

Geneticizing Ethnicity: A study on the “Taiwan Bio-Bank”

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Abstract Taiwan as an island country is an immigrant society where interethnic marriages have been common. In the past centuries, it has not been unusual that people in Taiwan change their ethnic identities for various reasons. Its “four great ethnic groups” (*sida zuqun*)—the Hoklo, Hakka, Mainlanders, and aboriginal peoples—exist only as a social construction that arose in the 1990s in a specific political–cultural context. In 2005, a major government-sponsored research project, the Taiwan Biological Sample Bank—or Taiwan Bio-Bank (TBB)—was organized by a group of scientists and physicians. The purpose of the project is to collect genetic data from the “four great ethnic groups” of Taiwan in order to build a national database. This paper has three parts. First, I briefly review how the relationship between genetic attribution and the conceptualization of race/ethnicity has been addressed by social scientists and medical researchers since the mid twentieth century. Secondly, I analyze the history of biomedicine in Taiwan and the social and political context of the formation of the TBB project and its precursors. Thirdly, I examine the TBB’s theoretical and methodological assumptions about race/ethnicity in Taiwan. I point out that the rise of biomedicine since the 1990s has contributed to the “ethnicization of biomedicine,” in the sense that scientists have used dubious ethnic/racial categories with increasing frequency in practicing biomedicine.

Keywords Biomedicine · Taiwan Bio-Bank · Gene · Race · Ethnicity · Identity politics

1 Introduction

Taiwan is an immigrant society where interethnic marriages have been common. Its “four great ethnic groups” (*sida zuqun*)—the Hoklo, Hakka, Mainlanders, and

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aboriginal peoples—exist only as a social construction that arose in the 1990s in a specific political-cultural context.¹ In 2005, a major government-sponsored research project, the Taiwan Biological Sample Bank—or Taiwan Bio-Bank (hereafter TBB)—was organized by a group of scientists and physicians. The purpose of the project is to collect genetic data from the “four great ethnic groups” of Taiwan in order to build a national database.² An ethnic categorization that emerged in the past 15 years or so has been taken for granted in a cutting-edge study.

Focusing on the TBB, I hope to analyze the relationship between the rise of biomedicine and the geneticization of ethnicity in Taiwan by tracing the increasingly intimate ties between genetic discourse and the conception of the four great ethnic groups. My analysis is based mainly on primary data, including such archival records as the “Preliminary Feasibility Report on the Establishment of the Taiwan Biological Sample Bank,” the “Final Report of the National Science Council’s Research Grant Proposal: The Completion of the Taiwan Biological Sample Bank,” “A Research Proposal for a Population Genetic Database for Taiwan: The Minutes of the 24th Academicians’ Meeting,” and the like. I also rely on such secondary sources as newspapers, magazines, and websites, emphasizing materials prepared by scientists themselves.

The paper that follows has three parts. First, I briefly review how the relationship between genetic attribution and the conceptualization of race/ethnicity has been addressed by social scientists and medical researchers since the mid-twentieth century. Second, I examine the history of biomedicine in Taiwan and the social and political context of the formation of the TBB project and its precursors. I argue that the development of biomedicine based on the new genetics has been contingent on the convergent effects of Taiwan’s particular ethnic politics, state hegemony, medical power, and relation to globalization. Third, I examine the TBB’s theoretical and methodological assumptions about race/ethnicity in Taiwan. I point out that the rise of biomedicine since the 1990s has contributed to the “ethnicization of biomedicine,” in the sense that scientists have used dubious ethnic/racial categories with increasing frequency in practicing biomedicine.

It is still early days for the TBB, which is (at the time of writing) in the midst of its pilot study and has not yet reached the laboratory stage. But it is important not to postpone an examination of how the project has been shaped politically and culturally and to point out its potential unintended social consequences. I argue that the TBB, meant to identify the definitive genetic markers of human similarity and difference, opens up new possibilities for the essentialization of ethnicity—even though biomedical scientists presumably do not mean to provide grist for ideological or political debates. This project, I argue, would make a significant contribution to the construction of Taiwanese identity politics by encouraging the view that Taiwanese people as a whole are genetically unique. My analysis of the TBB case

¹ During the postwar period, the ethnic categorization of Taiwan’s population was based on the “original domicile” system. Derived from this criterion, the distinction between “local Taiwanese” and “mainlanders” has shaped the subsequent political and cultural dynamics. The original domicile system was abolished after major institutional changes in the early 1990s, and the classification of the “four great ethnic groups” has largely replaced it. Still, the old distinction between local Taiwanese and Mainlanders lingers.

² See Shen et al. (2007). Also see the web page about The Preliminary Project of the Establishment of Taiwan Biological Sample Bank. Available at <http://www.twbiobank.org.tw> (retrieved April 23, 2010)

shows that at a specific social and historical moment science and politics may be mutually constitutive. A laboratory project like the TBB may be built atop politically and culturally loaded conceptions that invalidate all claims to scientificity. When those involved make theoretical and methodological assumptions about the “four great ethnic groups,” they neglect the problematical history of Taiwanese society, particularly the long series of clashes over ethnic politics. Unless biomedical scientists address these complicated issues by drawing on findings from the social sciences, their project may come to serve as the unreliable foundation for dubious cultural and political causes.

2 Genes, Race, Ethnicity, and Identity Politics

Biomedicine and biotechnology have developed rapidly since the late twentieth century. The Human Genome Project initiated in 1990 by the US Department of Energy and the National Institutes of Health was a significant moment. In the 2000s, scientists announced the first working draft sequence of the entire genome, and by April 2003 the project was complete. Since then, many countries have set about building national human genetic databases. Such projects, which involve vast numbers of genetic samples categorized by racial and ethnic labels, have brought about changes in contemporary identity politics.

First of all, *it has become increasingly difficult to distinguish the concept of race from that of ethnicity in biomedical and medical studies.* A bit of context is necessary here. In the humanities and social sciences, the notion of race was replaced by the concept of ethnicity in the 1960s. Ethnicity accounts for human variations in culture, traditions, language, social patterns, and ancestry, while the discredited idea of race pictured a humanity divided into fixed, genetically determined, biological types (Ashcroft et al. 1998). Since the 1980s, there has been concern about a possible revival of genetic and biomedical research based on racial or ethnic categories, which would take for granted the discredited yet resilient idea that such groups have essential, biological, and immutable characteristics. In some cases, the use of ethnic categories simply served as a cover for familiar racial criteria (such as skin color), racial categories (such as continental groups), and racial labels (such as Caucasian) (Smart et al. 2008a). When biomedicine began to develop rapidly, these two concepts have been increasingly lumped together. Their conceptual borderline has been blurred.

Can genes account for racial or ethnic differences? It depends on who you ask: the conceptualizations of race and ethnicity in the social sciences differ markedly from discussions in the medical field. In 1998, the following statement was adopted by the American Anthropological Association: “With the vast expansion of scientific knowledge in this century, however, it has become clear that human populations are not unambiguous, clearly demarcated, biologically distinct groups. Evidence from the analysis of genetics (e.g., DNA) indicates that most physical variation, about 94%, lies *within* so-called racial groups. Conventional geographic ‘racial’ groupings differ from one another only in about 6% of their genes” (American Anthropological Association 1999: 712–13). The statement is representative of the prevailing view in the contemporary social sciences. Many social scientists have questioned the

assumption that race is a scientific or objective reality, contending that it is forged from the discourses of politics, society, and history (Goodman 2000; Duster 2004, 2005; Schwartz 2001). However, as Alan H. Goodman (2000) points out in his article “Why Genes Don’t Count (for Racial Differences in Health),” genetic variation continues to be used to explain alleged racial differences. Goodman shows that such explanations require the acceptance of two disproved assumptions: that genetic variation explains disease, which is a form of geneticization; and that genetic variation explains the group pathologies, which is a kind of racialization and scientific racism. A methodology that exaggerates the salience of “race” can ignore other potential causes of disease.

