

## Pacific Biologies: How Humans Become Genetic

---

The announcement in 2016 that Eske Willerslev's laboratory at the University of Cambridge had sequenced genomes of 83 Aboriginal Australians caused quite a stir, exciting discussion in newspapers, radio, television, and social media across the southern continent. Published in *Nature*, the article traced the ancient divergence of Aboriginal and Papuan (New Guinea Highlander) populations from Eurasians, and the slightly more recent splitting and isolation of the Australians from their Papuan neighbors. The investigators—a multinational team, many of them Indigenous—deduced from these genomes that there had been a single colonization event, from which all Aboriginal Australians descended. Although they discerned subsequent European, Asian, and Melanesian genetic mixtures in samples, the nucleic-acid residues of such complicating ancestries could be set aside and discounted in the analysis.<sup>1</sup> One of the authors, Thomas Wales, an Aboriginal elder from Mapoon on Cape York, observed, “We have an oral history, that everyone knows, and you can lose all your oral [history]. Science, and DNA, and carbon dating . . . you can keep hold of things, tell us about our past.” Many Indigenous people had come to regard genetics as confirming, or even

\*Anderson: Janet Dora Hine Professor of Politics, Governance and Ethics, Department of History and Charles Perkins Centre, Quadrangle A14, University of Sydney, Sydney, NSW 2006, Australia; warwick.anderson@sydney.edu.au. Lindee: Janice and Julian Bers Professor of the History and Sociology of Science, Department of the History and Sociology of Science, University of Pennsylvania, Cohen Hall Suite 303, 249 South 36th Street, Philadelphia, PA 19104, USA; mlindee@sas.upenn.edu.

1. Anna-Sapfo Malaspinas, Michael C. Westaway, Craig Muller, Victor C. Sousa, et al., “A Genomic History of Aboriginal Australia,” *Nature* 538 (2016): 207–14. The sample did not include Aboriginal people from eastern Arnhem Land and the Gulf of Carpentaria, groups with a long history of mixing with the peoples of the Malay Archipelago.

---

*Historical Studies in the Natural Sciences*, Vol. 50, Number 5, pps. 483–497. ISSN 1939-1811, electronic ISSN 1939-182X. © 2020 by the Regents of the University of California. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the University of California Press's Reprints and Permissions web page, <https://www.ucpress.edu/journals/reprints-permissions>. DOI: <https://doi.org/10.1525/hsns.2020.50.5.483>.

refining, what they know about themselves, as solidifying their identities, serving as a resource for deciding who qualifies as Indigenous. Some, though by no means all, saw advantages in thinking about themselves genetically. “This information, coupled with the technology now used to assist in identifying where our human remains came from exactly, is exciting,” said co-author Colleen Wall, a Dauwa Kau’bvai woman from southeastern Queensland. “Placing them as close to country as possible will settle them down.”<sup>2</sup> Willeslev’s study joined many others in the early twenty-first century using powerful new genomic technologies to elucidate or to confirm the deep history of the population structures of Oceania, Australasia, and Southeast Asia.<sup>3</sup> A few critics characterized these investigations as a genetic “goldrush” or a “scramble” for Pacific genomes—perhaps less derogatory than alluding to the earlier, and related, Human Genome Diversity Project as the “vampire project,” but still indicating ambivalence toward, or wariness of, such genetic exploration and discovery. Concerns abided about what the implications might be for local people being told by scientists who they really are—and what commercial exploitation of DNA data might portend.<sup>4</sup>

2. Quoted in Dani Cooper, with Tom Forbes, “World-first genome study reveals rich history of Aboriginal Australians,” *ABC Science* (21 Sep 2016), <https://www.abc.net.au/news/science/2016-09-22/world-first-study-reveals-rich-history-of-aboriginal-australians/7858376> (accessed 27 Aug 2020). Warwick Anderson recalls hearing the Aboriginal host of an ABC Radio National program remarking casually after the report: “So, they’ve told us what we knew all along.”

3. For example, Jonathan S. Friedlaender, Françoise R. Friedlaender, Floyd A. Reed, Kenneth R. Kidd, et al., “The Genetic Structure of Pacific Islanders,” *PLoS Genetics* 4 (2008): 173–90; Mark Lipson, Po-Ru Loh, Nick Patterson, Priya Moorjani, et al., “Reconstructing Austronesian Population History in Island Southeast Asia,” *Nature Communications* 5, 4689 (2014): doi:10.1038/ncomms5689; and Mark Lipson, Olivia Cheronet, Swapan Mallick, Nadin Rohland, et al., “Ancient Genomes Document Multiple Waves of Migration in Southeast Asia Prehistory,” *Science* 361 (2018): 92–95.

