

Cosmopolitan Science

The life sciences are in the midst of a "fast and furious" race that will change the ways we engage with uncertainties in the politics of knowledge-making. Because the biological sciences took shape in "the West," we assume that North Atlantic institutions, actors, metrics, norms, and goals will continue to define the universality of the field. Our authoritative domination seems assured because we expect that data and discoveries developed in other sites will be subsumed under our governance of a transnational science commons.

My book *Fungible Life* complicates the picture. Drawing on research in Singapore and China, I illuminate how "cosmopolitan science" is a multi-sited endeavor, one that moves through a process of de- and recontextualization. In each research site, mobile technologies are copied and altered, thus destabilizing pre-existing codes, norms, and solutions. Dynamics of imitation and innovation, and of data and discovery, add complexity to what universality in science means.¹ Asian bioscience milieus, I suggest, are fascinating settings through which to investigate how situated responses to uncertainties about a nation's health future can unleash novel tweaks and bold leaps that mutate and evolve the life sciences.

Productive Uncertainty

In anthropology, "uncertainty" has emerged as a key concept in problematizing the governance of well-being. Because uncertainty both threatens life and is a mode of living, governance and biology have become intertwined aspects of modern statecraft. Paraphrasing Michel Foucault, uncertainty is itself a technique of power: uncertainty acknowledges the enigma of life but materializes it into a manageable kind of present-future.² Modern societies first aimed to tame the future through the statistical modeling of fertility, mortality, disease prevalence, et cetera as a way to forecast probabilistic trends.³ By the mid-twentieth century, affluent states had begun to develop infrastructures of vital systems security for governing future of catastrophic events, such as pandemics.⁴

But beyond the logics of preparedness, what other forms of risk management are there? It depends on what you mean by uncertainty. There is uncertainty as a future threat, and there is uncertainty as an

ever-present state of chaos. My question is, how can an existentialist sense of uncertainty about the future become, paradoxically, precisely the element that provides stability within modern societies?⁵ Specifically, what is the role of the state in shaping an "immuno-politics" against threats to life itself?⁶

This paper considers how uncertainty plays out at different scales that ripple across China's life sciences. At the state level, authoritarian politics is manifested not only through a system of centralized rule, but also by an entrenched abhorrence of uncertainty as a constant threat. For the autocratic state, the perennial question is how to harness uncertainty as disorder and chaos (*luan*) in order to effect political stability. Or, for example, how to transform myriad health threats into a generalized condition of biosecurity (*shengxu anfang*), and, in the process, develop a strategy to play catch-up in the medical sciences.⁷

Conditions of productive uncertainty in science, I argue, are crystallized by the novel interaction of disparate rules, the biopolitics of "sheer life,"⁸ and moral reasoning in China. Official calls to "innovate" (*chuangxin*) push health scientists to engage in cutting-edge operations that seek to create domains of certainty out of uncertain futures.⁹ Chinese scientists are making "tweaks," or small changes to established solutions; a few maverick actors seek to leap beyond ethical barriers. Because experiments invariably generate risks, they raise questions about what is culturally justifiable in enhancing human lives and regimes of living.

Biosecurity and Correct Science

In contrast to the model of "global health" proposed by Western funders, experts, and activists,¹⁰ China's biomedical platform is configured according to a resolutely national strategy. The People's Republic of China's (PRC) obsession with health insecurity can be traced to the early nineteenth century; then, triumphant colonial forces called the prostrate nation they addicted with opium "the sick man of Asia." The historical links between extreme poverty, debilitating diseases, and national weakness implanted faith in modern science for solving problems today.¹¹ After all, the PRC confronts myriad uncertainties in achieving an elusive promise of biosecurity for its 1.4 billion people. Besides the looming crisis of aging millions, the nation is menaced by a multitude of lethal diseases.

The densely populated, semitropical environment in Southern China has long been a hotspot for diabetes, hepatitis, dengue fever, malaria, cholera, and influenza. Today, unrelenting urbanization,

migration, and environmental destruction have further increased incidents of viral spillovers from animals to humans. The region, which overlaps Southeast Asia, is now officially designated as a zone of Newly Emerging Infectious Diseases (an epidemiological designation).¹² It is the epicenter of viral pandemics such as the avian flu H5N1. At the turn of this century, coronaviruses originating in bats (traced to caves in Yunnan) caused deadly epidemics: first SARS-1 in 2002, and the current SARS-CoV-2 or Covid-19 plague. After the first short-lived SARS epidemic, which threatened to derail economic growth, China began to support the training of epidemiologists and the building of virology labs. Thus, with SARS 2, Beijing did not hesitate to impose a draconian lockdown on the epicenter of Wuhan. We may say that an epidemic imaginary haunts the nation.

