roy Douglas Wright Collection

81 Cancer Institute Board (Melbourne)
Minutes of board meeting no. 22, 24 July 1952
typescript
33.0 × 20.9 cm
Folder 5/3, 1968.0003, Roy Douglas Wright Collection

82 Earle Page (1880–1961, federal minister for health)
Letter to Sir Peter MacCallum, 19 October 1954
typescript
The minister is agreeing to organise a conference to discuss the progress of different states in the fight against cancer.
Folder 24a, 1975.0042, Peter MacCallum Collection
(see p. 153)

83 Cancer Institute Board (Melbourne)
'Synopsis of the development of the Anti-Cancer Council of Victoria', March 1955
typescript
Folder 24a, 1975.0042, Peter MacCallum Collection

84 Cancer Institute Board and Anti-Cancer Council of Victoria
Conference on Radiation Biology 12th–16th December 1955, 1955
printed conference program
31.8 × 20.4 cm
Folder 5/3, 1968.0003, Roy Douglas Wright Collection

85 Peter MacCallum (1885–1974)
Speech notes, 1956
typescript with annotations in ink
20.5 × 20.9 cm
Notes for opening of linear accelerator suite; thanks to minister for opening.
Folder 24e, 1975.0042, Peter MacCallum Collection

86 Peter MacCallum (1885–1974)
'Cancer concepts'
reprint from *Medical Journal of Australia*, vol. 43, no. 9, 3 March 1956, pp. 347–9
Folder 11, 1975.0042, Peter MacCallum Collection

87 Peter MacCallum (1885–1974)
Pocket diary, 1957
cardboard, paper, ink
12.5 × 7.9 cm
Folder 10, 1975.0042, Peter MacCallum Collection

88 Anti-Cancer Council of Victoria
Program for the Victorian Cancer Congress, Melbourne, 22–25 August 1960, 1960
printed program
20.3 × 13.0 cm
Folder 24e, 1975.0042, Peter MacCallum Collection

89 Anti-Cancer Council of Victoria
Sir Peter MacCallum's name badge for the Victorian Cancer Congress, Melbourne, 22–25 August 1960, 1960
ink, paper, plastic, metal
4.0 × 6.0 cm
Folder 24e, 1975.0042, Peter MacCallum Collection

90 Central Cancer Registry (Melbourne)
Cancer registration templates, c. 1960
printed cards
Included are a case abstract card, registration card, and patients' annual muster roll, in Appendix 'A' envelope.
Folder 24a, 1975.0042, Peter MacCallum Collection
(see p. 87)

PRIVATE COLLECTIONS

91 Kristin McFarlane (Australian, b. 1968)
Reflection 1: Fragile strength, 2016
glass lenses, botanical specimens, mirror, copper
70.0 × 70.0 × 2.0 cm
Collection of the artist
(see pp. 138 and 141)

92 Kristin McFarlane (Australian, b. 1968)
In the silence I can hear my tears fall, 2017
glass, metal, wood, mixed media
approx. 140.0 × 30.0 × 44.0 cm
Collection of the artist

93 Kristin McFarlane (Australian, b. 1968)
I find myself when I need to lose myself, 2017
encaustic, botanical specimens, mixed media
30.0 × 166.0 × 40.6 cm
Collection of the artist

94 Leslie Morgan (English/Australian, 1955–2017)
Hazardous yellow, 2013
oil on canvas
56.0 × 40.0 cm
Private collection
(see p. 130)

95 Leslie Morgan (English/Australian, 1955–2017)
White robe, 2013
oil on canvas
46.0 × 40.0 cm
Private collection

96 Leslie Morgan (English/Australian, 1955–2017)
View from above and below, 2013
oil on canvas
122.0 × 91.0 cm
Private collection
(see p. 142)

97 Leslie Morgan (English/Australian, 1955–2017)
Self-opening 2, 2013
oil on canvas
91.0 × 122.0 cm
Private collection

98 Polixeni Papapetrou (Australian, b. 1960)
Blinded, 2016
from series *Eden* (edition of six plus two artist's proofs)
pigment print
127.3 × 85.0 cm
Collection of the artist
(see p. 128)

99 Polixeni Papapetrou (Australian, b. 1960)
Heart, 2016
from series *Eden* (edition of six plus two artist's proofs)
pigment print
127.3 × 85.0 cm
Collection of the artist

100 Polixeni Papapetrou (Australian, b. 1960)
Flora, 2016
from series *Eden* (edition of six plus two artist's proofs)
pigment print
127.3 × 85.0 cm
Collection of the artist
(see p. 134)

101 Polixeni Papapetrou (Australian, b. 1960)
Amaranthine, 2016
from series *Eden* (edition of six plus two artist's proofs)
pigment print
127.3 × 85.0 cm
Collection of the artist
(see p. 137)

102 Polixeni Papapetrou (Australian, b. 1960)
Delphi, 2016
from series *Eden* (edition of six plus two artist's proofs)
pigment print
127.3 × 85.0 cm
Collection of the artist

103 Breast Cancer Network Australia
11,500 Field of Women, Melbourne Cricket Ground, May 6, 2005
Melbourne: Herald Sun, 2005
photograph on paper
23.0 × 17.5 cm
Private collection
(see p. 36)

AUSTIN HOSPITAL COLLECTION

104 GWR Johnson, architect (1840–1898)
Incurables Hospital, Heidelberg: Ground plan, c. 1876
ink on paper
78.5 × 60.5 cm
This drawing was used by builder Mr James Greenlaw during construction of the original Austin Hospital Building in 1876. It was presented to the hospital by Miss Ruby Greenlaw in 1957.
(see p. 12 and inside back cover)

105 ***Matron entertains sisters 1916–1917 to tea on the lawns***, 1917
photograph
16.0 × 12.0 cm
(see p. 7)

106 Flora Lion (English, 1878–1958)
Mr Meyer Zeltner (1862–1950), c. 1940
oil on canvas
95.0 × 85.0 cm
(see p. 16)

AUSTRALIAN POSTAL CORPORATION COLLECTION

107 Alex Stitt (1937–2016) (designer) and Australia Post
We're going to quit, 1990
Community Health series
41 cent stamp
printed on paper
2.60 × 3.75 cm

108 Alex Stitt (1937–2016) (designer) and Australia Post
Guess who's just had a checkup, 1990
Community Health series
41 cent stamp
printed on paper
2.60 × 3.75 cm

109 Lynda Warner (designer) and Australia Post
Breast cancer, 1997
45 cent stamp
printed on paper
2.60 × 3.75 cm
(see p. 24)

