

ANI versus ASI, or Aryans versus Dravidians?

Science-Politics Entanglements in the Making of New Categories of Difference in India

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Abstract *The article examines the entanglements between population genetics of India and its deep-rooted political implications by analyzing the construction of the categories “Ancestral North Indian” (ANI) and “Ancestral South Indian” (ASI). Beginning with the historical backdrop of the Aryan migration theory and its connection to racial frameworks, I explore how recent (a)DNA research has rekindled debates about ancestral origins, the caste system, and inequality in India. Scrutinizing the crafting of ANI and ASI categories by the US-based geneticist David Reich and his collaborators, I discuss these scientists’ attempts to disentangle genetics from politics and show how they, however, inadvertently align with Hindu nationalist narratives. Examining the limitations and implications of this nationalization of ancestral categories, the article reflects on the inescapable politicization of such terms and their exclusionary effects. I argue that the persistent challenges posed by the legacies of race within the sciences of human diversity cannot be resolved solely through categorical rebranding or by efforts to isolate science from politics. The conclusion argues for a more nuanced and reflexive understanding of science-politics entanglements and gestures toward the importance of community involvement to better navigate the ethical and political complexities of population genetics.*

Introduction

Discussions about human diversity in India have long simmered around the search for the origins of human differences in the past. How did differentiations among social groups come about? How did the so-called caste system emerge? Do the different castes in India have different ancestries? In dealing with these questions, many scholars have focused on the “Aryan migration theory” (AMT), earlier mostly known as Aryan invasion theory. Theories about an Aryan *people* or *race* took on a prominent role in Nazi ideology, and, in fact, nineteenth-century German Indologists played a key role in theorizing and popularizing ideas about Aryan ancestry, often in an imagined dichotomy with another racialized group, whether Jews in Germany or so-called Dravidians in South Asia (Figueira 2002). Accounts of AMT encompass the idea that an ancestral group of people

known as Aryans migrated from Eurasia down to India a few thousands of years BCE, encountering (or conquering) at least one other ancestral original population, known in some accounts as Dravidians. The many various versions of this model define Aryans and Dravidians in different ways as linguistic, racial, and/or ancestral groups that shaped the diversity of current populations in the Indian subcontinent. Many human groups usually in the North of India are identified with an ancestry/language/race that is Aryan or Indo-European (depending on the model's version), while most groups in the South are identified with the one defined as Dravidian.

AMT became an “obligatory passage point” (Latour 1987, 132) in inquiries about ancestry and the peopling of India. While AMT had been laid to rest in the past, the recent development of new DNA analysis technology reopened this debate. However, this molecular reassessment of old questions about origins has not been free of controversies—both political and scientific. The reassessment of this Indian ancestral history debate through new genomic and ancient DNA technology has stirred up tensions regarding social differences and inequality in the subcontinent. This is also because many versions of AMT had located South Asia's caste differentiations with the incoming Aryans, who are in some accounts regarded not only as the ancestors of today's uppermost caste groups (such as Brahmins) but also as the writers of texts that are considered foundational to Hinduism. Concomitant with the recent rise of Hindu nationalism, this new research refueled and reignited debates about diversity and inequality in India, about the relation of casteism to AMT and the relation between casteism and racism, and, more specifically, about the concepts and categories used to denote ancestral groups (Egorova 2009, 2010; Subramaniam 2019).

In this scenario, the terms “Ancestral North Indian” (ANI) and “Ancestral South Indian” (ASI) have recently emerged in the debate. In this article, I draw from ethnographic research and a close reading of population genetics publications to examine the political and scientific entanglements in which the categories ANI and ASI were crafted.¹ Against the backdrop of the racial legacies in scientific inquiries about human diversity in India, I discuss how key scientists in this field deal with what they see as the “trouble” of the entanglement of their sciences with politics. In the following section, I provide a background on discussions on AMT since the nineteenth century and its relation to racial theories. Then, I analyze how, and with what political reverberations, recent studies on population genetics reignited the flame of racialized understandings of caste and difference in India. The subsequent section examines how the crafting of ANI and ASI relied on inventive—rhetorical, methodological, and practical—efforts by scientists such as David Reich and his collaborators in their attempt to overcome the political (and racialized) weight of other categories of difference but, as a result, ended up being complicit with Hindu nationalistic political framings and other discourses of Indian national integration. Finally, I discuss the limitations and implications of the nationalization of categories for ancestral difference and reflect on the entanglements between science and politics in the field of population genetics of India. I argue that while contemporary scientists might perceive national terms as a suitably “apolitical” replacement for troubling

1 I conducted ethnographic fieldwork between 2017 and 2020 in India, whereby I interviewed several human geneticists and anthropologists and participated at their scientific meetings.

racialized categories, in fact national categories are inevitably politicized and can have important exclusionary consequences. I conclude by contending that the persistent troubles of race in sciences of human diversity will not be solved by simple categorical re-branding or by isolating the realm of science from politics.