Some biomedical and medical researchers believe that gene frequencies cluster by continent, supporting the definition of race based on continental origins. Moreover, they contend that people share a significantly larger number of human leukocyte antigen types with members of their own ethnic or racial group (Burchard 2005). By contrast, some scientists, such as Raj Bhopal and Liam Donaldson, argue that it is time to abandon race as a variable in public health (Buehler 1999). A 1998 manifesto by Mindy Fullilove that appeared in the *American Journal of Public Health* recognizes the salience of race to personal identity but calls for the abandonment of race as a formal variable in public health. Another journal, *Archives of Pediatrics and Adolescent Medicine*, announced a new policy in 2001 that required that authors not “use race and ethnicity when there is no biological, scientific or sociological reason for doing so” (Epstein 2007: 207–8). Similarly, Francis Collins (2004:13–15), the director of the National Human Genome Research Institute, wrote, “Race and ethnicity are poorly defined terms that serve as flawed surrogates for multiple environmental and genetic factors in disease causation. [. . .] Research must go beyond these weak and imperfect proxy relationships to define the more proximate factors that influence health.”

In newly developed bio-bank projects, the concepts of race and ethnicity usually intertwine. Taking the United Kingdom Bio-Bank as a case study, Andrew Smart et al. (2008a) showed that the ethnic group traits that researchers tend to assume rarely square with the traits that may be relevant to biomedical science (including genotypic, phenotypic, sociocultural, and socioeconomic characteristics). There is no consensus about what race and ethnicity mean and how they can be operationalized (Ellison et al. 2007). No one has satisfactorily addressed the operational problems raised by the collection of ethnicity data in bio-bank studies. Indeed, bio-banks could create problems for ethnic groups by emphasizing alleged differences among such groups and thus essentializing them (Chadwick 2003). This important issue remains relatively under-researched.

The second major effect that contemporary research on the human genetic profile has had on identity politics is *the increasing potential that biomedicine has to facilitate the biological expression of social identity and difference*. A number of social scientists have emphasized that novel biomedical techniques make new identity formations possible (Epstein 2007; Reardon 2005; Sleeboom-Faulkner 2006; Atkinson et al. 2007). Scholars have begun to speak of a “geneticization of identity” (Heath et al. 2004). This applies to such existing categories as race, ethnicity, and even national identity. For example, DNA may be regarded as a national resource and a repository of national characteristics; the genomic revolution has furnished potent resources for the expression of nationhood and shared origins.

In the same vein, the idiom of genomics can provide a potent resource for the expression of social differences (Atkinson et al. 2007). Bob Simpson (2000) takes Iceland’s biogenetic project, DeCode, as an example of the geneticization of ethnicity. Arnar Arnason and Simpson (2003) trace how the images and metaphors drawn on by Icelanders on all sides of the debate furnish a biogenetic language for conceiving of the link between contemporary identity and the past. DeCode locates the essence of “Icelandicness” in the very building blocks of people’s bodies, offering novel ways of contemplating and asserting identity. This project has achieved a significant public reactions victory by highlighting features of the past that supposedly make Iceland uniquely appropriate for the development of the database.

Facilitating the biological expression of social identity and difference, biomedicine has significant potential to change identity politics at the local level. How bio-banks are involved in the process of ethnic categorization, to the extent that they may also be involved in the evolution of identity politics in different countries, has been a topic of interest (Arnason and Simpson 2003). This topic, however, like the racialization of ethnic difference in bio-bank projects, remains under-investigated.

Focusing on the case of the TBB, I examine how socially constructed ethnicity is essentialized—if not racialized—and what effect it may have on ethnic politics in Taiwan. I hope to shed light on the complicated and intriguing relationship between genetic discourse and racial/ethnic construction in particular, and between science and politics in general.

3 Context and Development: The Taiwan Bio-Bank and Ethnic Politics

3.1 The early Development of Biomedicine in Taiwan: National Economic Transition and Global Influence

In the 1980s, the government of Taiwan began to support the development of biotechnology. Within a decade, genetic research had achieved remarkable vigor, partly as a result of institutional support from the Executive Yuan, the National Science Council, and the Department of Health. In the 1990s, the focus was on basic and clinical research. Beginning in 1996, the Executive Yuan and the National Science Council cooperated on a project called the Advanced Research in Genetic Medicine and Sanitation Plan (ARGMSP). The phrase “advanced research” indicates the specific level of importance assigned to the plan: a lack of commercial interest kept the government from making it a national project.

But after the Executive Yuan held five meetings on biotech industry strategy in 1998, the National Science Council recommended that the ARGMSP be promoted to a national program. Four years later, a National Research Program for Genomic Medicine (NRPGM) was inaugurated under the auspices of the Ministry of Economuc Affairs, the National Science Council, and the Department of Health. Its goal is the use of human genomic knowledge to give Taiwanese medical research a competitive edge.

The birth of this ambitious program shows that the state had made a commitment to playing a more active role in facilitating a genetic discourse, formulating related

policies, and organizing research. Furthermore, with the emergence of a global political economy in which biomedicine promises to play a hugely profitable role, such a program may reap significant economic returns on investment. The formation of the NRPGM speaks volumes about the changing national interest in an era of globalization.

Science and technology development in Taiwan may be divided into two stages: a labor-intensive stage from 1952 to 1985, and after that a technology-intensive stage (Council for Economic Planning and Development and Executive 2007). The production of electronics and computer components drove the “Taiwan miracle” over the past two decades. Since the mid-1980s, government support for science and technology and technology-intensive industries has increased. Expectations have been high that biotechnology and biomedicine could become the next engine of Taiwanese economic growth. In 2005, after the NRPGM had decided to establish the TBB, the *Formosan Journal of Medical Humanities* showed its support: “To ensure progress both economic and technological, Taiwan needs a new direction. The computer industry has brought it much wealth in recent years, yet Taiwan cannot depend solely on that, so a new industry has been targeted—biotechnology. In order to qualitatively fortify Taiwan’s bioresearch, a bio-bank seems to be indispensable.”³

The formation of the NRPGM, and the later establishment of the TBB, shows the government’s commitment to repositioning the national economy during a time of intense international scientific, technological, and economic competition.

3.2 From Disease Research to the National Human Gene Bank

On July 3, 2000, Academia Sinica, Taiwan’s leading research institute, convened its 24th academicians’ meeting, and academician Zhuang Ming-Zhe proposed the establishment of a “genetic database for Taiwan” based on cooperation among Academia Sinica, concerned national agencies, schools, and local and foreign experts. With strong support from Academia Sinica’s Biology Division, the motion was revised and passed by majority vote.⁴

Academia Sinica has long played a pivotal role in the formulation of national technology policy and scientific research. In particular, Lee Yuan-Tseh, who was awarded the Nobel Prize in Chemistry in 1986 while working in the USA, subsequently returned to Taiwan to head Academia Sinica; he has become the most influential figure in the advancement of the island’s biotechnological aspirations.

The concepts of race and ethnicity were discussed in the initial stages of developing a Taiwanese bio-bank. Zhuang, the driving force behind the project, explained that genetic data collection would be a large interagency project and that samples for the bank would be taken only from willing participants. He also made it

³ See the journal editor’s introduction to this issue, “The debate of establishing a Taiwan biobank” (*The Formosan Journal of Medical Humanities*, 1/2 (2006)).

⁴ The proposed work included: (1) a conference of Taiwanese scientists, physicians, and ethicists to plan; (2) a genetic population database comprising permanent DNA samples from all Taiwanese who agreed to participate; (3) the database was to be available to qualified researchers to study (a) the effects of gene variation on Taiwanese health, (b) the effects of gene variation on response to medication, and (c) the genetic relationship between Taiwanese and other groups; (4) project members were to educate the Taiwanese public about the genetic contribution to health and well-being (5) and to study ethical issues raised by a population genetic database and its impact. See Zhuang Ming-Zhe 2000.

clear that *a certain number of samples would be taken from each of Taiwan’s ethnic groups, proportionate to its share of the population* (Yang 2000).

