

Indigenous DNA as a metaphor: Nation-building and scientific debates on the rediscovery of Taiwanese ancestry

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Abstract

In this paper, I investigate the co-production of genetic research and national politics in post-martial law Taiwan. This entails analyzing two co-produced phenomena: the nationalization of biomedicine—in which the national discourse over racial/ethnic categories and ancestral origin increasingly shapes scientists' biomedical research; and the biomedicalization of the nation—in which people in public discourse increasingly use biomedical categories in characterizing national differences and identities. I analyze how the production and representation of scientific knowledge of the ancestral origins and genetic make-up of Taiwan have been embedded in Taiwanese politics. This includes the emergence of a new categorization into four great ethnic groups, multiculturalism, and the assertion of a distinct Taiwanese national identity, particularly in response to the People's Republic of China's claims of common ancestry. I also examine how the scientific findings produced in the lab have spilled out into both Taiwan and China through journals, media, history textbooks, and public disputes since the 1990s and brought about significant social impact.

Keywords

indigenous DNA, Taiwanese ancestry, identity politics, co-production, indigeneity, nation-building

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The development of genealogical science in the twenty-first century has important implications for national and racial construction (Abu El-Haj, 2012; Nash, 2008). In Taiwan, genealogical science is involved in the dispute over Taiwan's national identity in opposition to the official claims of the People's Republic of China that 'we are the same roots (兩岸同根生)' or 'blood is thicker than water (血濃於水).' After the end of the martial law period (1945-1987), scientific research on the multiple origins and genetic makeup of Taiwan emerged. Dr. Marie Lin, M.D., and her co-workers have been devoted to revealing the origins of the ethnic groups in Taiwan. Based on findings over the last three decades, Lin argues that (1) 85% of Taiwanese have indigenous genes, (2) the local Han Taiwanese (Hoklo and Hakka ethnic groups) who immigrated to Taiwan starting in the seventeenth century are mainly the descendants of the Yueh people (越) from the Indigenous peoples of southern China instead of the pure Han from northern China, (3) a major part of blood attributes of the Han Taiwanese is derived from Plains Indigenous Peoples, and (4) Indigenous peoples in Taiwan have multiple origins. These arguments challenge the Chinese nationalist ideology enforced during the period of authoritarian rule, which insisted that the Taiwanese were simply Chinese.

The term 'Taiwanese Indigenous Peoples (台灣原住民族)' refers to the descendants of the Austronesian-speaking¹ inhabitants who came to Taiwan eight thousand years ago. Starting with the Taiwanese identity movement in the 1980s, Indigenous peoples have played a key role in rewriting the history of Taiwan and changing the understanding of Taiwanese people's ancestry. With the boom in the study of Taiwan's genealogy in the 1990s, the study of Taiwanese indigenous genetics has taken a prominent place in Taiwanese national discourse not only in relation to Taiwan's changing internal national identity but also to the scientific disputes in Taiwan and the PRC about the rediscovery of the multiple origins of Taiwanese ancestry. Findings regarding Indigenous contributions to Taiwanese genetic ancestry have been used in Taiwanese media to differentiate the Taiwanese from the Chinese, in contrast to the PRC's claims of shared ancestry. In this article, I ask: How have the changes in identity politics in Taiwan shaped scientific research on Taiwanese ancestry? How has Lin's research influenced Taiwanese identity formation? How has scientific knowledge been produced, represented, and contested when it engages in the exploration of the origin of the Taiwanese? What is at stake in these scientific debates? How can we understand the complicated relationship between genetic research and identity politics while avoiding its homogenizing effects?

Building on Jasanoff's (2004) concept of the co-production of science and politics, this article pushes the concept further by addressing the '*nationalization of biomedicine*' and the '*biomedicalization of the nation*'. I analyze how the change of identity politics—including the emergence of a new categorization of four great ethnic groups, multiculturalism, and Taiwanese nationalism—has influenced the scientific production of Taiwanese genealogy and how scientific findings produced in the lab have moved more widely into public discourse in both Taiwan and the PRC through journals, media, history textbooks, and public disputes. I also examine how the emergence of the concept of Taiwan as a nation with multiple origins from genealogical science and its social appropriations has reproduced, contested, or transformed pre-existing narratives about Taiwanese ancestry in post-martial law Taiwan.

A co-productionist approach to studying genetics, ancestry, indigeneity, and national identity

In 2000, the mapping of the human genome revealed that humans are 99.9% the same genetically. Nevertheless, after scientists completed the first human genome sequence in 2003, genetic research has focused mainly on genetic variations between human populations. This has led to biomedical research that celebrates genetic differences—what Brubaker (2015) terms ‘the return of biology’—with significant implications for the construction of ethnic or national identity.

In the age of biomedicalization (Clarke et al., 2010), there has been a large amount of research and reflection on disease and health (Duster, 2001, 2005; Goodman, 2000). However, the recent involvement of genetic research on ancestral origins, racial/ethnic classification, and national politics is worth studying. Most existing literature that focuses on genetically informed accounts of differences has had an unforeseen impact on the re/creation of categories of human classification, such as the concepts of race and ethnicity (Duster, 2006; M’charek et al., 2014; Reardon, 2005; Tallbear, 2013) and the nation (e.g. Burton, 2018; Hinterberger, 2012a). In addition, genetic knowledge has already been applied to reconfigure ancestral origin, indigeneity, and understandings of history (e.g. Abu El-Haj, 2012; Fujimura & Rajagopalan, 2011; Nash, 2008; Nelson, 2008; Hinterberger, 2012b). Earlier academic debate regarding genetics and identity predominantly focused on aspects of race and ethnicity. However, this literature seems to underrepresent the analytical category of the ‘nation’ in terms of conventional ideas of shared descent and ancestral origins, despite the evident connections between race and nation. As Anderson (2003, p. 2) notes, the lab should be studied as a site where a nation could be imagined.

In the past 20 years, research in science and technology studies (STS) on the impact of human genetic research on the concept of the nation and the nationalization of the genome has focused on three main currents. First, some national genetic projects attempt to link bio-geographical ancestries to particular genetic traits associated with national patterns of diseases. For instance, biomedical research in Mexico assumes a shared genetic ancestry for disease risks based on an assumption of common citizenship at the national level. Thus, genetic science is presented as a solution for the nation’s perceived pathologies of obesity and diabetes (Wade et al., 2015; see also Peltonen et al., 1999).

Second, there has been a close relationship between national biobanks, genetic sovereignty, and national identity. A variety of ‘imagined genetic communities’ (Simpson, 2000) or ‘imagined future communities’ in nation-building (Tsai & Lee, 2021) have emerged at different national biobanks, such as in Iceland, the UK, Korea, and Taiwan. Branding the uniqueness of a national population as a biological unit for national biobanks is often used to connect ancestral, historical, and cultural heritage to national identity construction (Busby & Martin, 2006; Fletcher, 2004; Tarkkala & Tupasela, 2018; Tsai & Lee, 2021), particularly concerning genetic sovereignty within the territorial boundaries of a given nation-state (Benjamin, 2009).

