

Discovery of DNA is the story of our times

Part I Massive cancer genome projects are starting to save lives

SUZANNE CORY



TRY to count the number of times you might have died were it not for medical science. Have you ever had an ear infection? I woke up in terrible pain so many times as a child — without antibiotics, I could have developed a deadly brain infection. Have you had polio, tetanus or measles vaccines? Without immunisation, any of these diseases could have killed you. Are you in remission after a course of cancer treatment?

Yes, we are extremely fortunate to be living in a time of unprecedented healthcare. In ancient Egypt, Babylon and Greece, the average life expectancy was about 30. And this didn't change throughout Europe for 25 centuries. Today, boys born in Australia can expect to live until they are almost 80 and girls until they are 84.

This dramatic change is thanks to medical science. How much further can it go? Can we expect — or afford — continued improvement? The 21st century ushered in a new era of medicine, driven by two intersecting scientific tidal waves: genetics and IT. You're all aware of the impact of the digital revolution — babies now play with iPhones. The impact of the DNA revolution is perhaps not so widely known.

The story of DNA is fascinating — it's the story of our times. It's also the reason I became a molecular geneticist. I still remember that moment at university in the 1960s, when my first-year genetics lecturer rushed in to tell us, hot off the scientific press, that our chromosomes each contain a single gigantic DNA molecule.

The DNA revolution had begun in 1953, when two brash young scientists, Jim Watson and Francis Crick, raced some of the most eminent scientists in the world and beat them at their game. They deduced the structure of DNA — the elegant double helix known as the Mona Lisa of modern science.

What they had seen was that if you peeled the two DNA strands away from each other and copied each of them, you'd end up with two identical double helices — it became obvious how genetic information could be passed from one cell to the next, and one generation to the next.

In the wake of this discovery, a new science — molecular biology — sprang up. When I arrived at Cambridge in 1966, five of the six founding fathers were still there and four had already won Nobel prizes. The one who influenced me most was Fred Sanger, whose DNA sequencing method laid the foundation for the Human Genome Project.

The first human genome sequence took 13 years and cost about \$3 billion. But the technology has advanced so much that you can now get your genome sequenced in a week, and soon it will cost only \$1000.

We now know the genomes not only of humans but also of

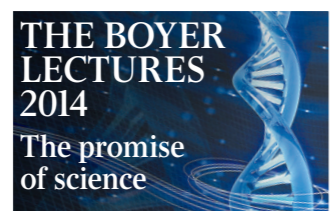
many animals, plants and microbes. The information is continually updated and publicly available in huge databases.

These digital gene banks represent one of humankind's greatest treasures. Through them, we shall understand, in ever increasing detail, how our bodies function and how diseases develop. Through them, we have entered the age of precision medicine.

I'd like to use my own field, cancer, to give you a feel for precision medicine. But the principles apply to every area of medicine. Cancer is a malady of our genes. Put simply, it is the uncontrolled growth of cells.

When I entered this field with my scientific partner (and husband), Jerry Adams, little was known about the molecular causes of cancer. It is now known that each of our cells has a repertoire of several hundred latent cancer-causing genes: these genes, dubbed oncogenes, are not "designed" to cause cancer, but they can be liberated from normally strict controls, or mutated into active form.

At the Walter and Eliza Hall Institute in Melbourne, Jerry and I are part of a research team working with industry to develop novel drugs that kill cancer cells by switching on the natural cell death process. It is early days, but these drugs are looking very promising. Each precision cancer drug represents decades of work by hundreds of scientists and



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clinicians, in academia and industry, and the total dollar cost is huge. Much remains to be done — there are still no magic bullets for many types of cancer.

Researchers want to change that. To speed up the discovery process, international consortia, which include Australian scientists, are collecting many different sorts of tumours from hundreds of people, and sequencing their DNA. These massive cancer genome projects hope to find patterns among the genetic changes that will lead to specific treatments.