This announcement provoked mixed reactions. At the 24th academicians’ meeting, there was concern about the potential for “racial discrimination.” Some academicians pointed out that genetic data might be used to argue that one racial group had a biological edge over another. Academician Jacqueline Whang-Peng reminded her colleagues that the term “race” was itself contentious; she suggested “individual differences” as an alternative (Zhang 2000b). Yang Chen-Ning, a 1957 Nobel laureate in physics, brought attention to the sensitive nature of discussions of alleged racial differences based on genes, and he asked the members of the biology division to explain how large the genetic differences among human populations were. In response, Wu Kun-Yu, who was to serve as the chief of the ARGMSPP, insisted that the genetic database should be used only for disease research, not for ethnic studies, in order to steer clear of the thorny issue of race and political dispute (Yang 2000).

On July 4, 2000, the day after that meeting, Taiwan’s major newspapers ran prominent stories about the proposed genetic database; the headline in the *China Times* read “Whose Genes Are Representative of the Taiwanese People?” Some journalists had evidently sensed the danger of applying ethnic categories to the study of Taiwan’s genetic profile (Zhang 2000a). In spite of some concerns, the proposed genetic database had been approved during the meeting. Since that date, the project of building a genetic database, with the support of government, has moved ahead and a particular, though untenable, way of imagining Taiwan’s ethnicity has shaped the TBB research design.

3.3 A Project in Progress: Identity Politics and the Taiwan Bio-Bank

Since 2000, Taiwan’s national policy has shifted from emphasizing disease-based research to focusing on population-based research. Many of the scientists working on the TBB have embraced the concept of “four great ethnic groups,” itself a novel idea that dates from the early 1990s.

Perhaps we should not be surprised that the genetic distinctness of the Taiwanese people has become the focus of their discussion, as the popular conceptual framework of ethnic groups has the potential to help construct a distinct Taiwanese identity. The database project is connected to a broad set of cultural and political transformations that have accompanied the emergence of Taiwanese identity over the last three decades or so. In order to examine how recent trends in identity politics have shaped the conceptual framework of the TBB project, it is essential to understand the political changes of the past century.

A part of the Qing Empire until 1895, Taiwan was ceded to Japan after China’s defeat in the Sino-Japanese War. The Xinhai Revolution, led by Sun Zhongshan, overthrew the Qing in 1911, and the Republic of China was established in 1912. The Chinese Nationalist Party (also known by its Chinese name, Guomindang), which was founded in 1919 and traced its origins to several political organizations founded by Sun, was led by Jiang Jieshi after Sun’s death—it became the ruling party of China. After Japan lost the Second World War in 1945, Taiwan was reclaimed by the Republic of China. In 1949, the government of the Republic of China, controlled by the Nationalists, took refuge in Taiwan after it lost a civil war against the Chinese Communist Party. From then on, the Republic of China presented itself as the

legitimate government of China. Taiwan, the Republic of China, and the Nationalist Party, effectively coterminous, were known in the international press as Free China. In 1971, Taiwan was forced to withdraw from the United Nations as the communist People's Republic of China supplanted it as the formal representative of China. Since then, Taiwan has been vexed by the problem of international recognition.

During nearly 40 years of single-party rule, from 1949 to 1987, Taiwan experienced the most protracted period of martial law in the world. Political opposition was ruthlessly suppressed. Then, in 1986, the Democratic Progressive Party was established, and the era of multiparty politics had begun.

Since the 1990s, China has maintained its claim to sovereignty over the territory of Taiwan. At the same time, China has tried to isolate Taiwan's government, keeping it off the international stage. This island country has been marginalized in the global community because of this pressure. During the same period, democratic institutions have developed rapidly. In 1996, Taiwan carried out its first direct presidential election. Four years later, the election was won by the Democratic Progressive Party, a feat repeated in 2004. This represented a significant consolidation of the "indigenization" or "Taiwanization" of politics and culture (Makeham and Hsiau 2005). Over time, more people have come to identify themselves as Taiwanese rather than as Chinese, and a majority of the island's population now believes Taiwan should have a distinct political status instead of being seen as part of China.⁵

The development of the study on the particular genetic makeup of the Taiwanese people is intimately connected with an attempt to redefine who they are. In the initial proposal, Zhuang submitted to the Academia Sinica meeting in July 2000, he emphasized: "*Here are several potential uses of a Taiwanese Human Genetic Database. It would help us learn more about the population's genetic structure, the migration history of Taiwan, and the degree to which Taiwanese are genetically similar to and different from other Asian populations. [. . .] Because there is no assurance that markers discovered in Western populations will also show variability among Taiwanese, specifically Taiwanese studies are needed*" (Zhuang 2000: 3; emphasis mine).

Another Academia Sinica scholar, Chen Jian-Ren, had a similar view: "Taiwan's population is diverse and significantly different from Chinese around the world, as well as from Europeans; a national genetic bank would help Taiwan discover these differences and facilitate linguistic, cultural, and 'national' research" (Yang 2000: A4). When the draft proposal for the TBB was being drawn up, Chen Yuan-Tsong and

⁵ According to a series of surveys conducted by the Center for the Study of Elections at National Chengchi University, during the period 1992–2007, Taiwanese national identity underwent a dramatic transformation. The number of those who identified themselves as Chinese decreased while the number of those who identified themselves as purely Taiwanese rose from 17.3% to 43.7%. The survey conducted in June 2007 shows that 45.8% of interviewees identified themselves as both Taiwanese and Chinese. But while 5.5% identified themselves as exclusively Chinese, 43.7% declared themselves exclusively Taiwanese. Another index, attitudes toward Taiwan's political future, also showed a significant change from 2001 to 2007. In general, there was an increase in the number of those who support Taiwan's political independence: from 28.1% in 2001 to 44.7% in 2007. The number of those who wished to preserve the status quo rose from 32.1% to 34.9%. By contrast, the number of those who supported the idea that Taiwan should be reunified with China declined from 20.0% to 14.4%. See the web page about Changes in the Taiwanese/Chinese Identity of Taiwanese (1992–2007). Available from <http://esc.nccu.edu.tw/>. (Retrieved on April,23,2010)

Shen Chen-Yang, two leading members of the TBB from the Institute of Biomedical Sciences, Academia Sinica, sent a letter to the editor of a newspaper. They tried to convince the public by setting out the merits of a national genetic database:

The genetic inheritance of the Taiwanese people is unique; lifestyles and risk factors for disease differ from country to country. Therefore, we hope to build a biological database for Taiwan to look into the factors causing common chronic disease in Taiwan and to understand the impact of the interaction among genetic and environmental factors on such diseases in order to establish effective treatments and preventive strategies to safeguard the health of Taiwan’s people. Because Taiwan’s social environment is unique, this major research project will be relevant to our national biomedical development and the well-being of all citizens several decades from now. (Chen and Shen 2006: A15; emphasis mine)

The emphasis on the genetic uniqueness of the Taiwanese people and on the potential contribution of the TBB has been repeated in a variety of project drafts and reports. In “The Taiwan Bio-Bank Project: For the Health of Future Generations”, an article published in English on *Academia Sinica E-News* in 2007, Shen et al. emphasized that “the Taiwan Bio-Bank plans to use prospective cohort studies based on ethnicity (population-based) that will help determine the effects of the environment or the gene alone and of gene–gene interactions and gene–environmental factor interactions in common diseases. [. . .] The ethnicity of Taiwan is unique and the Taiwan Bio-Bank can be expected to develop into the supply center for a Chinese database” (Academia Sinica 2007).⁶

It would be a mistake to ascribe the support for the TBB exclusively to the desire to reconstruct Taiwanese identity, to carve a niche for Taiwan in the arena of global politics, but the long-standing problem of international recognition has affected how social agents think about their existence, identities, and actions. Claims made by Zhuang, Chen, and Shen suggest that one of the main impetuses behind the call for establishing the TBB project is the desire of an internationally marginalized country to claim its own identity and niche, both domestically and internationally.