Racial Categories in an Old Debate

Inquiries about the migration of so-called Aryans to what is now the territory of India have been replete with ambiguities as much as they have had heightened political affordances. Thapar (2019) explains that defining the entity “Aryan” has been a problem since it was referred to for the first time several centuries ago. “In the public mind,” writes Thapar (2008, 1), “the meaning of the term [Aryan] remains a bit vague and arbitrarily conflates race, ethnicity, culture, language, religion and geography.” Similar to “race,” as much as the term “Aryan” might be ambiguous, it has also been remarkably elastic and therefore enabled different interpretations and rearticulations in public and scientific discourses.

The history of studies on Aryans coming into India goes back to the late eighteenth century, when the British orientalist Sir William Jones talked about an ancient “Aryan invasion” and proposed “the idea of a racial difference existing between northern and southern Indians, and between high and low castes” (Bates 1995, 233). While Jones’s theories “were only weakly supported by linguistic and archaeological evidence” (*ibid.*), they were taken up in the nineteenth-century scholarship on ancient Sanskrit scriptures. German Oxford professor Friedrich Max Müller, for instance, was emblematic of the time in theorizing on the similarities between Sanskrit and European languages to then elaborate that Sanskrit-speaking Aryans moved from somewhere in Eurasia down to India en masse, in approximately 3000 BCE, conquering the Aboriginal Dravidian-speaking peoples of the subcontinent (Thapar 2008). Building upon the widespread perception that South Indians generally have darker skin color tones than North Indians, Müller used the word “race” to describe these two linguistic groups and, based on philological evidence, asserted that the Aryans described the people they encountered as “noseless” and “dark,” which he hastily interpreted as racial markers (Trautmann 1997; Channa 2003). Along these lines, Müller suggested a racial distinctiveness and ancestral origin of the speakers of what he called Indo-Aryan languages (the Sanskrit-related modern languages spoken in the northern areas of the Indian subcontinent), which he contrasted to the Dravidian languages mostly spoken in the Indian South (Channa 2003; Sur 2011). The binary racial contrast between Aryans and Dravidians runs parallel to the contrast, also drawn by Müller, between Aryans and Semites; in both binary constructions, the Aryans stood as an idealized ancestral people, over which eugenicist, nationalistic (and masculinist) mythical fantasies would be projected, not only in India but also, notoriously, in Germany (Figueira 2002).

This orientalist work, in turn, inspired the racial classifications of the British colonial administrator and anthropologist Sir Herbert Risley, who was responsible for formulating a methodology for government surveys on “castes” and “tribes” of British India, to which he included a series of anthropometric measurements. Risley believed that anthropometry could distinguish between Aryan and non-Aryan descent among different

tribal and caste groups. For Risley, the migration of Aryans was at the root of the preserved diversity of Indian populations: he attributed the institution of caste endogamy to the Aryans' wish to maintain their racial distinctiveness. For him, the idea of a "community of race ... is the real determining principle, the true *causa causans* of the caste system" (Risley 1891, 259). Risley elaborated a taxonomy which prescribed that "the people of India" could be racially classified mainly in two main types: Aryan and Dravidian. Thus, like Müller's, Risley's racial typological reasoning was shaped by a two-race historical model that considered Aryans as the major migrating group to the interior of India, which had previously been inhabited by groups that could be racially classified as Dravidians (Sur 2011).

Risley's ideas were discussed by subsequent generations of Indian scholars.² Sociologist-anthropologist G. S. Ghurye argued in his famous book *Caste and Race* (1957 [1932]) that caste endogamy emerged from a racial purity wish among upper-caste Brahmins, who he believed were incoming Aryans, with an ancestral Nordic racial origin. Ghurye based this argument on the interpretation that "varna," the Sanskrit word that describes the four main ranks of castes, also meant "color," which he attributed as a sign that this *varna* differentiation corresponded to skin color differences. In this logic, the four *varnas*—Brahmins, Kshatriyas, Vaishyas, and Shudras—had different skin color tones. In sum, Risley's, Ghurye's, and many other scholars' racial articulations of AMT composed what Trautmann summarizes as a "racial theory of Indian civilization":

This is the theory that the light-skinned, Sanskrit-speaking Aryans clashed with the dark-skinned indigenous peoples of India, speaking non-Indo-European languages, whom they conquered. The sequel was the creation of the caste system, understood (in this perspective) to be the enduring constitution of Indian civilization, keeping the peoples of India separate from one another in respect of marriage ... (Trautmann 2019, 272).

In turn, intellectuals opposed to casteism criticized some aspects of this racial theory of Indian civilization but not necessarily the Aryan narrative or the racial framework embedded in it. Whereas Ghurye—himself an upper-caste Brahmin—stopped short of questioning caste and the principle of racial purity, anticastivist intellectuals such as Phule theorized on the Brahmanical origin of caste endogamy with the goal of criticizing it. Instead of justifying the institution of caste by Brahmins, Phule denounced it, blaming the *invading* Aryans' Brahmanist eugenicist thinking for the intentioned caste segregation and inequality in India (Figueira 2002). Thereby, Phule and other anticastivist intellectuals still articulated the Aryan migration/invasion theory in their writings, even

2 While Risley's ideas resonated widely, they were also contested, including by the German Indologist Müller, who later questioned the use of racial anthropometric methods to study the distinction of modern descendants of Aryans and Dravidians. Although Müller had suggested the equation of racial and language groups in many previous texts (Thapar 2008), in response to Risley Müller advocated for a strict separation between what he called "a phonological race" and a "ethnological race," cautioning against the collation between language and anthropometrically observed physical appearance (Müller 1891, 179). However, "Müller spoke too little and too late" (Figueira 2002, 45).

ascribing upper-caste communities with Aryanness both in the sense of origin and racial traits. By doing so, they argued that invading Aryans oppressed—and, through instituting the rules of caste endogamy and untouchability, segregated themselves from—the original inhabitants of India. This account presented these original inhabitants of India as the ancestors of those who today suffer the most from caste segregation, namely low-castes, Dalits, and Adivasis. Hence while these theories for the origin of the caste system were anticastist in their political orientation, they nevertheless tended to confirm longstanding racial frameworks in the search for the origins of difference and inequality among these social groups.