Indeed, managing health threats is vital to the legitimacy of the state. President Xi Jinping's leadership promises to ramp up this self-described "moderately prosperous" (*xiao kang*) society to achieve full modernization by the mid-century.¹³ Plans such as "Made in China 2025," "Healthy China 2030," and state management of the weather system are to lay the foundations of an ecological civilization (*shengtai wenming*).¹⁴ The China Dream integrates health, well-being, and modernity in its socialist civilizing regime. To achieve this technological process of domestic re-/decontextualization, the state shifted from promoting low-wage manufacturing to integrating indigenous (*bentihua*) innovations, entrepreneurship, and creativity.¹⁵

In this Asian Sputnik moment,¹⁶ leaders recognize that the power to sequence, map, and edit our genomes drives the contemporary bioscience revolution.

The Chinese state has invested heavily in training, research, and key biotechnologies. In China, *true science* for its own sake follows established procedures and guidelines, whereas *correct science* seeks practical solutions to particular, politically identified problems. A culture of scientism pervades the PRC, and life scientists in particular are celebrated as heroes who, by competing at the frontiers of bioscience, will save the nation.¹⁷

For instance, Chinese scientists have begun to corral and sequence a vast multitude of life-forms—from the microbial to the iconic—and assemble these into a biological and informational infrastructure seemingly circumscribed by a sovereign space. DNA studies have helped researchers to engineer food crops¹⁸ as well as to customize medicines that target human diseases prevalent in China. The life sciences thus forge a national foundation of information through which a range of values is generated:

agricultural development, environmental sustainability, precision medicine, and a form of deep biological knowledge of life in the nation. From this platform, data and discoveries can be made fungible across multiple domains of application, of production, and of profit making.¹⁹ But while China has become the world's largest producer of chemical materials for drugs and vaccines, other biomedical projects have had less clear-cut outcomes and implications for society.

Cloned Monkeys and Other Tool Animals

Biomedical experimentation does not only produce discoveries for therapies and medicine; it also engenders complex and contingent interrelations between human and nonhuman life forms. The deployment of animal science in the service of medical research involves a process of biopolitical parasitism, whereby nonhuman animals are used and destroyed for the benefit of human animals.

As surrogates for humans, other primates have long been subjugated in the biological sciences, but through the process of experimentation, they can also become subjectivized as beings that are valuable scientific tools. But outside the lab, cultural ascriptions of near-humanness have also been applied to actual humans: that is, to marginalized and stigmatized groups such as impoverished peasants, migrants, persons with disabilities, and other minorities. But by cloning near-human primates, researchers unwittingly cast the differential valuation of humans into stark relief.

Over the winter of 2017, scientists at the Shanghai Institute of Neuroscience cloned macaque monkeys, a first-in-the-world achievement. Images of the adorable pair suggested that they might be named Mickey and Minnie, cartoon figures of American cultural imperialism. But the macaque clones are named *Zhongzhong* and *Huahua*—each bearing half of the word for *Zhonghua*, the cultural name of China. The scientists announced that the cloned macaques were precursors to lab-cloned chimps, which, as apes, are even nearer to humans. So, like the cavorting Monkey King in the legend "Travels to the West," cloned apes are to play a role in China's quest, not for Buddhist sutras, but for bioscience supremacy.

By the mid-twentieth century, the United States had pulled ahead of its European rivals in vaccine development; over 1.5 million rhesus macaques (*Macaca mulatta*) may have been used in developing the polio vaccine. Since then, the spectrum of medical research that relies on primate models has widened: the TB vaccine, antivenom medicines, and maternal deprivation studies in the US, for example.

An initial facility in Florida later mushroomed into a network of primate centers throughout the United States.²⁰

But in recent decades, China took advantage of two openings to develop nonhuman primate (NHP) research. First, experiments on primates have declined steadily in the US, fueled in part by PETA (or People for the Ethical Treatment of Animals), which violently protested the use of monkeys as lab equipment. Nevertheless, macaque monkeys are still being used to test potential vaccines, as in the current coronavirus pandemic, for example. Second, India used to be the world's supplier of lab monkeys until it banned primate exports in 1977, which is when China rushed in to fill the gap. Since 1982, China has been the largest producer of rhesus macaques for the world's labs.

