
ENIGMATIC VARIATIONS**Beyond Fortune-Cookie Genetics**

In September 2013, an invitation to order a “your 23andMe kit today” arrived at my home in Berkeley. 23andMe is a personal genome service company that was cofounded by Anne Wojcicki (who is related to a founder of Google) in the heart of Silicon Valley. The letter claims that “the service reports on more than 240 health conditions and traits, including carrier status, disease risk and how your DNA may impact your overall health.”¹ Furthermore, it added, “You can also learn about your ancestral history.” This marketing gimmick underlines that “preventive health information should be accessible to everyone,” thus combining a democratizing accessibility with a sunny injunction to self-management.

23andMe celebrates the dream of making DNA technology relevant to personal health, educational benefits, and cultural self-discovery. At UC Berkeley, some administrators were inspired to adopt this user-friendly approach to spark student interest in modern science. In the fall of 2010, the campus initiated a voluntary Bring Your Genes to Cal program. Incoming freshmen were invited to send in their saliva samples to be tested for different kinds of enzyme intolerance.² Meanwhile, 23andMe has been promoted in American popular culture for its power and potential to help individuals search for unknown ancestors. A television show on PBS hosted by the Harvard historian Henry Louis Gates Jr. used 23andMe kits to trace the genetic ancestry of famous individuals, stirring widespread

interests among African American people seeking to rediscover family lines disrupted by the kinship-shattering cataclysm of slavery. But despite concerns that exposing personal features to the public may lead to social discrimination,³ personal genetics, packaged and exemplified by 23andMe's merging of consumer empowerment and genomic self-knowledge, is publicly touted as the intertwining of American ingenuity, democracy, and individualism, all mined through individual bloodlines and genomes.

This popular image of genomic science was dismissed as "fortune-cookie genetics" by Dr. Edison Liu, then the lead scientist at Biopolis, Singapore's ecosystem of bioscience institutions. He explained that the growth of personalized genetics companies in the United States has generated the private misuse of genetic information for clues to personal ancestry and health. While 23andMe, for Liu, a U.S. citizen, represents a typically American genomic preoccupation with individualistic conceptions of kinship and descent, he had some reservations. The fact that most people are unable to interpret the data without the intervention of physicians means that the self-knowledge acquired from a cheek swab is not useful from a medical point of view, and indeed it might even encourage individuals to make health decisions without consulting with medical specialists. Indeed, Liu's position was echoed by U.S. doctors and the American Food and Drug Administration (FDA), which disapproved of individuals learning about their own DNA for these reasons. In 2013, the FDA sought to curb the misuse of commercialized, personalized test kits that had led some individuals, on their own, to seek out serious medical procedures such as a radical mastectomy.⁴ For Liu, the market packaging of user-friendly DNA is a neoliberal capitalization on individual desires for fortune-telling that only contributes to the fortune of companies and perhaps to the detriment of falsely empowered individual patients.

By invoking 23andMe, Liu seized the opportunity to differentiate an American use of genomics, which seems to project rugged individualism and valorized self-care,⁵ from Biopolis, where genomics are managed by scientists for collective health needs. Although the Biopolis hub is closely informed by American scientific administration and practice, as the hub's spokesman, Liu sought to highlight a defiantly Asian difference. As a state-funded project, the Singapore genomics initiative began earlier (2003), intending not to promote personal genetics, but rather to connect genetic data and tissues already stored in hospitals and clinics in Singapore and other sites, especially in China. A community of scientists, not private companies, will supervise the work of

linking multiple existing data sources in research institutions and filling in the gaps in genomic knowledge about peoples in Asia.

The Singapore biomedical initiative also challenges the fortune-telling belief that the inheritance story is told exclusively by DNA. Liu explains: “We are in a ‘new risk genomics’ moment because new research shows that our inheritance is infinitely more mysterious than previously assumed in Mendelian genetics.” At the turn of the century, the Human Genome Project was intended to usher in a DNA-focused approach to personalized medicine. Soon after, the focus shifted from a narrow focus on genetics to epigenetics, or the study of gene–environment effects on the performance of genes.