Concurrently, most positions within the discourse of Hindu nationalism today oppose such anticastism-oriented Aryan *invasion* theory articulations and stress that the Aryans' homeland is India. Because the Aryans were believed by many to be the writers and protagonists of scriptures that are considered foundational to Hinduism, many Hindu nationalist narratives claim that the Aryans were the ancestors of the Hindus. Therefore, such narratives associate the birth of Hinduism and by extension the territoriality of India with the homeland and ancestral holy land of the Aryans and, by extension, the Hindus.³ As Hindu supremacy ideologue Savarkar (1989 [1923], 85) declared: "All Hindus claim to have in their veins the blood of the mighty race incorporated with and descended from the Vedic fathers." This racial and religious association between Hindus and the glorious times of the Aryans of the Vedic scriptures infuses this discourse of Hinduness, also known as Hindutva, with a profound weight of timeless tradition, bonding it with a patrilineal familial-reproductive temporality (today's Hindus being the children of the "Vedic fathers" of the past). The temporal and affective affordances granted by the Aryan figure in association with the roots of Hinduism in India are key to the imaginations of a national belonging in which Hindutva is seen as the country's *Leitkultur*, the leading cultural bearer that grants social cohesion to the nation. Some take this narrative as far as to claim that the heartland of Aryan civilization was in India and that the Aryans migrated from there toward Europe. Some versions of this narrative argue that AMT "is a colonial conspiracy that erases India's glorious precolonial history" (Subramaniam 2019, 150).

Thus, the ongoing aggravation and mainstreaming of Hindu nationalistic discourses since prime-minister Modi's strident Hindu nationalistic government (2014–present) amplifies the political stakes of research about Aryan migration. Because arguments that challenge the sacred territoriality and origins of Aryans (and their descendants) can be read as anti-Hindu(tva) and antinational, scholarly articulations and activist mobilizations of Aryan migration/invasion theories have had a pronounced political potency.

3 One needs to note, nevertheless, that the current Indian homeland-oriented discourse on Hinduism is also a rather recent historical formation, which is tightly enmeshed with the mainstreaming of Hindu nationalism. There were widespread positions in the previous centuries that rather aligned Vedic scriptures with a foreign (often even Nordic) Aryan origin (e.g., Tilak 2011 [1903]; see also Banerjee 2016).

Troublesome Legacies in the Population Genetics of India

As a result of these scientific and political debates on ancestry and origins in India, up to this date Aryan migration stories carry very high political stakes that are inevitably tied to caste-related anxieties. These anxieties also accompany new studies based on genetics research that have, since the 2000s, revisited these stories of ancient migrations to India. Even when genetics narratives on ancestral migrations to India are not articulated with the loaded AMT terminology, population geneticists' euphemizing deployment of continental categorizations did not prevent anxious public repercussions, similar to the old troubles of racializing Aryan migration stories.

An emblematic case in this regard is the controversy that followed the publication of the article "Genetic Evidence on the Origins of Indian Caste Populations," first-authored by Utah-based geneticist Bamshad (et al. 2001). Tracing ancestry in distinction between paternally inherited Y-chromosome and maternally inherited mitochondrial DNA, the paper asserted that "European" or "West Eurasian" *males* migrated to the Indian subcontinent and, once there, either happened to be accepted as belonging to upper-caste groups or formed a caste system hierarchy in which they were at the top. Although the paper deflected from the term "Aryan," its argument confirmed a key assumption in some versions of AMT discussed above, namely that the Aryans were either the direct ancestors of upper castes or that they were responsible for caste differentiations and segregation as known today. Multiple other interpretations of the paper's arguments flourished in its public rearticulations. Associating the continental category "European" used in the paper with long-standing accounts of Aryan invasion, some interpretations picked on the Europeaness or foreignness of the origins of upper-caste individuals and therefore of the caste system itself, while other responses read the evidence of a European Y-chromosome lineage as a sign of this male mass migrations' sexual violence against indigenous women in the subcontinent (Egorova 2009; 2010). This also stirred up caste-based resentments and other historical anxieties concerning sexual violence, which disproportionately affects socially minoritized—often lower caste and Dalit—women (see Rao 2005). Furthermore, anticasteism and Dalit activists mobilized Bamshad's article to sustain their plea for the inclusion of caste-based discrimination as a topic of discussion at the United Nations' 2001 World Conference against Racism in Durban. This in turn sparked a heated public debate in India on the relation between race and caste, and racism and casteism. While Indian scholars were divided on both sides of this debate (pro and against the understanding of casteism as a form of racism), the Indian government—and Hindu nationalists—successfully blocked any mention of caste in the proceedings of the World Conference (Natrajan and Greenough 2009; Egorova 2009; 2010; Benjamin 2018).

