The Origin of WEIRD Essentialism

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1 Introduction

Researchers aiming to understand the evolution of human behavior must grapple with its tremendous flexibility and the cultural variation present across geography and history. This is particularly challenging because researchers themselves are not external observers, but are raised, educated and trained within a particular culture. Such an upbringing inevitably generates expectations about how all humans reason and behave. Moreover, when empirically testing hypotheses, the most readily available subjects are typically those from a researcher's own population, who share the same upbringing, and thus are disproportionately likely to behave in the expected way. Until data is generated from elsewhere, this circularity can transform local cultural practices into seemingly universal, evolved human behaviors. Here, we outline how such a dynamic came to be in play with the hypothesis that ethno-racial essentialism is underpinned by evolved folk-biological reasoning. We first outline the hypothesis and note that while much evidence from industrial populations supports it, data from other populations provides a more complex picture. It is not that industrial populations are simply more or less essentialist that others, but that essentialism in industrial populations is an unusually good match for folk-biology relative to essentialism in other groups. We then seek to explain this by describing how essentialism and biology became intertwined in Western thought over the past few centuries. We conclude that essentialism may well have an evolutionary basis as a general feature of human cognition, one that applies across many domains, but its relationship to biological reasoning is likely to be culture specific.

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2 Essentialism and Folk-Biology

The belief that individuals are guided in their attitudes and behavior by a stable, internal, causal factor subject to biological inheritance (henceforth "essentialism") has a rich history of study (Allport, 1954), particularly among Western academics. In large part, the study of essentialism was spurred on by the horrors of the Nazi regime, whose genocide of the Jews and other groups was firmly rooted in an essentialist theory of Aryan supremacy. Beliefs about the disunity of humanity were not new though; for centuries, taxonomists had attempted to catalogue human diversity into a varying number of types, often in strikingly naïve ways such as the claim that people from neighboring British counties had reliably different facial structures (Ritvo, 1998). Paradoxically, such beliefs were even widespread among groups who were targeted on that basis. For instance, early twentieth-century Jewish anthropologists wrestled with the question of whether Jews were biologically capable of assimilating into broader European societies, and some concluded that they were not (Lipphardt, 2016).

The essentializing of racial and ethnic groups is all the more striking because we now know they lack a biological basis. That is, the stable, internal, causal factors of biological organisms are now understood as genes, yet very little genetic variation falls between racial groups (Lewontin, 1972; Rosenberg et al., 2002). Such information was not available prior to the mid-twentieth century, and the expectation of many evolutionary biologists prior to these discoveries was that most species would be virtually genetically homogenous, with their various alleles fixed at the "wild type" (Gayon, 1998; Mayr, 1998). For instance, American geneticist, Nobel Prize winner and progressive eugenicist Hermann Muller argued that individual humans had, on average, only eight loci with mutant alleles—a tiny fraction of the overall genome (Muller, 1950; Paul, 1987). On this basis, race being a cue of important genetic differences made more sense.

Given its poor concurrence with reality and negative social consequences, how humans come to hold essentialist beliefs has become a key research question, with many studies investigating the development of essentialism in young children. For instance, in one study (Rhodes et al., 2012), both children and adults were introduced to a new group of people called "Zarpies" through a story book. The "Zarpies" presented were of different races and genders, and so cut across commonly essentialized groups. Nonetheless, when "Zarpies" were described using generic language (e.g., "Zarpies are scared of ladybugs") around half of children and a clear majority of adults adopted an essentialist attitude toward "Zarpies," describing their properties as innate, causal, group-typical, and unalterable. The adult participants went on to use generic language when describing "Zarpies" to their children, thus perpetuating an essentialized view. These results, along with many others (cf. Gelman, 2003; Gelman & Hirschfield, 1999) paint a strong picture of young children as inherently prone to essentialist views of the world.