Scientists realize that while the genome evolves slowly through centuries, the epigenome, which turns a gene on or off, can change very quickly, within a few generations. The new science is called post-genomics. Liu prefers the term “new risk genomics,” which describes a highly interdisciplinary field that includes genetics, epigenetics, biostatistics, proteomics (protein studies), and metabolomics (the study of cellular metabolites). Liu believes that, as a center for the study of new risk genomics, Biopolis has the potential to generate a tremendous amount of digital information that will revolutionize diagnostic and therapeutic methods. The high ambition of this interdisciplinary ecosystem is architecturally rendered as well in the design of Biopolis itself as a network of interconnected research towers.

Yet, despite Liu’s rhetorical dismissal of recreational fortune-cookie genomics, some kind of fortune-telling is involved in genomic science, albeit in the abstract language of DNA and mathematics that still manages to work in “Asian” cultural elements. In the post-genomic landscape that Biopolis configures, and indeed mimetically hails through its architecture, it is precisely the attempt to design and then harness the “experimental future”⁶ and its fortunes in Asia that is at stake. This book attempts to illuminate what is cosmopolitan science and what are the variations and differences that become coded in Asian post-genomics.

Biotechnologies today are involved in decoding the secret workings of the genome and recoding it in relation to other systems of codes and information (e.g., ethnicity, disease, nationality, geography). Genetic technologies can be likened to the Enigma machine used during World War II, a device for coding and decoding secret messages.⁷ As in the mid-twentieth-century coding industry, the contemporary biomedical enterprise is resolutely multidisciplinary, driven by biological research and bioinformatics. The research milieu is a

strange place where mathematicians, biologists, engineers, and other scientists work in tension and in concert across different fields.

The work of unlocking the enigma of life—the double helix of science and passion—now includes research venues in Asia. At Biopolis, DNA databases are coded to “Asian” ethnicities and other elements, thereby redefining what “Asian” means in variations of genes, identity, disease, and space. As a supplement to the American paradigm of the new genomics, researchers in Singapore are amassing and gathering for the first time millions of data points on Asian vulnerabilities and variations, so that other scientists can develop drugs and therapies tailored to the needs of bodies within Asia. I seek to illuminate one of the latest iterations of a century-long migration of scientific and technological knowledges originating in Europe and the United States to Asia, and the situated discovery of new findings within particular biomedical assemblages that transform contemporary science.

Asia, Anthropology, and Science Studies

The path for the study of post–World War II science, technology, and medicine in East Asia was blazed by anthropologists conducting research on Japan, arguably the most scientifically advanced nation in the region. In a pathbreaking study of high-energy physicists in Japan and the United States, Sharon Traweek examined the social and discursive construction of scientific communities.⁸ Margaret Lock’s award-winning studies of aging and menopause, as well as of organ transplantation, also situated biomedical innovations within a Japan–North American framework.⁹ Arthur Kleinman pioneered the cross-cultural study of health practices by contrasting Western and Chinese-style approaches to psychological illness in Taiwan.¹⁰ In a similar cross-cultural vein, Lawrence Cohen explored the medical and cultural construction of senility and cultural anxieties in India and the United States.¹¹ By taking a comparative approach, these works highlight Asian cultural notions of community, sickness, and bodies that contrast with American scientific understanding. Collectively, such perspectives situate Asia within contrastive cultural contexts for modern sciences.

More recent studies about how scientific and medical knowledges are taken up in diverse regions tend to focus on exploitation and ensuing ethical dilemmas. Brandishing the notion of “biocapital,” Kaushik Sunder Rajan framed India as a site that has been exploited by biomedical trials in search of readily available experimental subjects.¹² Other anthropologists have portrayed Asia as a region of coerced and illicit organ harvesting, supplying body

parts for transplant procedures, as well as a site of affective labors that serves a burgeoning medical tourism industry.¹³ The implications are that besides the “bio-availability” of exploitable populations, cultural and social arrangements in parts of Asia abet in the biocapitalist pursuit of readily available bodies, labors, and “fresh” human organs from the developing world.