In this scenario of heightened political sensibility, some population geneticists started to newly consider how they denominated categories of ancestral populations in their research in India. The terms Ancestral North Indian (ANI) and Ancestral South Indian (ASI) came out for the first time in a 2009 paper that made the cover of *Nature*, titled "Meet the Ancestors: Indian Population History from Gene Screening." The paper was written by collaborating teams led by the Harvard-based David Reich and the Indian biologist Kuramasamy Thangaraj, a scientific director at the Centre for Cellular and Molecular Biology (CCMB) in Hyderabad. Reflecting how Thangaraj proudly displayed a

sample of that edition of *Nature* on his coffee table in my visit to his office in 2019, the 2009 paper is considered a turning point in this scientific field.

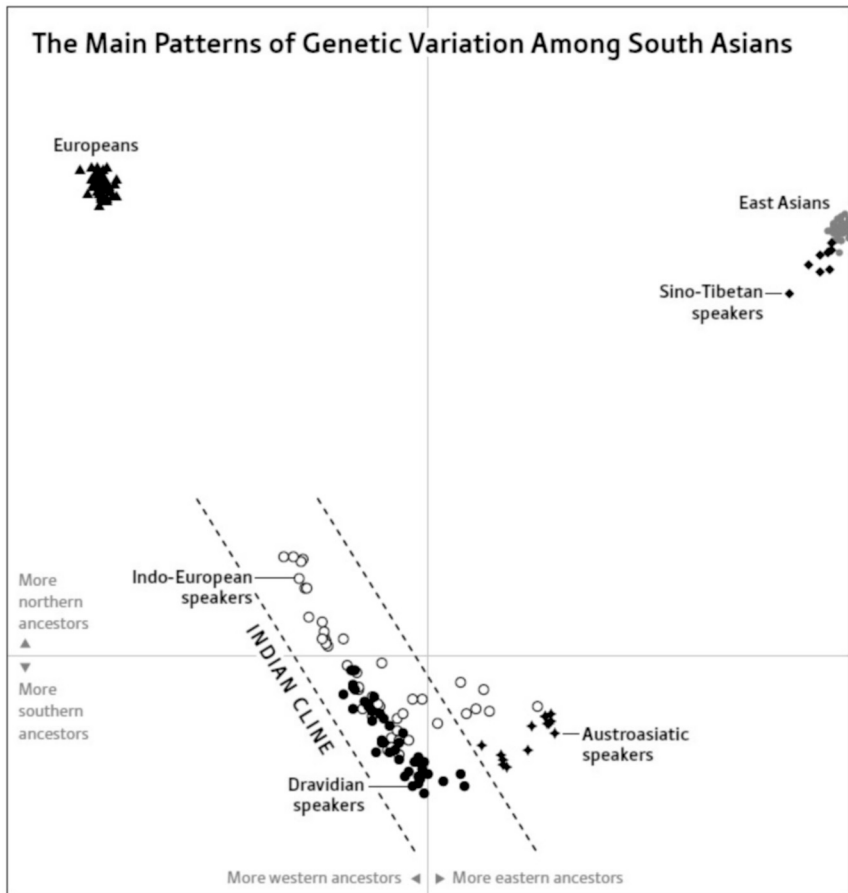
Figure 1: Cover of *Nature* 461, issue 7263, 24 September 2009.



Since 2009, the acronyms ANI and ASI have constituted an integral part of the vocabulary of the population genetics of India (e.g., Moorjani et al. 2013; Haak et al. 2015; Narasimhan et al. 2019). If “any claimed connection between a present population and a hypothesized past population always arises from a specific chain of technological interventions and discursive acts” (Oikkonen 2017, 204), the formation of the hypothetical ANI and ASI populations also relied on rhetorical and practical efforts by these scientists. These efforts were driven by a worry about the political troubles of the debate.

To illuminate the scientific and political aspects of the construction of these categories of difference, in the following I examine Reich's best-selling science book *Who We Are and How We Got Here* (2018) in closer detail. In first-person narration, Reich describes in detail how his cooperation with the CCMB started and how his team, in order to solve an impasse with the Hyderabad-based scientists, came to the idea of forging the terms ANI and ASI.

Figure 2: Reich's graphic representation of the Indian Cline of northern and southern ancestry.



Source: Reich 2018, 131.

Reich introduces the book's chapter about his population genetics research in India by addressing the old central question in the field: AMT. He starts by lamenting that the idea of Aryans coming into India has been "difficult to discuss in an objective way" because it "has been seized on by nationalists in both Europe and India"—"including Nazis"—and blames what he calls the "politicization" of the question for the regrettable fall of the "Aryan invasion theory," a term that he would have otherwise preferred (Reich 2018, 125, emphasis mine). Although he acknowledges the lack of archaeological evidence that would support this invasion theory, he contends in response that evidence from genetics can solve the debate on ancient migrations to India, a country which he frames as a "the product of collisions of culture and people" (ibid., 126).