4. On the “scramble for genes as geopolitical objects,” see Christophe Bonneuil, “Seeing Nature as a ‘Universal Store of Genes’: How Biological Diversity Became ‘Genetic Resources,’ 1890–1940,” *Studies in History and Philosophy of Biological and Biomedical Sciences* 75 (2019): 1–14, on 8. On the “vampire project,” see Hilary Cunningham, “Colonial Encounters in Post-Colonial Contexts: Patenting Indigenous DNA and the Human Genome Diversity Project,” *Critique of Anthropology* 18 (1997): 205–33; Michael Dodson and Robert Williamson, “Indigenous Peoples and the Morality of the Human Genome Diversity Project,” *Journal of Medical Ethics* 25 (1999): 204–08; Jenny Reardon, “The Human Genome Diversity Project: A Case Study in Coproduction,” *Social Studies of Science* 31 (2001): 357–88; and Amade M’charek, *The Human Genome Diversity Project: An Ethnography of Scientific Practice* (Cambridge: Cambridge University Press, 2005). See also Jonathan Marks, “‘We’re Going to Tell These People Who They Really Are’: Science and Relatedness,” in *Relative Values: Refiguring Kinship Studies*, eds. Sarah Franklin and S. McKinnon (Durham, NC: Duke University Press, 2002), 255–83.

For centuries, Australasia and the Pacific have been key sites of biological collection and analysis. The scientific endeavor to render visible the life forms of the global south often has focused on humans, attempting to discover ancestral origins, register “races,” and make sense of population structures or collective risks.<sup>5</sup> Before World War II, using methods of anthropometry and blood grouping, physical anthropologists sought to reveal and document either what they perceived as dwindling Indigenous groups or rising mixed-race populations of the region.<sup>6</sup> Their studies constituted a new field of inquiry, which they sometimes called “human biology” to distinguish it from older typological and Mendelian racial studies.<sup>7</sup> After World War II, these biological anthropologists generally stopped measuring Indigenous peoples but bled them more than ever, determining their blood groups, protein variants, chromosome patterns (or karyotypes), and later, genomes.<sup>8</sup> During the Cold War, the Human Adaptability Section of the International Biological Programme managed some of this collating and archiving of Indigenous blood and other specimens; later, the Human Genome Diversity Project rationalized widespread exsanguination. Much of the scientific interest after World War II in the region, especially the genetic demography of D. Carleton Gajdusek, Roy

5. Bronwen Douglas and Chris Ballard, eds., *Foreign Bodies: Oceania and the Science of Race 1750–1940* (Canberra: ANU E-Press, 2008); Bronwen Douglas, “Terra Australis to Oceania: Racial geography in the ‘fifth part of the world,’” *Journal of Pacific History* 45 (2010): 179–210; Warwick Anderson, *The Cultivation of Whiteness: Science, Health and Racial Destiny in Australia* (Durham, NC: Duke University Press, 2006 [2002]), and “Racial Conceptions in the Global South,” *Isis* 105 (2014): 782–92; and Paul Turnbull, *Science, Museums and Collecting the Indigenous Dead in Colonial Australia* (London: Palgrave Macmillan, 2017). For island Southeast Asia, see Warwick Anderson and Ricardo Roque, “Imagined Laboratories: Colonial and National Racializations in Island Southeast Asia,” *Journal of Southeast Asian Studies* 49 (2018): 358–71.

6. For example, Warwick Anderson, “Ambiguities of Race: Science on the Reproductive Frontiers of Australia and the Pacific Between the Wars,” *Australian Historical Studies* 40 (2009) 143–60, and “Hybridity, Race, and Science: The Voyage of the *Zaca*, 1934–35,” *Isis* 103 (2012): 229–53.

7. Warwick Anderson, “Racial Anthropology and Human Biology in the Island Laboratories of the United States,” *Current Anthropology* 53, S5 (2012): S95–S107.

8. On the history of blood grouping elsewhere, see William H. Schneider, “The History of Research on Blood Group Genetics: Initial Discovery and Diffusion,” *History and Philosophy of the Life Sciences* 18 (1996): 277–303; Lisa Gannett and James R. Griesemer, “The ABO Blood Groups: Mapping the History and Geography of Genes in Homo Sapiens,” in *Classical Genetic Research and Its Legacy: The Mapping Cultures of Twentieth-Century Genetics*, eds. Jean-Paul Gaudillière and Hans-Jörg Rheinberger (Abingdon: Routledge, 2004), 119–72; and Jenny Bangham, “Blood Groups and Human Groups: Collecting and Calibrating Genetic Data After World War II,” *Studies in History and Philosophy of Biological and Biomedical Sciences* 47 (2014): 74–86.

T. Simmons, Robert Kirk, and Jonathan Friedlaender, concentrated on so-called “primitive” isolates—as a sort of salvage project—in contrast to the immediate prewar emphasis on race mixing and human hybridity.<sup>9</sup> During the twentieth century scores of scientists thus labored to make Australasian and Pacific peoples biologically legible, to record supposed “primitives” in a variety of modern ways. As the region became a nuclear testing ground, new incentives for biological collection and analysis intersected with older imperatives. That the first populations to be exposed to significant levels of nuclear irradiation, increasing the risk of genetic damage, happened to be located in and around the Pacific—in Japan, Australia, the Marshall Islands, and nearby sites—added a new dimension to assays of the global meaning of Oceanic human genomes.<sup>10</sup>