⁶ It has to be noted that although those scientists who support the establishment of the TBB have emphasized the genetic uniqueness of the Taiwanese people and the possible difference between Taiwanese and Chinese genetic inheritance, in some contexts their arguments may be confusing. Just consider Shen’s suggestion that “the Taiwan Bio-Bank can be expected to develop into a reservoir of Chinese (華人) genetic data.” The following newspaper report, taken from the March 19, 2005, issue of *Ziyou shibao*, exemplifies the potential problems: “Since genes possess specificity and vary according to human populations, the Taiwanese people cannot rely on other countries to do the research for us. The genetic inheritance of the Taiwanese people and geographic location are unique. Furthermore, our national health insurance maintains health records. The project has the potential not only to establish a center for a Chinese genetic database based on Taiwanese people, but also to develop the first Chinese genetic database in the world” (see Guo 2005). It might be argued that the TBB scientists emphasized the genetic distinctness of the Taiwanese people as well as the importance of establishing “a center for a Chinese genetic database based on Taiwanese people” to rally popular support, in particular the financial support of the Legislative Yuan, which continued to be controlled by the Guomindang even after the Democratic Progressive Party had nominally taken power. Thus, one may further argue that the TBB project has little to do with identity politics. In any case, highlighting the genetic particularity of the Taiwanese people is possible only in the context of Taiwan’s quest for an international niche.

3.4 An Island of Biomedical Technology and the Taiwan Bio-Bank

In 2005, Taiwan's government announced the goal of transforming the country into "the island of biomedical technology"—at least NT\$15 billion (US\$ 480 million) would be provided. The plan has three parts. The first, a national health information project, will digitize and integrate all health records kept by the Bureau of National Health Insurance and other national programs. The second part is a clinical medical research project. The third part is devoted to the Taiwan Bio-Bank.

To establish a national human genetic database, the Institute of Biomedical Sciences at Academia Sinica would collect and store blood samples and personal information from 200,000 participants aged 30–70. Participants would be chosen to represent the "four great ethnic groups" and would be drawn from three geographic areas. The medical records for the sample group, all kept at the Bureau of National Health Insurance, would be made available to the database team.⁷

This project was divided into three stages. From September to December 2003, a preliminary feasibility study was executed by the Institute of Biomedical Sciences. From August 2005 to July 2007, a second feasibility study was conducted; it was sponsored by the National Science Council and carried out by the Institute of Biomedical Sciences. The plan was to collect blood samples from 1,032 subjects in Jiayi, a city of 75,000 people in the island's southwest. Since December 2005, scientists have been carrying out the Preliminary Plan for Establishing the Taiwan Biological Sample Bank; work is scheduled to conclude in October 2010. They hope to have compiled 15,000 samples from three areas, relying on the usual method of encouraging subjects to participate by combining the data collection with health checkups and screenings for seasonal illnesses. The Institute of Biomedical Sciences anticipates that the larger study to follow will be funded by the Department of Health.

From December 2005 to January 2006, the National Research Program for Genomic Medicine, the National Science Council, Academia Sinica, and other groups organized a series of conferences where scientists from the humanities, the social sciences, and medicine discussed the scientific, legal, and ethical aspects of genetic research. All of the panel sessions were recorded on video for public access and free download. On January 10, 2006, the session on "The Human Genetic Database: Collecting and Studying Ethnic Blood Samples" had three keynote speakers—the history professor Fu Daiwie, the legal scholar Liu Hung-En, and the biomedical scientist Shen Chen-Yang. Shen asserted that ethnic background was the most important factor that influenced the genetic attributes and gene-related diseases of Taiwan's population:

If we want to understand how genes influence the diseases of the Taiwanese people, [we must know that] the most important factor that influences the genes of Taiwan's population is clan [*shizu* 氏族], that is, [the distinction between] the Hoklo, the Hakka, the Mainlanders, and the aboriginal people. Different clans probably have different genes. Therefore, if you want to see how genes influence diseases, you have to take a look at people from different

⁷ See the web page about The Preliminary Project of the Establishment of Taiwan Biological Sample Bank. Available at <http://www.twbiobank.org.tw> (retrieved on April,23,2010)

clan backgrounds. Now we hope that we can collect 15,000 examples [i.e., blood samples] from Taiwan's Miaoli County, Jiayi City, and Hualien County within two years, beginning in 2007.⁸

Although Shen, in a more or less casual way, used the concept of clan, a kinship term which in anthropology typically denotes a group of people with genealogical links (real or alleged) to a common ancestor, he definitely revealed that his conceptual framework was the popular "four great ethnic groups."

The design and development of the TBB show that there is an elective affinity between the development of biomedicine and ethnic politics which has been leading to a geneticized conception of ethnicity. As shown above, this affinity is contingent on domestic cultural and political changes and the globalization of biomedicine. A distinct form of Taiwanese identity may emerge as a result of the interaction between ethnic politics and economic interests, either in the local or the global arena. However, the potential negative social effects of the ideas about ethnicity presumed in preliminary discussions of the TBB have sparked ethical concerns. In fact, the TBB scientists are themselves aware of such effects. In the section of the 2008 ethical code of practice for the Preliminary Plan for Establishing the Taiwan Biological Sample Bank (Second Edition) devoted to "informed consent," the genetic study of ethnicity is said to run the risk of "stigmatizing specific human subjects and the groups they represent."⁹ In spite of this admission, the TBB scientists have shown little awareness of the possibility that their own work might benefit from the insights of social science. Moreover, when the Institutional Review Board of Academia Sinica concluded that the TBB postulated ethnicity as a significant variable, it pointedly questioned the conceptual validity of ethnicity and demanded that the project give full attention to the cultural, social, and political implications and effects of its work.¹⁰ Still, the TBB scientists have shown little interest in thinking differently.

For the last decade, the pilot project has repeatedly been criticized by citizens' groups, legal scholars, indigenous peoples, and the media, who have expressed concerns about genetic privacy, informed consent, human rights, matters of law, technology policymaking, and such like (Liao 2000; Chen 2000; Liu 2004, 2005; Chou 2007). However, the adverse effects the project could have as a result of drawing on the socially constructed ethnic categories have been overlooked.

4 The Taiwan Bio-Bank, Ethnicity, and Problems of Methodology

In this section, I examine three epistemological and methodological assumptions about the "four great ethnic groups": (1) Taiwan is ethnically homogeneous, (2) the classification of "four great ethnic groups" is biologically valid, and (3)

⁸ See the web page about The Humns Genetic Database: Collecting and Studying Ethnic Blood Samples, Available at <http://elsi.nccu.edu.tw/lecture2005/index.htm> (retrieved on Dec 12, 2008).

⁹ See the website about The Ethical Code of Practice for the Preliminary Project of Establishing Taiwan Biological Sample Bank (Second Edition), Available at <http://www.twbiobank.org.tw>. (retrieved on Dec 12, 2008).

¹⁰ See the web page about The Preliminary Project of the Establishment of Taiwan Biological Sample Bank, Available at <http://www.twbiobank.org.tw> (retrieved on Dec 12, 2008).

representative numbers of samples should be based on county boundaries. I hope to show that in defining ethnic groups, recent sociopolitical classifications used by the state have played an important role in the perception and formulation of genetic target groups in population genetics. However, historically, relations among various groupings in Taiwan have been subject to drastic change: the groups are relatively porous and interethnic marriages are common. In a settler or immigrant society like Taiwan, which has a high degree of intermarriage and blood mixing, it is difficult to find “pure” blood samples for each of the assumed four great ethnic groups.

Assumption 1: Iceland is an isolated island and comparatively ethnically homogenous. Taiwan is similar to Iceland. If Iceland can establish its DeCode biobank, so can Taiwan.

Fact 1: Taiwan is an immigrant and hybrid society. It is different from Iceland.

From the earliest days of planning the TBB, people assumed a series of resemblances between Taiwan and Iceland. At the Academia Sinica meeting of July 2002, for instance, Zhuang Ming-Zhe argued that the Icelandic experience could be applied to Taiwan (Yang 2000). In 2003, a national newspaper reported:

Academia Sinica is planning to establish a national “Super Control Genomic Database,” making Taiwan the second country after Iceland to collect samples for a large-scale national gene bank. [. . .] Academia Sinica’s Chen [Yuan-Tsong] said that many countries around the world have research programs of this nature, but so far only Iceland has carried out a national referendum to approve the establishment of a national gene bank. He stressed that Iceland’s small population gives it an advantage in this respect, an advantage Taiwan shares, in contrast to United States, where ethnic diversity augments the difficulty of such a program. (Song and Li 2003: A9)

Iceland attracted considerable international attention because of plans to use its country’s population as a resource for establishing the first national genetic database. The project began in 1996. After complex and protracted negotiations, the government awarded the contract for creating this database to DeCode, a biopharmaceutical company based in Reykjavik that is financed primarily by Americans. The company was granted a 12-year exclusive monopoly license (Arnason and Simpson 2003).