But why would selection have favored such a tendency when, as discussed above, it is a poor match for the reality of human groups? One proposal is that essentialism

reflects the application of evolved folk-biological reasoning to human populations (Atran, 1993; Gil-White, 2001). Many of the aspects of essentialism that are a poor match for human groups are actually well-suited to reasoning about species: the differences between tigers, butterflies, and eels reflect differences in stable, internal factors that direct their growth and behavior. Thus, an evolved capacity to reason about biological species may bleed over into reasoning about human groups. Moreover, while it is possible that essentialist thinking about human groups is a misapplication of biological reasoning, Gil-White further argues that for much of human history this was actually a valuable heuristic because humans lived in groups with markedly different cultural practices, but little variation within these groups. In such a context, human cultural groups mimic biological species and so the application of folk-biological reasoning to human groups, although ultimately incorrect, was nonetheless an effective way to navigate the social world (Gil-White, 2001). Over time, this tendency was selected for and became an innate feature of human reasoning.

While the folk-biological origins of ethno-racial essentialism is a potentially plausible hypothesis, the relationship between essentialism and biological reasoning is debated (Gelman & Hirschfield, 1999). This is principally on the grounds that it is not clear whether essentialist thinking is limited to biological categories (or pseudo-biological categories in the case of human populations). From this perspective essentialist reasoning is a broad feature of human cognition with no particular link to biological categories. Ultimately, this position is what the current chapter will conclude in favor of, nonetheless, there is evidence linking essentialism and biological reasoning. For instance, children from both Turkey and the USA show remarkable similarity in their essentializing of various human categories, ranging from gender to sports-team affiliation (Davoodi et al., 2020). Specifically, 5-year-olds show a tendency to essentialize across all dimensions, however as children grow up, they maintain or increase their essentialism of categories with a (pseudo-)biological basis (e.g., gender, nationality), but decrease their essentialism of categories that lack such a basis (e.g., socio-economic status, sports-team affiliation). This is the same pattern exhibited by adults (Davoodi et al., 2020). Similar cross-cultural patterns have been documented between adults from China and the USA, where respondents from both nations rated various human categories with the same degree of naturalness (naturalness being a key component of essentialism), and also agreed that categories with a (pseudo-)biological basis (i.e., race and gender) were more natural than those without such a basis (i.e., socio-economic status and religion) (Xu et al., 2023).

3 Essentialism Elsewhere

One limitation of much of the work discussed above, is that it is largely based on data from participants who live in large-scale, industrial societies. Such groups have earned the moniker of WEIRD (an acronym for Western, Educated, Industrialized, Rich, and Democratic; Henrich et al., 2010a, 2010b). Although Chinese and Turkish participants differ from those in the US (Muthukrishna et al., 2020), who

are archetypally WEIRD, they certainly inhabit societies that are much WEIRDer than were human societies for the vast majority of human history. This discrepancy between human participants and human populations is important because WEIRD people are known to reason about the world in distinct and unusual ways (Henrich, 2020; Kroupin et al., 2024). As one example, moral reasoning in WEIRD populations is often rule-based or deontological, drawing on principles like individual rights and a reluctance to cause harm, leading to hesitation about actions that would benefit many individuals by harming one (Awad et al., 2020). In contrast, the Mayangna, a Nicaraguan horticultural community, display much higher use of consequence-based, utilitarian reasoning, prioritizing saving the most lives even if it means causing harm (Winking & Koster, 2021).

On this basis, it is particularly instructive to consider work where essentialism has been investigated in non-WEIRD populations, and indeed, such populations display different patterns of ethno-racial essentialism that often contradict the expectations of a biological model. For instance, one study compared (i) US adults, with adults and children from, (ii) Huatasani, a rural town in the highlands of Puno, Peru, situated along the Aymara-Quechua linguistic border, where most people engage in agro-pastoralism, and (iii) Teci and Dalomo, two neighboring villages on the Fijian island of Yasawa, where people rely on fishing and horticulture (Moya et al., 2015). Participants were presented with adoption and migration vignettes in which a child from one group was adopted by a family in another group or moved with their family to another group, respectively. Participants were then asked whether the child would resemble their birth parents or their adoptive parents/new group in a variety of ways. Around 80% US adults reported that the child would physically resemble their birth parents despite adoption/migration, and adults from the other populations showed a similar pattern which increased across adolescence. Nonetheless, both the Peruvian and Fijian participants expected the child to resemble their birth parents in terms of their beliefs, norms and skills to a much greater degree than did US participants. In this way, the Fijian and Peruvian participants exhibited a greater degree of essentialism than did US participants, but they also violated Western folk-biological expectations by essentializing "non-biological" traits to a greater degree.