An abundant domestic supply of lab monkeys and the return of overseas-trained scientists are the two so-called national strategic resources that allowed China to grow nonhuman primate (NHP) research capacities. Primate facilities have been built in Suzhou, Guangzhou, Hangzhou, and Kunming to rear populations of genetically modified monkeys customized for biomedical research and drug testing. Chinese scientists are betting on the capacity to breed "tool animals" (*gongju dongwu*) as the strategy to make China competitive in the race for more accurate, effective, and affordable animal tests for new drugs and clinical trials for new therapies. Because of their biological near-humanness, cloned monkeys can become a novel petri dish for culturing human illnesses.

Zhongzhong and Huahua were successfully cloned using somatic cell nuclear transfer (SCNT). The Chinese Academy of Sciences claimed that their scientific milestone both technically and ethically surpasses the method that was used to clone Dolly-the-sheep by British scientists, including Alan Colman (who is now at Singapore's Biopolis).²¹ The Chinese scientists used nonreproductive cells, or adult cells, a much more difficult but ethically less objectionable procedure. In addition, instead of the conventional electrofusion technique, a graduate student applied micromanipulation to more successfully trigger cell nuclear transfer and produce normal SCNT blastocysts. (A blastocyst possesses an inner cell mass which subsequently forms the embryo.)²² So, the Chinese innovation is adding technological enhancement for the method of cloning mammals generally, but also includes an ethical enhancement that evades the problems of making primate clones from embryonic tissues specifically.

Cloned monkeys are biologically closer than lab mice are to humans, and as model systems, nonhuman primates serve as ideal surrogates for human biology in experimental studies of genetic diseases. This breakthrough produces an intellectual property that seems to technically and economically justify moving ahead with the use of monkey clones in the lab. With near-human primate models, Chinese researchers think they have a better approach (than, say, that of immunological therapy) for pursuing treatments or cures for brain diseases and cancers.

Cloned macaques, they hope, are a one-shot method for circumventing the biological, social, ethical, and legal obstacles to NHP modeling for precision medicine. The labs follow strict international guidelines for animal research set by the US National Institutes of Health, and are responsive to ethical demands defined by the biomedical parameters of cosmopolitan science as well.

Returning scientists are at the forefront of spreading cosmopolitan scientific knowledge and "best practices" in their respective fields in China. Their efforts to maintain the ethical care of laboratory animals enhance China's multiple advantages, when compared to the United States, for developing translational medicine. In addition to its wide availability of lab monkeys and its access to a sizeable human population (for disease study and clinical testing), China affords an ease of integration for utilizing clinical resources across state-supported hospitals, universities, and staffs.²³ With generous grants from the Chinese state as well as from San Francisco Bay Area biotech companies, US-educated scientists founded Wincon, an NHP facility in Guangxi, as the model primate center.

Stanford University alumni Piu Chan and colleague Alex Zhang have actively mediated between international research protocols for experimental NHP care and Chinese social attitudes toward animals. In 2006, Wincon received international accreditation for its high-quality animal care and use.²⁴ The standard international guide has been translated into Chinese, and Wincon's president, Alex Zhang, serves on the international accreditation council. At present, Wincon remains the only formally recognized NHP facility in China, but other NHP labs also claim to follow guidelines for animal research set by the US NIH.

To Chinese scientists, lab-cloned monkeys are an ethical wager—the future yield justifies the present sacrifice of life, cloned or otherwise—in the service of refining techniques of potential benefit to human health. Currently,

cloned macaques are used for clinically testing drug and gene therapies in animal trials before they can be applied to human patients. Researchers investigate disease-associated genes in the lab monkeys in order to identify culprit genes that can be re-edited in human patients, with the goal of treating particular diseases such as Alzheimer's and Parkinson's, which afflict a high proportion of the rapidly aging population. Researchers also hope cloned monkeys can give them an edge in neuroscience projects, like the mapping of primate brains.²⁵

Besides, cloned monkeys allow scientists to bypass some of the ethical concerns that have traditionally accompanied the experimental testing of lab animals. Chinese scientists argue that cloned primates lessen labs' dependence upon the use of "actual" nonhuman primates.²⁶ But, beyond the lab, cloned monkeys pose other ethical issues for Chinese society. How does the high valuation of nonhuman primate models impact the low valuation of near-human humans?

