Haunting Biology

Science and Indigeneity in Australia

Emma Kowal

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EXPERIMENTAL FUTURES

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To Ramona and Dave, with gratitude

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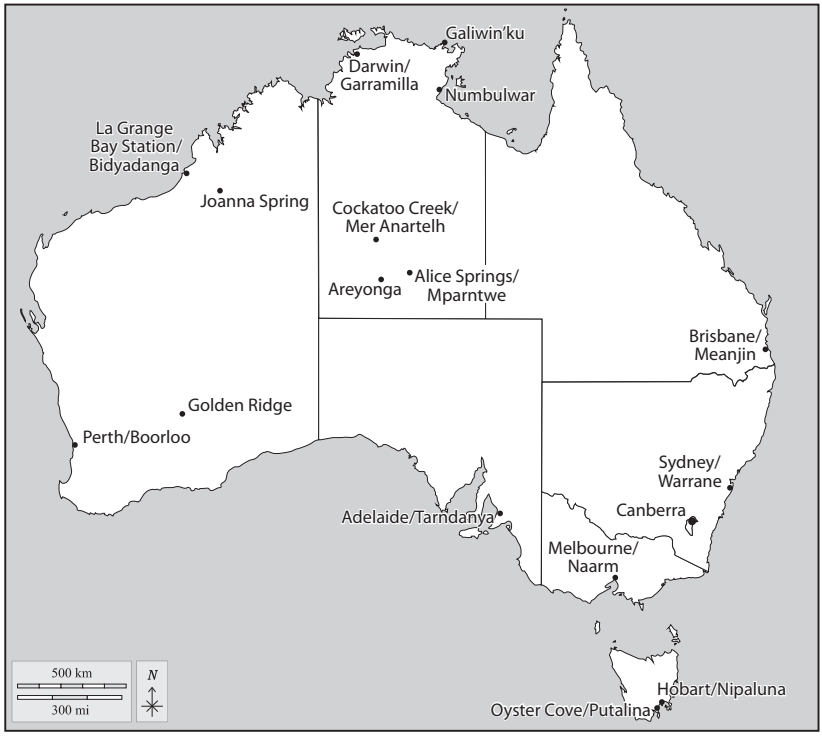

MAP 1. Map of Australia with locations relevant to the text.

WARNING: This book contains images of Aboriginal and Torres Strait Islander people who have passed away.

A Note on Terminology

The terms used to refer to the Indigenous peoples of Australia have changed over time and vary depending on who is using them. In the historical periods discussed in this book, terms including "native," "aborigine," "full-blood," and "half-caste" were often used. Adjectives such as "primitive" were also common. All of these terms are no longer acceptable for general use but can be found in this book as part of historical quotes or in quotation marks when discussing their historical contexts. Today, common general terms for Indigenous peoples of Australia are "Aboriginal and Torres Strait Islanders" (the Torres Strait Islands lie between the Australian mainland and Papua New Guinea) and "Indigenous Australians." In recent years, the terms "First Nations" and "First Peoples" have become more popular and may replace "Aboriginal and Torres Strait Islanders" and "Indigenous Australians" as preferred terms in the future. I tend to use "Indigenous Australians" throughout the book as a currently acceptable term, while acknowledging it may become outdated and it would not have been the term historical actors would have used. In some chapters that focus specifically on the historical theories of the "race" of Indigenous mainlanders (i.e., not Torres Strait Islanders), I refer to "Aboriginal" rather than "Indigenous" people. The term "traditional owners" is used when referring to Indigenous people who are recognized as the custodians of a specific area. In some historical passages of the book that discuss the science of racial origins, "Australian" refers to Indigenous Australians, but otherwise it refers to the Australian nation-state. The varied use of the troubled concept of "race" is a major subject of the book, and the term is used frequently, often but not always with quotation marks. Even where quotation marks are omitted for stylistic reasons, readers should maintain a highly critical stance to the term.

I capitalize "Indigenous" and "Aboriginal" in this book, in line with a practice that is well established in Australia (since the 1970s). As Indigenous people in other countries are increasingly capitalizing "Indigenous," I capitalize the word throughout. I use the currently accepted terms to refer to Indigenous groups from other countries such as Native Americans in the United States, Maori in Aotearoa/New Zealand, and Aboriginal or First Nations people in Canada. The term "non-indigenous" refers to Australians who are not Indigenous. "White Australians" refers to Australians of Anglo-Celtic background (the majority of settlers) and can also include descendants of southern and eastern European migrants who arrived in great numbers after World War II. "Settler" is a more recent signifier used by progressive non-indigenous Australians as an alternative to "non-indigenous," as it foregrounds settler colonialism. Where I use "we" in the book, it usually refers to settler Australians, although at times it denotes my "generation"—people born in or adjacent to the 1970s.

While there are no photographs of human remains in this book, I wrestled over whether to include historical images of living Indigenous people. Images of relatives that have since passed away can be distressing for their Aboriginal and Torres Strait Islander descendants. At the same time, historical images help the reader to understand the material. Encouraged by readers and reviewers, I have made the decision to include some images, together with the warning that Aboriginal and Torres Strait Islander readers should proceed with caution.

Acknowledgments

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Historical, Philosophical and Sociological Studies of Science. Chapter 6 has its origins in the How Collections End workshop at the University of Cambridge's Department of the History and Philosophy of Science that I co-convened with Jenny Bangham and Boris Jardine. Our resulting special issue of the journal *BJHS Themes*, "How Collections End" (2019), contains an earlier version of that chapter.