Today Iceland’s population is roughly 318,000. The country was settled by a relatively homogenous group of people that has, until recently, lived in relative isolation. So its population is presumably more ethnically homogenous. Furthermore, the Icelandic National Health Service possesses medical records for all its patients dating back to 1915. In introducing the idea of a genetic database, DeCode emphasized that the Icelandic population was uniquely suited to the venture.

A patchwork of different peoples drawn from a wide geographic area, Taiwan differs markedly from Iceland. Bio-bank scientists have neglected—or is it misunderstood?—Taiwan’s complicated history of ethnicity, which I shall now sketch.

1. Taiwan before Han Chinese rule

The ancient history of Taiwan is still largely unknown. Approximately 6,000 years ago, the island was inhabited by aboriginal people whose descendants are still there. By the

time the Dutch colonized Taiwan in the 1620s, they found Han Chinese living there who had crossed from two mainland provinces, Fujian (福建) and Guangdong (廣東). Those who came from Fujian identified with their native prefecture—they called themselves “Zhangzhou people (漳州人)” and “Quanzhou people (泉州人).” These two groups were lumped together and called Hoklo(福佬) or Minnan (閩南), although they spoke different forms of the Southern Min language. Immigrants from Guangdong were primarily Hakka (客家); they too spoke a distinctive language (Hsiao 2000:4).

The population in the southwestern core, under Dutch control, was ethnically diverse. In the 1620s, aborigines made up the majority. There is historical evidence of Han-Aborigine intermarriage early in the Dutch period that could have produced mixed ancestry (Brown 2004:146; Campbell 1903:127).

2. From the Zheng dynasty to Manchu rule (1661–1895)

The ethnic balance of power in Taiwan changed dramatically in 1661, when a force of 30,000 invaded. This largely Han Chinese group was led by Zheng Chenggong (also known as Koxinga), a Ming loyalist who defeated the Dutch and founded the Zheng dynasty in opposition to the Qing dynasty on the mainland.

In 1683, the Qing sent a naval force to Taiwan and the Zheng dynasty collapsed. After that, Taiwan remained under Qing control until 1895. Early in that period, Han Chinese settlers became the preponderant group, and they have become ever more dominant since.

3. Taiwan under Japanese colonialism (1895–1945)

In 1895, after losing the Sino-Japanese War, Qing China ceded Taiwan to Japan. Japan ruled the island from 1895 to 1945. The official creation of ethnic groups under the Japanese was a political decision. Under the household registration system instituted by the colonial government, people were classified according to “race”—two categories of Han and two categories of aborigines, those from the plains and those from the mountains (Wang 2005).

The Japanese colonial government conducted seven censuses, in 1905, 1915, 1920, 1925, 1930, 1935, and 1940. The distinction between people from Fujian and Guangdong, aborigines from the plains and the mountains was made in all seven, though it was not until 1935 that the terms “plains aborigines” and “mountain aborigines” came to replace the old classifications used by the Qing—“cooked savages” and “raw savages” (Wang 2005). The Japanese colonial government distinguished “Fujianese people,” “Guangdongese people,” “plains aborigines (平埔族),” and “mountain aborigines (高山族)” on the basis of their linguistic, cultural, and other differences. However, this does not imply a biological foundation for the classifications.

4. Taiwan under Guomindang rule and after (1945–present)

The Japanese authorities offered an estimate of the total number of plains aborigines, which grew, they reckoned, from 58,219 in 1936 to 62,199 in 1943. When the Guomindang government conducted its first census in 1956, it dropped the “plains aborigines” category; those originally so categorized were presumably treated as Hoklo or Hakka as a result of being assimilated into mainstream Han society (Wang 2008).

Between 1948 and 1950 an estimated 950,000 Mainlanders, most of them soldiers, left mainland China for Taiwan (Li 1969). As political refugees, mainlanders became a new ethnic group. According to Wang (1993), among those

born before 1950 ethnic intermarriage was mainly the result of a skewed sex ratio: older mainland males marrying younger Taiwanese females. But soon cultural (including linguistic) assimilation had come into play, residential and educational segregation had begun to break down, the consequences of intermarriages had begun to make their presence felt, and the sex ratio became more balanced.

Xu (2002) investigated interethnic marriages for three generations of the “four great ethnic groups.” The rate of interethnic marriages among those married before 1961 was 12.8%; for those who married between 1961 and 1981, the figure was 21.5%; it grew to 28.2% among those married after 1981 (see Table 1). As the following tables show, the rate of interethnic marriages in the third generation of Hoklo was 15%, 63.4% in Hakka, 82% in Mainlanders, and 38.2% in aborigines (Tables 2, 3, 4, and 5). Although the rate of interethnic marriages among Hoklo remained low, those of the other three groups were very high.

Changing ethnic classifications and rising interethnic marriage have made Taiwan a hybrid society. In fact, during the past two decades or so, among Taiwan’s Han Chinese, the idea of a pure Han ethnicity has been weakening, and some have started to acknowledge the possibility that their own forefathers did not always mate within their group (Sleeboom-Faulkner 2006). Obviously, Taiwan is different from Iceland. The generalizability of Iceland’s DeCode to Taiwan’s context is limited by the differing social and cultural context, especially the specificity of Taiwan’s historical process of ethnogenesis. Intermarriage makes it a challenge to classify ethnic groups according to genetic data. More important are the doubts cast on the systems of ethnic classification made up in different historical periods: just consider what happened in the 1956, when a group previously represented in several censuses was simply erased.

Assumption 2: TBB scientists take the “four great ethnic groups” for granted.

Fact 2: The division of Taiwan’s population into “four great ethnic groups” is a recent social construction.

As mentioned earlier, when they presented the TBB project, Chen Yuan-Tsong and Shen Chen-Yang insisted that the most important influence on the genetic attributes and gene-related diseases in Taiwan was the ethnic group (Chen and Shen 2006). Each of the “four great ethnic groups,” it follows, has particular genetic attributes which in turn influence health. So the four great ethnic groups have been targeted for bio-sample collection (see Fig. 1). Moreover, the Preliminary Plan for Establishing the Taiwan Biological Sample Bank refers to collecting blood samples and personal information from members of different *shizu*. The *shizu* are the four ethnic groups.

Table 1 Intermarriage over three generations (%)

Time span	Before 1961	1961–1981	After 1981
Spouse’s ethnicity			
Total	100.0	100.0	100.0
Same	87.2	78.5	71.8
Different	12.8	21.5	28.2

Table 2 Hoklo intermarriage (%)

Time span	Before 1961	1961–1981	After 1981
Spouse's ethnicity			
Total	100.0	100.0	100.0
Hoklo	95.9	90.4	85.0
Hakka	2.5	5.0	6.1
Aborigines	0.1	0.2	0.5
Mainlanders	1.4	3.5	5.9
Foreigners	0.1	0.7	1.5
unsure	0.1	0.2	1.0

The “before 1961” column of this table in Xu (2002) adds up to 100.1

Table 3 Hakka intermarriage (%)

Time span	Before 1961	1961–1981	After 1981
Spouse's ethnicity			
Total	100.0	100.0	100.0
Hoklo	18.1	33.7	51.4
Hakka	78.8	55.0	36.6
Aborigines	–	0.9	0.5
Mainlanders	2.7	9.5	8.7
Foreigners	–	0.7	2.7
unsure	0.4	0.2	–

The “after 1981” column of this table in Xu (2002) adds up to 99.9

Table 4 Mainlander intermarriage (%)

Time span	Before 1961	1961–1981	After 1981
Spouse's ethnicity			
Total	100.0	100.0	100.0
Hoklo	43.9	61.4	68.9
Hakka	5.9	6.1	6.6
Aborigines	0.4	1.4	–
Mainlanders	47.6	28.7	18.0
Foreigners	2.2	1.7	2.7
Unsure	–	0.7	3.8

Table 5 Aborigine intermarriage (%)

Time span	Before 1961	1961–1981	After 1981
Spouse's ethnicity			
Total	100.0	100.0	100.0
Hoklo	6.7	8.9	32.4
Hakka	–	1.8	–
Aborigines	93.3	76.8	61.8
Mainlanders	–	12.5	5.9
Foreigners	–	–	–
Unsure	–	–	–

The “after 1981” column of this table in Xu (2002) adds up to 100.1.