Meanwhile, the rapid deployment of specific biotechnologies in Asia requires a shift from contrastive cultural or political economic comparisons, to consider emerging competitive scientific milieus in their own right. The volume *Asian Biotech* casts light on the varied deployment of biotechnologies in Asian sites and on their enmeshment with situated forms of nationalism, biosovereignty, and ethics.¹⁴ The newly influential journal *East Asian Science, Technology and Society* publishes articles that attempt to discover similarities and differences in the production of scientific knowledge in various historically situated but globally enmeshed contexts. Indeed, researchers in the anthropological and science and technology studies (STS) fields are studying emerging science contexts in Asia, which can generate potentially critical insights that richly expand the field beyond its originating Euro-American context.

Framed by the concept of “global assemblage,”¹⁵ this book identifies an emerging context of what may be called Euro-American cosmopolitan science, crystallized in Singapore. First, assemblage concept departs from simplistic cross-cultural and North–South contrasts; it also challenges the STS theory of a universal science that floats beyond local mediations. The emergence of a science milieu in Asia, I argue, is the particular outcome of complex mediations between global technologies and situated forces. Second, if we understand Euro-American cosmopolitan science as regulated science, one should not assume in advance that biomedical science in other places is merely a debased form. Rather, this work will illuminate how, in order to become universal, cosmopolitan science must remediate situated elements so that it can attend to an array of “global” scientific problems. What is “global” and what is “situated” are destabilized in processes of scientific remediation across the planet. In order to be universalizable, cosmopolitan science depends on this constant effort to be particular, to remediate situated elements.

Radical uncertainties, the historian of science Steven Shapin observes, attend much of contemporary science, and “it is the quotidian management of those uncertainties”¹⁶ that is the stuff of my investigation here. My overarching theme is productive uncertainty, in that scientific practices responding to myriad challenges are productive of new forms that in turn create uncertainty.

Different registers of uncertainty are at play in conditioning the experiment at hand: from the calculation of genetic risks for diseases, to uncertainties surrounding the science and the endeavor, to the larger “known unknowns” that science confronts in attempts to secure the immediate future.

Here I take the opportunity to state that, as an anthropologist, my task is to report and interpret scientific practices and ideas in context, without advocating on behalf of actors or experiments under investigation. My approach has consisted less in judging ethical or redemptive claims about specific research objectives than in identifying the particular biomedical assemblages within which ethical problems and conundrums crystallize, which actors seek to resolve. By offering a multifaceted ethnography of bioscience at Biopolis, I aim to illuminate how science projects are complex entanglements of reason and the passions. The branding of a new biomedical center is often surrounded by promotional publicity. As such, media stories and hype are part of the affective work of the trust-making necessary for garnering legitimacy for this kind of state-supported scientific enterprise. Discursive and nondiscursive practices surrounding Biopolis illuminate what might be called a form of scientific “exuberance”¹⁷ as well as the affective uncertainty that perturbs the orderly landscape of science.

At Biopolis, scientific entrepreneurialism as a mode of risk-taking seeks to shape an emerging region for health markets and biosecurity. This ambitious and potentially risky project is inextricably linked to narratives that establish a spectrum of “Asian” differences—in DNA, populations, disease risks, disease forms, geography, research capacities, customized therapies, markets, and collective goals. The remarks of scientists and physicians accord value not only to themselves as experts, but also to the techniques and procedures involved in the acquisition of these truths.¹⁸ My informants often make optimistic projections about the novel value of their discoveries and techniques for “Asian” peoples, the region, even the world. Such narratives and claims are consequential: the regime of truth accepts and makes true the critical potentials of their science.

In addition, science discourses and metrics are strategic when lab findings migrate to the public realm, and science spokesmen must perform in order to continue to draw multibillion-dollar investments from the Singaporean state and from foreign entities. Collectively, promissory claims about the science being produced animate political interest and legitimacy in what citizens may view as an uncertain economic enterprise. Such political justifications have scientists posing the need for Biopolis and the post-genomic research

that occurs there in relation to the many diseases and ailments that vex and will vex Asian bodies. To gain further traction, long-standing notions of Asia, now reworked as a genomic, epidemiological, and environmental continuity, come into play. In Singapore, discourses of cultural, ethnic, and geographic differences are less about cultural jingoism than strategic claims to leverage Singapore's potentialities in global genomic science while also making the state investment in biomedical research also a reinvestment in the well-being of a vulnerable and racialized populace.