My colleagues at the Alfred Deakin Institute at Deakin University have provided all kinds of support—intellectual, emotional, practical, and more. Thanks especially to its director, Fethi Mansouri, and fellow deputy director Shahram Akbarzadeh, who have taught me so much as we work to carve out hospitable places for humanities and social science research. Thanks to cherished Alfred Deakin Institute colleagues Tim Neale, Victoria Stead, Thao Phan, Carina Truyts, Andrea Witcomb, Anita Harris, Eben Kirksey, Billy Griffiths, Melinda Hinkson, Jon Altman, Tanya King, David Giles, Yamini Narayanan, Holly High, Jason Gibson, Alex Roginski, Jaya Keaney, Joe Latham, Will Smith, Chris Mayes, Tiffany Shellam, Rose Butler, Sarah Hayes, and Miguel Vatter. Outside of the Alfred Deakin Institute, the Deakin Science and Society Network, the Australasian STS Graduate Network, the TransAsiaSTS Network, and the Society for Social Studies of Science (4S) have all been wonderful venues to support STS scholarship and to be inspired by junior and senior colleagues. I wrote the book concurrently with work on other projects that helped my slow thinking through this book's questions. These include two Australian Research Council Discovery Projects: one on genetic testing and Indigeneity in collaboration with Cressida Fforde and Elizabeth Watt, and one on epigenetics and Indigeneity in collaboration with Megan Warin, Maurizio Meloni, Jaya Keaney, and Henrietta Byrne. The book itself is an outcome of my Australian Research Council Future Fellowship (FT160100093).

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Introduction

The camp was pitch-black and below freezing as three scientists rose from their beds and gathered up their equipment: gas cylinder, masks, rubber tubes, paper. The rest of the expedition party—nine other scientists and a guide, a cinematographer, a pastor, and an Aboriginal interpreter—lay snoring in their swags, the camels tethered nearby. Shivering in the desert night, they made their way by the light of kerosene lanterns through acacia forest to the "native" camp. There they encountered a row of nine young Anmatjerre men lying naked in shallow depressions dug into the sand, their heads beneath a low windbreak made of grasses and branches. Small fires, some still smoldering, lay at their feet and in between them. Although the men appeared to be sleeping, the scientists knew they were being carefully watched.

The three scientists, led by New Zealand–born physiologist C. Stanton Hicks, had traveled from Adelaide, the capital of South Australia, to Cockatoo Creek in Australia's central desert for this rendezvous with the Anmatjerre men. Together with their anthropology, archaeology, medical, and dental science colleagues from the University of Adelaide and the South Australian Museum, they formed the 1931 cohort of the annual Board for Anthropological Research expeditions. The objective of Hicks and his assistants was to record the Anmatjerre men's basal metabolic rate (BMR), a measure of how much oxygen the body needs for its basic internal functions. By the 1930s BMR had been measured in diverse world populations and found to differ between different "racial" groups (and by sex). Hicks had taken on the task of calculating the "Aboriginal" BMR to add to global knowledge.

Their early morning start was necessary because BMR had to be measured in bed, just as someone woke from a night's sleep. For accurate measurements, the nostrils had to be tightly clipped so that no air would escape. All breathing

had to be done through a mask fit snugly around the mouth. Measurements were continuously taken for fifteen minutes and, after a short break, repeated twice more. Although the scientists struggled to securely attach the mouthpiece and noseclips, which were designed for European subjects, they successfully took multiple measurements on three subjects who, Hicks recalled, "suffered . . . indignities at our hands without one single departure from the strict requirements of our precise measurement of their oxygen intake!" (1974, 33). After further experiments with men (and only men) of other desert tribes on subsequent Board for Anthropological Research expeditions, by the mid-1930s Hicks concluded that Aboriginal people had the same BMR as Europeans. Like all good scientists, however, he was attuned to the questions raised by his results. The ability of his subjects to maintain a "normal" metabolic rate while lying naked in below-freezing conditions led to a research program that attracted the attention of postwar US defense scientists. A large team made multiple visits in the 1950s to investigate the possibility that the desert sleepers could enter a state of torpor—temporary hibernation—previously thought to occur only in certain birds and mammals.

Not long ago, I became aware that this potential biological superpower was still being actively investigated, not in the men of the central desert but in US Navy SEALS, an elite group of soldiers. A biomimicry expert contacted me, claiming to work for a secret company conducting classified research for an unnamed government. While his identity was unverifiable, and our communication only virtual, there was more to his story than I anticipated. Apparently driven to contact me by his guilty conscience, he was concerned that unique biological properties evolved by Indigenous people of central Australia were to be exploited by the US Department of Defense for the purposes of developing covert biological warfare and the future colonization of Mars. The far-reaching connections and implications of Hicks's early morning encounters with the Anmatjerre may seem surprising. But in global histories of scientific research on Indigenous biological difference, spectacular afterlives are the rule rather than the exception. Hicks's experiments in Aboriginal physiology, a story I tell in chapter 5, were one of a plethora of scientific studies on Indigenous people across the nineteenth and twentieth centuries. In the earliest years of British colonization after the initial invasion in 1788, European scientific leaders scrambled to access newly available Aboriginal skeletal remains taken from burial sites by doctors, amateur naturalists, and government officials (MacDonald 2010; Turnbull 2017). Leading comparative anatomists such as German physician and anthropologist Johann Friedrich Blumenbach were sent

Australian skulls to add to their international collections, developing theories of racial variation from their analyses of cranial form. The American physician and scientist Samuel George Morton systematized skull measurements by filling them with shot pellets to measure their "internal capacity," producing tables of biological data that mirrored the racial hierarchies of the time (A. Fabian 2010; Stepan 1982; Stocking 1968). Australians often appeared at the bottom of the list, above only the "Tasmanians," the inhabitants of the large island directly south of mainland Australia, who were considered a separate race altogether.