Third, an increasing number of genetic studies have been applied to link ancestral origin, indigeneity, and national identity (Abu El-Haj, 2012; López-Beltrán &

García-Deister, 2013; Nash, 2008; Nelson, 2008; Tallbear, 2013). The genetic ancestry project in the UK produced a geneticized national indigeneity and created the image of a British nation. It emphasized the mixture resulting from the ancient migration of Vikings and Anglo-Saxons but marginalized recent migrations from the former colonies, effectively depicting the nation as White (Fortier, 2012; Nash, 2013). In contrast, the importance placed on the *mestizo* in Mexico and the *mestiço* in Brazil is fundamental to understanding their nation-building. In Brazil, scientists studied the ancestry of Brazilians, highlighting that many 'Whites' have African and Amerindian ancestry, while many 'Blacks' have high levels of European ancestry. Genetic research tended to reinforce existing social distinctions such as 'Indigenous' and 'Black', even though ideas of the *mestiço* in terms of genetic ancestry are crucial to Brazilian national identity (Wade et al., 2015). In Mexico, scientists have contributed to the national construction of the molecular *mestizo* and the bioinformatic *mestizo* based on their research on the biological markers of the mixture of Europeans and indigenous peoples (López-Beltrán & García-Deister, 2013; Wade et al., 2015). Uruguay was considered a country with an almost totally White population until the 1970s. However, genetic research began to challenge dominant ideas about the nation as White by demonstrating the presence of African and Amerindian ancestry (Sans, 2011). In the PRC, the Chinese Human Genome Project emphasizes ethnic diversity in the context of the nation-state's interest in territory. Simultaneously, it is used in political propaganda to support the policy of a united China. (Sleeboom-Faulkner, 2006).

We can see, then, that genetic research has had powerful effects on nation-building in nuanced ways. Genetics has become a scientific standard for shaping how we think about our collective past. At the same time, identity politics surrounding genetic variation has significant effects in the present, by redefining the boundaries of kinship, race, ethnicity, and nationality (Wailoo, 2012).

Many STS scholars have argued that we should reflect on the co-production of genetic science and identity politics (Epstein, 2007; Fujimura & Rajagopalan, 2011; Jasanoff, 2004). Jasanoff uses 'co-production' as a term for 'how scientific ideas and beliefs, and (often) associated technological artifacts, evolve together with the *representations, identities, discourses, and institutions* that give practical effect and meaning to ideas and objects' (2004, pp. 2–3). Many scholars working in STS and other areas of the humanities and social sciences adopt a biosocial co-productionist perspective, to emphasize that the emergence of genetic research on ancestral origins, family *history*, and lineages is not simply a scientific phenomenon. Abu El-Haj (2012) analyzes how genetic research on Jewish origins has been used to contend that Jews originated in Palestine as part of Zionist political propaganda. The question 'who are the Jews?' is intrinsically entangled with biological identity, cultural imagination, and political commitments. Slightly differently, Nash (2008) explores how research on the ancestral origin of the Irish is interconnected with geographies of identity—familial, ethnic, national, and diasporic. In fact, genealogical science has influenced identity formation, but this is more than a simple reductionist process. A co-productionist approach highlights the intricate interplay between biological and social factors in shaping the concept of ancestry.

Furthermore, to understand how genetic evidence contributes to concepts of nation and ancestry, researchers also need to examine the use of relevant technologies and methodologies. For example, ancestry-tracing technology—primarily dependent on examining mitochondrial DNA (mtDNA), paternal Y-chromosomes, and specific alleles or mutations to reconstruct ancestral origin and history—is noteworthy. Fujimura and Rajagopalan (2011) examine a population genetics software technology used by GWAS² researchers. They find that it is difficult for researchers studying population genetics to refrain from using the concept of race. The genetic study of population ancestry not only involves old discourses of race, but incorporates new technology and political and scientific commitments. Or, in a study of research on the history of the Inuit, Pálsson (2007) shows that genetic research on indigenous history has its own politics of naming and human classification in the identification of which populations to sample. Pálsson shows that more attention should be paid to the methodology of genetic research, especially to how populations have been sampled based on preconceived ideas and circular reasoning.

The co-productionist perspective found in the above STS research is especially relevant to concepts of ancestry and nation, which have long acted as boundary objects in scientific and social classifications (Bowker & Star, 1999). As Brodwin (2005, p. 139) argues, tracing one's ancestry is no longer a mere laboratory technique, but also a political act.

This article builds on existing studies and conversations on genetic knowledge/technology, ancestry, indigeneity, and nation, which have focused primarily on the United States, Europe, and a few Latin American cases and neglected examples from Asia. In particular, Taiwanese indigenous genetics has become an important symbol of the new Taiwanese nationalism and aims to give Taiwan a more prominent ancestral connection to Austronesia and Southeast Asia (Brown, 2004; Munsterhjelm, 2014; Sugimoto, 2017). This article attempts to deepen the concept of co-production by addressing how biomedicine premised on genetics has led to the *nationalization of biomedicine* and the *biomedicalization of the nation* in Taiwan. It aims to show how *genealogical science* regarding the Taiwanese population's multiple origins, hybridity and indigenous ancestry and *Taiwanese national identity* co-produce each other. Finally, this article intends to explore epistemological and methodological problems inherent in such genealogical science.

Research methods

This article is based on interviews with scientists and qualitative discourse analysis. First, I interviewed scientists involved in scientific research on Taiwanese genealogy. In particular, I interviewed Dr. Marie Lin, who has studied the DNA makeup and origin of the Taiwanese and published more than 160 journal articles and two books. I then collected and read more than three hundred medical articles and books on Taiwanese genealogy and ethnic origins. Following that, I collected materials from newspapers, magazines, and TV channels on Taiwanese genealogy either in Taiwan or China. Finally, I collected the latest history textbooks according to the '12-Year Basic Education Curriculum', announced by the Ministry of Education in 2018 and implemented in 2019. Some versions feature Lin's genetic findings as an important part of Taiwan's history.

A social transition moves into the lab: The recategorization of medical samples from Chinese to Taiwanese

Race and ethnicity as a taboo issue before the 1990s in Taiwan

After World War II, the government of the Republic of China (ROC)—controlled by Chiang Kai-shek and his Chinese nationalist party, KMT—took over Taiwan. They retreated to Taiwan in 1949, after losing the Chinese Civil War to the Chinese communists. Under the KMT's domicile system, Taiwan was one of China's 35 provinces. Every resident in Taiwan had his/her geographic origins traced to a province in China. The KMT claimed that the Taiwanese are of purely Han origin and as such are children of the Yan and Yellow Emperor (炎黃子孫). In fact, during this period of KMT rule, the most salient divide in Taiwan was between the local Taiwanese, who immigrated to Taiwan over four hundred years ago from Southern China (comprising both Hoklo and Hakka³ ethnicities), and mainlanders who came over with the KMT in 1949. During the Martial Law era (1949–1987) under the KMT's assimilation policy, race and ethnicity were a taboo issue in Taiwan.

After the 1980s, ethnic equality became the rallying cry of the main political opposition movement in Taiwan, which called for recognition of the languages and cultures of the Hoklo, Hakka, and Indigenous Peoples in Taiwan. These peoples had previously been forced to suppress their identities and assimilate to a homogenous Chinese culture enforced by the KMT. To challenge KMT's myth of homogeneous origins and Chinese nationalism, the Taiwanese opposition movement cooperated with the Indigenous movement to reshape Taiwan's history. The activists claimed that Taiwanese Indigenous Peoples were the only inhabitants of Taiwan for thousands of years, and that the ancestry of local Taiwanese is not pure Han. They stressed interracial marriage since the Qing dynasty between early Chinese immigrants (local Taiwanese) and the Plains Indigenous Peoples (Hsiau, 2012, pp. 315–320). These indigenous origins are considered the key to tracing the multiple origins of Taiwanese people and Taiwan's history.

In 1994, the Democratic Progressive Party (DPP) Legislator Chu-lan Yeh (葉菊蘭) proposed an image of four great ethnic groups: Hoklo, Hakka, Mainlanders, and Indigenous Peoples. This image suggested a changed ideal relationship among these groups, from the KMT's assimilationism to the DPP's ethnic multiculturalism, highlighting different cultural and historical experiences. The population became distinctly Taiwanese, based on these four ethnic groups, rather than Chinese under the Taiwan Province of China (Wang, 2008).