Despite our small population, Australians have played a disproportionately strong role in medical research. Of the 15 Australian Nobel prize winners, seven have been medical researchers. Our strength in biomedicine is no accident. Starting with the founding of the National Health and Medical Research Council in 1937, it is a result of sustained scientific and political leadership, unwavering commitment to excellence and strong philanthropic support.

As we look into the future through the eyeglass of stringent "fiscal restraint", we can't rest on our laurels. As renowned health advocate Mary Lasker said to the US congress: "If you think research is expensive, try disease."

This is an edited extract of the first 2014 Boyer lecture presented by Suzanne Cory. It will be broadcast on ABCRN today at 1pm. The next lecture will be broadcast on September 13 at 1pm. ABC Books will publish the full texts and an e-book. abc.net.au/rn

Dual visions of defining moments

There are lessons from New Zealand's efforts to deliver justice to the Maoris

DAMIEN FREEMAN



IF NSW Governor Marie Bashir is known for one thing, it is her ability to praise the good in everyone. Recently, she spoke at a service in Westminster Abbey to dedicate a stone in memory of Arthur Phillip as the "founder of modern Australia". On many occasions, Bashir has publicly lamented the enduring legacy of the mistreatment of Aborigines since Phillip established the colony at Sydney Cove in 1788. Yet on this occasion she praised Phillip for his determination "to ensure the fair treatment of the Aboriginal people — he actively fostered harmonious relations with them".

There is nothing inconsistent in the crown's representative lamenting the mistreatment of Aborigines since the crown established the first colony in Australia, and praising the crown's first representative for his determination to ensure their fair treatment. Both sentiments are appropriate responses to the historical relationship between the crown and the Aborigines since 1788.

The Westminster Abbey commemoration at which the NSW governor spoke was followed up last week by a commemoration in Canberra, when the *Defining Moments in Australian History* exhibition was opened at the National Museum of Australia. Tony Abbott said that Phillip's action in establishing the colony at Sydney Cove was "the defining moment in the history of this continent" and "a moment that set the course for modern Australia" because "it was the moment this continent became part of the modern world".

Warren Mundine, chairman of the Prime Minister's indigenous advisory council, responded with the observation that "it was a defining moment, there's no argument about that. It was also a disastrous defining moment for indigenous people."

It is a hard truth about Australian history that defining moments in the development of the

nation's prosperity are also defining moments in the deterioration of the nation's indigenous cultures. This is exemplified by Phillip's defining moment.

Phillip's determination to ensure the fair treatment of Aboriginal people was not some personal idiosyncrasy. In 1787, he received formal instructions from King George III. They outlined the various things that Phillip was to do on the journey to Australia, then on establishing a colony in Australia.