The growing influence of evolutionists Charles Darwin, Alfred Russel Wallace, and Thomas H. Huxley in the last decades of the nineteenth century further increased the perceived value of Aboriginal remains. Emerging theories of human evolution viewed Indigenous Australians as the living remnants of "stone-age man," and their remains were thought to contain the "missing link" between humans and nonhuman apes. In the mid-nineteenth century, the leading scientific elites in several Australian colonies established museums and sought to fill their collections with "native" skeletons and cultural objects.

As the twentieth century dawned, a new kind of collecting emerged. Research in Australia was key to this shift: the 1898 Cambridge Anthropological Expedition to Torres Straits, led by ethnologist Alfred C. Haddon (discussed in chapter 3), is often credited with the first use of the term "fieldwork." Rather than relying solely on the reports of colonial correspondents, ethnologists and physicians began collecting their own data from living subjects. These practitioners of the burgeoning field of anthropology performed ever more systematized anthropometric measurements of faces, limbs, hair, and skin (W. Anderson 2002).

Soon, the emerging experimental and field sciences of physiology and human biology joined the Aboriginal research enterprise. Research conducted during World War I in the port of Salonika on blood group differences between "races" had found that group A blood was predominantly found in Europeans, and group B in Asians. From the 1920s, University of Adelaide pathologist J. B. Cleland led blood group research, demonstrating the absence of group B blood in Indigenous Australians (W. Anderson 2002; D. Thomas 2004). This finding, repeated among thousands of subjects, was regarded as confirming an origin theory that had circulated since the late nineteenth century (discussed in detail in chapter 4): Aboriginal people were archaic Caucasians, "primitive" cousins of present-day Europeans. Hicks's physiological studies in Cockatoo Creek similarly found that the BMR of "native" Australians was the same as

that of Europeans, confirming his view that "the aborigines are, in fact, archaic Europeans" (1974, 38).

By midcentury, advances in serology and portable freezing technologies brought other disciplines into the mix. Human biologists such as R. L. Kirk (discussed in chapter 2) collected blood samples from Indigenous people across Australia and transported them to his laboratory (first in Perth, then, from 1967, in Canberra) for analysis of the protein variants contained within them. Kirk (2001) mapped possible relationships between Australians and their Asia-Pacific neighbors by comparing the frequency of different variants of newly understood blood components: haptoglobins, transferrins, and lipoproteins (see also Mukharji 2020). As archaeologists used new carbon dating techniques to gauge a time depth of Aboriginal occupation of at least forty thousand years, the archaic Caucasian hypothesis was replaced by debate over whether humans had arrived in one migration or two, or even three, and by what route (Kirk and Thorne 1976).[1] For human biologists, the tens of thousands of years of evolution in relative isolation on the Australian continent promised, and delivered, many serological discoveries. Most famously, Kirk supplied Baruch Blumberg with serum from Aboriginal people in central Australia, from which Blumberg isolated the "Australia antigen." This mysterious entity was found to be hepatitis B, a discovery that netted a Nobel Prize (Blumberg 1976; Bootcov 2024).

Drawing on both famous and obscure episodes in the history of scientific research on Indigenous bodies and populations, this book tells a larger story of how and why biological knowledge about Indigenous Australians was produced. Through these stories I address questions that have relevance for scientific and health research in all diverse societies: *How are we to understand Indigenous biological difference in the twenty-first century?* Is it a racist ruse, a stubborn residue of racial pseudoscience? Is it something that exists but that should not be allowed to have social or political relevance? Or is it a potentially empowering force that can be unlocked by newly accurate science? Or by being under Indigenous control?

To answer these questions, *Haunting Biology* traces the rise and fall of different lines of biological and medical inquiry over the twentieth century and up to the present. Each new discipline that sought to produce biological knowledge about Indigenous people claimed new theories or methods that were superior to previous modes of knowledge production. Along the way, thousands of bones, hair samples, blood samples, pathology slides, placental samples, and much more were acquired, collated, and stored in museums and laboratories across Australia and the countries of the Global North. The following

chapters illustrate how the material persistence of samples over decades and centuries folds together the fates of different scientific methodologies. Blood, bones, hair, comparative anatomy, human biology, physiology, and anthropological genetics all haunt each other across time and space, together with the many racial theories they produced and sustained. In the stories ahead, we will meet a variety of ghostly presences: a dead anatomist, a fetishized piece of hair hidden away in a war trunk, an elusive "white" Indigenous person, a secret physiological superpower, and a statue of an iconic collector that refuses to be still.