The concept of four ethnic groups first appeared in a proposal made by Ye Ju-Lan, a legislator from the Democratic Progressive Party, in 1993. The fact is that the current classification of “four great ethnic groups” is just a 1990s social construction.

Drawing on a wide range of historical and contemporary texts, sociologist Wang (2003, 2005, 2008) convincingly demonstrated the socially constructed nature of

先期規劃(四年計畫) 現在邀請您參與的部份

依據不同遺傳氏族在台灣地區居住分佈的特性，收集自願參與者的健康情形、疾病史、生活形態、生活環境資訊以及檢體等資料。

- 地區：在桃竹苗、雲嘉南、花東三個地區
- 對象：年齡在30至70歲之間且不限性別，共招募15,000名自願參與者
- 排除條件：不收具有外國籍、外國血統或經醫生確診罹患癌症者
- 收案時間：2008年~2010年

初期15,000人

未來200,000人

Fig. 1 A page of the online pamphlet introducing the TBB. Source: <http://www.twbiobank.org.tw>

ethnicity in Taiwan. Based on Wang’s work, Fig. 2 shows the complex historical changes to Taiwan’s ethnic categories over the past centuries (Wang 2008). Changes in these categories have accompanied other transformations in politics and culture.

4.1 The Hoklo and the Hakka

As mentioned above, the Hoklo and the Hakka arrived in Taiwan in the late Ming and early Qing dynasties from Fujian and Guangdong. The Hoklo were from Zhangzhou and Quanzhou—both in Fujian province. The Japanese noted linguistic and cultural differences between Hakka and Hoklo, and divided the Taiwanese on the basis of province of origin, Guangdong and Fujian, ignoring the fact that some immigrants from the Ding River basin (汀洲流域) in northern Fujian were mostly Hakka, or that people living in Chaozhou (潮州) in Guangdong were mostly Hoklo.

In the first postwar census conducted by the Guomindang government (in 1956), not only were those formerly labeled “plains aborigines” shunted into other categories, many Hakka people were wrongly classified as Hoklo because they had lost the ability to speak their ancestral language (Wang 2008:5).

4.2 The Mainlanders

The Mainlanders are those who came from 35 provinces in China after the Second World War, and their offspring. Mainlanders as an ethnic group do not share the same ancestry. There are, naturally, significant differences in language and culture within this group. Owing to the confrontations between local Taiwanese and Mainlanders after 1945, the latter began to be regarded as a discrete ethnic group.

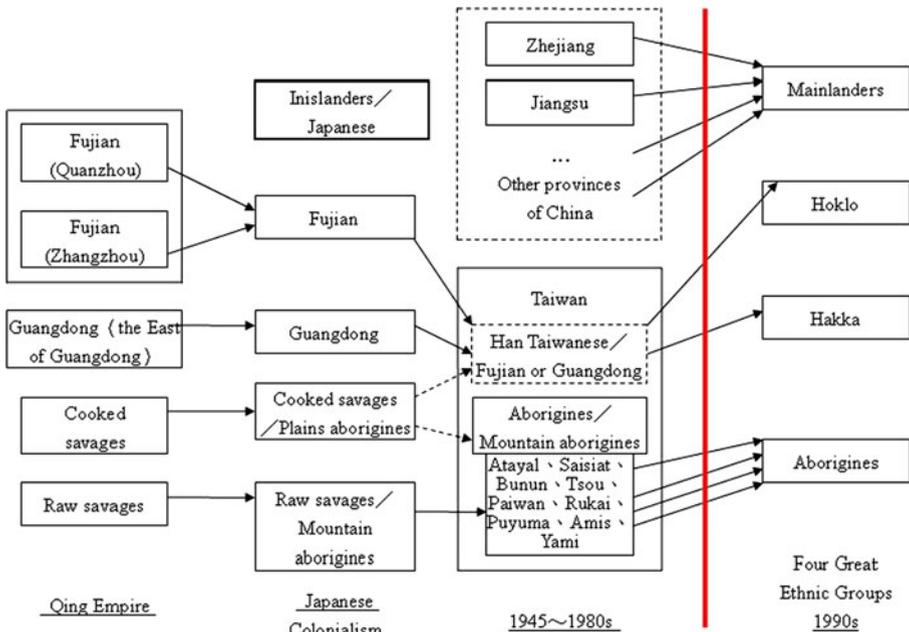


Fig. 2 The complex historical changes in Taiwan’s ethnic categories. Source: Wang 2008

4.3 The Aboriginal Peoples

The earliest attempt to categorize Taiwan's aboriginal peoples divided them into "cooked savages" and "raw savages." In 1935, by which time Japan had occupied Taiwan for 40 years, this crude distinction was abolished. The colonized were classified into seven ethnic groups, including two subcategories of Han Chinese—Fujianese and Guangdongese—and two subcategories of the aboriginal people, plains aborigines and mountain aborigines. Then, in 1956, the postwar Guomintang government dropped the category of plains aborigines because it was believed that they had been assimilated into Han Chinese society.

After 1945, the Republic of China inherited the seven-group classification employed by the Japanese colonial regime. On March 14, 1954, the Ministry of the Interior changed the classification to nine groups (Chen et al. 1994). Today, there are 14 officially recognized ethnic groups in Taiwan, but they do not share the same ancestry and culture any more than the Mainlanders do. This official system used by the government is based mainly on cultural differences such as language, marriage customs, and, to a lesser extent, biological characteristics.

But the Taiwan Bio-Bank takes these ethnic categories for granted and analyzes the genetic data of the Taiwanese people in terms of the four ethnic categories. Given the prevalence of mixed marriages, scientists will have difficulty finding a "pure" ethnic group if they adhere to the principle that both parents of group members must have been group-endogamous for three generations (Chen 2000). But the ultimate determinant of ethnicity, according to the TBB, is the donor's subjective belief. Unfortunately, when ethnic identity is a matter of choice, people frequently have several ways of categorizing themselves. In fact, during the past few centuries, many people in Taiwan have changed their ethnic identities for one reason or another. Take a recent case for example. A survey conducted by the Council of Hakka Affairs in 2004 showed that when questionnaires about one's ethnic identity were provided with multiple-choice answers, subjects tended to disclose their Hakka identity more easily, increasing the number of those who identify themselves as Hakka (Xingzhengyuan keja weiyuanhui 2008).

There is a danger of using socially-defined groups as proxies for genetic differences. Discussing the difference between the four great ethnic groups, some sociologists state that none of the groups is a concrete reality. Systems of ethnic categorization amount to ideologies. What we should be asking is when, why, and how this classification became so important (Wang 2003, 2008; Hsiao 2008). The social construction of the four great ethnic groups and the state of ethnic politics in Taiwan raise challenging questions for the TBB. Questions about the biological meaning of ethnic groups obviously cannot be disentangled from questions about their social meaning and political identity.

Assumption 3: Genetic samples representative of each of the great ethnic groups can be collected in three different areas in Taiwan.

Fact 3: The areas selected will not provide samples that can represent pure ethnic groups.

Early scientific accounts of the geographical history of *Homo sapiens* were connected with core hypotheses about whether racial differences are the evolutionary effect of migrations from one original location, or the result of different geographical

origins for different races. That is, geography is commonly assumed to account for racial differences “as a result of evolution.” The main physical index associated with race—skin color—was until recently believed to be the result of natural selection within populations living under greater or lesser sun exposure (Zack 2002).

The TBB has been planning to collect blood samples of the “four great ethnic groups” from three areas (see Fig. 3). The argument is that the majority of the residents of Taoyuan, Hsinchu, and Miaoli counties in northern Taiwan are of Hakka descent; Hoklo make up the majority in Jiayi, Yunlin, and Tainan counties in southern Taiwan; and aboriginal peoples are common in Hualien and Taitung counties in eastern Taiwan. The mainlanders, who migrated to Taiwan after 1945, are a minority in all three locations, but they are of a sufficient size in each location to be included as a target population (Xingzhengyuan keji weiyuanhui 2008: 6).