Suzhi: The Quality of Being Human in Neoliberal Times

"Especially in Asian societies," feminist Mely Chen notes, "non-human animals and matter animate biopolitical realizations and affectivity of what it means to be human."²⁷ We are at a point when Chinese scientists are scaling the biomedical heights in a country where about 135 million people (one-tenth of the Chinese population) still live on less than \$1 a day, an international measure of abject poverty. Folk terms compare the laboring classes to draught animals (i.e., buffalos), and both sets of beings, one may say, have long been treated as traditional kinds of "tool animals." The question is, can international legislated care for lab animals coexist with the almost nonexistent welfare for the human masses?

And so, there was scientific trepidation in stressing legislated care in animal facilities. In an initial testing of public reception in 2004, the Beijing municipal government posted a draft of an animal welfare law onto its website. The public response was so overwhelmingly negative that after two days, the draft was withdrawn. For many ordinary people, the idea of lab animal welfare—including Wincon's requirements of music, toys, and purified water—was morally outrageous and insupportable. Besides, a science report notes, "The 900 million rural Chinese who cannot afford basic medical care won't be able to benefit from the millions of yuan spent on research to find treatments for Parkinson's disease, diabetes, and cardiovascular disease."²⁸ An ethics of care for animals can seem a particularly cruel mockery of people eking out a bare living. But the analogy goes beyond a convenient biological metaphor or the

anthropomorphism of lab animals. The cloned near-humans seem to have thrown a monkey wrench at a cultural system of graduating humanity.

In post-Mao development, Chinese biopolitics centers upon improving the quality (*suzhi*) of the population (*renkuo suzhi*), as expressed in the slogan, "Healthy birth, nurture, quality education." The key feature of *suzhi* is the embodiment of *potentiality* for acquiring new kinds of skills, a self-improving capacity that families are responsible for cultivating in their children. Anthropologist Ann Anagnost has argued that migrant workers—despite having built China's impressive cities—are considered low value (*mei suzhi*) compared to middle-class babies whose parents have carefully invested with modern skills.²⁹ *Suzhi*—especially attributes of cultural and human capital—has become an urban code for valuing and devaluing individuals and groups in neoliberal times.

In the new animal labs, different kinds of near-humanness are eerily juxtaposed.

Therefore, with scientific advancement, different notions of near-humanness converge: low-value actual humans who are foundational to China's economic rise, on the one hand, and high-value primates that are novel technological equipment on the other hand. For instance, poorly paid human-worker tool animals care for the highly prized cloned tool animals in primate facilities. But will lab primates, thanks to liberalist bioethics, enjoy more ethical claims than human near-humans?

After all, Zhongzhong and Huahua have been mascot-ized as figures of Chinese life sciences. Now, creatures made through cloning rather than through sexual reproduction can be dealt with as things rather than beings. Yet, these cloned macaques are multiply constructed creatures, as animal models, as intellectual property, and, perhaps, as novel kinds of beings (with subjectivity). Researchers not only hold their legal custody but also need to protect, care, and follow ethical standards in order to ensure the viability of future NHP research. So, what obligations do Chinese scientists owe their strange offspring, liminal entities existing between lab tools and living beings? Dr. Poo, of the lab that created the clones, compared Zhongzhong and Huahua to junior members embedded within the filial chain of kinship.³⁰ Animal labs hold in proximity the bio- and necro-politics of "tool" life; science paternalism invokes Confucian ethics to absolve the bringing of these precious creatures to life and subsequently sacrificing them for the well-being of the human collective. Sacrifice of life is the highest expression of filial piety.

In the next case, gene-editing also raises uncomfortable questions about ethics, as near humanness works through the proximate bodies of humans with and without suzhi.

CRISPR Babies: From Near to Designer Humans?

The next year, the science world woke up to the news of another first in China's genomic science. He Jiankui announced that he had created the world's first known genetically modified babies, using CRISPR tools.³¹ Gene-editing, a technique to modify the genomes of living organisms, is a consequential innovation: to fight off attacks by viruses like SARS-CoV-2, to discover underlying mechanisms of cancer, and to edit human germ lines. By thus "correcting" the genome, it can intervene into human evolution.

In many ways, He seemed a poster boy of Chinese bioscience: US-trained in the latest biotechnologies, a recipient of state funding, and a reveler in the spirit of entrepreneurial science. He trained in genetic sequencing with Michael Deem at Rice University, receiving his PhD in 2007. As a postdoctoral researcher with Stephen Quake at Stanford University, He learned the Cas9 gene-editing technique, which acts like molecular scissors to cut and insert specific genes to prevent or cure diseases. Upon returning to China, He opened a lab at the Southern University of Science and Technology in Shenzhen. This high-tech city had won state funding from the Thousand Talents (*qian ren jihua*) project and grown into a biomedical hub. He received 40 million RMB from the city and founded Direct Genomics with his US contacts.