AS A WORK OF historical anthropology—in conversation with the history of science, science and technology studies, and Indigenous studies—this book looks to the past with an eye on the present. Contemporary Australian views of the sciences of Indigenous biological difference are highly influenced by critiques made since the 1970s. Both the history of the twentieth-century sciences and the history of Indigenous critique of these sciences are central to the questions I explore in the following chapters. Biological knowledge about Indigenous Australians was always already loaded with meaning. Nineteenth-century studies lent scientific kudos to long-standing racial hierarchies that justified British colonialism and denied the very humanity (let alone human rights) of Australian "natives." From the late 1960s, Indigenous activists and their non-indigenous supporters campaigned in earnest for an end to discrimination against Indigenous people. The cause was dramatically endorsed by the vast majority of Australians in a 1967 referendum that amended the Constitution to allow the Commonwealth (the national government) to pass legislation regarding Indigenous people, a privilege formerly reserved for the states. This change underpinned the many positive interventions of the progressive Labor government led by Gough Whitlam in the 1970s, including steps toward Aboriginal land rights (Chesterman and Galligan 1997).[2]

In this quest for Indigenous people to be treated as equals, earlier scientific research was newly considered exploitative and demeaning and soon became an object of sharp critique. The Australian Institute of Aboriginal Studies, an institution discussed in chapter 2, was the site in 1974 of the first Indigenous critique of the disciplinary authority of archaeology and anthropology, with critiques of other disciplines soon to follow (Briscoe 1978; Langford 1983; Langton 1981; Liddle and Shaw [ca. 1983]; McNiven and Russell 2008; Widders 1974). Indigenous health research, itself a new field in the 1970s, persisted but became closely regulated by the 1990s (National Health and Medical Research Council 1991). In Australia the disciplines that studied Indigenous biology without a clear health rationale, particularly the genetic sciences, largely became taboo.

Research funding in these areas dried up, and graduate students found non-Australian or nonhuman subjects to study.

In these tumultuous times of the mid-1970s, I entered the picture. I was born in Melbourne to two children of Holocaust survivors. Their parents had arrived in the 1950s as Jewish refugees from rural Poland, a country where 90 percent of the Jewish population were murdered by the Nazis. Three of my grandparents were the sole survivors from their families; one of them was the only Jew from his village to survive. The main attractions of Australia were its distance from war-ravaged Europe and its willingness to admit them. At university in the 1990s, I became aware of the war against Indigenous people that continued to ravage my family's adopted country, a country I learned was stolen from its original inhabitants. Informed by my familial knowledge of genocide and its aftermath, my career in medicine, public health, and finally anthropology has focused on both addressing Indigenous disadvantage and analyzing the bitter ironies of this task.[3]

When I began working in Indigenous health as a young doctor over twenty years ago, I and most of my colleagues considered the idea that Indigenous people might be genetically susceptible to some diseases to be categorically racist. Almost no research was being conducted on Indigenous Australian genetics. The critiques of Indigenous biological sciences that began in the 1970s had been further sharpened by the Human Genome Diversity Project in the 1990s. This project (a companion to the better-known Human Genome Project) sought to sample and characterize genetic diversity among Indigenous peoples worldwide (M'charek 2005). Run by population geneticists who referred to Indigenous groups as "Isolates of Historical Interest," it was soon met with global resistance from Indigenous groups who dubbed it the "vampire project," as discussed in chapter 2 (Reardon 2005). Indigenous Australian leaders compared genetic research to the racial science of the nineteenth and early twentieth centuries that had served to justify Indigenous dispossession and relentless state control. Indigenous people exercised their hard-won agency over the conduct of research and declined to participate (*Green Left Weekly* 1994).

My dissertation research focused on the ways that non-indigenous people construct the idea of Indigenous cultural difference in Indigenous health research (Kowal 2006, 2008, 2015). As I completed the fieldwork for that project in the mid-2000s, the question of biological difference began to interest me. Even as Indigenous and progressive opinion had firmly rejected research into Indigenous biological difference, genetic research on other populations had made great strides, fueled by enormous public (and some private) investments

in the Human Genome Project. In the years after the first draft of the human genome sequence was completed in 2000, it became clear that the influence of genetics and genomics on all aspects of human life would only increase.[4] I realized that the interdisciplinary field of science and technology studies (STS) had many scholars working on historical and contemporary questions of race, science, and colonialism.[5] It seemed to me that the rise of genomics would inevitably collide with the stigma of biological difference within Indigenous research. I believed that analyzing this collision could lead to important insights on twenty-first-century intersections of race, science, and justice.

Over the course of my research on the implications of genetics for Indigenous people, the field has changed dramatically. In the past decade, the taboo on studies of Indigenous biological difference appears to have been lifted. Genomics has become a relatively common tool in studies of Indigenous health, ancient DNA studies of deep Indigenous history have proliferated, and growing numbers of Indigenous people are using direct-to-consumer genomic ancestry testing to inform their family history and identity (Kowal 2012b; Watt and Kowal 2019a, 2019b; Watt, Kowal, and Cummings 2020). Rather than a passive observer, I have been an active participant in these shifts. My background in Indigenous health care and research, combined with my activist disposition, led me to support national conversations among Indigenous leaders on how genetic research should be governed (Kowal and Anderson 2012; Kowal, Rouhani, and Anderson 2011). Genomics was coming to Indigenous Australia, and it was important to me that Indigenous people had the opportunity to control how this unfolded. This led me to play a key role in the development of the National Centre for Indigenous Genomics, the world's first Indigenous-governed genome facility and part of the story I tell in chapter 2.

I come to this topic, then, as an anthropologist of science and Indigeneity, and as a participant in Indigenous-governed genomics: simultaneously an anthropologist and part of my anthropological object. My involvement in the transition from the late twentieth-century rejection to the twenty-first-century relative embrace of genomics in Indigenous research has made me appreciate the importance of careful histories of twentieth-century biology, an area of growing interest in the history of science. An appreciation of how the current scientific understanding of human difference relies on or recapitulates earlier paradigms, including those that had devastating effects for certain populations, is important to temper current enthusiasm about the potential benefits of the science of human differences to improve health and well-being through stratification and precision medicine.[6] No one who makes knowledge about Indigenous people in the present is immune to these legacies.