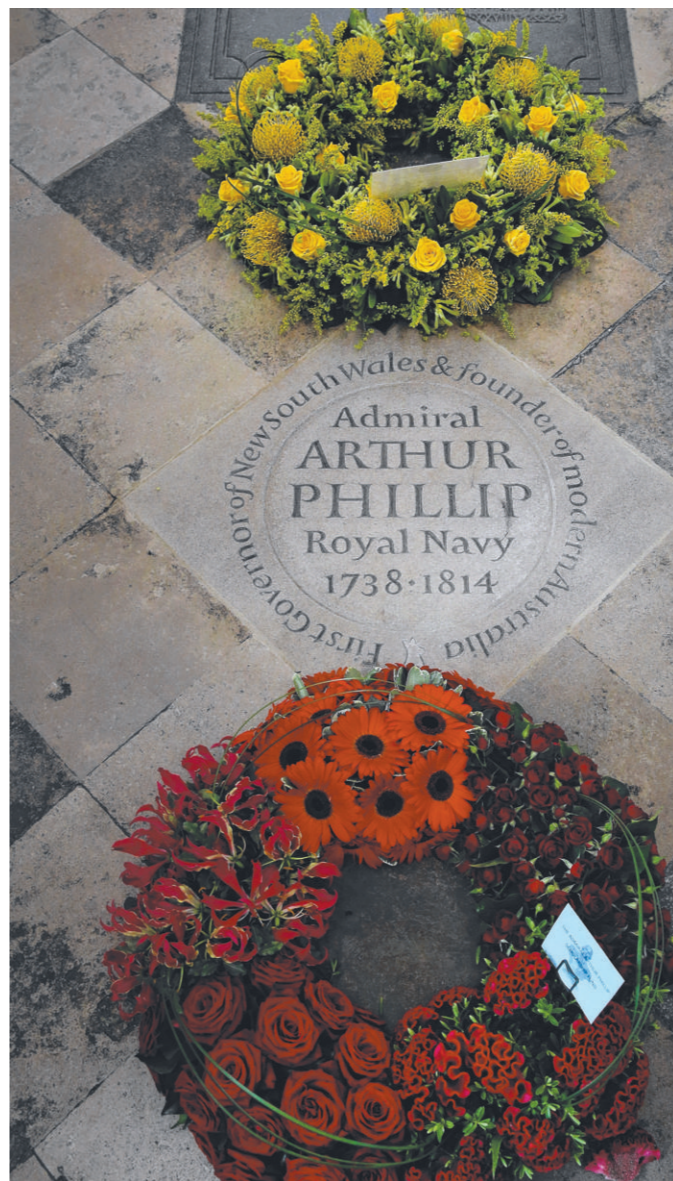
Among other things, the king instructed Phillip: "You are to endeavour, by every possible means, to open an intercourse with the natives, and to conciliate their affections, enjoining all our subjects to live in amity and kindness with them. And if any of our subjects shall wantonly destroy them, or give them any unnecessary interruption in the exercise of their several occupations, it is our will and pleasure that you do cause such offenders to be brought to punishment according to the degree of the offence. You will endeavour to procure an account of the numbers inhabiting the neighbourhood of the intended settlement, and report your opinion to one of our secretaries of state in what manner our intercourse with these people may be turned to the advantage of this colony."

The instructions, although formally from the crown, were prepared by its advisers — the British ministers of the crown. So the situation that emerges is one in which the earliest advisers and representatives of the crown were acutely aware of the moral imperative to ensure the fair treatment of the Aboriginal people in Australia.

Alas, successive generations of the crown's Australian representatives and advisers (on the assumption of responsible government in 1856) failed to ensure that this noble aspiration was realised and, as a consequence, indigenous people in Australia remain among the most disadvantaged people in the country.

In New Zealand, the situation is both similar and different.

New Zealand regards the Treaty of Waitangi, concluded between the representative of



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The Arthur Phillip memorial stone at Westminster Abbey

Queen Victoria and the Maori chiefs in 1848, as its founding document. There is no similar founding document in Australia. The treaty imposed certain obligations on the crown in terms of how the Maori were to be treated.

The unfortunate similarity with Australian history lies in the fact the crown failed to ensure that the Maori were treated fairly in New Zealand according to the treaty, just as it failed to ensure that Aborigines were fairly treated in Australia, in the way that the crown's 1787 instructions to Phillip acknowledged they should be treated.

However, things have moved on in New Zealand.

In 1975, the Waitangi Tribunal was set up to investigate contemporary breaches of the Treaty of Waitangi by the crown. In 1985,



RECOGNISE

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how it will provide redress for the cultural and economic losses that the tribe has sustained.

In 1995, the first settlement between the crown and one of the Maori tribes was concluded. The Queen signed the apology and presented it to the Waikato-Tainui tribe during her tour of New Zealand that year.

The time has come for the crown to acknowledge to individual indigenous communities in Australia that, despite the lofty intentions of the instructions issued to its first representative, Phillip, and despite his best endeavours to realise these intentions, successive generations of the crown's representatives and advisers in Australia failed to treat these communities fairly.