In July 1997, the National Assembly announced that 'the State affirms cultural pluralism and shall actively preserve the development of indigenous languages and cultures', which had also enabled the assertions regarding multiculturalism and respect for the will of the Indigenous Peoples—both proposals made by the Indigenous movement activists—to be specifically included in *The Additional Articles of the Constitution* (憲法增修條文). As Chang (2002) points out, in the amended articles of the Constitution, the original term 'Indigenous People' (原住民) was modified to 'Indigenous Peoples' (原住民族), adding the Chinese character 族 (ethnic group) to recognize all indigenous

peoples as a group in Taiwan. It represents Taiwan as a sovereign state with multinational populations, indicating the possibility of national autonomy and joint governance between the Indigenous and Han peoples in the future. Thus, the Indigenous movement contributed to multiculturalist policy and the recognition of the multiple origins of the nation in Taiwan's pursuit of democratization and indigenization.

In the *Taiwan Medical Journal*, Dr. Y. Lin (1993) states that 'for the past century, partly due to humiliation inflicted by foreign powers, and partly due to the standoff between the KMT and the Communist parties, there was no research about the genetic kinship of residents on the two sides of the Taiwan Straits' (p. 428). In the same journal, Dr. Jen-yi Chu (1999) emphasizes that 'in the past, it was dangerous to study the relationship of ethnic groups in Taiwan, particularly their ancestral origin' (p. 252). In *Our Blood is Different*, Dr. Lin writes: 'In the past no one dared to study Taiwanese ethnic origins. After the lifting of martial law in 1987, our laboratory stepped into the study of ethnic groups in Taiwan, through which we found the ethnic diversity on this island. ... But I think, once the people start to question ancestral origin, it is a significant task to provide scientific evidence' (Lin, 2010, p. 10). These scientists' statements explain how ancestral origins used to be taboos under the repressive political climate of the martial law period. The emergence of genealogical science in Taiwan was embedded in societal changes including identity politics, indigenization and democratization.

The transition of identity politics alters the categorization of medical samples from Chinese to Taiwanese

The 1980s also saw the government of Taiwan begin to fund biotechnology projects. In 1996, the government announced substantial support for the development of genetic research in the National Science and Technology Conference (全國科技會議). This support was expanded in 2005, when the government initiated a national project to transform Taiwan into a Biomedical Technology Island. This resulted in an increase of funding for genetic studies that went hand-in hand with the declaration of four great ethnic groups. Over time, these trends contributed to the biomedicalization of ethnicity as the category of ethnicity became increasingly applied in biomedical research (Tsai, 2010).

As Taiwan's oldest medical journal, *Journal of the Formosan Medical Association* (台灣醫學會雜誌) is a valuable resource for understanding how Taiwanese biomedical scientists have addressed race and ethnicity over time.⁴ Starting with the journal's founding during the Japanese colonial period and continuing through the period of KMT control, writers have made use of categories of human classification. A significant shift occurred in the 1990s, when Taiwanese scientists began publishing dedicated work on the ancestral origins, ethnic lineages, and DNA make-up of Taiwanese people. Table 1 shows the changing ethnic classification and representation in medical samplings in this journal.

During the Japanese colonial period, the 'race' category used in the journal reflects the population censuses conducted by the Japanese government. These divided the population into Shina Mainland Chinese (支那人),⁵ Islanders of Taiwan (本島人) including 'Han people with Fujian lineage' (福建系台灣人) and 'Han people with Guangdong lineage' (廣東系台灣人), Raw Savage (生番), and Cooked Savage (熟番)⁶ in this medical journal.

Table 1. Changing ethnic classification and representation in medical samples in the Journal of the Formosan Medical Association (1899–2022).¹

Period	Changing ethnic classification and representation in medical samples			
The Japanese colonial period (1899–1945)	Shina Mainland Chinese (支那人)	Islanders of Taiwan (本島人) 1. Fujian Taiwanese (福建系台灣人) 2. Guangdong Taiwanese (廣東系台灣人)	Raw savage (生蕃) (1899–1934)→Mountain indigenous peoples (高砂族) (1935–1945)	Cooked savage (熟蕃) (1899–1934)→Plains indigenous peoples (平埔族) (1935–1945)
Subtotal	25	164	150	1
The postwar period of KMT control (1946–1990)	Chinese (中國人)	Taiwanese, Taiwan Province (台灣省下台灣人)	Mountain compatriots (山胞) 1. Mountain-area mountain compatriots (山地山胞) 2. Plains-area mountain compatriots (平地山胞)	Plains indigenous peoples (平埔族)
1946–1960	37	99	50	10
1961–1980	156	211	45	3
1981–1990	86	80	7	0
Subtotal	279	390	102	13
The period of democratization and indigenization in Taiwan (since 1991)	Chinese (中國人)	Taiwanese (台灣人)	Indigenous peoples (原住民族) 1. Lowland indigenous peoples (平地原住民) 2. Highland indigenous peoples (山地原住民)	Plains indigenous peoples (平埔族)
1991–2000	31	32	5	0
2001–2010	9	113	6	0
2011–2022	33	94	7	0
Subtotal	73	239	18	0

¹The author has collected related articles in the *Journal* from 1899 to 2022 from three sources: (1) The search system of the 'Taiwan Medical History Database' of the Academia Sinica (<http://aslib.sinica.edu.tw/database/alldb.html>) was used to collect titles from the Journal of the Formosan Medical Association from 1899 to 1999, including its predecessor 'Taiwan Medical Journal'. Before 1945, the articles were mainly in Japanese. During the period (1899–1945) the publication of the journal might have also been temporarily discontinued. The Chinese articles in this search system were mainly collected from 1946 to 2000. (<http://2011hj01.litphil.sinica.edu.tw/8035/cgi-bin/2/Libo.cgi?>). (2) The search system of the National Library of Taiwan Periodicals Index was used to collect articles from 2000 to 2005. (3) The journal database of the Journal of the Formosan Medical Association was used to collect articles from 2006–2022. Each article can only count toward one category based on the human classification used in the article's title.

During the KMT era from 1946 to the 1990s, all ‘Han’ Peoples, whether mainlanders or local Taiwanese (Hoklo/Hakka), were considered Chinese. The majority of local Taiwanese belonged to Taiwan Province of China. The only other category included in the KMT’s original human classification was mountain compatriots (山胞), which included both ‘mountain-area mountain compatriots (山地山胞) and plains-area mountain compatriots (平地山胞)’, and plain Indigenous peoples (平埔族). Medical samples taken in Taiwan were typically classified as Chinese, given the KMT’s Chinese nationalism, and were considered to be representative of all Chinese. If some samples happened to be classified as Taiwanese, it meant only they were from Taiwan Province. For example, in a 1956 article titled ‘A study on the hypertension disease among the urban residents of the Chinese people’ (中國人都市住民之高血壓症研究), although blood samples were obtained from Taipei residents, the research title and findings were directly inferred to represent all Chinese (Lin et al., 1956).

After the 1990s, there was a change from categorizing the population of Chinese to categorizing the population of Taiwanese. Thus, more recent papers in the journal make a clear-cut distinction between Taiwanese and Chinese. Blood samples taken in Taiwan were no longer classified as Chinese and the use of the term Taiwanese steadily increased. The concept of four great ethnic groups was also applied to sample classification. For example, a 1997 article titled ‘Blood groups and transfusion medicine in Taiwan’ pointed out that its samples were obtained from the four great ethnic groups and that its findings were used to make inferences about the Taiwanese population (Lin, 1997). The social transition from Chinese to Taiwanese has changed the criteria and representativeness of human classification in biomedical research. It has also produced a new unit of analysis—Taiwanese—for the national genetic profile that has replaced the previous use of the term ‘Chinese’ in the lab.