It is equally crucial *not* to essentialize contemporary science as simply a continuation of the nineteenth-century beliefs in distinct and hierarchical races that underpinned harmful policies based on eugenics or assimilation. Scholars such as Troy Duster (1990) and Dorothy Roberts (2011) have made powerful arguments about the continuities between eugenics and genome science.[7] However, it is also important to trace the changing scientific conceptions of "race" across the twentieth century and avoid conflating or collapsing different disciplines, tools, and theories (one example with regard to conceptions of race in Australia is the differing aims of "absorption" and "assimilation" discussed in chapter 4). My aim is not to indict twentieth- or twenty-first-century biology for being "just like" nineteenth-century racial science but rather to understand the rise and fall of different disciplines—including comparative anatomy, human biology, population genetics, and evolutionary biology—within a longer story of making biological knowledge about Indigenous Australians. This will allow a better answer to the question of whether a just genome science is possible, or whether the tools of genomics will inevitably reinforce lines of historical oppression.

My use of the terms "Indigenous biological difference" and "biological knowledge" in this book is deliberately broad and reflects my methodological commitment to resisting claims of historical discontinuity (e.g., "what we do now is completely different from our predecessors") and, equally, resisting claims of homogeneity (e.g., "precision medicine is no different from eugenics"). To illustrate my approach, let's consider two attempts to produce biological knowledge about Indigenous people. When W. L. H. Duckworth (1894), a Cambridge physical anthropologist, took forty-four separate measurements of twenty-eight Aboriginal skulls, including cranial capacity, "estimated by using No. 8 shot, which was arranged by shaking the skull and occasional use of a wooden rammer" (287), he was looking for evidence of fixed racial characteristics.[8] The second example takes place over seventy years later and two continents away. In the wake of the 1967 referendum that demonstrated national support for Indigenous rights, medical researcher David G. Jose and colleagues from the Queensland Institute of Medical Research conducted a health survey of around six hundred children living on twelve Queensland missions. Analysis of their blood, physical examinations, and mission records demonstrated high rates of child mortality and preventable diseases, including rheumatic fever (Jose, Self, and Stallman 1969). The damning results were partially censored by the Queensland state government (Kidd 1997).

At first glance, these two examples represent very different kinds of biological knowledge. One demonstrates the inevitably inferior features of the

Aboriginal "race" using nineteenth-century racial science, while another highlights the woeful shortcomings of state-sanctioned missions in providing for their Aboriginal wards and recommends improvements in "housing, diet and education" (Jose, Self, and Stallman 1969, 86). However, Jose's research had more continuities with Duckworth's than meets the eye. Two years after blood samples were collected, Jose sent a small portion of each sample to R. L. Kirk at the Australian National University to further his research on the genetic structure of the Cape York Aboriginal population. Kirk (1973) published results of blood group, serum proteins, and enzyme variation across the region, calculating the genetic distance between various groups to provide clues to their origins. Jose did not see any contradiction between his own research on the acquired diseases of Aboriginal people and Kirk's genetic research on Aboriginal origins—both were inherently valuable.

From the perspective of the present, it is tempting to support Jose's research and disparage Kirk's, and certainly Duckworth's. The creation of biological knowledge that views differences as socially or environmentally determined may seem far less harmful—indeed, beneficial—compared to biological knowledge of characteristics that are considered inherited and fixed. This book refuses the comfort of this division. To be sure, the range of historical and contemporary actors that populate these chapters mean different things when they measure or interpret a biological difference between Indigenous and non-indigenous people. Some see evidence of a fixed racial type—or the merging of two or more fixed racial types—and others see the transitory impact of the environment on a person or group of people. Most waver between these extremes of "hard" and "soft" heredity, perceiving shorter or longer timescales of adaptation and varying modes of inheritance.[9]

My refusal to distinguish between "good" and "bad" biological knowledge aims neither to dismiss all biological knowledge as racist nor to excuse any of its negative effects on Indigenous people. Instead, I argue that biological data as different as diabetes incidence and hair form both contain haunting possibilities and resonances.[10] From chapter 2 to chapter 6 of this book, I examine twentieth-century episodes in the production of biological knowledge about Indigenous people and find persistent ghostly presences.

The increasing engagement of Indigenous Australians in genomics across the past decade has troubled the relative certainty I experienced twenty years ago that there were no essential biological differences between Indigenous and non-indigenous people, there were only inequalities resulting from disadvantage and oppression. For some, that certainty continues: the sciences of biological difference are pseudoscience, as we are all the same under the skin. For

others, both Indigenous and non-indigenous, the status of biological differences between human groups is ever more confusing. Jenny Reardon's analysis of the perpetual return of the "crisis" of biological race is cogent here. She argues that the post–World War II consensus—epitomized in the UNESCO statements of 1950 and 1951 (UNESCO 1952)—of "biology as a distinct realm of knowledge production that exists apart from any societal taint" (Dunklee, Reardon, and Wentworth 2006) produced a division of labor between social scientists and biologists (see Latour 1993). The consensus promised that as long as biologists ensured their work was "not political," biology as usual could proceed. Social scientists could be reassured that biology was (for now) no longer racist and keep their attention on properly "social" concerns.