However, the idea that there exists a clear relationship between ethnicity and geography is doubtful when applied to as small an area as Taiwan. Government survey data show that 60.6% of the population in Miaoli County is Hakka, 33.6% Hoklo, 3.0% Mainlander, and 0.9% aboriginal. In Jiayi, 2.7% of the population is Hakka, 81.9% Hoklo, 8.5% Mainlander, and 0.6% aboriginal. And 22.1% of the population of Hualien County is Hakka, 46.2% Hoklo, 10.2% Mainlander, and 18.4% aboriginal (see Table 6). Moreover, the traditional tribal communities of such aboriginal groups as Saisiat, Bunun, Tsou, Rukai, and suchlike fall outside of Hualien and Taitung counties. The blood samples collected from these two counties of eastern Taiwan would be limited, failing to represent the diversity of aboriginal genetic attributes.

Briefly, there is no correspondence between the boundary of a county and the boundary of an ethnic group. Each of the three counties includes diverse ethnic groups. Studying only geographically stable samples does not take into account the effects of intermarriage and other forms of population mobility. Obviously, the blood samples collected in this way should not be used to pin down the genetic attributes of these three ethnic groups.

5 Conclusion: Science and Ethnic Politics

Due to a faulty understanding of ethnicity, the Taiwan Bio-Bank has essential problems it has to clear up. My analysis shows how the categories that defined

Fig. 3 The three areas from which blood samples from the “four great ethnic groups” will be drawn. Source: <http://www.twbiobank.org.tw>



Table 6 Ethnic groups in Taiwan

Ethnic groups County/city	Hakka	Hoklo	Mainlander	Aboriginal	other	unknown
Taoyuan County	32.2	51.7	9.0	1.8	1.2	2.0
Hsinchu County	63.0	25.9	3.8	3.2	0.8	0.9
Miaoli County	60.6	33.6	3.0	0.9	0.3	0.1
Yunlin County	2.7	92.1	2.8	0.3	0.8	1.1
Jiayi County	3.4	85.1	3.8	1.5	2.5	3.0
Tainan County	1.5	91.8	3.4	0.6	1.0	1.3
Taitung County	12.7	48.8	7.2	28.2	0.1	1.4
Hualian County	22.1	46.2	10.2	18.4	0.3	0.9
Jiayi City	2.7	81.9	8.5	0.6	3.4	2.4
Tainan City	2.8	86.4	5.3	0.1	1.8	3.3

ethnicity in Taiwan changed many times over the past centuries. The examination of the TBB's policy narratives shows how in turn the TBB's production of scientific knowledge has been informed by concepts emerging from a specific social-political context. Situated at a particular moment in Taiwanese history, the ambitious plan to map out the genetic attributes of ethnicity is contingent on the interactive dynamics of state governance, genetic discourse, the interests of a varied scientific community, and identity politics. The historicity of the project and its unintended cultural and political effects are a question subject to investigation.

By relying on the conceptual framework of the “four great ethnic groups,” the TBB provokes deep misgivings about the methodological validity of the project. Under this framework, the TBB is trying to posit a gene-environment interaction specific to an ethnic group. It is true that many biomedical researchers focus not only on ethnic genetic affinity but on environmental influences as well. However, this does not justify conflating the social construction of ethnicity and the biological essence of ethnicity, which is what the TBB does. Such an act should be investigated and not be legitimated in the name of science. As the American Anthropological Association argues, human populations are not clearly demarcated, and the differences among what one might call biologically distinct groups are genetically minute. This is especially true of such a comparatively small area with a long history of mixed marriage as Taiwan. The TBB has to face a crucial challenge: why should a socially constructed and politically and culturally loaded conceptual framework be accepted as a valid biological entity? Neglecting the complicated history of Taiwanese ethnic politics renders the project unsatisfactory and leaves room for essentializing the “four great ethnic groups.”

The TBB is not the only project that faces methodological problems regarding ethnic conceptualization. Using insights from science and technology studies about classification and standardization, Smart et al. (2008b) showed how classifications of race and ethnicity as boundary objects are used across a range of social settings. The conceptualization of race and ethnicity, the authors pointed out, was ambiguous in the samples they collected—biomedical science editorials and UK bio-bank studies.

The multiple and conflicting constructions of meaning, measurement, and utility of race and ethnicity, they argued, indicated that the concepts were contingent, heterogeneous, and locally situated. Furthermore, the routinized or unreflective adoption of the census classification “threatens to erode the epistemological status of its categories as socio-political constructs” (416–18).

By emphasizing the alleged biological differences among the “four great ethnic groups,” TBB scientists would encourage the belief that ethnicity has a genetic essence and forms an objective reality. This would facilitate the ethnicization of biomedicine and the racialization of ethnic difference. As the long history of racial science has shown, a national project like the TBB could transform sociopolitical constructs into objective biological categories that are simply taken for granted. It could also help to construct an imagined community ethnically divided but nationally associated. Although plans for a Taiwanese genetic database have not progressed beyond a pilot study, my study rings some early alarm bells by bringing attention to social sciences’ insights into ethnicity.

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References

- Academia Sinica. (2007). The Taiwan Biobank Project: For the health of future generations. Academia Sinica E-news, April 19. Available at <https://www.sinica.edu.tw>.
- American Anthropological Association. (1999). American Anthropological Association statement on “race.” *American Anthropologist*, 3, 712–713.
- Amason, A., & Simpson, B. (2003). Refractions through culture: The new genomics in Iceland. *Ethnos*, 4, 533–553.
- Ashcroft, B., Griffiths, G., & Tiffin, H. (1998). *Key concepts in post-colonial studies*. London: Routledge.
- Atkinson, P., Glasner, P., & Greenslade, H. (Eds.). (2007). *New genetics, new identities*. London: Routledge.
- Brown, M. J. (2004). *Is Taiwan Chinese? The impact of culture, power, and migration on changing identities*. Berkeley: University of California Press.
- Buehler, J. W. (1999). Abandoning race as a variable in public health research. *American Journal of Public Health*, 5, 783.
- Burchard, E. G. (2005). Latino populations: A unique opportunity for the study of race, genetics, and social environment in epidemiological research. *American Journal of Public Health*, 12, 2161–2168.
- Campbell, W. (1903). *Formosa under the Dutch*. London: Kegan Paul.
- Chadwick, R. (2003). Genomics, public health and identity. *Aeta Bioethica año*, 2, 209–218.
- Chen, M. T., et al. (1994). *Taiwan yuanzhuminzu zuqun yu fenbu zhi yanjiu* 台灣原住民族族群與分佈之研究 (A study of the aboriginal ethnic groups and their distribution in Taiwan). Taipei: Neizhengbu.
- Chen, S.H. 陳叔倬. (2000). “Yuanzhumin renti jiyin yanjiu zhi lunli zhengyi yu lifa baohu” (Ethical and legal dimensions of aboriginal genetic research). *Shengwu keji yu falü yanjiu tongxun* 生物科技與法律研究通訊 Newsletter of Biotechnology and Law, 6, 7–28.
- Chen, Y. C. 陳垣崇., & Shen, C. Y. 沈志陽. (2006). “Jinshen guihua shengwu ziliaoku” 謹慎規劃生物資料庫 (Be careful in designing the Biological Database). *Zhongguo shibao* 中國時報 (China Times). April 2: A15.