CANCER COUNCIL VICTORIA COLLECTION

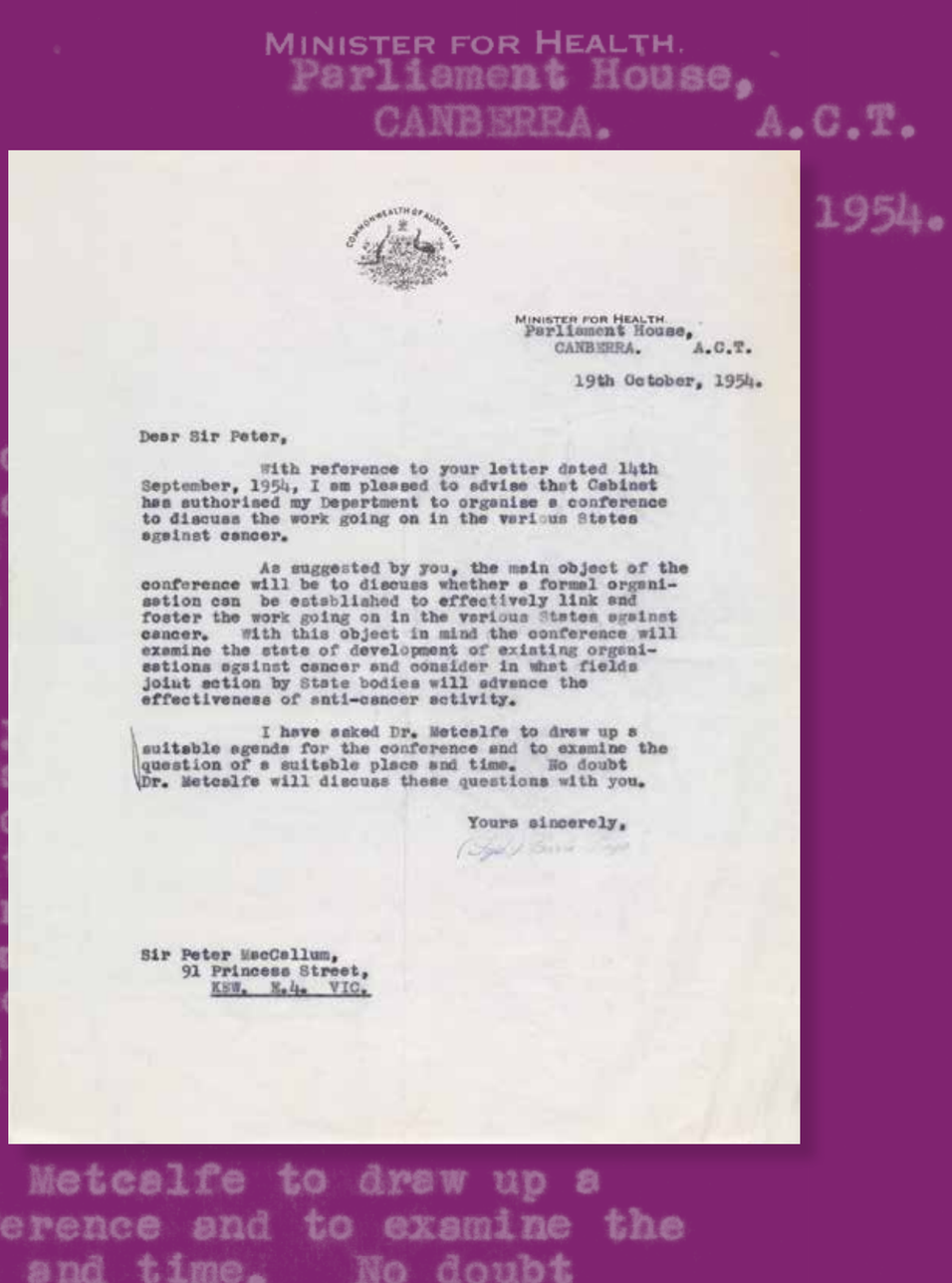
110 Mervyn John Holmes (1884–1965)
Review of cancer organization in Australia and of the position regarding facilities provided for investigation, examination and treatment
Canberra: L.F. Johnston, Government Printer, 1935
File 85.1, B0000114111

111 Parliament of Victoria
Anti-Cancer Council Act 1936
File 95.3 B0000114111
(see p. 21)

112 John Howard Lidgett Cumpston (1880–1954) and Australian Department of Health
Report of the Seventh Australia Cancer Conference, Melbourne. 4th–8th May, 1936
Commonwealth of Australia, 1936
File 95.2, B0000114111

113 ***Statement submitted to the Victorian Anti-Cancer Council by the Melbourne Cancer Causation Research Committee, August 1936***
[Melbourne: Anti-Cancer Council of Victoria, c. 1936]
File 95.3, B0000114111

Cat. 82 Earle Page (1880–1961, federal minister for health), **Letter to Sir Peter MacCallum**, 19 October 1954, typescript. Folder 24a, 1975.0042, Peter MacCallum Collection, University of Melbourne Archives.


MINISTER FOR HEALTH.
Parliament House,
CANBERRA. A.C.T.

1954.

MINISTER FOR HEALTH.
Parliament House,
CANBERRA. A.C.T.

19th October, 1954.

Dear Sir Peter,

With reference to your letter dated 14th September, 1954, I am pleased to advise that Cabinet has authorised my Department to organise a conference to discuss the work going on in the various States against cancer.

As suggested by you, the main object of the conference will be to discuss whether a formal organisation can be established to effectively link and foster the work going on in the various States against cancer. With this object in mind the conference will examine the state of development of existing organisations against cancer and consider in what fields joint action by State bodies will advance the effectiveness of anti-cancer activity.

I have asked Dr. Metcalfe to draw up a suitable agenda for the conference and to examine the question of a suitable place and time. No doubt Dr. Metcalfe will discuss these questions with you.

Yours sincerely,

Sir Peter MacCallum,
91 Princess Street,
KEW. N.4. VIC.

114 Peter MacCallum (1885–1974)
'Talk to be broadcast from 3 A.R. on Wednesday, 14th April, 1937. 10 p.m. to 10.10 p.m., Anti-Cancer Council Appeal. Professor P. MacCallum, Chairman of the Medical and Scientific Committee', 1937
typescript
25.5 × 20.7 cm
File 95.4, B0000114111

115 Commonwealth X-ray and Radium Laboratory, University of Melbourne
Review of the activities of the laboratory during the year 1936
Melbourne: Commonwealth X-ray and Radium Laboratory, c. 1937
File 95.4, B0000114111

116 Robert Fowler (1888–1965) and Anti-Cancer Council of Victoria, Central Cancer Registry
First annual analysis of clinical cancer statistics: Report, December 1941
Melbourne: Royal Australian College of Surgeons, 1941
Folder 7.2, box B000114376

117 Cecil Ernest Eddy (1900–1956) for the Commonwealth X-Ray and Radium Laboratory
'Report of the activities of the Commonwealth X-Ray and Radium Laboratory for the year 1943', 1944
typescript
33.0 × 21.2 cm
File 80.1, B0000114101

118 Anti-Cancer Council of Victoria, Central Cancer Registry
Handbook of the Central Cancer Registry
Melbourne: Anti-Cancer Council of Victoria, 1946
signed by Dr Douglas Rankin (1929–1991)
Folder 79.23, B000014096

119 Anti-Cancer Council of Victoria, Central Cancer Registry
Handbook of the Central Cancer Registry
Melbourne: Anti-Cancer Council of Victoria, 1950
signed by Peter MacCallum (1885–1974)
2.1.2, Folder 79.23, B000014096

120 Robert Fowler (1888–1965)
'Some observations on the epidemiology of lung cancer'
reprint from *Medical Journal of Australia*, 2 April 1955
Sydney: Australasian Medical Publishing Company
File 171, B0000114100
(see p. 89)

121 **'Deaths from cancer of the lung, census years 1911–1963 and each year from 1956–1963'**, 1956–63
typescript
33.0 × 20.7 cm
File 8.4.4, B0000114372

122 Public Education Sub-Committee, Anti-Cancer Council of Victoria
Notes for lay speakers on cancer, 1958
printed publication
24.0 × 18.0 cm
B0000113868

123 Anti-Cancer Council of Victoria
One more river to cross ... cancer, 1958
printed booklet
17.5 × 24.5 cm
B0000113868

124 Anti-Cancer Council of Victoria
Why the Anti-Cancer Council of Victoria is appealing for £500,000 to fight cancer, 1958
printed brochure
27.6 × 22.0 cm
B0000155466

125 Anti-Cancer Council of Victoria
Planning your programme for next year? Have you considered including a talk on cancer?, 1959
printed pamphlet
14.0 × 8.0 cm
B0000113868

126 Anti-Cancer Council of Victoria
Central Cancer Registry and Central Cancer Library, 1959
printed pamphlet
14.0 × 8.0 cm
B0000113868

127 Public Education Sub-Committee, Anti-Cancer Council of Victoria
Victorian Cancer News, no. 1, July 1959
File 1, B0000113964