The consequence of this division has been periodic crises of racialized biology (a fairly recent episode, for example, was triggered by leading geneticist David Reich's defense of meaningful genetic differences between racial groups; Kahn et al. 2018; Reich 2018). Reardon and colleagues argue that the surprise experienced by both scientists and social scientists when these crises recur is a "consequence of a system that delineates the social and the political from the biological: sociologists and humanists can only encounter race's return within biology when they fail to see it all along; biologists can only experience a shock of politicization when the ongoing political dimensions of their work are out of view" (Dunklee, Reardon, and Wentworth 2006). Writing well over a decade ago, Reardon and colleagues hoped that scholars might finally transcend the division between social and biological inquiry to interrupt the cycle of periodic crisis.

The story that opens the next chapter shows this has not yet been achieved, although this book is another hopeful attempt at interruption. The chapter explains my approach to haunting and why it matters to Indigenous worlds that have always been thick with ghosts but have encountered genomics only recently. I start with a spectacular example of the politicization of Indigenous biological difference in the genomic era. The lead-up to the 2019 parliamentary elections for New South Wales, Australia's most populous state, demonstrated how the status of biological difference has enormous implications, potentially affecting the very identities of Indigenous Australians.

Appendix 1

DRAMATIS PERSONAE

Note: People are listed in chronological order by date of birth and then alphabetically for those with the same year of birth.

TRUGANINI (ca. 1812–76), known at the time of her death as the "last Tasmanian"

F. J. GILLEN (1855–1912), Alice Springs post and telegraph station master, special magistrate, and Sub-Protector of Aborigines, coauthor of *The Native Tribes of Central Australia*

ALFRED C. HADDON (1855–1940), reader in ethnology, University of Cambridge; led 1898 Cambridge Anthropological Expedition to Torres Straits

BALDWIN SPENCER (1860–1929), anthropologist, professor of zoology, University of Melbourne; honorary director, National Museum of Victoria; coauthor of *The Native Tribes of Central Australia*

WILLIAM COLIN MACKENZIE (1877–1938), orthopedic surgeon; director of Australian Institute of Anatomy

JOHN B. CLELAND (1878–1971), professor of pathology, University of Adelaide; member of the Board for Anthropological Research

C. STANTON HICKS (1892–1976), professor of physiology, University of Adelaide; member of the Board for Anthropological Research

NORMAN B. TINDALE (1900–1993), anthropologist, South Australian Museum; member of the Board for Anthropological Research; member of the Harvard-Adelaide Universities Anthropological Expedition

XAVIER HERBERT (1901–84), author of *Capricornia* and *Poor Fellow My Country*

P. R. STEPHENSEN (1901–65), publisher, author, activist, founder of Jindyworobak movement

MARGARET LILARDIA TUCKER (1904–96), Indigenous activist, Victorian Aborigines League

A. A. ABBIE (1905–76), professor of anatomy and histology, University of Adelaide; member of the Board for Anthropological Research; author of *The Original Australians*

P. F. SCHOLANDER (1905–80), professor of physiology, Scripps Institution of Oceanography; researched cold tolerance in the 1950s

JOSEPH B. BIRDSELL (1908–94), biological anthropologist, professor of anthropology, University of California, Los Angeles; member of the Harvard-Adelaide Universities Anthropological Expedition

R. L. KIRK (1921–2010), geneticist, John Curtin School of Medical Research, Australian National University; chair of Human Biology Advisory Committee, Australian Institute of Aboriginal Studies

ALAN THORNE (1939–2012), professor of archaeology, Australian National University; chair of Human Biology Advisory Committee, Australian Institute of Aboriginal Studies

SUE SERJEANTSON (1946–), professor of genetics, John Curtin School of Medical Research, Australian National University; deputy vice-chancellor, Australian National University

MICHAEL DODSON (1950–), professor of law and director of National Centre for Indigenous Studies, Australian National University; Aboriginal and Torres Strait Islander social justice commissioner; inaugural member of the Indigenous Governance Board, National Centre for Indigenous Genomics

SIMON EASTEAL (ca. 1950–), professor of genetics, John Curtin School of Medical Research; and inaugural director, National Centre for Indigenous Genomics, Australian National University

MICK GOODA (ca. 1950–), inaugural chair of the Indigenous Governance Board, National Centre for Indigenous Genomics; Aboriginal and Torres Strait Islander social justice commissioner

MARCIA LANGTON (1951–), anthropologist, geographer, activist; professor of Indigenous studies, University of Melbourne; associate provost, University of Melbourne

IAN ANDERSON (1965–), doctor, health researcher; professor of Indigenous health, University of Melbourne; deputy secretary of Indigenous Affairs, Department of Prime Minister and Cabinet; deputy vice-chancellor, Australian National University

ALAN COOPER (1966–), evolutionary geneticist; professor of ancient biomolecules, Oxford University; professor of genetics, University of Adelaide; dismissed in 2019

ESKE WILLERSLEV (1971–), evolutionary geneticist; professor of evolution, Copenhagen University; professor in ecology and evolution, University of Cambridge

MISTY JENKINS (1978–), immunologist; laboratory head, Walter and Eliza Hall Institute for Medical Research; inaugural member of the Indigenous Governance Board, National Centre for Indigenous Genomics