Many of the stories we tell here foreshadow twenty-first century surveys such as Willese’s accumulation of Aboriginal genomes. In our own times, it seems every nation and ethnic group (and even every family, as direct-to-consumer DNA testing makes clear) draws on ideas about the genome to establish identity or legitimacy. What was once fundamentally a colonial enterprise has morphed into a national, ethnic, and personal branding exercise.<sup>11</sup> Increasingly, genomic affiliations and molecular affinities are substituting for

9. Susan Lindee and Ricardo Ventura Santos, “The Biological Anthropology of Living Human Populations: World Histories, National Styles, and International Networks,” *Current Anthropology* 53, S5 (2012): S3–S16; Emma Kowal, Joanna Radin, and Jenny Reardon, “Indigenous Body Parts, Mutating Temporalities, and the Half-Lives of Postcolonial Technoscience,” *Social Studies of Science* 43 (2013): 465–83; Joanna Radin, “Latent Life: Concepts and Practices of Human Tissue Preservation in the International Biological Program,” *Social Studies of Science* 43 (2013): 484–508, and *Life on Ice: A History of New Uses for Cold Blood* (Chicago: University of Chicago Press, 2017); Jenny Bangham and Soraya de Chadarevian, “Human Heredity after 1945: Moving Populations Center Stage,” *Studies in History and Philosophy of Biological and Biomedical Sciences* 47 (2014): 45–49; Veronika Lipphardt, “Geographical Distribution Patterns of Various Genes: Genetic Studies of Human Variation after 1945,” *Studies in History and Philosophy of Biological and Biomedical Sciences* 47 (2014): 50–61; and Alexandra Widmer, “Making Blood ‘Melanesian’: Fieldwork and Isolating Techniques in Genetic Epidemiology (1963–1976),” *Studies in History and Philosophy of Biological and Biomedical Sciences* 47 (2014): 118–29. See also Jacob W. Gruber, “Ethnographic Salvage and the Shaping of Anthropology,” *American Anthropologist* 72 (1970): 1289–99.

10. M. Susan Lindee, *Suffering Made Real: American Science and the Survivors at Hiroshima* (Chicago: University of Chicago Press, 2008); and Mary X. Mitchell, *Test Cases: American Law, Nuclear Weapons, and Extraterritorial Power in the Postwar Pacific* (book manuscript).

11. John L. Comaroff and Jean Comaroff, *Ethnicity, Inc.* (Chicago: University of Chicago Press, 2009); and Aaro Tupasela, “Populations as Brands in Medical Research: Placing Genes on the Global Genetic Atlas,” *BioSocieties* 12 (2017): 47–65.

social bonds, cultural relations, and even family ties—and so, biochemical retellings replace historical and environmental relationalities and intimacies. We hear ever more strident assertions of national genomic sovereignty—often based on the research of local, non-European scientists, not only the white sojourner and settler scientists of the recent past.<sup>12</sup> Several Indigenous groups have resorted to genomic articulations of identity, privileging molecular markers of genetic ancestry in determining tribal status. As Kim TallBear puts it, “Indigeneity recast as genetics becomes a discourse of scarcity and death, rather than what it is, an indigenous social movement, a discourse of survival.”<sup>13</sup> Sometimes in anxious settler colonial societies like Australia and Aotearoa New Zealand there occurs a comingling of both projects, whereby Aboriginal or Maori genomes might serve perversely as proxies for the authenticity and antiquity of the new nation, as sources of white settler or Pakeha pride.<sup>14</sup> In this issue we provide some critical perspectives on these clamorous contemporary formations of the geneticizing of human life, history, relationships, and identity.

The articles that constitute “Pacific Biologies” recognize Australasia and the Pacific as places of scientific knowledge making, thereby resisting collusion with imperial visions of the southern hemisphere as no more than a vast data mine or the commodious receptacle for supposed scientific verities generated

12. Ruha Benjamin, “A Lab of Their Own: Genomic Sovereignty as Postcolonial Science Policy,” *Policy and Society* 28 (2009): 341–55; Wen-ching Sung, “Chinese DNA: Genomics and Bionation,” in *Asian Biotech: Ethics and Communities of Fate*, ed. Aihwa Ong and Nancy N. Chen (Durham, NC: Duke University Press, 2010), 263–92; Amy Hinterberger, “Investing in Life, Investing in Difference: Nations, Populations, and Genomes,” *Theory, Culture and Society* 29 (2012): 72–93; Jantina De Vries and Michael Pepper, “Genomic Sovereignty and the African Promise: Mining the African Genome for the Benefit of Africa,” *Journal of Medical Ethics* 38 (2012): 474–78; Amade M’Charek, Katharina Schramm, and David Skinner, “Topologies of Race: Doing Territory, Population, and Identity in Europe,” *Science, Technology and Human Values* 39 (2014): 468–87; Yinghong Cheng, “Is Peking Man Still Our Ancestor? Genetics, Anthropology, and the Politics of Racial Nationalism in China,” *Journal of Asian Studies* 76 (2017): 3575–3602; and Elise K. Burton, “Narrating Ethnicity and Diversity in Middle Eastern National Genome Projects,” *Social Studies of Science* 48 (2018): 762–86. On the connections of DNA to identity making more generally, see Dorothy Nelkin and M. Susan Lindee, *The DNA Mystique: The Gene as Cultural Icon* (New York: W.H. Freeman, 1995).