Another study used adoption and migration vignettes to test beliefs about the stability of ethnic identity among the Himba and Herero, two groups from Namibia that separated in the last 150 years and have adopted different practices (Moya & Scelza, 2015). The Himba are semi-nomadic pastoralists, while the Herero are more assimilated into the market economy and wealthier. The two groups wear strikingly different styles of clothes, and also exhibit different dialects and ritual traditions. Despite these differences, respondents did not believe that an individual's identity or cultural practices were stable, and instead they expected migrants would steadily acculturate to their new group with parents having relatively little influence. This position de-essentializes cultural practices, and was characterized as consistent with folk-sociology as opposed to folk-biology (Moya & Scelza, 2015).

Similarly, ethnographic work by Astuti et al. (2004) shows that the Vezo people in Madagascar conceptualize group identity not as something that is fixed by birth or ancestry, but rather as a result of what people do—their actions and way of life. For

example, Vezo people explicitly state that "the Vezo are not a kind of people." In their cultural understanding, "kind" typically refers to something that is biologically, or ancestrally, fixed, like mackerels being a kind of fish. Instead, being Vezo is defined by living in the coast and engaging in specific activities such as fishing, paddling, and navigating the sea. Thus, the Vezo emphasize that their identity is performative: it is acquired through practice and participation in coastal lifestyle, rather than through descent. As a result, someone who wasn't born Vezo can become Vezo by mastering these practices, while someone who is born into a Vezo family but doesn't engage in these activities may no longer be considered Vezo. This performative theory of group identity reflects a non-essentialist view by the Vezo people in their reasoning of social groups, even though they apply more essentialist, folk-biological thinking to other domains like animals and objects.

The flexibility of human reasoning is further illustrated by a study along the Aymara-Quechua linguistic border in Peru (Moya & Boyd, 2015). Participants were asked about their perceptions of different social categories (linguistic categories, communities, socio-economic status, morphology, politics, and religion) and analyses tested for the extent to which they used these categories as the basis for stereotyping, assortment, hostility, and essentialism. The results showed a highly complex pattern where different categories were used in varying ways. For instance, socio-economic status was the basis of stereotyping, while political affiliation mediated assortment and hostility. Interestingly, none of these categories were seen as stable (a central part of essentialism). Moreover, morphology (including skin tone and facial structure, a critical part of many ethno-racial taxonomies and related to folk-biological reasoning) was regarded as unimportant and fluid in their relationship to social identities.

The variability of essentialism, and its sensitivity to local conditions, suggests that, far from being guided by evolved bio-analogical reasoning, humans are instead adept at identifying and adapting to local cultural patterns as they arise (Moya & Boyd, 2015). Such a position is consistent with the hypothesis that essentialism represents a general tendency to homogenize categories of all kinds (Gelman & Hirschfield, 1999), and that humans do so in order to simplify problems and thereby make the most effective use of finite cognitive resources (Callaway et al., 2022; Ho et al., 2022; Lieder & Griffiths, 2020). If correct, this implies that, to the extent essentialism has a dedicated evolutionary basis, its domain of application is likely to be exceptionally broad and its primary function is as a cost-saving measure, where the savings exceed the costs resulting from decreased decision-making accuracy. More generally, it challenges the hypothesis of an evolved folk-biological origin for ethno-racial essentialism because essentialism is broader than, and inconsistently applied to, biological categories.

4 The WEIRD Origins of Folk-Biology and Essentialism

The diversity of beliefs about social boundaries described above begs the question of where this diversity comes from, and, in particular, why data from WEIRD populations often exhibit views consistent with a folk-biological basis for essentialism. We might also ask why folk-biological reasoning is such an intuitive hypothesis for WEIRD researchers, and one that broadly holds true for their own populations. In the remainder of this chapter, we will suggest that, while humans may have a broad tendency toward essentialist reasoning, neither ethno-racial essentialism nor folk-biology (or even their constituent beliefs in the stability, coherence and heritability of biological categories) are evolved reasoning strategies. Instead, we will argue that all are culturally evolved beliefs that have an intertwined history in WEIRD populations. As described below, what we refer to as folk-biology, and its corresponding essentialism, only came to dominate WEIRD thinking in the past few centuries. It thus varies across time and space, and is not a human universal.