128 Wolfgang Sievers (Germany/Australia, 1913–2007)
In this special kitchen at the Austin Hospital, the housewife may resume her domestic duties preparatory to returning home, 1960
silver gelatin photograph
15.5 × 20.1 cm
TCCVODD000027

129 Wolfgang Sievers (Germany/Australia, 1913–2007)
Mr Jack Callow (R.M.H.) radiographer, 1960
silver gelatin photograph with tracing paper
25.0 × 19.5 cm

130 Wolfgang Sievers (Germany/Australia, 1913–2007)
A visiting nurse chats with one of her patients, 1960
silver gelatin photograph
20.9 × 15.4 cm
TCCVODD000027

131 Anti-Cancer Council of Australia
List of members, 1960
printed publication
19.0 × 13.0 cm
File 5.1.1, B0000114366

Cat. 38 The Victoreen Instrument Co. (Cleveland, Ohio, 1928–2004), **Dosimeter in case** (used to measure the absolute dosage of ionising radiation), 1928, metal, leather, velvet, paper, ink; 39.0 × 14.0 × 5.0 cm. R68, gift of Peter MacCallum Cancer Centre, 2017, Peter MacCallum Radiology Collection, Medical History Museum, University of Melbourne.

132 Anti-Cancer Council of Victoria
What you should know about cancer, 1960
printed booklet
17.5 × 11.7 cm
B0000113868
(see p. 28)

133 Anti-Cancer Council of Victoria
Cancer: What you should know about it, c. 1960
multi-lingual printed pamphlet
16.5 × 11.5 cm
B0000113868

134 Anti-Cancer Council of Victoria
Cancer facts for you, c. 1960
printed pamphlet
22.0 × 9.0 cm
B0000113868

135 Stuart Penberthy (Melbourne)
Anti-cancer display stand at the Melbourne Home Exhibition, c. 1960
photograph
18.0 × 25.5 cm

136 Stuart Penberthy (Melbourne)
Demonstration of radioisotopes in medicine, c. 1960
silver gelatin photograph
20.3 × 25.7 cm

137 Anti-Cancer Council of Victoria
Help yourself to recovery, c. 1960
printed pamphlet
13.0 × 19.0 cm
B0000113868

138 Anti-Cancer Council of Victoria
My new lease of life: A talk by Mrs. Margaret Eldridge, c. 1960
vinyl record, print on paper
17.5 × 17.5 cm
Folder 4.14, B0000114366

139 Zanthus Films (Brighton, Melbourne)
***You are not alone*: shooting script**, 1961
typescript
33.6 × 20.7 cm
Folder 4.13, B0000114366
(see p. 99)

140 Anti-Cancer Council of Victoria, Central Cancer Registry (Melbourne)
'Registrations of lung cancer expressed as percentage of all sites excluding skins, 1948–1962', 1948–62
typescript
33.0 × 22.0 cm
B0000114372

141 Stuart Penberthy (Melbourne)
Group of men with Mr AJ Brown receiving cancer information in front of a mobile information van, 1962
photograph
10.2 × 15.8 cm

142 Anti-Cancer Council of Victoria
A handbook for guidance of country cancer committees, 1962
printed booklet
25.5 × 20.6 cm
Folder 4.19, B0000114366

143 Central Cancer Registry (Melbourne)
Case abstract card, January 1962
print and ball-point pen on paper
12.7 × 20.3 cm
Folder 79.23, B000014096

144 Central Cancer Registry (Melbourne)
Report no. 1, May 1962, Cancer registration in Melbourne, 1962
printed publication
23.5 × 15.7 cm
File 5.1.3, B0000114366

145 Anti-Cancer Council of Victoria, Central Cancer Registry
'Cancer registrations for the year ending 31st December, 1962', 1962
typescript
40.5 × 29.5 cm
File 6.3.1, B0000114372

146 Public Education Committee, Anti-Cancer Council of Victoria
Smoking and your health, c. 1962
printed booklet
19.0 × 8.5 cm
B0000113868

147 **Dr Esmond Venner Keogh (1895–1970)**, c. 1962
photograph
13.5 × 11.0 cm
(see p. 91)

148 Stuart Penberthy (Melbourne)
Mr AJ Brown showing a group of women the early warning signs of cancer, 1963
silver gelatin photograph
16.5 × 25.6 cm

149 **'Note on apparent consumption figures from Mr. Street, Com. Statistics Office, 1961–1964 for tobacco, cigars and cigarettes'**, 1961–64
typescript
20.2 × 12.4 cm
File 9.4.1 B0000114372

150 Anti-Cancer Council of Victoria
An answer to cancer, 1965
printed booklet: Cancer Campaign promotional material
13.0 × 13.0 cm
Folder 4.26, B0000114366

151 Anti-Cancer Council of Victoria
Cancer Campaign 1965, 1965
printed pledge card
6.6 × 10.5 cm
Folder 4.26, B0000114366

152 Anti-Cancer Council of Victoria
Cancer Campaign—1965. A report from the chairman of the Cancer Campaign, September 1965
printed booklet
24.2 × 18.5 cm
Folder 4.27, B0000114366

153 David J Hill (public education officer, Anti-Cancer Council of Victoria)
Measuring effectiveness of public education in Victoria, 1966
typescript
26.1 × 20.7
Folder 4.12.1, B0000114366

154 Stuart Penberthy Pty Ltd (Melbourne)
Woman reading billboard stating *Lung cancer deaths up again*, 1966
silver gelatin photograph
25.5 × 20.7 cm
(see p. 43)

155 **Newspaper articles**, 1966–67
printed on paper
6.3 × 9.4 cm to 64.5 × 17.8 cm
File 9.8, B0000114372

156 George E Moore, Irwin Bross, Raymond Shamberger and Fred G Bock
'Tar and nicotine retrieval from fifty-six brands of cigarettes'
reprint from *Cancer*, vol. 20, no. 3, March 1967
File 9.9.2, B0000114376

157 Esmond Venner Keogh (1895–1970) (medical advisor to the Anti-Cancer Council of Victoria)
Letter to Dr Alan McPhate (1929–2016) about rising mortality from lung cancer, 2 May 1967
typescript
33.6 × 20.7 cm
File 8.1.2, B0000114372

158 National Health and Medical Research Council
'Agenda item 6.1: Health dangers of cigarettes, October, 1967', 1967
typescript
29.7 × 21.0 cm
File 9.3.1, B0000114372

159 Commission of Public Health, Government of Victoria
'Cancer of the lung. Transcript of discussion with Dr. E. V. Keogh Medical Advisor to the Anti-Cancer Council', 1967
typescript
33.5 × 20.7 cm
File 8.2.2, B0000114372

160 Peter Hudson (b. 1946)
Letter to the community about 'plenty of good reasons not to smoke', 1969
ink on paper
29.7 × 21.0 cm
TCCVODD000027

161 Anti-Cancer Council of Victoria
Champion goal kicker, Peter Hudson doesn't smoke, 'Smoking and fitness don't mix', he says, 1969
printed flier
21.4 × 14.0 cm
TCCVODD000027

162 Les Tanner (1927–2001)
What about an excise tax on coffins?, c. 1970
photograph of cartoon
20.4 × 25.6 cm

163 Stuart Penberthy Pty Ltd (Melbourne)
Tar test equipment and cigarette packets, c. 1970–74
silver gelatin photograph
16.5 × 22.0 cm

164 Nigel Gray (1928–2014)
'Advertising agents' luncheon, 17 June 1971: Address by Nigel Gray, MB, BS, MRACP, FACMA, director, Anti-Cancer Council of Victoria', 1971
typescript
26.2 × 21.4 cm
File 25, B0000114109

165 Stuart Penberthy Pty Ltd (Melbourne)
Women handing out *Free for smokers* information pamphlets, 1974
photograph
15.5 × 25.8 cm