13. Kim TallBear, “Genomic Articulations of Identity,” *Social Studies of Science* 43 (2013): 509–33, on 516, and *Native American DNA: Tribal Belonging and the False Promise of Genetic Science* (Minneapolis: University of Minnesota Press, 2013).

14. Miranda Johnson, *The Land is Our History: Indigeneity, Law, and the Settler State* (Oxford: Oxford University Press, 2016).

elsewhere.<sup>15</sup> In particular, the authors sought to resituate twentieth-century genetic research, attending to the fusion of laboratory and field to locate their practices in a shared frame, moving from blood testing and biochemistry to population biology, and transferring action and agency from the North Atlantic littoral to Australasia and the Pacific.<sup>16</sup> In part, this required us to rethink the scalar and temporal dynamics of genetic investigation. It involved attending to procedures such as chemical preservation, freezing, transport, paperwork, and storage—technologies that could be leveraged to reconfigure the mobility and temporality of marked bodies and identities—as guides to how kinship and sociality might be reworked. In a sense, we were asking how the “primitive” changed from a subject of nostalgia to an object of continuing presence, authenticity, and even anticipation in the biological sciences—and how the presumed isolate thus became cosmopolitan.<sup>17</sup> To do this, we needed to know more about the encounters and exchanges between local people and visiting scientists, and how these entanglements often allowed for—at the same time as they might transpose or resist—the extraction, appropriation, haunting, mobilization, standardization, registration, and archiving of things as persons, or persons as things. We needed to recognize, too, the local histories, meanings, and values of Australasian and Pacific communities, and what sort

15. Warwick Anderson, “From Subjugated Knowledge to Conjugated Subjects: Science and Globalisation, or Postcolonial Studies of Science?” *Postcolonial Studies* 12 (2009): 389–400; Anderson, “Postcolonial Science Studies,” in *International Encyclopedia of the Social and Behavioral Sciences*, 2nd ed., ed. James D. Wright (Oxford: Elsevier, 2015), 652–57; Anderson, “Remembering the Spread of Western Science,” *Historical Records of Australian Science* 29 (2018): 73–81; David Wade Chambers and Richard Gillespie, “Locality in the History of Science: Colonial Science, Technoscience, and Indigenous Knowledge,” *Osiris* 15 (2000): 221–40; and Suman Seth, “Putting Knowledge in Its Place: Science, Colonialism, and the Postcolonial,” *Postcolonial Studies* 12 (2009): 373–88. We should point out that we are mostly concerned here with population genetics, focused on the normal, not with the development of a distinct medical genetics, which identifies pathological markers. For suggestions of what might become a history of Indigenous medical genetics, see Emma Kowal, Lobna Rouhani, and Ian Anderson, eds., *Genetic Research in Aboriginal and Torres Strait Islander Communities: Beginning the Conversation* (Melbourne: Lowitja Institute, 2011).

16. On lab-field connections, see Joel B. Hagen, “Naturalists, Molecular Biology, and the Challenge of Molecular Evolution,” *Journal of the History of Biology* 32 (1999): 321–41; Robert E. Kohler, *Landscapes and Labsapes: Exploring the Lab-Field Border in Biology* (Chicago: University of Chicago Press, 2002); and Bruno Strasser, “Laboratories, Museums, and the Comparative Perspective: Alan A. Boyden’s Quest for Objectivity in Serological Taxonomy, 1924–1962,” *Historical Studies in the Natural Sciences* 40 (2010): 149–82.

17. Warwick Anderson, “Objectivity and Its Discontents,” *Social Studies of Science* 43 (2013): 557–76.

of scalar and temporal and affective work all people were doing in these encounters. We thus contend that colonial, national, and commercial structures and demands made possible and shaped much of this research—just as the sciences of heredity and biological identity are intimately linked to contemporary processes of modernization and development.

During the past decade, historians of the recent human sciences have started to turn their attention to diverse field sites, studying how scientists in the second half of the twentieth century came to “make up” persons and populations at different locations—but rarely has their gaze rested on the Pacific and its environs.<sup>18</sup> Previous inquiries into Western European and North American anthropological debates after World War II have detected a patchy decline in the salience of racial typologies and taxonomies in science, along with the gradual ascendancy of population thinking, “informed by post-synthesis evolutionism and molecular biology,” and prompted by revulsion toward the excesses of hardline eugenics and Nazi racism.<sup>19</sup> Breaking out of North Atlantic salons, some scholars have begun to recognize significant Latin American and Pacific agency and authorship in the paradigm shift.<sup>20</sup> But we still know relatively little about how populations actually came to be refigured after the war on the ground and across the oceans,

18. Ian Hacking, “Making Up People,” in *Reconstructing Individualism: Autonomy, Individuality, and the Self in Western Thought*, eds. T. L. Heller, M. Sosna, and D. E. Wellbery (Stanford, CA: Stanford University Press, 1986), 222–36; and Staffan Müller-Wille, “Making and Unmaking Populations,” *Historical Studies in the Natural Sciences* 48 (2018): 604–15. Among the obvious exceptions are: Lindee, *Suffering Made Real* (ref. 10); Anderson, “Hybridity, Race, and Science” (ref. 6) and “Racial Anthropology” (ref. 7); and Widmer, “Making Blood ‘Melanesian’” (ref. 9).