Part of the process of reconciliation and recognition of indigenous people must involve the crown entering into a new relationship with Australia's indigenous communities, as it has with New Zealand's indigenous communities. This needs to be a partnership in which the indigenous community is empowered to manage its own affairs.

What the New Zealand experience shows us is that this is only possible if the crown first acknowledges the specific failures of its representatives and advisers in the past, then proceeds to lay the foundations for a new partnership in the future. But this partnership also requires a package of constitutional and structural reforms that will transform this centuries-old dysfunctional relationship into a new functional one that enables governments to assist indigenous communities in becoming empowered and productive. It is not an either-or situation.

Earlier this year, in welcoming the Duke and Duchess of Cambridge to Parliament House, the Prime Minister said to them: "Many decades hence, when a currently unknowable Australian prime minister welcomes your

son, King George VII, to this building, that will be a sign of the stability and the continuity in the life of our nation."

So, too, we may hope that, many decades hence, when Australia's various indigenous communities welcome the Queen's great-grandson, that will be a sign of the evolution of the crown's relationship with Australia's indigenous communities: that welcome will embody the aspirations of her great-great-great-grandfather's instructions to Phillip, acknowledgment of the failure of successive generations of the crown's representatives and advisers to execute those instructions, the crown's apology for the acts and omissions of its representatives and advisers, and the beginning of the process of healing and a new age of co-operation with Australia's indigenous communities.

There is no doubt that Phillip's establishment of a British colony in 1788 was a defining moment in Australian history.

Indeed, as Abbott said, it is arguable that it was the defining moment in Australian history — for better and for worse.

What matters is that we acknowledge the myriad reasons it is a defining moment for better and for worse. It is a defining moment that must be recognised in terms of its aspirations and failures, and its commemoration gives rise to a deep need for apologies, healing and co-operation, as well as celebration.

Abbott needs to confront Mundine's point that indigenous people continue to bear the brunt of failures flowing from the defining moment in 1788 that set the course for modern Australia.

His package of reforms for constitutional recognition of indigenous people presents the opportunity for a new defining moment when the Australian nation unites to acknowledge the past and to declare its aspirations for the future; a future that guarantees Australia's indigenous people will have what George III instructed Phillip to secure for them in 1788, but that has proved elusive until now.

Damien Freeman lectures on ethics and aesthetics at Pembroke College, Cambridge, and at the Art Gallery of NSW in Sydney. He is also director of the Governor-General's Prize for the Constitution Education Fund Australia.

Symbolic gestures are fine, but practical achievements come first

WESLEY AIRD



THE most pressing issue facing indigenous Australians has nothing to do with constitutional recognition. It's not whether we are recognised in the preamble or the body of our Constitution. Nor is it the race provisions in the body of the document.

Right now, as it has remained for decades, the most pressing issues facing indigenous Australians are getting our children to school, the parents to work and to make our communities safer.

Without doubt symbolism has an important place in our society and this is amply demonstrated by

a history rich with great events and colourful characters.

But symbolism can take us only so far unless there are solid achievements to match. For indigenous Australians the national story is big on symbolism but light on results. It shouldn't be a choice of symbolism or solutions. We should have both. We should be able to settle the issue of the Constitution without losing a moment's work on practical indigenous advancement.

As I look back at some of the recent events described as defining moments for our nation, what I see is not encouraging. Hundreds of thousands of Australians walked across bridges and planted cut-out hands in lawns. As a nation we cheered Cathy Freeman to victory at the 2000 Olympics, and so many placed all their hope in the 2008 apology from the then prime minister, Kevin Rudd.

Millions of Australians invest enormous amounts of emotional

energy into indigenous affairs for what always appears to be a great cause at the time. Yet grand gestures come and go, and indigenous people continue to endure unacceptable disadvantage. It seems we are capable of doing only one thing or the other.

I support minimalist constitutional recognition for Aboriginal and Torres Strait Islander people. I do not support grand gestures that may detract from immediate and substantial improvements in education, employment and community safety.