Appendix 2

TIMELINE OF RELEVANT EVENTS

1788	The First Fleet arrives in Botany Bay; Great Britain establishes the Colony of New South Wales as a penal colony
1835	William Buckley returns to Melbourne after thirty-two years living with the Wadawurrung people
1848	Ludwig Leichhardt goes missing in the western desert
1865	White settlers massacre Indigenous people in Lagrange Bay, Western Australia
1876	Truganini dies in Hobart, Tasmania
1876	Henry Morton Stanley reportedly contacts the white tribe of Gambaragara, Uganda
1889	Alexander McPhee finds Jungun in Joanna Springs, Western Australia
1894	W. L. H. Duckworth publishes his measurements of twenty-eight Aboriginal skulls (Duckworth 1894)
1898	Alfred C. Haddon leads the Cambridge Anthropological Expedition to Torres Straits
1899	Baldwin Spencer and F. J. Gillen publish *The Native Tribes of Central Australia* (Spencer and Gillen 1899); Spencer is appointed honorary director of the National Museum of Victoria (now Museums Victoria)
1901	Baldwin Spencer and F. J. Gillen begin the 1901–2 expedition to central Australia
1901	ABO blood groups are discovered by American biologist Karl Landsteiner
1901	The Commonwealth of Australia is established from six existing colonies; the Immigration Restriction Act is one of the first laws passed

1909	Alfred C. Haddon publishes *The Races of Man and Their Distribution* (Haddon 1909)
1923	Alfred C. Haddon collects a lock of hair from a "young Aboriginal man" at Golden Ridge, Western Australia
1925	Herbert Basedow publishes *The Australian Aboriginal* (Basedow 1925)
1926	The Board for Anthropological Research auspices its first expedition
1930	The Australian Institute of Anatomy opens under the leadership of William Colin Mackenzie
1931	C. Stanton Hicks joins the annual Board for Anthropological Research expedition and speculates on torpor in desert sleepers
1935	Alfred C. Haddon, Julian Huxley, and A. M. Carr-Saunders publish *We Europeans*, critiquing the race concept (Haddon et al. 1935)
1937	A. O. Neville, Western Australian commissioner for native affairs, advocates for the total absorption of the Aboriginal population into the white population (Commonwealth of Australia 1937)
1938	Norman B. Tindale and Joseph B. Birdsell begin the joint Harvard-Adelaide Universities Anthropological Expedition for the study of race mixture in Australia
1938	William Colin Mackenzie dies
1938	Xavier Herbert's novel *Capricornia* is published by P. R. Stephensen
1939	World War II begins
1950	The first UNESCO Statement on Race is released (UNESCO and Its Programme 1950)
1953	Article describing the structure of DNA is published by Francis Crick and James D. Watson (Watson and Crick 1953)
1958	P. F. Scholander and colleagues publish findings on "insulative cooling" among Aboriginal people in central Australia (Scholander et al. 1958)
1961	The Australian Institute of Aboriginal Studies is founded in Canberra
1964	The International Biological Program begins
1967	R. L. Kirk establishes his genetics laboratory at the Australian National University
1967	A national referendum is passed to allow the Commonwealth government to pass legislation regarding Indigenous people (formerly the purview of states)

1969	David Jose and colleagues publish a damning health survey of children on Queensland missions (Jose et al. 1969)
1969	The first documented case of albinism in an Aboriginal person is published in the *Medical Journal of Australia* (Walker 1969)
1969	A. A. Abbie publishes *The Original Australians*, including the archaic Caucasian hypothesis (Abbie [1969] 1976)
1972	Richard Lewontin publishes an article showing that most genetic variation occurs within, not between, population groups (Lewontin 1972)
1972	Peter Ucko is appointed as principal of the Australian Institute of Aboriginal Studies
1976	The Aboriginal Land Rights Act (Northern Territory) is passed by the Commonwealth government
1976	Truganini's remains are repatriated to the Tasmanian Aboriginal community
1976	Roy L. Simmons reports that thirty-five years of blood group research in Indigenous populations produced no conclusive results
1977	Margaret Tucker publishes *If Everyone Cared: Autobiography of Margaret Tucker*, the first book to detail the effects of the Stolen Generations
1981	The Commonwealth Department of Aboriginal Affairs proposes a three-part definition of Indigenous status: self-identification, ancestry, and community acceptance
1983	The first Indigenous doctor graduates from the University of Western Australia medical school
1984	The Australian Institute of Anatomy closes; ancestral remains are transferred to the National Museum of Australia
1985	Museums Victoria repatriates ancestral remains collected by George Murray Black to the Koori community
1987	The Royal Commission into Aboriginal Deaths in Custody is established by the Commonwealth government
1987	The Human Biology Advisory Committee of the Australian Institute of Aboriginal Studies ends; R. L. Kirk retires from the Australian National University
1991	National Health and Medical Research Council publishes guidelines for research in Aboriginal and Torres Strait Islander Communities
1991	The Council for Aboriginal Reconciliation is established by the Commonwealth government