19. Lindee and Santos, “Biological Anthropology” (ref. 9), S3. See Nancy L. Stepan, *The Idea of Race in Science: Great Britain, 1800–1960* (Basingstoke, UK: Macmillan, 1982); Elazar Barkan, *The Retreat of Scientific Racism: Changing Concepts of Race in Britain and the United States Between the World Wars* (Cambridge: Cambridge University Press, 1992); Michelle Brattain, “Race, Racism, and Antiracism: UNESCO and the Politics of Presenting Science to the Postwar Public,” *American Historical Review* 112 (2007): 1386–1413; Jenny Reardon, *Race to the Finish: Identity and Governance in an Age of Genomics* (Princeton, NJ: Princeton University Press, 2009); Jonathan Marks, “The Origins of Anthropological Genetics,” *Current Anthropology* 53, S5 (2012): S161–S172; and Perrin Selcer, “Beyond the Cephalic Index: Negotiating Politics to Produce UNESCO’s Scientific Statements on Race,” *Current Anthropology* 53, S5 (2012): S173–S184.

20. Sebastián Gil-Riaño, “Relocating Anti-Racist Science: The 1950 UNESCO Statement on Race and Economic Development in the Global South,” *British Journal for the History of Science* 51 (2018): 281–303; and many of the chapters in Warwick Anderson, Ricardo Roque, and Ricardo Ventura Santos, eds., *Lusotropicalism and Its Discontents: Racial Exceptionalism in the Portuguese-Speaking Global South* (New York: Berghahn, 2019).

especially in the global south.<sup>21</sup> What were the practices and politics of human population biology or genetic demography or systematic serology in Australasia and the Pacific in this period? How did the transition from essentialist physical anthropology to historicist genealogical reckoning take place? In what ways did the impact of radiation and Cold War nuclear testing—often involving groups presumed to be surrogates for “early man”—shape these population studies? And what, if anything, did it mean to be refigured, no longer as a type, but as a population? How might being operationalized as a particular kind of population matter in the global south?

While our view of the performance of genetic fieldwork is still clouded and partially obscured, some features come vividly into focus in the following articles. The fetish of the island laboratory or isolated population or unique group continued to command these researchers—thus Warwick Anderson notes that Joseph B. Birdsell could imagine his continental Aboriginal subjects in separate communities surrounded by oceans of desert or gibber plain. Then there is the practical transition—partial in Birdsell’s case—from morphological obsessions, involving intricate anthropometrical procedures, to consuming passion for blood, assumed to have long-term value “as yet unknown.”<sup>22</sup> After the war, improved methods for extraction, preservation, and analysis of blood made it possible to conjure genetically plausible populations, and to imagine forms of normality in the consistency of chromosomes, blood types, or cells. The “bloodworlds” explored by Projit Mukharji reflect overlapping but discrepant explanations of the Chenchu group, and also the idea (and perhaps social experience) that to be bled was to be recognized somehow as “human.” The chromosomes counted from populations around the world, as Soraya de Chadarevian points out, were part of a much broader effort to explain human difference in cellular and biological terms. Datasets compiled to understand Hawaiian populations, as Joan Fujimura and Ramya Rajagopalan propose, show how race has become imbricated in human population genetics and genomic biomedicine. Similarly, samples collected from atomic bomb survivors, as Susan Lindee suggests, were gradually transformed into something that could be presented as pure nature (biological, neutral, unmarked) and therefore relevant to new domains of biomedical research unrelated to radiation risk. Those studying

21. For a general intellectual history of “population,” concentrating on earlier usages, see Alison Bashford, *Global Population: History, Geopolitics, and Life on Earth* (New York: Columbia University Press, 2014).

22. Radin, “Latent Life” (ref. 9).

the atomic bomb survivors could see them as “the most important people living” by virtue of their exposure to radiation—separated from all other groups by a single historical event. Through the collection of blood, DNA, tumor samples, and even hair and teeth, people became ever more clearly visible at the molecular level, which provided information deemed more accurate and creditable than anatomical observations or ethnographic and historical intelligence.

The contributions to this issue provide new insights into how situations and relations shaped understandings of race and population during this period and into the present. They show us the complex interplay of close intersubjective rapport and distancing “objectivity,” the tensions between libidinal investment and scientific detachment, as well as the sheer ambiguity and confusion of various interactions among needy scientists and those whom they wanted to corral as research subjects.<sup>23</sup> All of the parties involved in field research were making up and collecting persons, in different ways and to different ends. It was through such vexing and complicated exchanges that experts imagined and stabilized new concepts of population. Additionally, these articles illustrate vividly how imperialism and settler colonialism, as well as commercial interests, military technologies, and religious missions, facilitated the field sciences, permitting their ramification across Australasia and the Pacific. Even after World War II, the field was still a complexly colonial site, a place of grossly unequal reciprocity if not outright appropriation and contestation. Through these claims and counterclaims on others’ bodies would emerge too, as out of muck and mire, a sort of Indigenous modernity, where local people, no longer seen as dying or degenerate races, might be made legible to the rest of the world and mobilized and rendered serviceable in the nether regions of global capitalism.<sup>24</sup> Accordingly, if we look carefully, we can witness in these stories, as they describe the normalization of difference, the dolorous confluence of anti-racist science and modern exploitation and dependency.