I fear there is a limited store of goodwill from everyday Australians when it comes to indigenous affairs. The feel-good campaigns allow mainstream Australians to assuage their conscience, but too often that's as far as it goes. They can tell themselves, "I've done my bit", without having to confront the issues that really matter. When the public is heavily invested in symbolic gestures and com-

passion is a finite resource, then important work such as tackling indigenous disadvantage suffers from not enough support.

Not prepared to settle for mere symbolism, Andrew Forrest focuses on indigenous education and employment as the means to rid indigenous Australia of the scourge of welfare. Not everything in his report will be acceptable to everyone. But his proposals on education and employment should be the subject of national discussion in indigenous affairs.

Faced with a choice between the symbolic or the practical campaign (but apparently not both), we should ask ourselves which would be better for Australia in 10 years. Objectively, the imperative is to fix indigenous education and employment, whether by Forrest's suggestions or some other way. When we are well and truly on the path to overcoming indigenous disadvantage we could try for minimalist constitutional rec-

ognition. In the meantime, indigenous Australians can continue to enjoy bountiful recognition in many ways. Some are genuine and some not so much.

Do not expect consensus from the indigenous population on the way ahead. There is pride in the cultural diversity within the indigenous population, which originally comprised a couple of hundred language groups. The result, not surprisingly, is that not all indigenous people agree on all topics. Social generalisations fail within the indigenous community just as they do with any other social or racial group. Expect indigenous people on the side of both the yes and the no campaigns for constitutional recognition.

In indigenous affairs our solutions are nowhere near as good as our marketing and consultation.

This campaign is no different. There is the Recognise campaign through Reconciliation Australia, an expert panel, a joint select com-

mittee and even a panel to review national support for the campaign, but alas no proposal and so the real debate — yes versus no — hasn't even begun.

Meanwhile, a couple of hundred thousand indigenous people continue to suffer each day, trapped by poverty because of poor education, unemployment and decades of bureaucracies unable to make tough decisions.

In this newspaper this week, John Hirst wrote: "The obvious place for recognition is in the preamble." ("Let's bring our Constitution in line with current practice", Commentary, September 4.) I look at it differently and believe the obvious place for recognition is second in line behind a three-way tie for first: education, employment and safer communities.

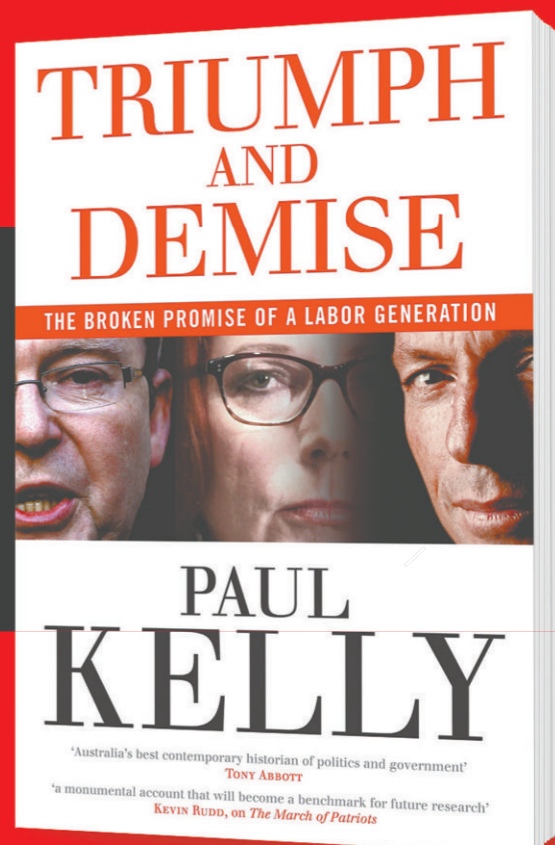
Wesley Aird is an adviser to the government on welfare reform and a member of Recognise What?

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