The rise of a decolonial counter-discourse: The hybrid and multiple origins of the Taiwanese

After the end of the martial law period, historians, politicians, and linguists enthusiastically delved into genealogical research to rewrite Taiwan’s history. Dr. Marie Lin and the research team she led as director of the Transfusion Blood and Molecular Anthropology lab at Mackay Memorial Hospital were at the forefront of rewriting the genetic history of Taiwan. For this work Lin was commended by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a distinguished female scientist.

Lin was born in Taiwan in 1938. Her family was representative of ethnic integration in the modern history in Taiwan. Her father was a famous Hoklo surgeon, and her mother was Japanese. When she was four years old, her father took all family members to Northeast China due to the Pacific War. In January 1947, they moved back to Taiwan during the Chinese Civil War. One month later, the February 28 incident broke out, in which many local elites were purged by the KMT. Her father escaped because he suffered from tuberculosis (Huang & Yang, 2017).

In our interview with her, Lin said:

We started in 1981, when Taiwan's economy had not yet taken off. I was also engaged in a large amount of research on blood types, and found that there were significant differences between the Taiwanese and Caucasians. This led me to thinking that there should be the establishment of safety operating standards specifically for Taiwanese.

The Japanese have always followed the same standards as the white people, but I felt that Taiwanese should establish our own standards, that means you have to do research to understand exactly what kind of blood types and antibodies exist among Taiwanese. ... In 2009, the pre-blood-transfusion Manual Polybrene (MP) testing method was established for Taiwanese. Taiwan became the first country in Asia to have its own localized standard blood transfusion system. Until now, Taiwan's MP method is well-known in the International Society of Blood Transfusion.

But for Lin the study of Taiwanese blood types became a jumping off point for the study of the unique and diverse ancestry of the Taiwanese people.

The article 'The origin of Hoklo and Hakka, the so-called "Taiwanese" inferred by HLA study' (Lin et al., 2001), published in *Tissue Antigens*, has drawn lots of public attention, especially for rejecting the idea that Taiwanese people are genetically similar to Chinese people. According to the KMT, Taiwanese people are pure Han from northern China. However, Lin's analysis of HLA (Human Leukocyte Antigen) haplotype frequencies indicates that the Hoklo and Hakka people, are descendants of the ancient Yueh (越) minority, and thus of Southern Chinese origin (not pure Han). This ancestral link is evidenced by the preservation of the genetic sequence A33-Cw10-B58-DRB1*03-DQB1*02 within the Taiwanese. Lin et al. (2001) further emphasize that gene flow from northern China into the South may have been caused by massive migrations of people fleeing political turmoil. The KMT's official narrative, however, asserted that Hoklo and Hakka are direct descendants of pure northern Han Chinese. (pp. 192–199). Because this article represents Taiwanese as genetically distinct from pure northern Han Chinese, it has been used to support Taiwanese nationalism.⁷

In addition, Taiwanese Indigenous Peoples were classified as Austronesian. From a linguistics perspective, Taiwan was a likely origin of all Austronesian languages. However, Lin and Broadberry (1998) argued that Taiwan is a station of Austronesian migration rather than the origin of Austronesians. In 'Heterogeneity of Taiwan's Indigenous population: Possible relation to prehistoric mongoloid dispersals', Lin et al. (2000) state that haplotypes commonly found in Taiwanese Indigenous Peoples also appear in high frequencies within certain Asian populations. Taiwanese Indigenous Peoples would thus share genetic affinities with both northern and southern Asians. Further analysis also reveals genetic affinity between Taiwanese Indigenous Peoples and Oceanians (Lin et al., 2000, pp. 7–8). After performing DNA analysis, Lin argued that Haplotypes in Taiwanese Indigenous Peoples also appear in Māori people, New Guinea Highlanders, Indigenous Australians, Inuit, Orochons, Mongols, Japanese, Manchu people, Buryats, and Indigenous Peoples in Northern Canada. Lin concludes that the genetic affinity between Taiwanese Indigenous Peoples and these populations demonstrates the multiple origins of the Taiwanese (Lin, 2010, p. 126).

Moreover, Taiwan was annexed by the Qing dynasty in 1683. The Qing government allowed only men to migrate to Taiwan, so early Chinese immigrants could only marry women of Plains Indigenous Peoples. This historical fact gave birth to the old Taiwanese saying, ‘we have great-grandfathers from mainland China, but no such great-grandmothers’ (有唐山公而無唐山媽). During their colonial rule, the Japanese adopted the Qing Dynasty’s racial classification, dividing Taiwanese Indigenous Peoples into ‘raw savages’ (生番) and ‘cooked savages’ (熟番). In 1935, the classification of raw savages and cooked savages in the population registers was changed to Mountain Indigenous Peoples and Plains Indigenous Peoples respectively (see Table 1). In 1954, the postwar KMT government dropped the category of Plains Indigenous Peoples as an ethnic group, in the name of Sinicization. After the martial law period ended, the renewed interest in Plains Indigenous Peoples also resulted in the Culture Revival Movement. Plains Indigenous Peoples have still not been recognized as a formal ethnic category, but an increasing number of Taiwanese have identified themselves as Plains Indigenous Peoples in the past two decades. Thus, the question of the exact percentage of Indigenous ancestry (Plains and Mountain Indigenous) in the Taiwanese genetic make-up has become a focus of scientific research. In our interview, Lin said: ‘If they identify themselves as Plains Indigenous Peoples, then we collected their blood samples and classified them as Plains Indigenous Peoples. ... We collected blood and saliva samples from the Siraya, a tribe of Plains Indigenous Peoples, from 1999 to 2006’. The research findings of Lin et al. emphasize that Taiwanese Plains Indigenous Peoples, Mountain Indigenous Peoples, and Southeast Asian populations all have some degree of genetic affinity. Besides, the genetic legacy of Plains Indigenous Peoples has not vanished, and the majority of local Taiwanese are the descendants of Sinicized Indigenous Peoples. (Lin, 2010, pp. 47–48).

Finally, in 2000, Lin published an article titled ‘Heterogeneity of Taiwan’s Indigenous Population: Possible relation to prehistoric mongoloid dispersals’, stating that Hoklo and Hakka are genetically hybridized with 13% Indigenous genes from the Y-chromosome (Lin et al., 2000). Furthermore, in 2006 Lin published ‘The difference in our bloods’ in the *Special Issue for Scientists*, using mtDNA matching to find that 26% of Taiwanese have indigenous genes from their mother-lines (Lin, 2006). In 2007, in ‘The genetic structure of non-Indigenous Taiwanese Han’, published by the *Liberty Times* newspaper, Lin suggests that 85% of Taiwanese have Indigenous Peoples’ genes from their father (Y-chromosome), their mother’s line (mtDNA), and HLA (Lin, 2007).

Lin and her team’s research over thirty years is summarized in two books: *Our Blood is Different* (2010) and *A Graphic Guide to the Taiwanese Blood* (2018). It challenges the KMT’s Chinese nationalism and myth of a homogeneous nation, which define Taiwanese as being purely of Han origin. Lin’s scientific imagination is not only in her lab but also intertwined with the change of identity politics from Chinese to Taiwanese. The scientific findings show a kind of decolonial counter-discourse⁸ in opposition to the KMT’s discourse.