Initially, the Chinese reception of He's gene-edited babies was rapturous. On November 26, 2019, *The People's Daily* released a report trumpeting the "first HIV resistant twins born in China," only to withdraw the announcement the same afternoon. In much of the Western world, it is illegal to implant a genetically modified human embryo. China does not have such a law, but a 2003 guideline states that the "genetic manipulation of human gametes, zygotes, and embryos for reproductive purposes is prohibited."³² In the brewing global scandal, the Chinese Academy of Sciences condemned He, charging his pre-emptive actions "insane." By breaching national rules and medical ethics in the pursuit of fame and profits, he delivered "a huge blow to the global reputation and development of Chinese science."³³ Southern University, which claimed it did not give approval for the experiment, terminated He's employment and all related research.

He was also met with widespread international condemnation from bioethicists and fellow genomic scientists. More than 300 scientists, including researchers from NIH, MIT, Stanford, Berkeley, Harvard, and the Chinese Academy, released a joint statement stating strong disapproval, raising ethical questions about safety, efficacy, follow-up responsibilities, informed consent, and so on. By December, He was sentenced to three years in jail, on charges of illegally practicing medicine by carrying out human embryo gene-editing intended for reproduction.

When he first completed the experiment, He left a voicemail for colleagues, saying in English, "I'm 70 percent happy and 30 percent uncertain." By alluding to the post-Mao party orthodoxy that Mao was 70 percent correct in his efforts to modernize China, He hoped to shield himself from criticism by implying that despite the risks, his efforts would yield positive results. At a genome summit in Hong Kong, He expressed his pride at what he had done; he had wanted China to have the first CRISPR babies. With mounting criticisms of an experiment that was neither "transparent" nor "medically necessary,"³⁴ He shifted the ethical focus on gene-editing from the procedure to the needs of a stigmatized group.

The son of rice farmers, He presented himself as caught between scientific ambition and the ethical goal of helping HIV-afflicted parents have healthy babies. He claimed that after visiting a village where one-third of the residents were HIV-positive, he became convinced that "they need this protection since the HIV vaccine is not available."³⁵

HIV-infected families are among China's most invisible communities. Ever since the 1990s epidemic, HIV/AIDS had been impugned as a disease of foreigners. Currently, about 600,000 people in China are living with HIV/AIDS, many of whom acquired the virus because of blood-plasma buying and tainted transfusion, a secondary epidemic that was earlier concealed by the authorities.³⁶ HIV/AIDS stigma had been used both to criticize Western cultures and to silence AIDS activists. HIV-infected people—mainly migrant workers and gay men—routinely faced discrimination in employment, health care, social opportunities, and access to marriage.

People living with HIV/AIDS routinely experience harsh economic and health conditions and struggle to have healthy offspring who will not be handicapped in the race to improve their lives. But AIDS/HIV-infected parents are banned from fertility clinics that can provide treatments to wash the virus off sperm, thus reducing transmission from parents to offspring. Furthermore, family planning rules

severely limit the chances of AIDS/HIV parents to have able-bodied children, who, besides being desired for their own sake, promise a form of old-age insurance that few can do without.

In this collision of bioethics and social ethics, He remarked to one of his American mentors, "You mean something as small as this [procedure] is as valuable as my two-year-old daughter?" He reported that while only one of the twin embryos had been successfully edited, the parents wanted to keep both babies, adding that HIV-infected "families should have the loudest voices in this matter."³⁷

He's 70 percent confident his experiment would be lauded, perhaps derived from a belief that he was following health policies requiring families to accumulate vitalism. From his perspective, a point could be made that disadvantaged parents' efforts to improve their DNA's *suzhi* may be a legitimate or even obligatory form of health management, through which to escape unequal embodiments of biological and educational qualities. In his video "'Designer Baby' is an Epithet," He says, "If we can help these parents protect their children, it is inhuman of us not to."³⁸

We can interpret He's 30 percent uncertainty as stemming from his fear of having violated research guidelines. He kept the implantation of the gene-edited embryos secret and forged approval forms at the hospital where the twins were born. In seeking consent forms from HIV-infected parents, He could have glossed the experiment as an AIDS-vaccine trial. At the Chinese hearing, some of the parents later reported that he did not inform them about the medical risks of gene-editing, but others wrote that they were aware of the risks of failure. One said, "We wanted to contribute to science and at the same time, wanted a healthy baby."³⁹

One need not agree with He's action—sparked by a heady mix of entrepreneurial science, patriotic opportunism, and humanistic concern—to note that the ethics of genetically engineering of humans worldwide is unstable and evolving. Currently, the gene-editing of embryos is taking place for research purposes in lab settings in the United Kingdom, Europe, and the United States, but for now, it is still illegal to implant genetically modified human embryos. In line with global standards, China is drafting new rules for governing "high-risk" biotechnology. But this does not mean that, in a volatile future, the Chinese regime of vitalist governance will not permit gene-editing to assist human reproduction.