166 **Lew Kiddle and WR De Long present cheque to Nigel Gray**, 1980
photograph
10.8 × 16.0 cm
Retired General Motors Holden (GMH) executive Mr Lew Kiddle (centre) and director of finance Mr WR De Long present the GMH employees' cheque of $1000 to Dr Nigel Gray (1928–2014), director of the Anti-Cancer Council of Victoria. The image appeared in *GMH People* (published by the Public Affairs Department of General Motors Holden) in March 1980.
TCCVODD000027

167 Stuart Penberthy Pty Ltd (Melbourne)
Warren Mitchell (1926–2015) as Alf Garnett, 1980
silver gelatin photograph with tracing paper
21.7 × 16.7 cm
TCCVODD000027

168 **Dr Margaret Garson (b. 1927) and colleague in office**, c. 1980–92
photograph
10.3 × 12.6 cm
B0000146034

169 Victorian Smoking & Health Project
Smoke gets in your eyes and lungs, c. 1980–89
printed poster
21.0 × 59.5 cm
B0000113724

170 **Port Melbourne VFA footballers in front of banner provided by Anti-Cancer Council of Victoria**, 1981
photograph
20.3 × 25.4 cm
TCCVODD000027

171 John Keesing and Associates (Melbourne)
Dr Margaret Garson (b. 1927) at St Vincent's Hospital, 1982
photograph
25.4 × 20.4 cm
820810A–7
(see p. 105)

172 John Keesing and Associates (Melbourne)
Cancer Registry staff, 1982
photograph
25.4 × 20.4 cm

173 John Keesing and Associates (Melbourne)
Volunteers bagging stamps for our stamp project, 1982
photograph
25.5 × 20.4 cm

174 **Cell type B with microvilli**, 1982
photograph
21.9 × 19.2 cm

175 Anti-Cancer Council of Victoria
Press release: *Local council reject tobacco advertising*, 18 July 1982
typescript
28.0 × 21.7 cm
File 9, B0000113844

176 Ann Westmore
'Get under a hat and protect your face from the sun'
The Age, 1 December 1982
newspaper cutting
File 99.119, B0000113986

177 **David Hill, Nigel Gray, Tom Roper and David Hunt sitting in front of anti-smoking posters**, c. 1982
photograph
12.6 × 17.7 cm
Professor David Hill, AO (Anti-Cancer Council), Dr Nigel Gray, AO (1928–2014, Anti-Cancer Council), the Hon. Tom Roper, MP (b. 1945, Victorian minister for health 1982–85) and Dr David Hunt (National Heart Foundation).

178 **SEM of a cell line RCH-ACH**, 1984
photograph
20.2 × 25.3 cm

179 John Keesing and Associates (Melbourne)
Dr Don Metcalf (1929–2014), Carden Fellow (1954–2014), 1985
silver gelatin photograph
25.4 × 20.4 cm
820812A–15
(see p. 103)

180 Parliament of Victoria
Tobacco Act 1987, 24 November 1987
print on paper
25.0 × 17.0 cm
(see p. 115)

Cancer Council Victoria cigarette packet collection

181 ***Scooters, Henri Wintermans, 10***, c. 1930s–40s
container for cigars
metal
9.5 × 9.5 × 1.0 cm

182 Carreras Ltd (London)
Cork tipped, Craven "A" Virginia cigarettes, c. 1930s–40s
container for cigarettes
metal
9.0 × 7.5 × 1.5 cm

183 W.D. & H.O. Wills [Aust.] Ltd
Imperial Crown, Aromatic, Pre-rubbed Pipe, 50g, net, c. 1960s.
container for tobacco
metal
3.0 × 8.0 cm diameter

184 ***du Maurier, 50 Filter Cigarettes***, c. 1960s
cigarette container
plastic
9.5 × 6.5 cm diameter
printed on container *WARNING – SMOKING IS A HEALTH HAZARD*

185 British American Tobacco Australia Ltd
Dunhill essence, King Size Superslims, 20, c. 1980s
cigarette container
metal
9.0 × 8.0 × 1.5 cm
printed on outside of container *SMOKING CAUSES MOUTH AND THROAT CANCER / Health Authority Warning*
printed inside *Smoking Kills / Call the Quitline / 131 848*
(see p. 33)

186 ***Holiday, Super Mild 50***, c. 1987–94
cigarette packet
cardboard
9.0 × 7.0 × 3.5 cm
printed *SMOKING CAUSES LUNG CANCER / Health Authority Warning*
(see p. 117)

187 American Cigarette Company Pty Ltd
Class A, Peter Stuyvesant, Extra Mild, 20, Mild Choice Tobaccos, King Size, c. 1987–94
cigarette packet
cardboard
9.0 × 5.5 × 2.5 cm
printed *SMOKING REDUCES YOUR FITNESS / Health Authority Warning*

188 Imperial Tobacco Australia Ltd
Peter Stuyvesant, Lights, 20, Mild Choice Tobaccos, King Size, American Tobacco Company, c. 1995–2004
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING WHEN PREGNANT HARMS YOUR BABY / Government Health Warning*

189 Philip Morris Ltd
Marlboro, 25, c. 1995–2005
cigarette packet
cardboard
9.0 × 6.5 × 2.5 cm
printed *SMOKING CAUSES HEART DISEASE / Government Health Warning*

190 Philip Morris Ltd
Marlboro, 25 [Racing Edition], c. 1995–2005
cigarette packet
cardboard
9.0 × 6.5 × 2.5 cm
printed *SMOKING WHEN PREGNANT HARMS YOUR BABY / Government Health Warning*

191 Imperial Tobacco Australia Ltd
Peter Stuyvesant, Classic, King Size 20s, American Tobacco Company, 1998
cigarette packet
cardboard
9.0 × 5.5 × 2.5 cm
printed *CAUSES OF DEATH IN AUSTRALIA* / TOBACCO – 19,019 / Alcohol – 2,831 / Motor Vehicle Accidents – 1,731 / Illegal Drugs – 863 / Murders – 203 / SMOKING – A LEADING CAUSE OF DEATH / Health Authority Warning*

192 Imperial Tobacco Australia Ltd
Peter Stuyvesant, Classic Blue, 20, c. 2006–12
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING CAUSES BLINDNESS*
(see p. 117)

193 ***Pall Mall, Famous Virginia Tobacco, Slims, 20 Blue***, c. 2006–12
cigarette packet
cardboard
9.0 × 5.0 × 2.0 cm
printed *SMOKING HARMS UNBORN BABIES / Health Authority Warning*

194 British American Tobacco
Pall Mall, Famous Virginia Tobacco, Slims, 20 Amber, c. 2006–12
cigarette packet
cardboard
9.0 × 5.0 × 2.0 cm
printed *SMOKING CAUSES LUNG CANCER / Health Authority Warning*

195 British American Tobacco
Pall Mall, Famous Virginia Tobacco, Slims, 20 Red, c. 2006–12
cigarette packet
cardboard
9.0 × 5.0 × 2.0 cm
printed *SMOKING CAUSES HEART DISEASE / Health Authority Warning*

196 British American Tobacco
Pall Mall, Famous Virginia Tobacco, Slims, 20 Fine Silver, c. 2006–12
cigarette packet
cardboard
9.0 × 5.0 × 2.0 cm
printed *SMOKING CAUSES EMPHYSEMA / Health Authority Warning*

197 British American Tobacco
Pall Mall, Famous Virginia Tobacco, Slims, 20 Ultimate Purple, c. 2006–12
cigarette packet
cardboard
9.0 × 5.0 × 2.0 cm
printed *SMOKING CAUSES EMPHYSEMA / Health Authority Warning*