In the 20th-century US, the one-drop rule and purity standard asserted that any person with even one ancestor of African ancestry (one drop of Black blood) would be considered Black (Davis, 2001). Racists and defenders of the one-drop rule stress the superiority of one race over the other. By analogy, for critics of Sinocentric discourse and the KMT’s official Chinese nationalism, it is essential to emphasize non-Han or hybrid

origins, dismantling the KMT's national myth. Taiwanese scientists have thus attempted to prove the ethnic hybridity of the Taiwanese and recognize that most Taiwanese are partly descended from Indigenous Peoples, who were once considered an inferior group of uncivilized savages. This kind of decolonial counter-discourse can be exemplified by Lin's controversial work, which demonstrates that the celebration of one drop of Indigenous blood and hybridity in Taiwanese is effective resistance to the pure Han ethnocentrism under Chinese nationalism. Leroux (2018) provides us with a parallel national context through which to consider scientists of *Epidemiologie genetique des populations du Quebec* (EGGPQ) efforts to link French Quebecois identity to Indigeneity. The logic of hyperdescent of Native American DNA based on genetic research provides the basis for white settlers to claim to be Indigenous and for some French Québécois to deny settler status, supporting a variety of forms of Québec nationalism.

Lin's research is not limited in the lab but is also embedded in changes in identity politics, whose advocates embrace the new identity and create anti-KMT discourses to defy Sinocentrism and Chinese nationalism. The changing identity politics since the 1990s in Taiwan, such as the four great ethnic groups, multiculturalism, and Taiwan nationalism, has led to the emerging genealogical science and the "nationalization of biomedicine". This has arguably led to scientists using social categories of ethnic/national and ancestral origin with increasing frequency in practicing biomedicine.

The spillover of scientific findings into the broader Taiwanese society

The public debate on Taiwanese with indigenous blood: 13 % (2000), 26% (2006) to 85 % (2007)

As people in Taiwan increasingly identified as Taiwanese rather than Chinese, Lin's research has reported increasing percentages of Taiwanese with Indigenous blood: from 13% (2000) to 26% (2006) to 85% (2007). Responding to public debate, Dr. Lin (2009) stated that, '[her] original plan was only to establish the genetic data of the Taiwanese. It was not [her] intent for genetic research to have anything to do with nation-building' (p. 344). Although Lin's research has avoided the use of any politically charged terms, her scientific findings have created political tensions. With regard to her seemingly inconsistent findings, Lin explained that 'this is because HLA comparison only allows us to find the genetic distance between ethnic groups. Based on mtDNA and Y-chromosome analysis, it can allow us to find the migratory pathways of Taiwan's different ethnic groups' (2006, p. 126).

In an article by biological anthropologists Shu-Juo S. Chen and Duan (2008), titled 'Plains Indigenous ancestors and Taiwan blood nationalism' and published in the journal *A Radical Quarterly in Social Studies* in Taiwan, the authors criticize Lin's research as politically charged doctrines in support of an independent Taiwanese identity. Using Admix 2.0 to analyze Y-chromosome data, Chen and Duan point out that the paternal lineage of the Taiwanese Han population shares a 93% similarity with that of the Southern Chinese Han, while having only a 7% similarity with that of Taiwanese Indigenous Peoples. Chen and Duan also criticized Lin's changing figures on the percentage of

Taiwanese Han with Taiwanese Indigenous Peoples DNA, as the percentages increased from 13% in 2000, to 26% in 2006, and then jump to 85% in 2008 through an indiscriminate broadening of the scope used to identify participants as having Plains Indigenous Peoples' ancestry (Chen & Duan 2008: 147–156, 163).

Different technologies and methodologies based on genealogical research have been used by the opposing sides to explain the percentage of Indigenous blood. Chen's emphasis is on the 'average ratio of the indigenous blood in the Han Taiwanese', whereas Lin's argument is based on the 'ratio of Han Taiwanese with one drop of the indigenous blood'. Applying Lin's interpretation and results to one hundred Han Taiwanese, twenty would have no indigenous ancestry (0), and be considered purely Han Taiwanese. Fifty would be 1/8 mixed (1.25), and the remaining thirty would be 1/4 mixed (2.5). Using Chen's formula, the average ratio of indigenous blood in Han Taiwanese would be calculated as $(0 \times 20 + 1.25 \times 50 + 2.5 \times 30) / 100 = 0.1375$ or 13.75%. Based on Lin's interpretation, since eighty out of one hundred Han Taiwanese have one drop of indigenous blood, 80% are considered to have indigenous ancestry. Lin concludes that 85% of Taiwanese have indigenous ancestry after combining the results of three technologies of maternal, paternal, and HLA analysis.

In her response to Chen and Duan, Lin counters that she was also subject to 'some criticisms and attacks on her findings, most of which originated from China' (2009, pp. 342–343). She asserts:

Chen Shu-Juo has up until recently been a titular member of China's Fudan University funded Key Lab of Contemporary Human Biology. Isn't it quite a coincidence that he would launch such an attack on any Taiwanese research that is in contention with China's political ideology? Perhaps I should consider his words as little more than politically charged doctrine supporting China's One-China policy. His article contains no data outside of a few lines of analysis performed using Admix 2.0, which he uses to somehow reach the conclusion that no more than 20% of the Taiwanese maternal DNA can be from Taiwanese Indigenous Peoples. It's not scientific. (2009, p. 344)

The controversy over Lin's findings has been aired on the Taiwan Indigenous TV (2010a, 2010b, 2010c) channel, in programs such as 'My blood flows toward Shanghai', 'My blood, your identity', and 'Where does our blood come from?'. In the last of these, Lin and Chen are both interviewed. When asked why Taiwan is listed as 'Taiwan Province, China' in his article (Chen & Duan, 2008, p. 146), Chen explained: 'We did inform our Chinese co-authors for this to be corrected, but they did not make any corrections as requested' (Taiwan Indigenous TV, 2010c).

The scientific dispute between Lin and Chen is not restricted to academic arguments but reflects the conflict over national identity and belonging. The aforementioned article co-authored by Chen and scientists in China makes inferences on the paternal origins of Taiwanese Indigenous Peoples using Y-chromosome analysis (paternal lineage) to conclude that Taiwanese Indigenous Peoples share consanguinity with China's Daic population, and all Austronesian populations are derived from the Daic people (Li et al., 2008). In contrast, Lin et al. used mtDNA testing (maternal lineage) to infer that Taiwanese Indigenous Peoples originated from Southeast Asian populations (Trejaut et al., 2005). Using different technologies, either Y-Chromosome in China or mtDNA analysis in

Taiwan, the two groups of scientists' different stances on their national identities have led to opposing scientific claims regarding the origins of Taiwanese Indigenous Peoples. Most significantly, the limitations of each methodology and technology leave the results open to scientific misinterpretation in the public discourse.

Furthermore, at the time of publication, Chen was a lecturer at Taiwan's Tzu Chi University and was credited as being from 'Taiwan, China', despite having been born and raised in Taiwan. In response to the labeling, the R.O.C. Ministry of Science and Technology proposed a new rule in 2010 for joint academic publications with scholars from China. Failure to comply with the correct labeling of R.O.C. nationality will render all offending articles invalid for academic evaluation in Taiwan. The ongoing scientific dispute has extended to the conflict of nationality across the Taiwan Strait.