Internationally, we seem to be at a moment when the bioethics of germline editing, with its individual focus, and biopolitics, with its collective characteristics, merge. Nobel laureate Craig Mello mused that if one day scientists have the capability to cure disease with perfect success rates, it may be unethical to not do it. Are they supposed to believe that the suffering of patients is ethical?⁴⁰ The International Commission on the Clinical Use of Human Germline Genome Editing concedes that some countries might eventually conclude that human genome editing in embryos is acceptable under some circumstances, such as preventing lethal disease. The president of the US National Academy of Medicine, Dr. Victor Dazao, noted that "some decisions may be culture-dependent." At Berkeley, Dr. Jennifer Doudna, one of CRISPR's inventors, said, "To me, the big question is not will this ever happen again. I think the answer is yes. The question is when, and the question is how."⁴¹ Globally, scientists are fiercely competing to achieve scientific breakthroughs in human genome editing.

Concluding Remarks

It is ironic that an ascendant state that abhors uncertainty is proliferating risky experiments that further unsettle borders between nonhuman primates and humans, cloned and actual life, the human and near-human, the national and the international.

As a technological powerhouse, the Chinese state considers the life sciences to be essential to its rise. Overseas-trained scientists mediate the gaps in biological resources, research, regulation, and ethics between the global and domestic levels. It is not yet clear whether the Chinese breakthroughs—cloning lab primates and gene-editing humans—will lead to the intended results in life sciences. Animal models rarely predict the effects of drugs on humans. An MIT review judged He's CRISPR experiment a failure.⁴²

But emerging at geographic and ethical borders, such edge cases have mutated techniques, ethics, and priorities that shape the human and the biological.

For instance, Chinese innovative tweaks and leaps test international opinions about what risks might be acceptable relative to potential benefits in cosmopolitan science. The Chinese cases also illustrate, perhaps more vividly than others, that science compels us to constantly experiment with living forms, and the only constant state is contingency.

Finally, I have illuminated how we transfer future uncertainty into the present as a state of exception. Each site will catalyze specific interventions into the unknown future, *perhaps* guided by what's achievable and necessary—perhaps not. Each milieu produces its situated sense of controlling the future, while at the same time altering the present to produce, in turn, other contingent futures which must be dealt with in turn. There is no doubt, however, that with the Chinese innovations, we are shifting from an ideal of a global science commons toward an emerging landscape—simultaneously networked and fractured—that foretells a possible future of the life sciences.

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¹ Aihwa Ong, *Fungible Life: Experiment in the Asian City of Life* (Durham, NC: Duke University Press, 2016). See also A. Ong and Nancy N. Chen, eds., *Asian Biotech: Ethics and Communities of Fate* (Durham, NC: Duke University Press, 2010).

² Michel Foucault, *Security, Territory, Population: Lectures at the College de France 1977-1978*, ed. M. Senellart, trans. G. Burchell (New York: Palgrave Macmillan, 2007), 11.

³ Ian Hacking, *The Taming of Chance* (New York: Cambridge University Press, 1990).

⁴ Stephen J. Collier and Andrew Lakoff, "Vital Systems Security: Reflexive Biopolitics and the Government of Emergency," *Theory, Culture, and Society* 32, no. 2 (2015): 19–51; Andrew Lakoff, *Unprepared: Global Health in a Time of Emergency* (Berkeley: University of California Press, 2017); and Limor Samimian-Darash, "Governing Future Potential Biothreats: Toward an Anthropology of Uncertainty," *Current Anthropology* 54, no. 1 (February 2013): 1–22

⁵ Niklas Luhmann, *Observations on Modernity* (Stanford, CA: Stanford University Press, 1998).