Race and Ethnicity in Medicine

The United States is a major shaper of cosmopolitan science, but it suffers from the historical convergence between structural racism, medicine, and biology that has had a devastating impact on minority populations. The history of misuse and abuse of racial data in medicine, with actual instances of eugenic and racial violence, is well attested.¹⁹ Owing to this history of race science—one that medical anthropologists have at times participated in—racialized medicine in America is often read as an insidious and virulent science-as-racism.

As many STS scholars of the history of American racial science have argued, race was never about nature or biology in the first place. Race itself was always “interpretive,” or a cultural construction, so to speak. Critics have argued that the uses of race were and are always confused about the genetics of populations, the genetics of race, and the genetic and social causes of diseases. Therefore, the reintroduction of race as a biomarker in genomic science has stirred old fears of the biologization of race, its stigmatization, and this reinforcement of social inequalities.²⁰ In *Backdoor to Eugenics*, Troy Duster explores the troubling social and ethical implications of genetic technologies, including the misuse of genetic theory and information, on minority groups such as African Americans.²¹ Especially among those working with populations that have and continue to be drawn into a new constellation of race and medicine in the United States, rightful skepticism continues, despite the fact that the new “ethnoracial” category incorporates the interplay of nature and nurture into medical research.

Indeed, genomic medicine has propelled the transition from race to ethnicity, thus effecting a different kind of interpretation of disease vulnerability, though the race-ethnicity divide is neither finite nor entirely clear. The employment of the ethnic heuristic should perhaps not be considered as a restoration of scientific racism in genomic science, but as a new technique that is intended to be inclusionary in the mobilization of health data. The

National Institutes of Health (NIH) Revitalization Act of 1993, Margaret Lock and Vinh-Kim Nguyen note, promotes the use of race (and gender) as a scientific category in DNA sampling. They are careful to note that “population,” “race,” and “ancestry” (the preferred term) that variously correspond to U.S. census categories are not considered discrete dichotomous variables but are used as heuristic devices for studying the frequency of specific genetic traits. This represents a gesture on the part of the NIH at navigating the fraught historical and political terrain in which “race” in its molecularized form has often been read as a causal explanation of historical and ongoing structural social inequalities.²² Duana Fullilove argues that the “molecularization of race” can be viewed as intended to rectify the systematic exclusion of gendered and raced minorities in American health research.²³ The ethnic heuristic—mobilizing ethnicity in an experiment as an interpretive tool rather than as a claim to some stable and preexisting biological reality—is one way in which researchers attempt to elaborate a bioscientific enterprise that can include questions of human difference without defaulting into the pitfalls of scientific racism and racist genetic determinism.

Ambivalence remains over the use of ethnoracial genomic data because of its unintended effects on racial politics. Even Lock and Nguyen worry that DNA fingerprinting outside the lab may give rise to biomedical practices that unintentionally promote racial stereotypes, affirm ethnoracial differences, or further commoditize racial medicine.²⁴ At the same time, despite risks of exacerbating racial blaming and oppression, there is a growing consensus that the use of such genetic markers should be dropped.²⁵ After all, besides their application as a mode of biomedical inclusion, ethnoracial categories may contribute to social healing in that minority groups, through their biomedical racialization, are finally receiving the sophisticated medical attention they have long deserved. Alondra Nelson has argued that commercialized ethnic DNA can be used as building blocks for projects of reconciliation and thus may be viewed as positive elements for the future of American racial politics.²⁶

As I will argue in this book, the ethnic heuristic as an inclusionary aspect of DNA fingerprinting is more unambiguously embraced overseas as an advantageous aspect of genomic science that gives texture and robustness to the DNA maps of global populations so far excluded from genomic science.

“The Difference That Makes a Difference”

We are at a moment when there is a growing international division of knowledge and labor as well as a pluralization of the life sciences. Genomic science

is a novel experiment in the interplay of biology, race, and the environment, but each national setting uses different concepts of race (historical, cultural, political, and biomedical) in relation to genomic science for different but not mutually exclusive strategies of bolstering national identity, biocapitalism, and/or biosecurity for the future.