The suggestion that folk-biology—a belief in the stability and permanence of biological species—is a relatively recent phenomenon might sound unusual. After all, was not the success of evolutionary thinking preceded by millennia of belief in divine creation and the unchanging nature of species? As it turns out, no, it wasn't. Species fixism is, in fact, a relatively young scientific discovery that emerged in the eighteenth century (Wilkins, 2018) and the idea that the past was dominated by species fixism is even younger (Winsor, 2006b). Prior to that, European folk and scientific beliefs accepted a wide (although not necessarily unlimited) variety of transmutational ideas (Amundson, 2005). These beliefs have been extensively documented by the American botanist and historian of science Conway Zirkle (1946, 1951, 1959). They included the emergence of certain kinds of life from non-life, such as harvested grain and fabrics producing mice (thus explaining the difficulty of keeping granaries rodent-free), and food producing mold, a hypothesis that was only disproved following the development of contaminant-proof insulation devices (Fry, 2000). Some organisms were also believed to be able to switch between what we now recognize as separate species. The most exotic example was the belief that the barnacle goose started life as a literal barnacle (Hacking, 1983), and although it may seem preposterous to modern readers, it was taken seriously enough that multiple historical taxonomists invested energy in putting it to the test (Wilkins, 2018). More mundane transformations were a perennial problem for farmers; domesticated plants often needed to be propagated through cuttings to prevent them transmuting to unproductive wild forms (Zirkle, 1951), domestic animals were believed to degenerate to the state of their wild ancestors if left unsupervised (Gayon, 1998, 2016), and inclement weather was believed to induce species changes in crops (Amundson, 2005). These views depict species identity as unstable, and only partially heritable, a far cry from essentialism. Indeed, the medieval understanding of the natural world was that God had imbued it with life giving powers, and not that God had directly created species themselves (Amundson, 2005).

In the seventeenth and eighteenth centuries, the Enlightenment saw the rise of reasoning on the increasingly exclusive basis of observation (Strevens, 2020). Within biology this produced experimental breeding programs, and it was the careful breeding experiments of the Swedish biologist Carl Linnaeus and other early naturalists that proved many earlier ideas false. In their place was ushered in an era of species fixism, not as folk belief, but as cutting-edge science. Such a suggestion was in no way problematic for dominant Christian practices and the religious interpretation shifted from one of God imbuing the world with creative powers to the familiar tale of divine creation. Moreover, species fixism has an inherent essentialist slant as species are clearly much more stable than was previously thought. Nonetheless, Linnaeus was not an essentialist: he regarded his taxonomic system as a human tool to understand the natural world, not a feature of the world itself (Amundson, 2005; Winsor, 2006a). As such, he based taxonomic affinities on single traits that he deemed useful, yet arbitrary (Ritvo, 1998). Moreover, although he originally endorsed divine creation of species, he later returned to a form of transmutation, arguing that God had originally created only a few forms, the rest of natural diversity arising through repeated hybridization events (Burkhardt Jr., 1977; Winsor, 2006a). Despite this watered-down essentialism, Linnaeus' taxonomic nominalism (Amundson, 2005) did not last long as subsequent naturalists sought to make taxonomy an accurate depiction of real biological relationships, often deriding Linnaeus' methods while keeping his system of binomial nomenclature (Ritvo, 1998).

The creation of a real taxonomy certainly engendered a view of species identity as innate and stable—the species essentialism typical of folk-biological theories. However, this too was short-lived as the recognition of natural relationships between species raised questions of the origin of these relationships. To answer these, within a century, naturalists were turning to theories of evolution; effectively transmutation once more, just over much longer timescales than medieval transmutation.

Despite evolution's transmutational flavor, the phenomenon of heredity—that offspring resembled their parents—implied some sort of internal causal factor consistent with essentialism. The nature of inheritance, however, was mysterious to nineteenth century scientists (Bowler, 1989; Costa, 2021). Early evolutionary theories, including Darwin's, included use inheritance, the idea that the actions, behaviors and experiences of an organism could change their nature in such a way that induced variations were passed on to offspring. This idea is often referred to as Lamarckian inheritance, although this was neither a central nor a distinguishing feature of Lamarck's theory (Burkhardt Jr., 1977). Use inheritance creates a tension with essentialism because it implies an organism's essence is somehow malleable, perhaps even under volitional control. This idea was a common feature of folk-biological beliefs of the time, with maternal impressions being a common mechanism by which a mother's experiences could affect offspring development. For instance, it was thought that a pregnant woman viewing a crab could cause the developing fetus to grow claws instead of hands (Arni, 2016). Within academic biology, Lamarck made reference to a sentiment intérieur ("inner feeling") driving evolutionary change. Although he never meant to imply that mental activity directly guided evolution, this line of attack was nonetheless used by his critics (Cuvier, 1835; Richards, 1987). Applied

to humans, use inheritance supported the flexible potential of marginalized groups, including Jews, to assimilate into European societies and so was favored by political progressives (Lipphardt, 2016).