⁶ Frédéric Neyrat, "The Birth of Immunopolitics," *PARRHESIA*, no. 10 (2010): 31–38

⁷ Recent Chinese history indicates that the very fear of instability has ironically fueled flexible strategies that capitalize on extreme conditions of uncertainty. In the late 1970s, the systemic failure of a planned economy prompted the state to unleash unbridled entrepreneurialism. Breaking with communist dogma, Deng Xiao Ping famously proclaimed, "It doesn't matter whether the cat is black or white as long as it catches mice." An unprecedented mix of central planning and neoliberal risk-taking eventually

launched China's rise as the world's second largest economy. See Aihwa Ong, *Neoliberalism as Exception: Mutations in Citizenship and Sovereignty* (Durham, NC: Duke University Press, 2007); and A. Ong, "Introduction," in *Privatizing China, Socialism from Afar*, ed. Li Zhang and A. Ong, 1–19 (Ithaca, NY: Cornell University Press, 2008), 9.

⁸ For a definition of "sheer life" as life stripped of social protections by the state, see Stephen J. Collier and A. Lakoff, "Regimes of Living," in *Global Assemblages: Technology, Politics and Ethics as Anthropological Problems*, ed. A. Ong and S. Collier, 22–39 (Malden, MA: Blackwell, 2005), 29. Collier and Lakoff were, of course, critically engaging with Giorgio Agamben, *Homo Sacer: Sovereign Power and Bare Life* (Stanford, CA: Stanford University Press, 1998).

⁹ Pat O'Malley, "From Risk to Resilience: Technologies of the Self in the Age of Catastrophes," *Carceral Notebooks* 7 (2011): 41–68. O'Malley notes that radical uncertainty justifies preemptive action such as "the development of risk strategies variously attempts to create domains of certainty out of uncertain futures" (54).

¹⁰ In 2000, the Gates Foundation was established with an interest in finding biomedical innovations against infectious diseases and ways to deliver the interventions to poor countries, thus providing the core of what has been called "global health." Bill Gates later said, "But it is really a government thing, just like the defense budget is there to help with an outbreak of war." See B. McKay, "Bill Gates Regrets the World Didn't Prepare for Covid-19," *Wall Street Journal*, May 12, 2020, A1, A9.

For the notion of a stateless global health, see Tobias Rees, "Humanity/Plan; or, On the 'Stateless' Today (Also Being an Anthropology of Global Health)," *Cultural Anthropology* 29, no. 3 (2014): 457–78, <https://doi.org/10.14506/ca29.3.02>. For a discussion of how "global health" was framed, see Andrew Lakoff, *Unprepared: Global Health in a Time of Emergency* (Berkeley: University of California Press, 2017).

¹¹ Ong, "Introduction: An Analytics of Biotechnology and Ethics at Multiple Scales," in A. Ong and Nancy N. Chen, eds., *Asian Biotech: Ethics and Communities of Fate* (Durham, NC: Duke University Press, 2010), 1–51.

¹² Ong, *Fungible Life*, chap. 8, "Viruses Don't Carry Passports," 174–196. Also see Lyle Fearnley, *Virulent Zones: Animal Disease and Global Health at China's Pandemic Epicenter* (Durham, NC: Duke University Press, 2020).

¹³ In 2018, *The People's Daily* endorsed President Xi's continuing leadership as a "guarantee that China will finish the building of a moderately prosperous society in all respects by 2020, basically achieve modernization by 2035, and grow into a great modern socialist country in every dimension by mid-21st century."

"Incorporation of Xi Jinping Thought into Constitution Conducive to National Rejuvenation," *People's Daily Online*, February 26, 2018, <http://en.people.cn/n3/2018/0226/c90000-9430280.html>.

¹⁴ Chinese "socialist ecological civilization" also aligns the survival of state socialism with the macro-management of the weather system. See Jerry C. Zee, "Machine Sky: Social and Terrestrial Engineering in a Chinese Weather System," *American Anthropologist* 122, no. 1 (March 2020): 9–20.

¹⁵ Li Nan, Li X, and Cui X, "Xi Jinping on Innovation, Entrepreneurship and Creativity," *Beijing Review*, March 3, 2019, http://www.bjreview.com/Nation/201903/t20190311_800161250.html.

For an American wake-up call, see James McGregor, *China's Drive for Indigenous Innovation: a Web of Industrial Policies* (Washington, DC: Global Innovation and Policy Center, 2010), <https://www.theglobalipcenter.com/chinas-drive-indigenous-innovation/>.

¹⁶ Aihwa Ong, "Introduction," *Asian Biotech*.

¹⁷ Susan Greenhalgh, "The Good Scientists and the Good Multinational: Managing the Ethics of Industry-Funded Health Science," in *Can Science Save China?*, ed. S. Greenhalgh and Li Zhang (Ithaca, NY: Cornell University Press, 2020).