198 British American Tobacco
Pall Mall Slims, Smooth Amber, 23, Famous Virginia Tobacco, c. 2006–12
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING CAUSES LUNG CANCER / BRYAN DIED AGED 34*
(see p. 117)

199 Philip Morris Ltd
Longbeach, 20 original cigarettes, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.5 cm
printed *SMOKING CLOGS YOUR ARTERIES / Health Authority Warning*

200 Philip Morris Ltd
Longbeach, Mild 20, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.5 cm
printed *SMOKING IS ADDICTIVE / Government Health Warning*
(see p. 117)

201 Imperial Tobacco
Nano, John Player Special, 20 Blue, 2012
cigarette packet
cardboard
8.5 × 5.0 × 2.0 cm
printed *DON'T LET CHILDREN BREATHE YOUR SMOKE / Health Authority Warning*
(see p. 117)

202 Imperial Tobacco
Nano, John Player Special, 20 Red, 2012
cigarette packet
cardboard
8.5 × 5.0 × 2.0 cm
printed *SMOKING CAUSES MOUTH AND THROAT CANCER / Health Authority Warning*

203 Imperial Tobacco
Nano, John Player Special, 20 Gold, 2012
cigarette packet
cardboard
8.5 × 5.0 × 2.0 cm
printed *SMOKING CAUSES EMPHYSEMA / Health Authority Warning*

204 American Cigarette Company (Overseas) Pty Ltd
Menthe, Vogue, 20, 2012
cigarette packet
cardboard
10.0 × 5.5 × 1.0 cm
printed *SMOKING IS ADDICTIVE / Health Authority Warning*

205 American Cigarette Company (Overseas) Pty Ltd
Bleue, Vogue, 20, 2012
cigarette packet
cardboard
10.0 × 5.5 × 1.0 cm
printed *SMOKING DOUBLES RISK OF STROKE / Health Authority Warning*

206 American Cigarette Company (Overseas) Pty Ltd
20 Superslims 100s, Vogue, Menthol, 2012
cigarette packet
cardboard
10.0 × 5.5 × 1.0 cm
printed *YOUR SMOKING CAN HARM OTHERS / Government Health Warning*

207 Philip Morris Ltd
Peter Jackson, Original Blue, 20, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING CAUSES BLINDNESS*
(see p. 117)

208 Rothmans of Pall Mall (Australia) Ltd
Rothmans King Size, 20, Filter tipped, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING IS ADDICTIVE / Government Health Warning*

209 British Tobacco Company
Rothmans Blue, 20, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING CAUSES PERIPHERAL VASCULAR DISEASE*

210 British American Tobacco Group, Rothmans of Pall Mall Trademark Owner
Rothmans King Size, Filter Tipped, 2012
cigarette packet
cardboard
9.0 × 5.5 × 2.0 cm
printed *SMOKING CAUSES PERIPHERAL VASCULAR GANGRENE*

WALTER AND ELIZA HALL INSTITUTE ARCHIVE

211 **Professor Gustav Nossal (b. 1931) at work in the laboratory**, 1969
photograph
20.0 × 15.0 cm
01203DIP
(see p. 101)

Authors

Dr Lorraine Baker, MBBS, DipRANZCOG, GradDipWomHlth, is a general practitioner who has worked in practice with her husband for more than 30 years. She was founding chair of the Inner East Division of General Practice, has served on various state government advisory groups, and is currently president of AMA Victoria.

Professor David Ball, MBBS, MD, FRANZCR, is a radiation oncologist and director of the multidisciplinary lung service at the Peter MacCallum Cancer Centre. He is a professorial fellow of the University of Melbourne, a graduate of the University of Adelaide, and a gold medallist of the Royal Australian and New Zealand College of Radiologists.

Lili Belle Birchall, BA(Hons), is in her final year of a Master of Arts and Cultural Management at the University of Melbourne, where she completed her honours degree in art history. She is currently completing an internship at the Medical History Museum through the Cultural Collections Projects Program.

Professor James F Bishop, AO, MD, MMed, MBBS, FRACP, FRCPA, a medical oncologist, established the Division of Haematology and Medical Oncology at the Peter MacCallum Cancer Institute in 1990, and the Sydney Cancer Centre at the Royal Prince Alfred Hospital/University of Sydney in 1995. He has been first chief cancer officer for NSW, chief executive officer of the Cancer Institute NSW, deputy director-general of health and NSW chief health officer, director of population health for NSW, Australian government chief medical officer, and inaugural executive director, Victorian Comprehensive Cancer Centre, and Herman Chair of Cancer Medicine, University of Melbourne.

Professor Antony Burgess, AC, FAA, FTSE, PhD, focused in his early research on white blood cell regulators. He has made significant contributions to research on epidermal growth factor receptor, colon cancer and growth factor. Formerly director of the Melbourne branch of the Ludwig Institute, he is now a laboratory head at the Walter and Eliza Hall Institute.

Associate Professor Lynda Campbell, MBBS, FRCPA, FHGSA, DHMSA, obtained her MBBS from the University of Melbourne in 1977 and trained as a haematologist before obtaining a Keogh Fellowship in 1988 to study cancer cytogenetics with Margaret Garson. She was director of the Department of Cytogenetics at St Vincent's Hospital from 1992 to 2015.

Professor Jonathan Cebon, MBBS(Hons), PhD, FRACP, is medical director and head of the Cancer Immunobiology Laboratory at the Olivia Newton-John Cancer Research Institute, and medical director of the Cancer and Neurosciences Clinical Services Unit at Austin Health.

Professor Mark Cook, MD, MBBS, FRACP, FRCP, is director of the Graeme Clark Institute, Sir John Eccles Chair of Medicine in the Department of Medicine, University of Melbourne, and director of neurology at St Vincent's Hospital. He is president of the Epilepsy Society of Victoria and his publications include *Epileptic seizures and the EEG*, with Andrea Varvasky and Iven Mareels. Professor Cook chairs the Advisory Committee of the Medical History Museum.

Professor Suzanne Cory, AC, PhD, FAA, FRS, is a molecular biologist and cancer researcher, and an honorary distinguished professorial fellow in the molecular genetics of cancer division at the Walter and Eliza Hall Institute. Her scientific achievements have attracted numerous honours and awards. She has served on many high-level committees in Australia and overseas.

Professor Peter Doherty, AC, BVSc, MVSc, PhD, FAA, FRS, shared the 1996 Nobel Prize for Medicine with Rolf Zinkernagel. He is an advocate for science and for evidence-based policy.

Associate Professor Kate Drummond, MBBS, MD, FRACS, is a neurosurgeon, divisional director of neurosciences, cancer and infection medicine at the Royal Melbourne Hospital, and an associate professor in the Department of Surgery at the University of Melbourne. She is also director of the Neuro-Oncology Tumour Stream at the Victorian Comprehensive Cancer Centre and deputy director of the Melbourne Brain Centre.

Professor Henry Ekert, AM, MBBS, MD, FRACP, FRCPA, is a paediatric haematologist/oncologist who trained with John Colebatch and subsequently at the Los Angeles Children's Hospital and at Great Ormond Street, London. His research has focused on the structure of Factor VIII, his main contributions being in leukaemia, Hodgkins disease and haemophilia.

Professor Sean Grimmond, BSc, PhD, FFS (RCPA), is director of cancer research and the Bertalli Chair in Cancer Medicine at the University of Melbourne Centre for Cancer Research, located in the Victorian Comprehensive Cancer Centre. His current research focuses on real-time omic analysis of recalcitrant cancers, testing the value of personalised therapies, and further cancer genome discovery.

Dr Derham Groves, BArch (Deakin), MArch (RMIT), PhD (Minnesota), teaches architecture at the University of Melbourne. He is interested in popular culture, architecture and design.