As Reich rearticulates the Aryan invasion theory in his work, his model of ancestry and admixture of Indian populations is informed by the binary of Dravidians versus Aryans, even though this assumption is not clearly laid out in his papers or book. As

the India chapter in his book progresses, the argument that comes to the fore is that the binary division of Indian populations simply inductively emerges from the genetic data. Reich argues that it was with use of a new DNA analysis technology—the single nucleotide polymorphism microarray (Reich 2018, 130)—that the Indian DNA samples brought to him personally by Thangaraj could be analyzed in Harvard; the analysis showed a “gradient of variation” in which today’s Indian groups (sampled as castes and tribes) seem to present different degrees of admixture between two poles: a West Eurasian-related ancestral population and another very different pole that is more prevalent in the southernmost inhabitants of India, where Dravidian languages are spoken (ibid., 132). He called this gradient “the Indian cline” (see Figure 2). Those groups of Indians outside the “Indian cline,” especially Austroasiatic and Sino-Tibetan speakers, were left outside Reich’s model.⁴

As Reich (2018) narrates, he did not initially have the categories ANI and ASI in mind; at first, he worked with the category “West-Eurasian” to describe the ancestral population which overlaps with accounts about Aryans and to a large extent genetically matches those who today speak Sanskrit-related languages. But then, during what he calls “the tensest twenty-four hours of [his] scientific career,” he was pushed to review the terms articulated in his genetics model for India: after he presented the results of his DNA analysis in a meeting with his collaborators in Hyderabad, Thangaraj and other Indian colleagues “seemed to be threatening to nix the whole project,” writes Reich (ibid., 134). According to the Harvard-based scientist, Thangaraj opposed the use of the term “West Eurasians” because it would suggest that West-Eurasian people migrated en masse into India. This was a conclusion for which—as the Indian colleagues “correctly pointed out,” Reich admits—his “data provided no direct evidence” (ibid.). In fact, population genetics models usually work in a way that allows the *direction* of ancient migrations to be guessed at best; to construct such migration hypotheses, geneticists usually interpret their data on genetic similarities between populations in different geographies (Oikkonen 2017). Questioning Reich’s hypothesis, the Indian colleagues reasoned that, instead, “there could have been a migration in the other direction, of Indians to the Near East and Europe”; they therefore preferred to frame the relation observed in Reich’s data as “genetic sharing” instead of precipitately asserting a direction of migration in which a foreign West-Eurasian population is ancestor to current Indian populations (ibid.). Facing this confrontation, Reich writes that he “felt that we were being prevented by *political considerations* from revealing what we had found” (ibid., 135, emphasis mine).

However, it was only after thinking about and around those “political considerations” that Reich came up with the following solution to the clash between the Harvard-based team and the Hyderabad group of scientists: the categories of ancestry needed to be reframed to conform to what Reich called the “cultural resonances” of their research (ibid.). This meant that the new categories should not suggest that present-day Indian groups had a foreign ancestry.

4 This exclusion of Sino-Tibetan and Austroasiatic speakers has been a major point of criticism in Reich and Thangaraj’s paper in its discussion within India (Majumder 2018, 973–974; Majumder and Basu 2015).

Making Up New Categories to Avoid the Trouble? Nationalizing “Ancestry”

How to talk about ancient migrations without disturbing a sense of a *national* population? How to avoid any trouble tied to ancestral population categories, especially when they invoke histories of foreign migrations and invasions? These were questions that Reich possibly thought about while he tried to find a way out of the conundrum in which he found himself in Hyderabad after his Indian collaborators questioned his hypothesis about ancestral West-Eurasian migrations into the Indian subcontinent.

It was through a conceptual maneuver that Reich achieved a way out of the impasse with his Indian collaborators: rebranding those ancestry categories as *Indian*. Reading between the lines of Reich's book, we see that the political background to his nationalizing terminological maneuver is present in his narration through the allegory of a national Hindu festivity: the Diwali festival marks the scene in which he was enlightened with a solution to the clash in that first meeting in Hyderabad. Reich narrates:

That evening, as the fireworks of Diwali, one of the most important holidays of the Hindu year, crackled, and as young boys threw sparklers beneath the wheels of moving trucks outside our compound, [my Harvard colleague] and I holed up in his guest room at ... Thangaraj's scientific institute and tried to understand what was going on. The cultural resonances of our findings gradually became clear to us. So we groped toward a formulation that would be scientifically accurate as well as sensitive to these issues.