Scientists seeking to configure new knowledge systems outside Euro-American milieus generate what Gregory Bateson calls “the difference that makes a difference.”²⁷ Different systems constantly experiment with form where the constant value is not a thing but a contingency. Drawing on ecology and biology, Niklas Luhmann argues that in society’s self-referentiality and future elaboration action is communicated through the constant creation of otherness (contingency) in relation to things that already exist. As is often the case, the largest register of difference is the West versus Asia not as stable things but as relationships among shifting contingencies identified in systems making. Differences (race, ethnicity, geography) therefore are not stable but are rather contingent values that systems use to reduce complexity but end up creating more complexity.²⁸ Throughout this book, “the West” and “Asia” are invoked by researchers, informants, and sometimes by me in order to indicate the registering of such contingent attributes and relationships from vantage points within different systems of knowledge making (biomedical, political, anthropological, etc.).

Difference and differentiation mark novel aspects of any scientific experiment. When American genomic science is used for non-European populations, race, used as a code for groups with distinctive clusters of genetic, epigenetic, and molecular features, is useful for developing customized medicine. In pharmacogenomics, infinitesimal genetic differences can have significant implications for disease susceptibility and therapeutic responses; and racial/ethnic markers have become a useful technology for sampling populations, testing drugs, diagnosing, and customizing therapies. For instance, variability in DNA and in immunology is scientifically significant in reproductive technologies. Charis Thompson argues that “race” in contemporary biomedical research is a heuristic for identifying the intricate interplay of nature and nurture, of genetics and epigenetics.²⁹ Thus, attention to “racial” biomarkers of gene–environment interactions is very critical in the success of transplant technologies.

But because race outside the lab can refer to a variety of things, the racialization of genomics often takes on political and symbolic overtones, just as it grows out of fraught histories for creating and classifying human difference.

Different national contexts of genomic science disclose various uses and meanings of race.³⁰ Latin American countries tend to construct “mestizo genomics” because scientists are influenced by notions of race mixture (from social, historical, and political sources) that come to shape research questions and answers.³¹ In Mexico, the digital database is racialized as mestizo or mixed race, in opposition to indigeneity and in acknowledgment of interwoven histories and populations who collectively symbolize the nation. Mestizo blood samples are critical for the Mexican biomedical enterprise because they represent a form of “genomic patrimony.”³² It is interesting that genomic science in Latin America seems to be primarily concerned about constructing unified, while mixed, national races in their databases. By contrast, in Asian biomedical sites, ethnicity as “the difference that makes a difference” is deployed as an astute strategy to enhance the scope and power of genomic knowledge thus generated.

Enduring European colonial legacies in Southeast and East Asia are constructions of plural society, of coexisting races (essentialized) closely tied to language and religion. Different authoritarian political orders are based on multinationalism (China) or on multiracialism (Singapore), and the major axis of difference is between majority and minority nations/races/populations. Although there is political emphasis on protecting the group rights of minority nations/races, the majority nation/race is variously privileged and enjoys political dominance. In Singapore, electoral democracy is tempered by a communitarian ethos that extols social obligations and the importance of the common good, thus emphasizing collective over individual autonomy and rights. An official order of so-called CIMO (Chinese, Indian, Malay-Muslim, Others) multiracialism aims to balance the claims of different races in the nation. At the same time, hate-speech statutes discourage talk about race and religion, and there is a healthy public defense against disparaging the cultural practices of any “race.” In this model of administrative homogenization of identities, “ascribed” race minorities are very different from “voluntary” self-inscribed minorities in liberal multiculturalism.³³

Nevertheless, in reaction against the state’s insistence on “racializing” everyone, media, academic, and “scientific” discourses increasingly use “ethnicity.” Researchers in Singapore shift from the official category of race (traced through patrilineal descent) to American uses of ethnicity (based on self-identification in medical records) in their effort to model ethnic biomedical collectivities. Fortuitously, they recognize that ethnic-differentiated

medical science makes their databases more performative and mobile across multiple sites. For instance, ethnic Chinese biomedical collectivities can come to represent huge numbers of people in the world who may self-identify as Chinese. Critically as well, English—the language of science and ethnicity as normalized by international social science—is utilized to strategic advantage by Singaporean health researchers. The ethnic heuristic helps to circulate their findings, claims, and applications to places where English denotes like-ethnicities are found.