Todd Harper, BEc, GradDipHealthProm, MHealthEc, is chief executive officer of Cancer Council Victoria. He has more than 20 years' experience in public health advocacy and implementation as a former chief executive officer of VicHealth, executive director of Quit Victoria, director of the VicHealth Centre for Tobacco Control, and executive director of the Tasmanian Council on AIDS and Related Diseases.

Dr Jacqueline Healy, BA(Hons), MBA, PhD, is senior curator of the Medical History Museum and of the Henry Forman Atkinson Dental Museum, University of Melbourne. She was inaugural director of Bundoora Homestead (the public art gallery of the City of Darebin), director of the Museum and Art Gallery of the Northern Territory, and director of public programs at the National Gallery of Victoria.

Professor David Hill, AO, PhD, MD (*Honoris causa*), FAPsS, is a former director (now honorary associate) at Cancer Council Victoria, and is a professorial fellow in both the School of Population and Global Health at the University of Melbourne and the School of Psychological Sciences at the University of Melbourne.

Professor Doug Hilton, AO, FAA, FTSE, FAHMS, is the sixth director of the Walter and Eliza Hall Institute, and is head of the Department of Medical Biology in the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne. He worked with Donald Metcalf for many years, exploring how normal and leukaemic blood cells are regulated.

Professor John L Hopper, AM, BSc(Hons), BA, MSc, PhD, a professorial fellow with a PhD in mathematical statistics, is currently director (research) in the Centre for Epidemiology and Biostatistics at the University of Melbourne. His areas of research include genetic epidemiology and the statistical analysis of twin and family data in the study of breast cancer, colo-rectal cancer, melanoma, prostate cancer, asthma, and mammographic density.

Dr Ryan Jefferies, BSc(Hons), PhD, is curator of the Harry Brookes Allen Museum of Anatomy and Pathology at the University of Melbourne, and creative director at Science Gallery Melbourne. He has a PhD in infectious disease research and extensive experience in multimedia design and science communication.

Dr Ross Jones, BA(Hons), DipEd, MEdStud, PhD, wrote *Humanity's mirror: 150 years of anatomy in Melbourne*. He is an honorary senior fellow in the Department of Anatomy and Neuroscience at the University of Melbourne, an associate in the History Department at the University of Sydney, and the 2016–17 Redmond Barry Fellow at State Library Victoria.

Professor Shitij Kapur, MBBS, PhD, FRCPC, FMedSci, is dean, Faculty of Medicine, Dentistry and Health Sciences, and assistant vice-chancellor (health), University of Melbourne. He is a clinician-scientist with expertise in psychiatry, neuroscience and brain imaging, his main research interest being schizophrenia and its treatment. He advises various public charities and pharmaceutical companies, has received national and international awards and fellowships, and serves on the board of the Royal Melbourne Hospital, the Walter and Eliza Hall Institute and the St Vincent's Research Institute in Melbourne.

Professor Mei Krishnasamy, BA, RN, MSc, PhD, is chair of cancer nursing at the University of Melbourne, and nursing research and education lead for the Victorian Comprehensive Cancer Centre. She is an honorary senior research fellow at the Olivia Newton-John Cancer Wellness and Research Centre and at the Peter MacCallum Cancer Centre.

Professor Tomas Kron, OAM, PhD, is director of physical sciences at the Peter MacCallum Cancer Centre. He holds academic appointments at several universities and has published more than 250 peer-reviewed publications. In 2014 he was awarded the Medal of the Order of Australia for services to medicine, research and education.

Professor Richard Larkins, AO, MDBS, PhD, LLD (*Honoris causa*, Melb), LLD (*Honoris causa*, Monash), FTSE, FAAHMS, FRACP, FRCP, FRCPI, FAMSing, has been the James Stewart Professor of Medicine at the University of Melbourne and Royal Melbourne Hospital, dean of Medicine, Dentistry and Health Sciences at the University of Melbourne, vice-chancellor of Monash University, inaugural chair of the Victorian Comprehensive Cancer Centre, chair of the National Health and Medical Research Council, president of the Royal Australian College of Physicians, and chair of Universities Australia. He is chancellor of La Trobe University.

Professor Sharon Lewin, FRACP, PhD, FAAHMS, an infectious diseases physician, is inaugural director of the Peter Doherty Institute for Infection and Immunity (a joint venture between the University of Melbourne and Royal Melbourne Hospital), professor of medicine at the University of Melbourne, and consultant infectious diseases physician at the Alfred Hospital.

Professor Fabienne Mackay, PhD, FAHMS, is the inaugural head of the School of Biomedical Sciences in the Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne. Her laboratory helped develop the B-cell activating factor (BAFF) inhibitor which was approved in 2011 as the first new treatment for lupus in more than 50 years. She is a fellow of the Australian Academy of Health and Medical Sciences.

Professor Geoff McColl, BMedSc, MBBS, MEd, PhD, FRACP, is head of the Melbourne Medical School and professor of medical education and training at the University of Melbourne. He has been developing and implementing the current Doctor of Medicine (MD) curriculum and has had significant experience in medical education research.

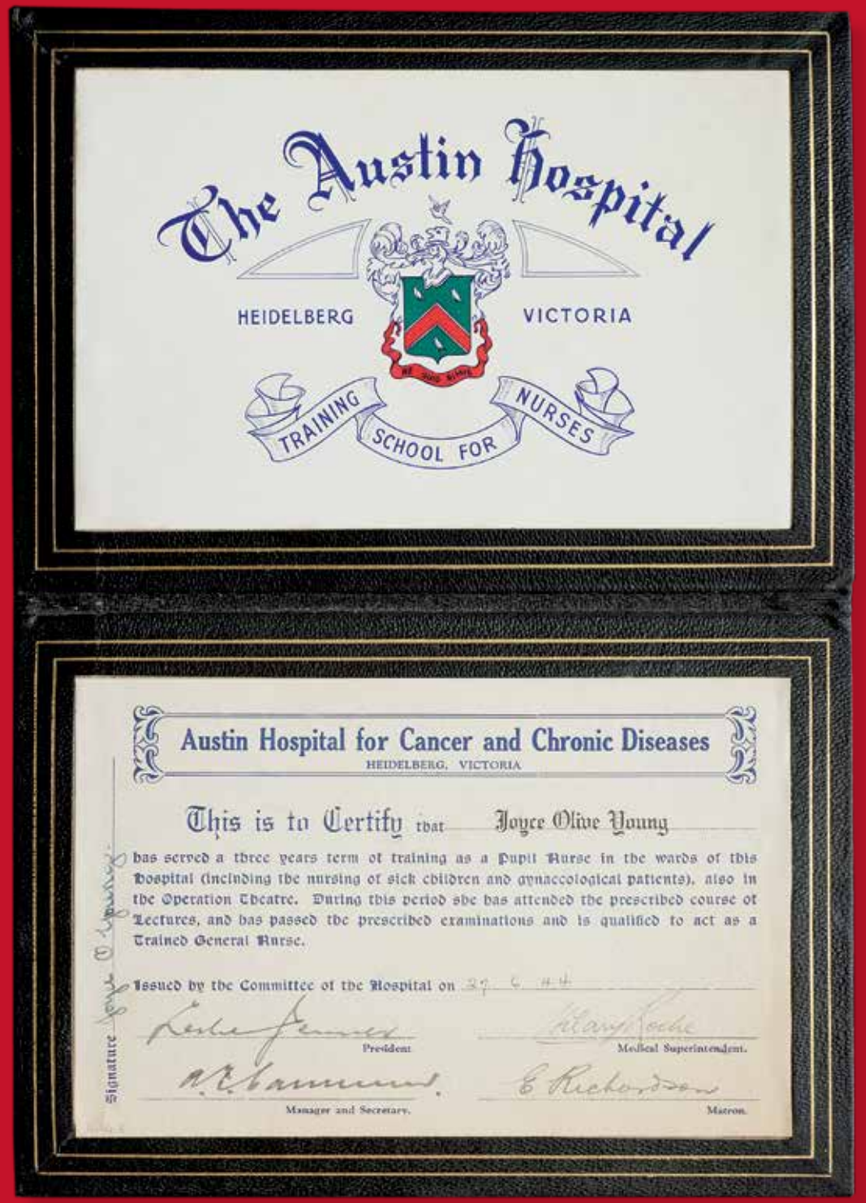
Kristin McFarlane, BA, GradDip, MFA, is a Melbourne-based artist and graphic designer working with glass, text and image. Her glass works have been included in the Ranamok Glass Prize, SOFA Chicago, and Salone del Mobile; and commissioned by HRH Queen Rania of Jordan, the Royal Melbourne Hospital and the Australian of the Year Awards.