¹⁸ Nancy N. Chen, "Feeding the Nation: Chinese biotechnology and Genetically Modified Foods," in *Asian Biotech*, 81–92.

¹⁹ Ong, *Fungible Life*.

²⁰ Paul Honess, "A Brief History of Primate Research: Global Health Improvements and Ethical Challenges," *Archives of Medical and Biomedical Research* 2, no. 4 (2015): 151–7, doi: 10.4314/ambr.v2i4.7. 152

²¹ Liu Wei and Luo Zhen, "China Focus: Macaque Cloning Breakthrough Offers Hope against Human Illnesses," *Xinhuanet*, January 1, 2018, http://www.xinhuanet.com/english/2018-01/25/c_136921949.htm.

²² Xin Hao, "Monkey Research in China: Developing a Natural Resource," *Cell* 129, June 15, 2007, 1033.

²³ "Interview with Piu Chan, MD PhD—Founder and President of Wincon China," Pharma Boardroom, June 22, 2013, <https://pharmaboardroom.com/interviews/interview-with-piu-chan-md-phd-founder-and-president-of-wincon-china/>.

²⁴ The Association for the Assessment and Accreditation of Lab Animal Care International (AAALAI). See "Interview with Piu Chan."

²⁵ But nowhere is brain disease cure or treatment emerging or cancer and immunological treatment coming out. It is basic research in the name of health; these are all goals that may be achieved.

²⁶ Liu and Luo, "China Focus: Macaque Cloning Breakthrough."

²⁷ Mel Y. Chen, *Animacies: Biopolitics, Racial Mattering, and Queer Affect* (Durham, NC: Duke University Press, 2012).

²⁸ Hao, "Monkey Research in China," 1035.

²⁹ Ann Anagnost, "The Corporal Politics of Quality (*Suzhi*)," *Public Culture* 16, no. 2 (Spring 2004): 189–208.

³⁰ Poo said, "We are very aware that future research using non-human primates anywhere in the world depends on scientists following very strict ethical standards." Liu and Luo, "China Focus: Macaque Cloning.

³¹ CRISPR (clustered regularly interspaced short palindromic repeats) is part of the immune system of bacteria. It captures an invader's DNA and integrates it into the genome of the bacteria, immunizing it from future attacks. Jennifer Doudna of UC Berkeley and Emmanuelle Charpentier of University of Vienna published a paper in 2012 on how to reprogram one particular CRISPR system, CRISPR-Cas9 (as molecular scissors), to enable the editing of genes. Cas refers to CRISPR-associated proteins. Feng Zhang of Harvard is also a pioneer of Cas9 gene editing.

³² Sui-lee Wee, "Man Who Claimed to Edit Baby Genes Gets Term in Jail," *New York Times*, December 31, 2019.

³³ Wee, "Man Who Claimed to Edit Baby Genes Gets Term in Jail,"

³⁴ "Scientist Defends Gene-Edited Babies," CNN World News, November 29, 2018, video, 2:04. <https://www.cnn.com/videos/world/2018/11/29/gene-edited-babies-alexandra-field-lkl-vpx.cnn>.

³⁵ Ibid.

³⁶ For an account of the state governance of blood donation, see Vincanne Adams, K. Erwin, and Phouc V. Le, "Governing Through Blood: Biology, Donation, and Exchange in Urban China," in *Asian Biotech*, 167–189.

³⁷ Preetika Rana, "Secret Science Made Gene-Edited Babies," *Wall Street Journal*, May 11–12, 2019, A1, 10.

³⁸ In the video "'Designer Baby' is an Epithet." In another video, "Draft Ethical Principles," He begins by saying, "family is the society's bedrock and our children are the center of family life." See Sylvia Yang, "Orderly Disruptions: Returning Genetic Scientists in the Chinese City of Experiment" (MA thesis, Asian Studies, Berkeley, May, 2020), 66.

³⁹ Rana, "Secret Science Made Gene-Edited Babies."

⁴⁰ Osagie K. Obasogie and M. Darnovsky, eds. *Beyond Bioethics: Toward a New Biopolitics* (Berkeley: University of California Press, 2018).

⁴¹ P. Wen and A.D. Marcus, "China Jails Gene-Editing Scientist," *Wall Street Journal*, December 31, 2019. The scientists are echoing the latest position.

⁴² Antonio Regalado, "Why the Paper on the CRISPR Babies Stayed Secret for so Long," *MIT Technology Review*, December 3, 2019, <https://www.technologyreview.com/2019/12/03/75084/nature-jama-rejected-he-jiangkui-crispr-baby-lulu-nana-paper/>.