Chen and Duan (2008) argue that 'self-identity has nothing to do with who your ancestors are, just live your life to the fullest' (p. 164). Lin responds with the same attitude: 'The act of exploring roots is just so that we can understand ourselves better, the identification of our ancestral origins has nothing to do with our ethnic identification. Our ethnic identity comes from cultural identity rather than biological blood' (2009, pp. 344–345). In my interview, Lin emphasized:

'What is your identity?' For me, it is still your cultural identity rather than biological identity. Like my mother is Japanese, but I don't identify as Japanese, and I say I'm Taiwanese. ... My maternal grandfather was a Tang Shan Gong (唐山公) from China, and my maternal grandmother was a Pingpu mother (平埔媽) from Taiwanese Plains Indigenous Peoples, but I still identify with my Pingpu mother. The bloodline or genetic ancestry is just a reference, right?

Even though both sides adopt the same position that identity is not based on blood, both remain directly opposed to the other's views on national identity. The denunciations of assumed political motives traded between Lin and Chen have evolved into a scientific competition over whose research finding is more correct. The scientific debate has spilled over into the issue of national identity and raises an important point: Scientific research does not offer unambiguous answers to complex issues related to identity and ancestral origin.

Social implications of media beyond the lab

After martial law ended, newspapers and magazines in Taiwan have been eager to report genetic findings about the multiple origins and genetic make-up of Taiwanese people. Table 2 shows that, since the 1990s, newspapers in Taiwan and China have published pieces on the ancestral origin of the Taiwanese, with a focus on Lin's research. However, newspapers in China criticize Lin's findings for promoting blood-nationalism. With increasing news coverage, genetic findings have become more publicly accessible.

First, Lin's 2001 research was interpreted by many newspapers as evidence that the Taiwanese are not Han Chinese, and that the Hoklo and Hakka are Yueh people. In media coverage, there were such titles as 'Taiwanese not Han Chinese. Blood analysis: Hoklo, Hakka Taiwanese are Yueh Indigenous Peoples in the southeastern coast of China' (People's Livelihood News, 2001) and 'Mackay Hospital Doctor: Taiwanese people are part of the Yueh people of the southeastern coast of China' (United Daily News, 2001).

Table 2. Newspaper articles on Taiwanese origins and genetic makeup. The numerals in the parentheses are the number of articles on Marie Lin's research.¹

Period	Origin of Taiwanese in genetics		Origin of indigenous peoples in genetics		Genetic makeup of Taiwanese		Genetic comparison of inter-ethnic groups		Subtotal	
	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China	Taiwan	China
1951–1980	1 (0)	No data	0 (0)	No data	0 (0)	No data	0 (0)	No data	1 (0)	Nodata
1981–1990	2 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	0 (0)
1991–2000	8 (0)	0 (0)	22 (5)	0 (0)	3 (0)	0 (0)	28 (1)	0 (0)	61 (6)	0 (0)
2001–2010	38 (14)	10 (4)	37 (18)	19 (3)	11 (11)	0 (0)	25 (10)	5 (4)	111 (53)	34 (11)
2011–2022	129 (23)	38 (0)	52 (9)	13 (1)	24 (19)	1 (1)	11 (2)	0 (0)	216 (53)	52 (2)
Subtotal	178 (38)	48 (4)	111 (32)	32 (4)	38 (30)	1 (1)	64 (13)	5 (4)	391 (113)	86 (13)

¹Numbers in Table 2 were collected from newspaper articles on Taiwanese ancestry and genetic research from 1951 to 2022. The sources for articles in Taiwan include: (1) the United Daily News Database, including the *United Daily News*, *Economic Daily News*, *United Evening News*, and *Min Sheng Daily News*; (2) four newspaper systems, including the Instant Headline Index Database, the News Knowledge Database, the Taiwan News Intelligence Network, and *Liberty Times*; (3) the *China Times* full-text image database, Taiwan News Intelligence Network, and Knowledge Winner database; and (4) Apple Daily Database. The sources of newspapers in China include (1) *WiseNews*, a collection of news-related resources from the Asia-Pacific region, (2) *People's Daily*, and (3) *Guangming Daily*.

The *China Times* in Taiwan stated simply 'Taiwanese are Yueh' (China Times, 2001), and *Kimo Digital News* published 'After the Uprising of the Five Barbarians, the Yueh people were Sinicized, causing the Hoklo to see themselves as the direct descendants of pure Han people' (Kimo Digital News, 2001). Through their differences, these titles draw a clear genetic distinction between Taiwanese and Chinese.

Second, newspaper titles drew a link between the Taiwanese Indigenous Peoples and Islanders in Southeast Asia and the Pacific Ocean, in response to Lin and Broadberry's work (1998). The *United Daily News* reported, 'Taiwanese Indigenous Peoples are genetically linked with Pacific Islanders' (United Daily News, 1999), and the *People's Livelihood News* wrote: 'Ancestors of Taiwanese Indigenous Peoples and Polynesians arrive at Taiwan fourteen thousand years ago. Shared genealogy with Indonesians, Malaysians, and Filipinos' (People's Livelihood News, 2004). Intensive reports followed Lin's research, such as 'Tracing Taiwanese Indigenous Peoples' genealogy through mtDNA. Mackay Hospital's Research: 6% Affinity with Southeast Asians and 3% with Mainlanders' (People's Livelihood News, 2002), 'The Taiwanese Indigenous Peoples and the Southeast Asians are genetically related. Polynesians are possibly from Taiwan' (United Daily News, 2004), and 'Hematologist: Taiwanese and South Pacific Islanders are one family' (China Times, 2005). These articles show the ethnic affinity between the Taiwanese Indigenous Peoples and islanders in Southeast Asia is well established in public media.

Third, Lin's research on the percentage of Taiwanese who have indigenous genetics received considerable coverage. Two newspaper reports⁹ on her academic findings emphasized the unique lineage of Indigenous Peoples, but did not mention the presence of Indigenous genes in 13% of Taiwanese. After she presented her paper stating that 26% of Taiwanese have indigenous genes (Lin, 2006), the *United Daily News* (2006) stated that 'genetic research shows 26% of Taiwanese have indigenous genes'. Subsequently, Lin's research received increasing coverage, such as in 'Marie Lin: 85% of Hoklo and Hakka have Indigenous genes' (China Times, 2007) and 'You might have Indigenous genes' (United Daily News, 2007). The simplifying titles painted a picture that most Taiwanese have Indigenous ancestry.

On 21 November 2007, the *Liberty Times*, whose political leaning was close to the pro-independent Democratic Progressive Party, maintained in an editorial, 'Taiwanese are genetically different from Chinese', that Lin's research subverted the Sinocentric view of history and worldview:

If we combine genetic and historical studies, it is not difficult to find out that ethnic integration in Taiwan started more than ten thousand years ago when the Indigenous People migrated from Southeastern Asia. The migratory spirit inherent in the Taiwanese genes stimulates the people to resist foreign colonialism and the Chinese ambition to annex the island. It can even help us to achieve the ultimate goal of state sovereignty and a normal nation. (Liberty Times, 2007)

With complex cross-strait relations, Lin's research attracted the attention of China's media. In the article 'People on the two sides of the Strait have the same ancestors. Studies on the Human Leukocyte Antigen: Taiwanese and the ancient Yueh have similar genes', the pro-Beijing *Wen Wei Po* (文匯報) condemned Lin's conclusions as shameful

and disgraceful, referencing the research of Ruofu Du (杜若甫), a leading scientist in ethnic and racial studies in Mainland China (*Wen Wei Po*, 2002). The *Oriental Daily News* (東方日報), in 'Lin's genetic research attacked as separatism', argued that there was a hidden separatist agenda in Lin's research as her findings suggested that Taiwanese Hoklo and Hakka are more genetically similar with people from Southeast Asia than with the Han Chinese in northern China (*Oriental Daily News*, 2003). China's media attempted to reassert the inseparable blood link between the Taiwanese and Chinese by referring to studies of fingerprints (dermatoglyphics) and names (anthroponymy). After Zhang Hai-Guo (張海國) of Shanghai Jiao-Tong University used dermatoglyphics to assert that Taiwanese Indigenous Peoples and Tibetans are all direct descendants of northern Han Chinese, with particular emphasis on the genetic unity of the 56 nations of China,¹⁰ *Wen Wei Po* published an article 'Dermatoglyphic discovery: 56 nations belonged to one family since the beginning of history. Taiwanese Indigenous Peoples are not from Southeast Asia' (*Wen Wei Po*, 2010). Covering Zhang's research, the *Shanghai Evening Post* (上海新聞晚報) endorsed the shared ancestral origin of 56 nations in China (*Shanghai Evening Post*, 2010), while the *Macau Daily News* (澳門日報) also asserted that the whole Chinese nation is one family (*Macau Daily News*, 2010).