Therefore, genomic science in Singapore does not reify colonial-era notions of biological race, nor does it uphold a single national race in the genomic lab. In addition, the assumed stigmatizing effects of ethnoracial medical data in the United States do not apply in Asia. People tend to have a robust sense of their (variously constructed) racial/ethnic identities viewed through the lens not of past victimization but of ancient roots and historic achievements. Genetic technology is new, and people welcome Asia-oriented research that targets their ethnoracial group for therapeutic research. Few express fear or ambivalence about ethnic specifications in biomedical sciences, which in any case are but tools to help clinicians develop the personalized genetic data one can get on a chip and soon on the iPhone. Ethnic-differentiated tools are part of being techno-savvy medical consumers.

By adopting the ethnic heuristic, Singapore can leverage an ethnic-rich genetic database and brand itself as a biomedical center for a broader Asia. Multiethnic DNA is less about investing in national unity (as in the Mexican case) than a pragmatic strategy to produce a statistical infrastructure for demographic and geographical reach. It is this convergence of the use of ethnic heuristics in cosmopolitan science and the existence and malleability of official racial classifications in Singapore and Asia through which this infrastructure emerges. Racial categories for population administration provide a convenient and salutary statistical framework for the biomedical sciences. Biopolis's American-style biomedical research is thus resolutely global in its ambition; and the ethnic heuristic, detached from specific national moorings, facilitates a transnational inclusiveness because majority populations (Chinese, Malays, and Indians) in the region who were previously excluded from "universal" biomedical research can now be brought under the molecular gaze. In recognition of this universalizable power of the ethnic heuristic, the NIH selected Singapore's "trans-ethnic" DNA project to develop statistical research on the DNA of "non-European" populations.³⁴ In a sense, American scientists furnished the ancestry/ethnic heuristic, as Lock and Nguyen have

argued, and their Singaporean counterparts apply it to majority (not minority) populations in Asia.

This book is an experiment in what I call an anthropology of the future. How can anthropology—the study of the diverse ways of being human—be made relevant in the twenty-first century? Whereas anthropologists have long assumed that “culture” has always had a monopoly in defining the human, Stephen J. Collier and I maintain that science and technology actively mediate cultural notions, thereby proliferating novel ideas of the human, living, and life itself. The task of anthropology therefore is to investigate how contemporary science participates in and transforms preexisting cultural ideas about the anthropos in multiple registers today.³⁵ In an age of hopes for science and technology, ethnographies are critical for illuminating how cultural, philosophical and political differences translate and shape experimental systems and milieus.³⁶ Following a visit to China, Nikolas Rose has observed that the racializing trend of pharmaceuticals in Asia should not be dismissed as due to simply cultural differences. Instead of a reflexive critical suspicion, he cautions, we might seek answers in “new relations of genomics, identity, biosociality, and bioeconomics.”³⁷

In the chapters that follow, my study of Biopolis in Singapore, with a glance at BGI Genomics in China, goes beyond cross-cultural and cross-disciplinary translations to interrogate how science itself becomes transmuted in the process of designing anticipatory futures. This book is an ethnographic study of Biopolis, Singapore’s City of Life, a global milieu that seeks not only to incubate a new life science in and of Asia, but also to mobilize new political and ethical horizons for managing uncertainties in a uniquely connected and vulnerable region. Even as therapies are becoming more and more individualized for the wealthy, as in the sequencing of Steve Jobs’s genome in order to treat his pancreatic cancer, pharmaceutical innovations continue to demand the capture of huge swaths of new data. But whereas biomedical science is amazing in promising to unlock the codes of life, our diverse and shared fortune as anthropos is not so easily predictable or prepared for.

The new biology evolving in Singapore and elsewhere is an interdisciplinary field, bringing together the diverse expertise of biostatisticians and classically trained biologists, engineers, and doctors who often do not see eye-to-eye but do depend on the same sources of state or overseas funding. Different techniques are fashioned from dry labs and wet labs: that is, sites for the analysis of computer-generated data and classic bench-top experiments with biological materials. My investigation focuses on some research

programs integrated with clinical and academic research communities, including genetics, oncology, stem cell research, and tropical diseases. I explore the biomedical assemblage from the inside to illuminate how the work of science is infused with intensities, optimism, and anxiety.