23. See also Warwick Anderson, *The Collectors of Lost Souls: Turning Kuru Scientists into Whitemen*, updated edition (Baltimore: Johns Hopkins University Press, 2019 [2008]); and M. Susan Lindee, “Scaling Up: Human Genetics as a Cold War Network,” *History and Philosophy of Biological and Biomedical Sciences* 47 (2014): 185–90.

24. Warwick Anderson, “On the Beach in the Marquesas: Weedy Historicities and Prosthetic Futures,” in *Pacific Futures: Past and Present*, eds. Warwick Anderson, Miranda Johnson, and Barbara Brookes (Honolulu: University of Hawai‘i Press, 2018), 263–79. We are pointing to the role of biological science in this shift from regarding “natives” as a “state of exception” to recognizing them as having potential to become disciplined subjects; that is, from *zōē* to *bios*, as described by Giorgio Agamben, *Homo Sacer: Sovereign Power and Bare Life*, trans. Daniel Heller-Roazen (Stanford, CA: Stanford University Press, 1998).

In many of these accounts, a subtle thread of disappointment appears. Opportunities for blood collection were constantly changing, as early assumptions about scientific rights gave way to concerns about the rights of research subjects. At the same time, experts hoping to find difference conclusively—in genes or chromosomes or blood types—often found instead that the body was recalcitrant, uncooperative, unwilling to display precisely the kinds of diversity expected or needed. People turned out rather more alike in blood or DNA, than they seemed to be in social order or history or cancer rate variation. Genetic and genomic data often were disappointingly trivial, or contradictory, or irrelevant to the specific technical or social agenda involved. When the architects of the Human Genome Project proclaimed that a mapped genome was a glittering universal resource for both medicine and human identity, an index of “what it means to be human,” they were perhaps unintentionally revealing their frustration. There really did seem to be something very much like the “standard human” genome. And as Fujimura and Rajagopalan demonstrate, it has taken a great deal of selective technical work to extract difference that “matches” social expectation from such genomes. Our articles thus track frustrated and often stymied efforts to use human bodies, banked bloods, and DNA to calculate relationships and explain biological difference in a geographical and ideological space made through colonialism, capitalism, violence, and war.

Anderson’s account of Joseph B. Birdsall’s practices and theories regarding Aboriginal Australians from the 1930s to the 1970s describes how population genetics became another method of ignoring contemporary Aboriginal degradation, suffering, and dispossession. Collecting blood as a scientific practice involved disengagement or disregard, Anderson proposes, a way of not noticing the exploitative conditions that made blood collection of this sort and at this time possible. The act of drawing blood itself, he suggests, was a form of sociological and political evasion. Birdsall constructed the native inhabitants of northwest Australia as creatures akin to the common fruit fly, which was the core subject of a very successful experimental system in genetics and evolution.<sup>25</sup> His field “experiments” with these human *Drosophila* involved, first, human hybridity (the study of race mixing, and “half-castes”) and later, the use of Aboriginal data to test population geneticist Sewall Wright’s evolutionary theories. Although Birdsall was at times sympathetic to those he studied, and aware of their experiences in a ruthless settler society, he limited his attention to

25. Robert E. Kohler, *Lords of the Fly: Drosophila Genetics and the Experimental Life* (Chicago: University of Chicago Press, 1994).

the scientific evidence their bodies could generate. As Anderson notes, the subjectivity of those he studied was not seen as relevant to the scientific calculus of human evolution—though, of course, biological theory even from the time of Charles Darwin had wrestled with how emotion matters to evolution. Late in life, Birdsell acknowledged the peculiar historical window that had opened to his advantage. Working with Aboriginal people in the way he did would not have been possible either before or after his years in the field. Refrigeration, air travel, blood type analysis, ideas about biobanking, and the durability of samples were allowing the efflorescence of field studies of isolated groups; whereas emerging post-colonial ethical concerns and Indigenous rights movements would later make such methods of collection and analysis impractical. Anderson demonstrates how Birdsell's field studies illuminate the scientific calculus that permitted his subjects to become epistemic objects. The human biologist sought what must have seemed like “deeper” genetic explanations of light-colored hair or genetic drift, of populations rather than actual people. He joined many others in twentieth-century efforts to use isolated or specially marked populations, hoping to reach conclusions about the origins and development of “mankind.”