These newspapers in Taiwan and China have not only facilitated the dissemination of scientific findings, but they have been associated with national disputes regarding the status of Taiwan vis-à-vis China. Taiwan's media tends to emphasize Taiwan as an immigrant society and celebrates its multiple origins. China's media upholds the blood unity of Han Chinese. Media reports across the Taiwan Strait tend to promote a sense of clear-cut human classification by simplifying scientific findings into a causal link. Moreover, genetic findings are interpreted differently by people with opposing standpoints, reinforcing the existing imaginaries of human classification based on essentializing specific national identities.

Genetic research to rewrite history textbooks and to challenge Chinese officials' statements

Even though the multiple origins of Taiwanese ancestry have remained controversial, the genetic findings have circulated as important evidence in shaping Taiwan's historical narrative. Genealogical evidence does not just spill over into society; it is central to constituting 'society'.

After the KMT came to Taiwan in 1949, Taiwan's history textbooks regarded Taiwan as part of China. All people in Taiwan are considered descendants of the Yellow Emperor. When Taiwan's society moved towards indigenization and democratization, there was a shift in history textbooks from a Han-dominated Chinese history to a multi-ethnic Taiwan-centered history, where Taiwanese Indigenous Peoples were the only inhabitants before the Han and other foreigners came to Taiwan.¹¹ With the research on Taiwan's genealogy in the 1990s, the genetic uniqueness of Taiwanese Indigenous Peoples has been used not only to rewrite history textbooks but also to challenge China's official claims. In the 2019 textbook published by Longteng, Chapter One, titled 'The formation of the multi-ethnic society: Austronesian and Taiwanese Indigenous Peoples', reports that biomedical scientists have sought to decipher Taiwanese blood and ancestry since the 1990s. It states that

Taiwanese Indigenous Peoples and Austronesian peoples have similar DNA markers. In the chapter, 'Who are the Indigenous People on this island?' published in a textbook by Nanyi (Chen, 2019), Lin's findings regarding 85% of Taiwanese people having indigenous blood are cited. Responding to the publication of this textbook, Chen argued that the incorporation of Lin's incorrect evidence into history textbooks could cause great harm and damage the students' view (Apple Daily New, 2019). Tsai Zhengyuan, a former KMT legislator, also criticized Lin's methodology and theorization as pseudo-science to endorse de-Sinicization (China Times, 2019). The next day, Nanyi Publishing company issued a formal statement that the textbook was professionally reviewed and officially approved.

Moreover, the new textbook celebrated indigenous blood and hybridity in the genetic make-up of the Taiwanese in order to challenge the idea of a unified Han Chinese nation in both the KMT's history and Chinese officials' claim that 'blood is thicker than water'. On January 2, 2019, Xi Jinping, president of China, delivered a speech at the Meeting Marking the 40th Anniversary of the Issuance of the Message to Compatriots in Taiwan: 'We people on both sides of the Taiwan Straits are Chinese and share a natural affinity and national identity built of kinship and mutual assistance, a fact that can never be altered by any force or anyone'. In response, the representatives of Taiwanese Indigenous Peoples held a conference to oppose Xi's declaration of the reunification of Taiwan with 'one country, two systems'. On January 11, 2019, the chairman of the Indigenous Missionary Committee of the Presbyterian Church in Taiwan, Pastor Udud Lebak, presented the joint declaration of more than 500 Indigenous churches, arguing that they opposed China's claim of blood ancestry and intention to annex Taiwan. Dr. Lin also joined the joint declaration and emphasized Taiwan's Mountain Indigenous People had been isolated from China for nearly 10,000 years and that 85% of Taiwanese people have indigenous blood. She argued that her scientific findings refute Xi's argument that the Taiwanese and Chinese are one family (Taiwan People News, 2019). On the same day, the article 'Are we a family? Taiwanese genetics are different from Chinese' in the *Liberty Times* cited Lin's findings to counter Xi's argument of shared blood (Liberty Times, 2019).

In the heated debate over national identity, genetic research on the multiple origins of the Taiwanese serves to reconstruct Taiwanese history and challenge China's official discourse. The scientific findings of Lin and her team have spilled out into media, history textbooks, and public debate, shaping the de-Sinicization of Taiwan. This has also led to more and more people in public discourse using biomedical categories in characterizing national differences and identities, reflecting the ongoing 'biomedicalization of the nation'.

Conclusion

The global development of genealogical science has various manifestations in different local contexts involving the contemporary nation-state and scientific practice. Through the Taiwan case, I have argued that genetic research in genealogical science has played an increasingly important role in national identity to bolster specific versions of difference and belonging in the post-genomic era. Genetic configurations of human

differences between Chinese and Taiwanese people gain meaning not only in the lab, but also through different social mechanisms that extend beyond the laboratory.

First, this article attempts to deepen a co-productionist approach by addressing how biomedicine premised on genetics has led to the 'nationalization of biomedicine' on the one hand and the 'biomedicalization of the nation' on the other. This article also shows that the inward invasion of social factors and concepts such as multiculturalism, four great ethnic groups, and Taiwanese nationalism into scientists' imaginary in the lab has resulted in the emergence of a new human classification, from the previously used 'Chinese' to 'Taiwanese' in medical articles after the 1990s. Moreover, scientific findings regarding hybridity and multiple origins for Taiwanese ancestry have moved out of the lab into media, history textbooks, and public debate, reshaping the de-Sinicization of Taiwanese identity. The biosocial co-production between Taiwanese ancestry and social transition is contingent on biomedicine, the technological policy of the Taiwanese government, and the identity politics of ethnicity and nationalism. Indeed, there are growing demands for reintegrating the natural and the social, and for strengthening transdisciplinary forums and collaborations, some of which have genomics-and-society as an important theme.

Second, under Epstein's biopolitical paradigm (2007, pp. 17-29), social identities such as gender, race, and ethnicity are the focus of biomedicalized human classification in the US. By contrast, the link between biomedicine and the politics of identity and difference in Taiwan has involved not only racial/ethnic issues but national construction as well. Harding (2009) showed that post-colonial studies' focus on race proved too narrow for STS scholars studying the construction of all forms of difference. In this article, I conclude that a reflection on the case of Taiwan contributes to our understanding of examples of Asian (or Han) settler-colonialism, in contrast to the usual focus on Euro-American examples. As Taiwan's case shows, the scientific discourse about multiple origins and Austronesian indigeneity in Taiwan is not simply genetic ancestry evidenced in scientific journals, but is selectively incorporated into nation-building efforts in differentiating the Taiwanese and the Chinese on opposite sides of the Taiwan Strait.