Emeritus Professor Peter McPhee, AM, BA, DipEd, MA, PhD, has published widely on modern France, recently *Liberty or death: The French Revolution* (2016). In 1999 he published *'Pansy': A life of Roy Douglas Wright.* He was deputy vice-chancellor (academic) of the University of Melbourne, and then its first provost in 2007–09. He became a Member of the Order of Australia in 2012.

Professor Rob Moodie, AM, MBBS, DipRACOG, MPH, DTMH, is professor of public health at the University of Malawi, and professor of public health at the University of Melbourne's School of Population and Global Health (MSPGH). Previous roles include director of teaching and learning at MSPGH and inaugural chair of global health at the Nossal Institute.

Leslie Morgan (1955–2017) was born in Britain of Anglo-Indian parents and emigrated to Australia in 1989. Morgan's art practice spans 30 years, and his artwork is represented in private and public collections around the world, including Tate Modern (London), Queensland Gallery of Modern Art, the National Sports Museum, and Museum Victoria. His trans-disciplinary work in painting and writing concerns race, diaspora, migration, cultural hybridity and whiteness. Some of his late work explored his responses to treatment for colo-rectal cancer.

Cat. 14 Austin Hospital for Cancer and Chronic Diseases, Heidelberg, Victoria (est. 1882), **Nurse's certificate, presented to Joyce Olive Young by Training School for Nurses**, 1944, paper, ink, cardboard, leatherette; 22.8 × 16.0 × 0.9 cm. MHM04243, gift of Mrs Jo Frances, 1997, Medical History Museum, University of Melbourne.



Associate Professor Declan G Murphy, MB, BCH, BaO, FRACS, FRCS Urol, is consultant urologist, director of genitourinary oncology, and director of robotic surgery at the Peter MacCallum Cancer Centre. He is honorary clinical associate professor in the Department of Surgery, University of Melbourne—St Vincent's Hospital.

Dr Polixeni Papapetrou, BA, LLB, MA, PhD, is an artist who explores ideas of identity and being in her work. She has participated in 150 solo, group and survey exhibitions in Australia and internationally, including major photography festivals. Papapetrou has received numerous grants from the Australia Council and Arts Victoria. Her work is widely collected in Australia and overseas.

Professor Richard Pestell, MBBS, MD, PhD, FACP, FRACP, Doctoris (*Honoris causa*), DMSc (*Honoris causa*), is president of the Pennsylvania Cancer and Regenerative Medicine Center. A graduate who ran track for the University of Melbourne, he lost his parents and many friends to cancer. He was director of NCI Cancer Centers (USA) from 2002 to 2015 and executive vice-president of Thomas Jefferson University before taking up his current position. He believes that Australian universities are the cornerstone of Australia's future.

Professor Andrew Roberts, MBBS, FRACP, FRCPA, PhD, is the Metcalf Chair of Leukaemia Research at the University of Melbourne, Walter and Eliza Hall Institute, and Royal Melbourne Hospital. His research focuses on pioneering new cancer therapies. He chairs the board of Cancer Council Victoria and the Research Committee of the Victorian Comprehensive Cancer Centre.

Dr Michelle Scollo, BBSc, Grad Dip Comm Hlth, Grad Cert Hlth Economics, PhD, has worked in tobacco control since 1988, first as director of the Quit campaign, then co-director of the VicHealth Centre for Tobacco Control, and currently as the senior advisor on tobacco policy for Cancer Council Victoria.

Adjunct Associate Professor Craig Sinclair is director of the World Health Organization's Collaborative Centre for UV Radiation, and head of cancer prevention at Cancer Council Victoria, where he is responsible for the development and delivery of population-wide cancer prevention and screening programs.

Associate Professor Raymond Snyder, MBBS, MMed, FRACP, trained in medical oncology at MD Anderson Hospital in Houston, Texas. In 1977 he was appointed a medical oncologist at St Vincent's Hospital in Melbourne, where he was director of oncology and of cancer services until 2014. He has held numerous positions in professional organisations.

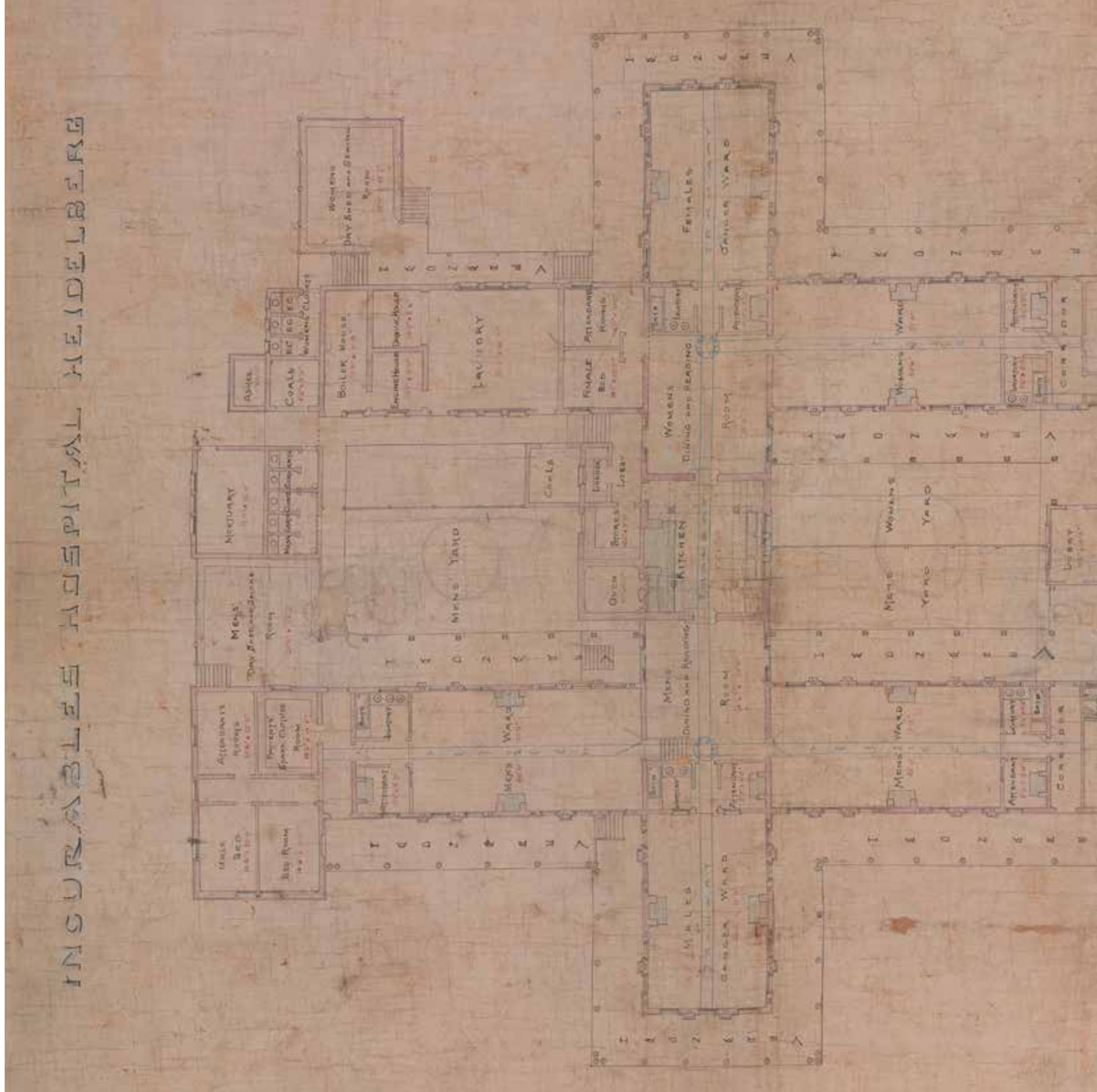
Lyn Swinburne, AM, is a women's advocate and longstanding spokesperson for Australians personally affected by cancer. Following her diagnosis of breast cancer in 1993, Lyn founded Breast Cancer Network Australia, which today has more than 120 000 members. She also holds various non-executive director positions, including as board chair of Melbourne's Royal Women's Hospital.