Birdsell reappears in Mukharji's exploration of how and why different parties—people in different situations—drew on blood, and even drew blood, to explain human relationships. Mukharji proposes that the “bloodworlds” of the twentieth century were mobilized to assemble partially compatible (but not identical) visions of the Chenchu people of India, long regarded as one of the oldest populations on the subcontinent and a potential link between South Asian and Australian populations. The 1952 joint Indo-Australian genetic studies of the Chenchu were expected to reveal the deeper demographic histories of both India and Australia, and coming with decolonization, these investigations signaled a new era of scientific “collaboration.” As Mukharji shows, such concerted scientific inquiries involved blood that functioned through assemblages that were not necessarily either “national” or “international,” secular or religious, racial or cultural. Religious connections played a key role in the Chenchu study, as Australian missionaries with ties to churches in South India participated in recruiting blood donors, all in the context of an intersecting theology of blood. Liturgies in South India emphasized the Eucharist as a sacrament, and the ritual importance of the body and blood of Christ—those promoting such ideas helped collect blood from Chenchu participants who were scattered deep in the forest and difficult to recruit. Birdsell's bloodworlds, conversely, were oriented around race crossing, and shaped by Adelaide entomologist and anthropologist Norman B. Tindale's implicit white nationalism. Birdsell was perhaps unique in openly articulating the contradictory

nature of post–World War II studies of human difference, and Mukharji identifies him as an eloquent witness to the inadequacy of nationalism alone as an explanatory framework for postwar physical anthropology. For Mukharji’s Chenchu Papaya of Sarlapalli, blood was instead a resource for kinship and community. Thus, the blood in Mukharji’s account is not an immutable mobile or even an epistemic thing. It is rather a site of friction, difference, and incoherence, sometimes non-utilitarian, sometimes political, sometimes magical or religious. For most of those studied—as colonized people of the world—being recognized as “human” was a part of their political struggle. Blood could bring such actors into “the human” as a resource for evolutionary theory, as in Anderson’s analysis, or as a guide to the history of human migration, as Mukharji recounts.

In Lindee’s case study, the biological materials collected from people exposed to radiation as a result of the uses of the atomic bomb at Hiroshima and Nagasaki can be seen as undergoing a similar transformation, from specificity to generality, and from radiation risk to an expansive vision of modern human biology writ large. Like materials taken from isolated populations around the world, the atomic bomb samples came to be seen as both unique scientific resources and universalized symbolic materials. The Biospecimen Center at the Radiation Effects Research Foundation (RERF) can therefore be aligned with an emerging style of twenty-first-century biobanks, in which materials originally collected for one purpose gain new meanings. The estimated 980,000 biological samples collected in Japan came to the research laboratories in a haphazard manner, across many decades, from survivors and controls, through autopsies, clinical care, and dental treatments. They were in the process of being rationalized and modernized into a cohesive, general frame, a telos relevant to unmoored elsewhere—as Lindee surmises, they were reimagined in clusters that could be leveraged to build new kinds of knowledge, indefinitely. They joined other forms of big data in their seamless transition from dramatic specificity to general relevance. The “first peoples of the atomic age,” in her terms, have contributed biological materials including blood, tumors, teeth, and preserved organs, all purged of historical specificity. Anthropological work has explored how relics, remains, bones and local arts can and do acquire more general value as those from whom they came are about to disappear. Indigenous inhabitants whose presence was a challenge to settlement, agriculture, economic growth or land tenure have often become the focus of sacralized memory at the very moment they were officially “vanishing.” Such sacralization may historically be necessary to the prosperity and social order of those who have taken over their country: things become

sacred when those from whom they were taken can no longer challenge systems of power. The romance of human remains thus depends on the anticipated disappearance of the persons from whom they came. According to Lindee, the RERF Biobank raises cognate questions of mobility, value, circulation, destruction, memory, and political organization. Samples can gain scientific value as they become embedded in different scientific explanations, being both destroyed and perpetually renewed as they are stored in freezers, enhanced with PCR, and circulated in transnational knowledge networks.

For Chadarevian, the study and standardization of human chromosomes collected around the world has involved a similar process of circulation, preservation, and abstraction, linked in this case to a fascination with racial categories that proved impossible to track through chromosomal difference. As she shows, the search for such difference in human populations remained an organizing principle for many human geneticists. Counting the newly visible and accessible chromosomes after 1946 enlisted familiar networks of population geneticists, radiation geneticists, and human biologists across the Pacific. Human chromosomes proved particularly intriguing because they were long interpreted as possible racial markers, even when they were generally miscounted. In the 1920s, when the human chromosome count seemed stable, a consensus emerged that “Whites,” “Negroes,” and “Japanese,” as well as women and men, possessed the same number of chromosomes. But the possibility that there might be chromosomal differences between various groups of people was never quite abandoned. When the human chromosome number was revised in the mid-1950s, the new count (48 to 46) came to be tested in populations around the world. In the search for chromosomal variation, David Hungerford, a cytogeneticist from the Fox Chase Cancer Center in Philadelphia, worked with an anthropologist carrying out fieldwork in northeastern New Guinea to “sample cytologically subjects from this relatively isolated area.” The anthropologist sent Hungerford skin biopsies placed in sterile vials containing growth medium, packed in vacuum flasks with water ice, brought out on foot and by motor vehicle to Lae. From there, the flasks were re-iced and flown to Sydney in a scheduled commercial flight. They were re-iced again and sent to Philadelphia on a commercial jet air freight. Thus, a complex system of technological acquisition and transfer helped construct ideas about racial difference.<sup>26</sup> Other studies looked at Aboriginal Australians and

26. For similar transactional networks or “kula rings,” see Anderson, *The Collectors of Lost Souls* (ref. 23).

Indigenous people from Kundiawa, in the highlands of New Guinea. These investigations of human variation, Chadarevian suggests, were inextricably linked to late-colonial studies of biological heredity.