The next day, the full group reconvened. We sat together and came up with new names for ancient Indian groups. We wrote that the people of India today are the outcome of mixtures between two highly differentiated populations, “Ancestral North Indians” (ANI) and “Ancestral South Indians” (ASI) The ANI are related to Europeans, central Asians, Near Easterners, and people of the Caucasus, but we made no claim about the location of their homeland or any migrations. The ASI descend from a population not related to any present-day populations outside India. We showed that the ANI and ASI had mixed dramatically in India. The result is that everyone in mainland India today is a mix, albeit in different proportions, of ancestry related to West Eurasians, and ancestry more closely related to diverse East Asian and South Asian populations. No group in India can claim genetic purity. (Reich 2018, 135)

It might not be coincidental that Reich's eureka moment of sensibilization toward the cultural and political resonances of his work in India—as well as the inspiration to the subsequent creative category-making—happened within the strident soundscape of Diwali, which is in fact the only Hindu holiday that is celebrated virtually all over India and not only by Hindus but also by different religious and nonreligious groups. By adding the adjective “Indian” to the categories of difference that convey the ancestry of present-day Indians, the collaborating teams of scientists truly Indianized, or nationalized, the reference point of that difference, in addition to deciding, at first, to not pinpoint the geographical “homeland” of that ancestry, which could fall, depending on the temporal reference, outside of current Indian borders. By separating language-based difference categories from ancestry, the researchers put forward a sense of distance between the

existing groups of today and their ancestors, while also counterbalancing this distance through the geographical reinforcement that both ancestral groups are *Indian*.

This nationalization of difference is reinforced by the conclusion that Reich draws from that category-making meeting with Thangaraj: he asserts that “no group in India can claim genetic purity”; all Indians are mixed (Reich 2018, 135). Here, one can sense the scientists’ carefulness in striving to prevent their research from giving leverage to political claims of genetic distinctiveness within India, unlike Bamshad et al.’s 2001 paper and other works that had used continental categories and ended up being mobilized by difference-based political claims. In this regard, Reich and Thangaraj’s argument that “all Indians are mixed” is similar to other genetic imaginations of national unity in mixedness. While such an argument in India resonates with anthropologist Irawati Karve’s post-Partition theorizations on how all Indians are “mongrels” (quoted in Barbosa 2022, 160; see also Deshpande and Barbosa 2024; Barbosa 2025; Mukharji 2022), narratives of national mixedness have also been observed internationally, for example in Latin America (Kent et al. 2015), East Asia (Tsai 2010), and the Middle East (Burton 2021). Even in national territories that have been at the “crossroads” of ancient migrations and home of supranational ethnic groups, such as Iran and Turkey, geneticists tend to nationalize categories of difference, conforming human variation to nation-state boundaries and emphasizing national admixture (Burton 2021). While the intentionality of such nationalizing moves is not always straightforward, Reich and his collaborators’ insistence on the mixedness of Indians demonstrates some concern with political appropriations of their work within the country.⁵

Thus, while Reich seemed to worry about *certain* political and cultural reverberances of his work about India, he and his collaborators rearticulated knowledge based on population genetics that would achieve *certain* political affordances. Specifically, they hoped to convey genetics categories and conclusions that would conform to the idea of unity in Indian nationality while avoiding providing material for possible political mobilizations based on genetic difference that might challenge national cohesion. At the same time, they continued to investigate the same old questions related to the debate on Aryan ancestry. In publications after that tense meeting in Hyderabad, Reich and his coauthors continued to analyze their genetic data of castes and tribes to, via the new ancestry categories ANI and ASI, discuss old questions related to the origins of human diversity in India (Reich et al. 2009; Moorjani et al. 2013; Haak et al. 2015). For example, in their first joint publication, Reich, Thangaraj, and coauthors aimed to pinpoint the time of the beginning of the caste system (framed by them as a drastic reduction in genetic admixture). And while they avoided the word “Aryan,” they nevertheless strove to locate the existence of ANI-related genetic markers in different Indian populations in the Indian North and South (Reich et al. 2009).

In sum, Reich continued to explore the same questions addressed by population geneticists in India at least since the mid-twentieth century, while aiming to shed new light on them through new technologies and denominations for categories of ancestry. An important continuity lies in how Reich’s model maintains a dichotomy between two

5 This assertion of mixedness of Indians has also been further reflected by more popular publications in India that reported on Reich et al.’s research (e.g., Joseph 2018).

ancestral populations to explain the peopling of India, which in orientalist scholarship was framed in the binary Aryans and Dravidians but which he now framed as ANI and ASI. Besides being grounded in the Aryan vs. Dravidian binary, Reich's model might have been designed in this way also due to the sake of methodological pragmatism: statistical methods of population geneticists work better in a model that only considers two ancestral populations in the mix (see Rajagopalan and Fujimura 2012). Possibly, it was also due to their avoidance of loaded terms such as "Aryan" or "invasion" and thanks to the Indianization of categories of difference that their paper did not spark a politically explosive debate—especially if compared to the controversy unleashed by Bamshad et al. (2001). Particularly, the use of ANI and ASI and the emphasis on admixture might have muffled the paper's appropriation by political movements, making more difficult this time for minoritized social groups in India, most notably Dalits, Adivasis, and other groups affected by casteism, to claim that dominant upper-caste groups in India had a foreign (West-Eurasian or Aryan) ancestry, as they had done before. Due to the nationalizing affordances of Reich and Thangaraj's terminology and conclusions, the mobilization of such an ancestry-based claim would be semantically and discursively more complicated this time. In this sense, their paper was much less threatening to the political status quo in the current context of the mainstreaming national unity claims that have been tightly enmeshed with Hindu nationalism. In fact, their paper—and the categories of difference they invented—politically afford the maintenance of the Hindu majority status quo.