Despite its historical popularity, use inheritance would not survive, and it was displaced by theories of hard heredity in which an organism's heritable material, its essence, was stable and unalterable through experience. This position was championed by the German embryologist August Weismann (Churchill, 2015). His early cytological work convinced him that the germ line cells (those involved in reproduction) were separated from the rest of the organism early in development and thereby insulated from all experiences. With use inherence unable to drive evolution, Weismann advocated for selection as the only evolutionary cause. Such was Weismann's commitment to selection that he thought it was necessary to explain stability as well as change, that is, without selection continually maintaining a trait, inheritance alone would quickly cause it to regress out of existence (Gayon, 2016). So successful was the switch toward hard heredity that for some time conditions such as fetal alcohol syndrome were dismissed on that basis that they implied maternal alcohol consumption could damage the immutable heritable material (Bonduriansky & Day, 2018).

Hard heredity is a key ingredient of biological essentialism and WEIRD folkbiology. However, it lacks one important feature of essentialism, which is its cohesiveness or the extent to which essences mark out categories in the real world. Indeed, Darwin's position was an individual-centric view of variation in which all individuals were effectively unique and the demarcation of species was an illusion created by the absence of intermediate forms (Gayon, 1998). Nonetheless, through the late nineteenth and early twentieth-century Darwin was an outlier in this regard and most scientists came to regard species as representing real, cohesive natural categories united by a shared essence. This view was promulgated by Darwin's half-cousin Francis Galton (also a founding figure in eugenics) who described biological change with a many sided polygon: while a polygon can be held at any angle, if dropped it will come to rest on one of its sides, and these sides were analogies for biological types (Gayon, 1998; Gillham, 2001; Krashniak & Lamm, 2021). Galton saw the discrete nature of biological types as undermining selection; in his analogy of the polygon, he thought selection was not strong enough to tip it over onto another face, and so selection could not produce significant changes. Others agreed, giving rise to "mutationist" theories in which dramatic mutation, not gradual selection, was key (Bowler, 1992). William Bateson, who coined the term "genetics," was one such example and he documented many examples of discrete variation in nature, remarking that "Discontinuity is not in the environment; may it not, then, be in the living thing itself" (Bateson, 1894). As Mendel's work with pea plants was discovered (Bowler, 1989), and its implications for a general theory of particulate heredity realized (Gayon, 1998), an essentialist "Mendelian-mutationist" view of biology was complete, with species being stable and distinct biological categories and evolution proceeding by occasional mutations between these types.

Such a view was, we now know, wrong: Genetic variation, although particulate, takes the form of many thousands of loci, each of a small effect. The end result

is that discrete alleles produce approximately continuous variation, and species are composed of similar-yet-unique individuals—consistent with Darwin's view, not Galton's. Despite these limitations, the Mendelian-mutationist model of heredity and evolution, in which species constituted well-defined biological types, quickly embedded itself into the popular consciousness. It was able to do this because it was extremely well-suited for rapidly industrializing Western nations and it became part of a new, and highly productive, view of the natural world. In particular, Wilhelm Johannsen's articulation of "pure lines" revolutionized industrial agriculture as traditional breeding programs, in which artisanal herders managed flocks, were replaced with the pedigree breeding technique (Bonneuil, 2016). Rather than imposing steady selection across an entire population, this method involved splitting the population into a vast number of genetically homogenous groups (the pure lines), and then perpetuating the most desirable lineage while extinguishing all others. Such an approach not only allowed enormously fast artificial selection, but also enabled the mass production of standardized biological organisms as needed by an industrial economy (Bonneuil, 2016). Similar techniques with microbial populations enabled the mass production of safe and standardized vaccines (Mendelsohn, 2016), and also enabled brewers to create homogenous yeast strains that guaranteed the quality of beer—Johanssen himself worked for Carlsberg (Bonneuil, 2016; Müller-Wille & Richmond, 2016).