In their article, Fujimura and Rajagopalan track how and why continental or “racial” biological collection became a counter-intuitive technical solution to the problem of genomic variations that potentially had no obvious health consequences—so-called single nucleotide polymorphisms. Their case study focuses on the idea of Hawai‘i as a “natural laboratory” for studies of human genetic diversity, in the wake of the development of a particular repository of biological samples and medical history data. Whereas the original purpose of the collection was to understand ethnic (that is, historical and cultural) differences in nutrition—in a bid to work out how nutrition might shape rates of so-called “common and complex diseases” like cancer and heart disease—the biological data repository later became a resource for assessing genetic causation. And this Hawaiian repository, with its racial categories reflecting the islands’ history, came to serve as a template for much later and broader DNA collections, which incorporated ideas about race as a way to figure out which variations might matter to health. Essentially, as they show, racializing of populations reflected the assumption of genomics researchers that there must be significant differences in SNPs between groups of people from different geographic regions. These differences might result in spurious correlation in statistical comparison between diseased and healthy research subjects. Scientists therefore decided to “control” for such errant associations by “accounting for population substructure.” Such accounting seemed to require recursion to racialized categories: populations were collected to represent the genetics of particular continents (Asia, Africa, and Europe). These decisions effectively operationalized continental reference populations, and SNPs were directly conscripted into efforts to cast difference as racial, with this racial difference as a confounding source of error in medical studies involving genomics. Whether or not researchers believed that races are or are not distinct genetic groups, Fujimura and Rajagopalan point out that the data infrastructures they built were organized by categories entangled in popular American notions of racial difference, or “folk” biology. Accordingly, “race” was sustained and reinforced even by practices that should reject it.

We hope that these articles signal the extension, if not the beginning, of the engagement of histories of biology with Indigenous histories, as well as with other regional histories of Australasia and the Pacific, many of them framed ethnographically. In time, such conjunctions will allow us better to formulate, and perhaps to

answer, several new questions.<sup>27</sup> How, for example, does the increasing mobility of Indigenous blood and other specimens correlate with the growing mobility and migration of Indigenous persons? What are the connections, or contrasts, between new biological time frames and Pacific and other Indigenous and local historicities and temporalities?<sup>28</sup> Are new forms of subjectivity, identity, and biosociality articulated through these researches, among local peoples and among scientists?<sup>29</sup> How are biovalue and other forms of value negotiated, imposed, or contested?<sup>30</sup> What does it mean for one's blood or DNA to be permanently banked or archived? Are these scientific studies—which bring deathly things into conversation with life—disciplinary or governmental projects, or are they cherished investments in surveillance and archival possession, claims to a novel form of sovereignty? How do we engage critically with the ineluctable “whiteness” of genetic field work?<sup>31</sup> These are a few of the questions that the articles urgently press upon us.

#### ACKNOWLEDGEMENT

We are grateful to the editors and reviewers of this journal for their guidance. The papers in this special issue benefitted from intensive discussion at a workshop on “Southern Oceanic Topologies and Genealogies: Genetic Explorations of the Pacific and Australasia,” held at the University of Sydney, December 12–14, 2016. In addition to the authors in this issue, participants included Chris Ballard, Bronwen Douglas, Sebastián Gil-Riaño, Miranda Johnson, Margaret Jolly, Emma Kowal, Matt Matsuda, Joanna Radin, Ricardo Roque, Alice Te Punga Somerville, Sonja van Wichelen, Ricardo Ventura Santos, Catherine Waldby, Sarah Walsh, Alexandra Widmer, and Christine Winter. James Dunk managed this colloquium, and a grant from the Australian Research Council (FL 110100243) generously supported it.

27. For extended discussion of decolonizing histories of science, see Warwick Anderson and Gabriela Soto Laveaga, eds., “Forum on Decolonizing Histories in Theory and Practice,” *History and Theory* 59, no. 3 (Sep 2020).

28. See Anderson et al., eds., *Pacific Futures* (ref. 24).

29. Paul Rabinow, “Artificiality and Enlightenment: From Sociobiology to Biosociality,” in *Incorporations*, eds. Jonathan Crary and Sanford Kwinter (New York: Zone Books, 1992), 234–52.

30. Catherine Waldby, “Stem Cells, Tissue Cultures, and the Production of Biovalue,” *Health, Illness and Medicine* 6 (2002): 305–23.

31. Anderson, *Cultivation of Whiteness* (ref. 5); Jenny Reardon and Kim TallBear, “Your DNA is Our History’: Genomics, Anthropology, and the Construction of Whiteness as Property,” *Current Anthropology* 53, S5 (2012): S233–S245.