Discussion and Conclusions

Population genetics has inherited troublesome legacies of race. The tie between racial frameworks and the population genetics of India can be perceived in the use of racialized difference categories (including "caste" or "tribe") or in the employment of theories with under-analyzed assumptions that associate ancestry, heredity, geography, Volk, culture, language, and biological markers. The Aryan versus Dravidian binary model configures one of these theories with racialized categories, one that runs deep in scientific genealogies that aim at explaining the peopling of India as well as the birth of the caste system, which is associated by some accounts with the incoming Aryans. While the Aryan migration/invasion theory has been intensively discussed in India, reracializing readings of it have been reinjected in this discursive field since the advent of new DNA technology in the 2000s mainly through the work of Global North-based geneticists, such as Bamshad and Reich.

This article has shown how the entanglement between science and politics shapes not only the public reception and impact of population genetics research but also the work of these researchers in the first place. We have seen how Harvard-based geneticist Reich took up the debate on AMT but, due to the pressure of what he saw as "politicization," tried to circumvent *certain* possible political effects of his research. He did so through the strategy of a new categorical denomination, coining the now widely accepted terms Ancestral North Indian (ANI) and Ancestral South Indian (ASI). While confined to a binary ancestry model—which overlaps with the Aryan/Dravidian dichotomy—the avoidance of terms that connect this ancestry to foreignness was meant to constrict possible status

quo-defying political affordances. Reich and colleagues tried to avoid the repercussion of Bamshad et al.'s paper a few years before, when anticasteism activists mobilized the foreignness associated to a Y-chromosome lineage and certain upper-caste groups with a political goal: to denounce the caste system as a violent, exogenous imposition, and to parallel casteism to racism. Instead, by nationalizing the ancestrality of the genetic lineage of the social groups sampled in India, Reich and his collaborators aimed at muffling any possible political appropriation of their research that would question the endogeneity of certain caste groups or of the caste system itself. Thereby, this nationalization of ancestry silenced the hauntings of caste by bringing the ghosts of Aryans home to India.

At the same time, rebranding categories of ancestral difference as “Indian” conformed to Hindu nationalism. What is at stake in population genetics for this religious-nationalistic discourse is the location of ancestral groups such as Aryans and, by association, the roots of Hinduism within the realm of India and Indians—even if “India” might mean, for some Hindu nationalistic accounts, a much larger territory beyond the (relatively recent and still disputed) Indian northern borders. If orientalist and colonial anthropological attempts to define “India” operate through reductionisms—often via an essentializing objectification of “Hinduness” that nevertheless formed a sense of Indian nationalism (Inden 2000)—population geneticists working with a pan-Indian national framing fall into the same traps of reductionism. In their attempt to formulate ambitious pan-Indian scale conclusions, both colonial scholars and today population geneticists can be blamed for essentializing and exclusionary reductions.

But as reductionism might be inevitable when scientists' ambitions go as far as to cover such a large scale (“India”) and the human diversity encompassed in it, we can ponder what kinds of exclusions and inclusions are accentuated in such reductions and with what effects. If the exclusions inherent to Hindu supremacist discourse are more obvious, the reductionisms in this population genetics of India can also have important consequences. These scientists have made laborious efforts to stabilize categories of difference which, especially given the deep temporalities unlocked by new genomic technology, need to be temporally frozen or put in relation with scientifically fabricated ancestral populational categories. Severe reductionisms also take place in sampling strategies: we have seen that social groups that are not primarily associated with ideas of the Indian Hindu nationhood, such as speakers of Tibeto-Burmese and Austroasiatic languages—not to mention Muslims—were excluded from sampling or from the analysis. In a circular logic, these reductionist exclusions confirm these scientists' conclusions regarding the genetic image of India that they imagine and paint.

Therefore, the somewhat inevitable reductionism of both the Hindu nationalism-inclined scholarship and the population genetics of India analyzed here results in the creation of a picture of India that brings certain social groups to the fore, while excluding, invisibilizing, enclosing, or assimilating others. The hardly commensurable social, cultural, and biological diversity of human groups living under the roof of the “Indian national” is thereby met with a coherence seeking effort of *domestication* (Subramaniam 2019, 147; Oikkonen 2017, 163; Burton 2021): this human diversity is flattened or simplified through the national scale of the interpretative grids of this India-framed genetics knowledge. The genetic diversity is framed in a way that it does “not undermine the essential unity of the nation-state” (Burton 2021, 215).

Coupled with the nationalization of ancestral categories, we have also seen the emergence of an idea of an Indian national unity in shared ancestry. However, this “unity in sameness” also reinforces—and is coconstitutive of—Hindu nationalist visions of India. Thus, we can expect that the conflict-domesticating efforts of the “unity in a pan-Indian shared ancestry” rhetoric of prominent geneticists like Reich will limit the transformative power of the mobilization of biohistorical arguments by anticaste activists. In this way, the pan-Indian biological-familial portrait fabricated in these geneticizing comprehensions of India has analogous limitations to that of a biological family. From a queer critique perspective (e.g., Anzaldúa 1987), one could think of the heteropatriarchal biological family as a space where male authority-centered and adultist structures enforce norms, secure privileges, and defuse conflict. In light of the “unity in shared ancestry” biological renderings of India, too, groups that see themselves outside the pan-Indian national family ideal have great difficulty in operationalizing biohistorical claims to differ and challenge the cohesive future of the nation-state. In other words, the linear familial-reproductive temporality articulated in population genetics knowledge that frame “Indians” as having a unified genetic ancestry might have a disciplining effect against unity-defying difference-based political claims. The discursive space of the biological-national family, after all, has not been prone to impulses toward progressive or social justice-oriented sociohistorical transformations—at least not beyond its anticolonial affordance.⁶