1992	The Australian National University repatriates Mungo Lady to traditional owners
1993	The Native Title Act is passed by the Commonwealth government in response to the High Court's recognition of the land rights of the Meriam people in the Torres Strait
1994	Global Indigenous opposition to the Human Genome Diversity Project peaks
1997	The report of the "Stolen Children" National Inquiry entitled *Bringing Them Home* is tabled in federal Parliament (Human Rights and Equal Opportunity Commission 1997)
2000	The Human Genome Project completes the working draft of the human genome
2000	The new Melbourne Museum opens; the Bunjilaka permanent exhibit includes a model of Spencer in a glass case
2008	Australian prime minister Kevin Rudd formally apologizes to the Stolen Generations
2009	Romaine Moreton is haunted by the ghost of Colin Mackenzie at the National Film and Sound Archive, Canberra
2010	Blood samples taken by Therese Markow for genetic research in the 1990s are returned by Arizona State University to the Havasupai people
2011	Eske Willerslev and colleagues publish the "first Aboriginal genome," sequenced from the lock of hair collected by Haddon in 1923 (Rasmussen et al. 2011)
2011	The Summer Internship for Indigenous Peoples in Genomics (SING) is established in the United States to train Indigenous peoples in genomics
2011	Melbourne Museum opens a new "First Peoples" exhibition; the Spencer exhibit is deinstalled
2013	The National Centre for Indigenous Genomics is established at the Australian National University
2015	Eske Willerslev and colleagues publish genetic analysis of the Ancient One/Kennewick Man (Rasmussen et al. 2015)
2015	Blood samples taken by Napoleon Chagnon for genetic research in the 1960s are returned by the US National Institutes of Health to the Yanomami people in Brazil
2016	Eske Willerslev and colleagues publish their analysis of eighty-three genomes from Aboriginal people around Australia, including speculation on adaptations to desert cold (Malaspinas et al. 2016)

2019	Conservative politician Mark Latham proposes DNA testing be used to establish eligibility for Indigenous benefits
2019	The National Centre for Indigenous Genomics repatriates desiccated blood samples of deceased donors to Galiwin'ku community
2019	The Australian chapter of Summer Internship for Indigenous Peoples in Genomics (SING) is established
2020	AncestryDNA releases an update that provides an "Aboriginal and Torres Strait Islander Ancestry Estimate"
2020	The Native BioData Consortium is established in South Dakota by Indigenous geneticists and ethicists

Notes

INTRODUCTION

1 At this point, the Out of Africa hypothesis—the now-dominant theory that *Homo sapiens* first evolved in Africa and then spread to the rest of the world—was still some years away. That hypothesis was first developed in the 1980s; an article analyzing mitochondrial DNA in 1987, including placental samples from Aboriginal women in Darwin and Alice Springs provided by Kirk, led to its wide acceptance (Cann, Stoneking, and Wilson 1987). In the past decade, it has been shown many times that world populations have admixture with "archaic" hominins such as Neanderthals and Denisovans, complicating the picture (Stringer 2012).

2 John Maynard (2007) outlines the important history of Aboriginal activism prior to its more public presence in the 1960s.

3 The profound health inequalities suffered by Indigenous Australians are well known but bear repeating. Mortality rates are twice that of the non-indigenous population; life expectancy is eight to nine years less; diabetes occurs at 3.5 times and kidney failure at 6.8 times the rate in the non-indigenous population; and all the social determinants of health (e.g., education, employment, housing) are far worse in the Indigenous population compared to the general Australian population (Australian Indigenous HealthInfoNet 2019).

4 Genetics is the study of individual genes, while genomics is the study of the entire genome, that is, twenty-three pairs of chromosomes in humans. In the twenty-first century, "genomics" has replaced "genetics" as the general term for the study of genetic determinants and associations of health and disease, as the methods used involve the production and analysis of genome-wide data.

5 For important reviews of "postcolonial science and technology studies" that capture some of this work, see W. Anderson and Adams 2007; McNeil 2005; and Seth 2009, 2017.

6 "Personalized" or "precision" medicine aims to use genomic information to predict, diagnose, and treat disease more effectively than current methods. It is based on the rationale that genomic information allows greater stratification to identify who is more likely to benefit from, for example, breast cancer screening, or exactly what dose of which medication is most likely to work in a particular person. There are some areas where precision medicine is of clear benefit, such as the treatment of some cancers, and other areas where the benefit is yet to be established, such as in targeted health promotion.

7 An example where these links are particularly stark is forensic DNA databases in the United States that are overwhelmingly made up of samples from African Americans, making them more likely to be falsely linked to a crime (D. Roberts 2011).

8 The current evolutionary anthropology laboratory at Cambridge is named after Duckworth and is part of the story told in chapter 3. The skulls Duckworth measured are still stored there.

9 These issues are explored in more depth by philosophers of biology; see, for example, Godfrey-Smith 2003; and P. Griffiths and Stotz 2013.

10 This is also illustrated in the emerging field of Indigenous epigenetics. Epigenetics is seen as a progressive science that shifts scientific attention from inherited to acquired/development characteristics, but it can be used in ways just as deterministic as genetics (Kowal and Warin 2018; Warin, Kowal, and Meloni 2020; Warin et al. 2022).

CHAPTER 1. LIVING WITH GHOSTS

1 The subheading "DNA Testing Plan for Aboriginal People" is taken from the headline of the news article by Esther Han (2019).

2 One Nation leader Pauline Hanson introduced what was known as the "It's OK to be white" motion into the Senate in October 2018. It was only narrowly defeated after initially being supported by the major conservative party (Norman 2018).

3 The party ended up with less than 7 percent of the vote and two seats, a similar outcome to the previous time they ran for office in New South Wales in 1999.

4 At the time this story broke, there were two companies (one based in the United States, one based in Australia) that offered a genetic test for Australian Indigenous ancestry based on short tandem repeat data. These tests are designed for forensic uses and are widely considered to be inaccurate when used for ancestry purposes. The services were never widely publicized, and both have since ceased operation. See Booth 2018; and Kowal and Jenkins 2016. However, in May 2020, as the COVID-19 pandemic dominated the global headlines, genetic ancestry industry leader Ancestry.com released an update to its algorithm that included an "Aboriginal and Torres Strait Islander ancestry estimate" (Ancestry Marketing Team, Australia 2020). The social effects of this are yet to be determined, and so far Ancestry.com has not actively advertised this capability.