As part of its quest to be a global biomedical hub, Singapore shifted from a British medical tradition focused on high-quality patient care to an American style of training physician-researchers engaged in innovative evidence-based practices. In 2003, Biopolis was established by the Agency for Science, Technology and Research (A*STAR). Biopolis comprises a cluster of public research institutions and corporate labs involved in many areas of biomedical science activities. Outside the Biopolis precincts, there are many international medical programs, including the Duke-NUS Graduate Medical School and the Johns Hopkins Cancer Center as well as major teaching hospitals and global drug laboratories. Biopolis is then itself less a singular site and more a network of institutions stretched across the island and beyond. With the term, “Biopolis complex or ecosystem,” I refer to this extended network of universities, hospitals, clinics, research institutions, and pharmaceutical companies in Singapore and overseas.

Singapore has gathered an international community of life experts (biostatisticians, geneticists, stem cell experts, neuroscientists, bioethicists), the so-called new specialists of the soma,³⁸ to meet such challenges. The bioscience research community draws from the public and private sectors, composed of more than two thousand scientists. Foreign and local-born researchers have been trained at leading world institutions such as Cambridge University, University of Edinburgh, Harvard University, MIT, Johns Hopkins, and many more in Europe and Australia, as well as Singapore’s own world-class universities. Science luminaries supervise labs, unfairly dubbed “research factories,” where hundreds of PhDs recruited from top-ranking universities in China, India, and Singapore work in some obscurity. Despite their busy schedules of work and travel, all scientists whom I contacted were responsive to requests for interviews. Biopolis has many corporate labs, but scientists there were unavailable for interviews because of concerns about intellectual property issues.

This book draws on research conducted between 2004 and 2013 during multiple summer visits to Singapore. In all, I interviewed a few officials and scores of researchers in fields such as population genetics, medical genetics, oncology, bioethics, infectious diseases, and stem cell research in the extended Biopolis complex. My investigation focuses on research practices

rather than on therapeutic activities, and my informants tend to be scientists (principal investigators) who often are clinician-scientists. Most of my interview data were collected in the spring of 2010, when I was a research fellow at the Asia Research Institute of the National University of Singapore. Some scientists were interviewed later at UC Berkeley and the UC San Francisco Medical School in California, and BGI Genomics, China.

Besides hour-long interviews (and repeat visits in many cases) at the offices of science institutes, I attended the many international conferences and lectures at Biopolis and the Duke-NUS Graduate Medical School. I also visited major teaching hospitals and clinics throughout the island, and I generally imbibed the biomedical culture brewing in Singapore. I hung around different medical campuses and ate in cafeterias serving international cuisine. This fieldwork, driven in part by my capacity to connect with individual researchers, offers captivating ethnographic and philosophical moments that highlight the invisible work, as well as the uncertainty, going on in some of the labs.

I am grateful to all respondents, from principal investigators to lab workers, from American scientists to mainland Chinese technicians, for their desire to explain to a nonspecialist what it is they are doing. I was generally impressed by their ardent interests, strong dedication, and professed optimism for the future. The identities of informants are disguised except where otherwise indicated. Scientists with public roles and well-known reputations—such as Edison Liu, director of the Singapore Genome Institute (2003–2010), and Henry Yang Huangming, a founder of BGI Genomics, among others—retain their own names. I appreciate the time and effort they took to engage someone who is concerned about the anthropos in other guises.

Not all scientists I encountered participated in the project of ethnic-stratified medicine, and many projects at Biopolis do not mark their data or claims in ethnic terms. But as one among other Asia-born researchers, my presence may have stimulated a degree of candidness seldom encountered by other anthropologists. In Singapore, cultural discourses suggest an overlap between race and ethnicity, and that will be evident in quotes scattered through this book. At the same time, most researchers frequently invoked “Asia” and/or “Asian” to highlight some dimension or element—in genetic variants, beliefs, values, way of life, and geography—that is a necessary and significant part of their work in forming this globalized biomedical milieu.