Even if now less explosive, the debate on AMT is far from settled. Dalit intellectuals still mobilize Aryan invasion arguments in their critical assessments on the origins of caste (e.g., Yengde 2021). And population geneticists did not give up on the topic: just in 2019, a *Science* paper published by Reich, Thangaraj, and as many as 116 coauthors again touched upon the most contentious aspects of this issue, this time avoiding the word “Aryan” by mobilizing its equivalent ancestral group “Yamnaya Steppe pastoralists,” but again resurrecting the argument of linkage between male (i.e., Y-chromosome) “Steppe ancestry” and the priestly caste groups, like Brahmins, that are, in their words, the “traditional custodians of literature composed in early Sanskrit” (Narasimhan et al. 2019, 12). We can, thus, expect further reverberation from this and upcoming genomic research. The multiple connections between humans that can be engendered through different temporal and spatial frames of DNA analysis can lead to flexible but also ambiguous appropriations of group-level genetic belonging (Oikkonen 2017). Therein, precisely, lies the high political appeal of population genetics knowledge.

Finally, which lessons can we learn from the science-politics entanglements in the population genetics of India? Reich’s pretension of politically unthreatening—and politically undisturbed—“purely factual” scientific objectivity seems to be, in fact, never accomplishable. This case is another demonstration of the entanglement of politics and science in population genetics: it shows that genetics research that aims at constructing knowledge about a nation will ultimately be important to the politics of its respective national context. This happens not only because genetic sciences operate on national infrastructures (Burton 2021), but also because such research delivers deep biological-historical narratives that feed group-making and political subjectivity processes (Oikkonen

6 See Oikkonen (2017, 139–142) for a queer critique of linear reproductive temporality in population genetics.

2017). In fact, as Burton (2021) argues, population genetics and nationalism have been “thoroughly co-constituted.” Thereby, population genetics research deals with very crucial elements related to nationhood and national belonging and exclusions. If “biologically founded pasts” might be used to “open up future prospects” and to “enforce or undermine current privileges” (Sommer 2016, 18–19), any scientific articulation on past or present human diversity might have important implications for political mobilizations about the inequalities that are intertangled with the difference categories that those scientists work with. This is especially so in the case in India, where we see a historical, intrinsic interlocking between difference, social cohesion, and social inequalities.

In sum, we can see that in this field of research, like in all scientific fields, there are several layers of questionable—but left largely unquestioned—assumptions that are built into theories, concepts, and categories, with consequences to the knowledge outcomes that, once taken up, might further shape society and politics. However, not only in Reich's (2018) writings but also among almost all the scientists I interviewed in India (from anthropologists and archaeologists to geneticists), there was a general lament about the “politicization” of scientific inquiries about the ancient past. These scientists complained about how ancestry and ancient migration research in India is often politically taken up by the media and activists, in ways that infect this field of research with politics. In other words, these scientists see the political sphere as a contaminating threat or, at best, a cause for troubling headache on the way of their objective scientific research and output. Furthermore, when they are forced to reflect about possible political impacts of their research, their reflection falls short in considering many possible detriment political implications. We have seen that Reich's effort to forge an ancestral category that would be, in his view, as politically unthreatening as possible vis-à-vis a sense of national (Hindu) religiosity ended up enabling an easier Hindu nationalistic appropriation of the team's research, while making it more difficult to be used to leverage status quo-defying arguments that would address historical caste-based inequalities. Thus, the case of Indian population genetics confirms the general observation that population geneticists—regardless to how they define or denominate categories of difference—cannot “produce politically neutral data about ancestry” (Burton 2021, 248–249).

Therefore, these scientists lack a sustained engagement with the multifaceted ways in which their science and its surrounding social world coconstitute each other. As a result, they can only insufficiently envision, reflect upon, and respond to the political implications of their research. In other words, their positivistic understanding of science severely comprises their well-intentioned efforts (when existent) of reflecting upon the consequences of their work. This is also evident in a more recent paper on global guidelines for ethical ancient DNA research, in which Reich and his coauthors (Alpaslan-Roodenberg et al. 2021) neatly separate “scientific” and “community” concerns and even argued that involving community members in decisions about publication and data sharing would be unethical. Echoing the response by Kowal et al. (2023), I argue instead that one possible orientation to provide a firm ethical ground to these scientists' responsibility vis-à-vis the many possible political troubles of population genetics is, precisely, the enhancement of community partnerships in all processes of research.

The issue of the racial legacy in sciences of human diversity will hardly be solved by relegating the responsibility for the effects of scientific knowledge to the political world

as if the realm of science were in isolation from politics (see also Reardon 2005; 2008; Subramaniam 2014). Nor will the hauntings of past racial research be avoided by strategies of categorical rebranding. If the sciences of human diversity are to break free from racialization, researchers are to engage in more reflective ways with the entanglements of their sciences with the political world.

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