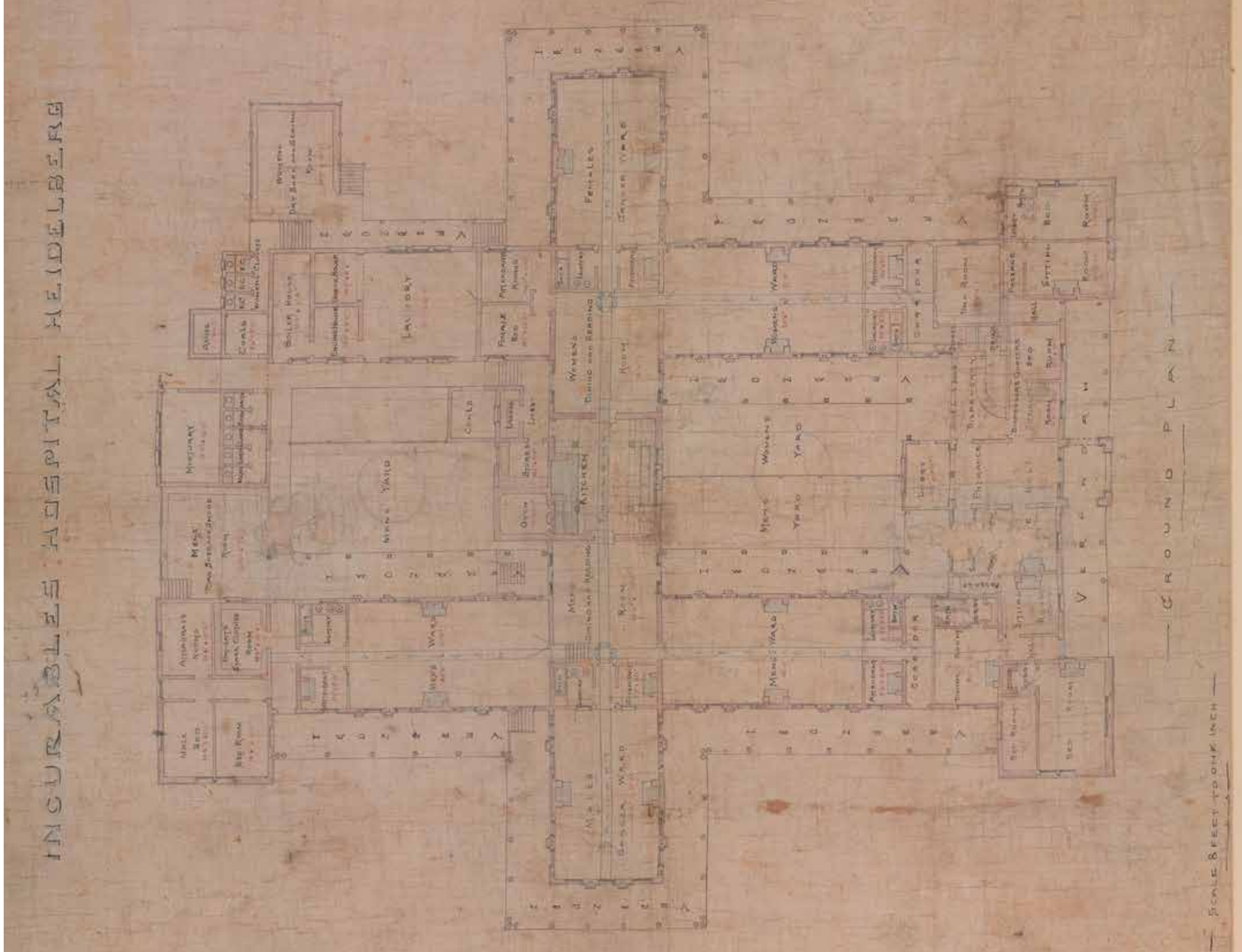
Professor Joseph A Trapani, MBBS, PhD, FRACP, FFSc (RCPA), is executive director of Cancer Research, head of the cancer immunology program, and head of the Cancer Cell Death Laboratory, at the Peter MacCallum Cancer Centre. His research interests include the immunopathology of viral and auto-immune diseases, apoptosis induction by cytotoxic lymphocytes, and cancer immunotherapy. Professor Trapani is also a member of the executive (board) of Cancer Council Victoria.

Professor Jane Visvader, BSc(Hons), PhD, FAA, is joint head of the Stem Cells and Cancer Division at the Walter and Eliza Hall Institute of Medical Research. Over the past decade the laboratory that she leads with Professor Geoff Lindeman has made important contributions to breast cancer research.

Dr Ann Westmore, PhD, is a writer and historian of medicine, and a fellow in the University of Melbourne's School of Population and Global Health. She has conducted Witness seminars on the history of both the Royal Women's Hospital and Cancer Council Victoria. Her latest book is *Finding sanity: John Cade, lithium and the taming of bipolar disorder* (with Greg De Moore).

Professor John R Zalcberg, OAM, MBBS, PhD, FRACP, FRACMA, FAHMS, FAICD, holds the Tony Charlton Chair of Oncology at Alfred Health, and is head of the cancer research program at Monash University. He completed medical training at the Austin Hospital in 1976, where he then commenced his physician training and PhD studies, returning in 1995 as director of cancer services. From 1997 to 2014 he was director of the Division of Medicine at the Peter MacCallum Cancer Centre.





The Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, has three museums: the Medical History Museum, the Harry Brookes Allen Museum of Anatomy and Pathology and the Henry Forman Atkinson Dental Museum.

The cancer puzzle: Patterns, paradoxes and personalities draws on the collections of the Medical History Museum and the Harry Brookes Allen Museum, the University of Melbourne Archives and Library, as well as the holdings of Cancer Council Victoria and other public and private collections.

museums.mdhs.unimelb.edu.au

Front cover: Sidney Hall, ***Cancer***, hand-coloured engraving, from Richard Rouse Bloxam, *Urania's mirror, or a view of the heavens* ..., London: Printed for Samuel Leigh, 1825. Courtesy Wellcome Library, London.

Inside front cover: Cat. 2 **Melbourne Medical School**, 1864, photograph, mounted, 14.1 × 20.0 cm (image). MHM00394, Medical History Museum, University of Melbourne.

Back cover: Peter Bennetts, **Victorian Comprehensive Cancer Centre: Interior** (detail), 2016. Courtesy University of Melbourne and Victorian Comprehensive Cancer Centre.

Inside back cover: Cat. 104 GWR Johnson, architect (1840–1898), ***Incurables Hospital, Heidelberg: Ground plan***, c. 1876, ink on paper, 78.5 × 60.5 cm. Austin Hospital Collection.