These practices revolutionized how humans interacted with other species, dramatically increasing productivity. They also reshaped how people thought about species, variation, heredity and evolution. The newly identified pure lines appeared to some as "elemental species," the apparently fine-grained and fundamental types around which variation was shaped (Bonneuil, 2016). The success of the pedigree method in effecting biological change, also engendered the belief that successful wild populations would be genetically homogenous, a mirror of industrial pure lines (Bonneuil, 2016). More abstractly, rather than a series of beads along a string, or a mosaic of multiple alleles, the genotype became seen as a single physical entity, synonymous with a pure line (Brandt & Schloegel, 2016). This typological view of biological variation also entered education with the canonical example of peppered moths, *Biston betularia*. Here, moths adapt not through the steady accumulation of minor variation, but, as emphasized by the English geneticist Reginald Punnett, by switching between different discrete types (Gayon, 1998). This interpretation has held on in the classroom even as subsequent discoveries documented that the dark form of the moth did in fact continue to evolve gradually through the small effects of many genes.

Thus, despite the increasingly understood limitations of the Mendelian-mutationist model, its simplicity and industrial utility made it a social and cultural success. It also happened to be a highly essentialist model, with individuals being of particular heritable types, type affecting appearance and behavior, and, aside from rare mutations, types being stable. The fine gradation between types, as identified by pure lines research, was critical fuel for ethno-racial essentialism as it meant that not only were species biological types, but so were different populations within a species. Advancing to the present day, the Mendelian-mutationist model persists. Organismal standardization remains key to industry, and discrete simplifications of continuous

traits remain common in the classroom, including peppered moths, human eye color and Mendel's peas. It is this cultural background that primes WEIRD researchers and their WEIRD experimental participants with a particular essentialist folk-biological model. Both parties are raised in a culture where essentialist biological thinking is a part of education and economic activity. Not only does this make folk-biological reasoning an appealing hypothesis to study, but it also generates empirical support for the hypothesis because WEIRD participants act in accordance with the essentialist model they were educated under.

5 Conclusion

Above, we have argued that the link between essentialism and biological reasoning, far from being genetically evolved, is a recent product of WEIRD cultural evolution. Empirical support for the priming effect of the Mendelian-mutationist model comes from the documentation of "genetic essentialism" (Dar-Nimrod & Heine, 2011). This is the finding that explanations of human traits or social group differences that invoke genetics, even when the genetic claims are scientifically tenuous, increase the extent to which WEIRD participants view these traits as immutable, biologically determined, and discrete. In keeping with our hypothesis, it is further argued that scientific communication and popular media play a central role in sustaining and amplifying genetic essentialism.

Despite this support, there are three points to note regarding the scope of our argument. First, we recognize that essentialism in WEIRD populations is not limited to biological reasoning. For instance, essentialism has many facets, including beliefs about group coherence (entitativity) alongside beliefs about biological naturalness (Haslam et al., 2000). Thus, we do not seek to explain essentialism in its entirety. Second, the association between essentialism and biological reasoning is not unique to WEIRD societies. For instance, beliefs regarding the non-WEIRD Indian caste system are often highly essentialized (Saini, 2019). Moreover, the examples discussed above show that some non-WEIRD participants essentialize more than their WEIRD counterparts. Thus, the historical account we provide is not the only means by which essentialism and biology can become intertwined. Lastly, our hypothesis does not discount the possibility of evolved reasoning playing a part in human thought. Indeed, we are persuaded by the data discussed above that humans, in particular children, exhibit a tendency for essentialist reasoning in general (i.e., both within and beyond biological questions). Nonetheless, the cultural variation exhibited in this regard makes clear that any such tendency is sensitive to developmental inputs. Here, we have identified the cultural evolution of the Mendelian-mutationist model of biological variation as one such input, and one that has its origins in WEIRD cultural history. As such, rather than painting essentialism as a WEIRD phenomenon, our goal is to outline a hypothesis for how ethno-racial essentialism and biological reasoning coevolved in WEIRD populations. While this belief complex may have

spread across the world, other populations will have their own cultural histories that invoke essentialism to varying degrees and to various ends.

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