Tallbear (2013) describes how Native American DNA comes to be used as evidence of one's ancestry and indigeneity in America. She demonstrates how 'tribes have increasingly moved away from the racial mechanism of total 'Indian blood' to a genealogical mechanism of 'tribe-specific blood', making Native DNA or ancestry tests incompatible with tribal enrollment. She criticizes genetic research that produces forms of indigeneity that might serve scientists better but damage tribal and First Nations' self-determination. It has resulted in claims of indigeneity becoming increasingly available to American citizens with no political ties of citizenship or cultural ties of upbringing to present-day Native nations. In contrast, the scientific discourse on indigenous contributions to the DNA makeup of the Taiwanese functions as a decolonial counter-discourse that is supported by some Taiwanese indigenous elites. It has celebrated indigenous ancestry and hybridity in Taiwanese people to challenge the Han-centrism promoted by the KMT and the Chinese Communist Party. As the Taiwan case shows, Lin's research emphasizes the multiple origins and high percentage of Taiwanese with indigenous blood, subverting the alleged Han Chinese origin tracing back to the Yellow Emperor and engaging in resistance to Han colonization. Taiwanese anti-colonialism, together with intellectual,

political, and social responses by Indigenous Peoples to oppose the KMT's colonial rule, is embedded in the change of identity politics that accompanied indigenization and democratization after the end of martial law. However, as genetic research wields increasing scientific authority on indigeneity and national identity in Taiwan, we need to reflect on who will benefit. Some scholars have reminded us that the claims to Taiwanese indigenous ancestry by the majority 'Han' settler-colonists may be seen as a threat to the identity and self-determination of the indigenous tribes of Taiwan (Hirano et al., 2018; Munsterhjelm, 2014; Sugimoto, 2017).

Third, different kinds of configurations of human classification come to matter in genetic research, knowledge, and technology. Genetic research does not simply produce new genealogical epistemologies connecting Taiwanese indigenous genetics and national identity, but rather defines a new boundary object—genetic ancestry in scientific and social classifications—that disseminates different interpretations of Taiwanese and Chinese ancestry and shapes the process of national self-actualization. When genetic technologies enter into cultures of remembrance (Sommer, 2010), national history and ancestry may be adopted for particular purposes in identity politics. This article shows that using different technologies, such as the use of mitochondrial DNA (maternal lineage) by Lin's team in Taiwan or the use of Y-Chromosome analysis (paternal lineage) by scientists in China, have led to different scientific findings regarding Taiwanese Indigenous origins and national identity. These scientific debates highlight that genealogical science and its relationship to the nation is a contested field. Using gene-level differences between Chinese DNA and Taiwanese DNA based on different technologies has become a significant force in shaping different understandings of ancestry and national belonging. Anderson's (1983) imagined communities are represented in the two versions of scientific studies on the opposite sides of the Taiwan Strait. Nevertheless, the exploration of different national contexts has shown that local politics play a significant role in the use of categories and technologies for building a new system of classification.

In fact, the genealogical research on ancestral origins creates opposing national imaginations in Taiwan and the PRC—whether it is the Taiwanese imagination of a distinct Taiwanese identity or the Chinese imagination of a singular Chinese community. However, varying interpretations of the imagined community are manifested through the public dissemination of scientific research. This research involves diverse sets of genetic data produced by scientists whose work is shaped by a complex co-production process influenced by evolving social categories. These categories guide the utilization of different technologies or definitions of samples, thus presenting varied opportunities for the national construction of the imagined community. While this paper has focused on the scientific debates between Taiwan and China, ancestry is a highly sensitive matter in many contexts, with potentially significant consequences for different groups of people striving for political recognition or access to important resources. For genealogical science to play a constructive role in identity-making, we need to extend our epistemological reflection. This means remaining vigilant to genetic technology, scientific knowledge formation, and methodology by looking at scientists' works and discourses through an STS perspective.

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Notes

1. The Austronesian peoples are peoples who speak Austronesian language, including the Indigenous inhabitants of Taiwan, most of the islands of Indonesia, the Philippines, Madagascar, the island groups of the Central and South Pacific, Malaysia and many parts of Vietnam, Cambodia, and Laos.
2. GWAS (genome-wide association studies) are observational studies of genome-wide sets of genetic variants in different individuals to see if any variants are associated with traits like major human diseases.
3. During the Japanese colonial period, Hoklo were categorized as 'Han people with Fujian lineage' and Hakka categorized as 'Han people with Guangdong lineage'. Both of them were under the category of 'Islanders of Taiwan'.
4. Prior to 1990, both Chinese and English articles could be found in the *Journal of the Formosan Medical Association*. From 1990 onward, this journal began to accept articles only in English, and by 2006 its journal name had been changed to *Journal of the Formosan Medical Association* in English.
5. Shina is a largely archaic Japanese name for China. During the Japanese colonial period (1895-1945), Shina Mainland Chinese, referring to Chinese from China, were distinguished from Islanders of Taiwan. After the end of World War II, the Japanese government accepted the request of the Republic of China government to stop using the term Shina. In 1946, the Japanese Ministry of Foreign Affairs issued an announcement to prohibit the use of Shina Mainland Chinese, so the term 'Shina' completely disappeared from the official documents, textbooks, newspapers, and magazines of the Japanese government (Japan Ministry of Foreign Affairs, 1946).
6. In 1935, the Japanese government renamed 'Raw savage' as Mountain Indigenous Peoples (高砂族) and 'Cooked savage' as Plain Indigenous Peoples (平埔族). Later, KMT renamed 'Mountain Indigenous Peoples' as Mountain Compatriots (山胞) in 1946.

7. Lin's research has been used to support Taiwanese nationalist discourse, for example the World United Formosans for Independence (WUFI), an international pro-Taiwanese independent group founded in 1970, has published Lin's article on its official website.
8. Wu, a historian and scholar of political science, notes the decolonization perspective of different ethnic groups in Taiwan. From the 'Mainlanders' point of view, the decolonization of Taiwan's politics was completed on October 25, 1945, when the KMT took over Taiwan from Japan (Taiwan Restoration Day). From the viewpoint of Local Taiwanese, decolonization means getting rid of the KMT's foreign regime. The decolonization of local Taiwanese began with the democratization and localization of political regimes in the 1990s and was completed with the change of political parties in 2000. From the viewpoint of Indigenous Peoples, decolonization means getting rid of the continuous domination under different political regimes for hundreds of years and achieving the goal of national self-determination. Politically, the signing of the 'New Partnership between Indigenous Peoples and the Taiwan Government' treaty between representatives of indigenous peoples and DPP's presidential candidate Chen Shui-bian in 1999 is a symbolic starting point for the decolonization of Taiwanese indigenous peoples. Compared to the Chinese nationalism centered on the Han-centric Chinese and silencing of indigenous history, the localization and democratization of Taiwanese cooperated with the indigenous movement to establish a new Taiwanese nationalism. Through indigenous peoples, it re-wrote the ancestral origin of the Taiwanese and brought in multiculturalism in the constitution. In a sense, it is still regarded as a decolonization discourse that is also supported by some Taiwanese indigenous elites (Wu, 2016). Please see the conclusion for further reflection on the Indigenous Peoples as the decolonial discourse.
9. *United Daily News*, 13 November 1999; *People's Livelihood News*, 13 November 1999.
10. According to Zhang, Tibetan dermatoglyphics shows characters of the northern group. Therefore, it seems that Tibetans are a northern group and not a 'southern group from India' as has been suggested by scholars. See Zhang et al. (2010).
11. The period of Dutch rule from 1624-1661, Spanish rule, the Zheng family rule from 1661-1895, Qing dynasty rule, along with Japanese colonization from 1895-1945 and the arrival of the KMT, saw the status of Taiwanese indigenous peoples shift from that of the only inhabitants to the people being dominated.

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