- Chou, K. T. (2007). Conflicts of technology policy and governance paradigm in a knowledge-based economy: A case analysis of the construction of the Taiwan biobank. *Issues and Studies*, 3, 97–130.
- Collins, F. (2004). What we do and don't know about race, ethnicity, genetics and health at the draw of the genome era. *Nature Genetics Supplement*, 36, S13–S15.
- Council for Economic Planning and Development, Executive Yuan, ed. (2007) Economic Development ROC (Taiwan). Taipei: Council for Economic Planning and Development Executive Yuan, ROC.
- Duster, T. (2004). Selective arrests, an ever-expanding DNA forensic database, and the specter of an early twenty-first-century equivalent of phrenology. In D. Lazer (Ed.), *DNA and the criminal justice system: The technology of justice* (pp. 315–334). Cambridge, MA: MIT Press.
- Duster, T. (2005). Policy forum: Race and reification in science. *Science*, 307, 1050–1051.
- Ellison, G. T. H., et al. (2007). Racial categories in medicine: A failure of evidence-based practice. *PLoS Medicine*, 9, 1434–1436.
- Epstein, S. (2007). *Inclusion: The politics of difference in medical research*. Chicago: University of Chicago Press.
- Goodman, A. H. (2000). Why genes don't count (for racial differences in health). *American Journal of Public Health*, 11, 1699–1702.
- Guo, Y. J. 郭怡君. (2005). “Wo jiang she huaren yichuan zixun zhongxin” 我將設華人遺傳資訊中心 (Taiwan plans Han Chinese infectious materials center). *Ziyou shibao* 自由時報 (*The Liberty Times*), March 19: 19.
- Heath, D., Rapp, R., & Taussig, K.-S. (2004). Genetic citizenship. In D. Nugent & J. Vincent (Eds.), *A companion to the anthropology of politics* (pp. 153–167). Malden, MA: Blackwell.
- Hsiau, A. C. (2000). *Contemporary Taiwanese cultural nationalism*. London: Routledge.
- Hsiau, A. C. 蕭阿勤. (2008) Huigui xianshi: Taiwan 1970 niandai de zhan hou shidai yu wenhua zhengzhi bianqian 回歸現實：臺灣1970年代的戰後世代與文化政治變遷 (Return to reality: political and cultural change in 1970s Taiwan and the postwar generation). Taipei: Zhongyang yanjiu yuan, Shehuixue yanjiusuo.
- Li, D. M. 李棟明. (1969). “Guangfu hou Taiwan renkou shehui zengjia zhi tansuo” 光復後台灣人口社會增加之探討 (An analysis of population growth in postwar Taiwan). *Taipei Wenxian* 台北文獻 *Taipei Historical Documents Quarterly*, 10, 215–49.
- Liao, W. Z. 廖文孜. (2000). “Renlei jiyin ziyuan de jiti quanli wenti chtan—jianlun guanyu yuanzhumun zuqun de teshu kaoliang” 人類基因資源的集體權利問題初探—兼論關於原住民族群的特殊考量 (A preliminary examination of the collective rights issues in human genetic resources, with a discussion of special considerations for aborigines). *Shengwu keji yu falyu yanjiu tongxun* 生物科技與法律研究通訊 *Newsletter of Biotechnology and Law*, 6, 29–37.
- Liu, H. E. 劉宏恩. (2004). “Renqun jiyin ziliaoku fazhi wenti zhi yanjiu – guoji shang fazhan yu Taiwan xiankuang zhi pingxi” 人群基因資料庫法制問題之研究—國際上發展與台灣現況之評析 (Biobank legalization issues: international development and the state of the field in Taiwan). *Lishi zazhi* 律師雜誌 *Taipei Bar Journal*, 303, 71–94.
- Liu, H. E. (2005). Jiyin ziliaoku yanjiu zhong de gongzhong xinlai, shangye jieru yu liyi gongxiang. 基因資料庫研究中的公眾信賴、商業介入與利益共享 (Public trust, commercialization, and benefit sharing in Biobanking). *Taipei daxue faxue luncong* 台北大學法學論叢 *Taipei University Law Review*, 57, 367–393.
- Makeham, J., & Hsiau, A. C. (2005). *Cultural, ethnic, and political nationalism in contemporary Taiwan*. New York: Palgrave Macmillan.
- Reardon, J. (2005). *Race to the finish*. Princeton, NJ: Princeton University Press.
- Schwartz, R. S. (2001). Racial profiling in medical research. *The New England Journal of Medicine*, 344, 1392–1393.
- Shen, C. Y., et al. (2007). Final report of the National Science Council's research grant proposal: The completion of the Taiwan biological sample bank. Sponsored by National Science Council. NSC 94-3112-B-001-017.
- Simpson, B. (2000). Imagined genetic communities—ethnicity and essentialism in the twenty-first century. *Anthropology Today*, 3, 3–4.
- Sleeboom-Faulkner, M. (2006). How to define a population: Cultural politics and population genetics in the People's Republic of China and the Republic of China. *BioSocieties*, 1, 399–419.
- Smart, A., et al. (2008a). Social inclusivity versus analytical acuity? A qualitative study of UK researchers regarding the inclusion of minority racial/ethnic groups in biobanks. *Medical Law International*, 9(2), 169–190.

- Smart, A., et al. (2008b). The standardization of race and ethnicity in biomedical science editorials and UK biobanks. *Social Studies of Science*, 38, 407–423.
- Song, H. L. 宋豪麟., & Li M. Y. 李明揚. (2003). “Guoren jiyin ziliao ku, Zhongyanyuan choujian” 國人基因資料庫, 中研院籌建 (Academia Sinica initiates national genetic material bank). *Lianhe bao* 聯合報 (*United Daily News*), July 22:A9.
- Wang, F. C. 王甫昌. (1993). Guangfu hou Taiwan Hanren zuqun tong hun de yuanyin yu xingshi chutan 光復後台灣漢人族群通婚的原因與形式初探. Causes and patterns of ethnic intermarriage among the Hokkien, Hakka, and Mainlanders in postwar Taiwan: a preliminary examination. *Zhongyang yanjiuyuan minzuxue yanjiusuo jikan* 中央研究院民族學研究所集刊 *Bulletin of the Institute of Ethnology, Academia Sinica*, 76, 43–96.
- Wang, F. C. (2003). *Dangdai Taiwan shehui de zuqun xiangxiang* 當代台灣社會的族群想像 Ethnic imagination in contemporary Taiwan. Taipei: Qunxue .
- Wang, F. C. (2005). You “Zhongguo sheng ji” dao “Taiwan zuqun”: hukou pucha jibie leishu zhuanbian zhi fenxi 由「中國省籍」到「台灣族群」: 戶口普查籍別類屬轉變之分析. From Chinese natal place to Taiwanese ethnicity: an analysis of census category transformation in Taiwan). *Taiwan shehuixue* 台灣社會學 (Taiwanese Sociology), 9, 59–117.
- Wang, F. C. (2008). Taiwan zuqun fenlei gainian yu neihan de yanbian 台灣族群分類概念與內涵的演變 The evolution of attitudes toward ethnic categories and assimilation in Taiwan. Paper presented at Annual Conference of Taiwanese Sociological Association, Taiwan: Academia Sinica.
- Xingzhengyuan keja weiyuanhui 行政院客家委員會(2008) 97 niandu quanguo keja renkou jichu ziliao diaocha yanjiu 97 年度全國客家人口基礎資料調查. Taipei: Xingzhengyuan keja weiyuanhui.
- Xu, Z. M. 許咨民 (2002). Taiwan and Fujian 3 generation intermarriage survey analysis. *Newsletter of the Chinese Statistical Association* 中國統計通訊, 13(11), 13-16.
- Yang, Z. M. 楊正敏. (2000). Taiwan renqun jiyin ku, choubei zhengyi da 台灣人群基因庫, 籌備爭議大 (Taiwan people’s genetic bank, great initial controversy). *Lianhe bao* 聯合報 (*United Daily News*), July 5:A4.
- Zack, N. (2002). *Philosophy of science and race*. London: Routledge.
- Zhang, L. W. 張璿文. (2000a). Shei de jiyin neng daibiao Taiwanren? 誰的基因能代表台灣人(Whose genes are representative of the Taiwanese People)? *Zhongguo shibao* 中國時報 (*China Times*), July 5:A5
- Zhang, L. W. (2000b). Zhongyanyuan yanyi shezhi guoren jiyin ku 中研院研議設置國人基因庫 (Academia Sinica discusses making a citizens’ gene bank). *Zhongguo shibao* 中國時報 (*China Times*), July 5: A5.
- Zhuang, M. Z. (2000). Research proposal: a population genetic data base for Taiwan. In *The Minutes of the 24th Academicians’ Meeting, Academia Sinica*, July 3.