

A Cultural Species and its Cognitive Phenotypes

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Abstract

After introducing the new field of cultural evolution, we review a growing body of empirical evidence suggesting that culture shapes what people attend to, perceive and remember as well as how they think, feel and reason. Focusing on perception, spatial navigation, mentalizing, thinking styles, reasoning (epistemic norms) and language, we discuss not only important variation in these domains, but emphasize that most researchers (including philosophers) and research participants are psychologically peculiar within a global and historical context. This rising tide of evidence recommends caution in relying on one's intuitions or even in generalizing from reliable psychological findings to the species, *Homo sapiens*. Our evolutionary approach suggests that humans have evolved a suite of reliably developing cognitive abilities that adapt our minds, information-processing abilities and emotions ontogenetically to the diverse culturally-constructed worlds we confront.

How much does culture shape people's brains and cognition? Does culture shape 'core' or 'basic' aspects of our attention, perception, thought, memory, reasoning, motivations, mentalizing abilities, decision heuristics/biases or moral intuitions? Does culture influence our epistemological inclinations such as what constitutes a good argument or solid evidence? Given that over 90% of all research in the experimental social sciences is done with samples drawn from societies that are Western, Educated, Industrialized, Rich and Democratic (WEIRD), how appropriate is the pervasive, though often implicit, assumption that such findings can be generalized to the species (Henrich et al., 2010)? In this paper, we'll address these questions by reviewing the available research in psychology, cognitive science, cultural evolution, economics and allied fields. However, to properly understand how and why culture can shape our minds so profoundly, we begin with a brief introduction to the interdisciplinary field of cultural evolution.

A cultural species

Unlike other animals, humans have evolved genetically to rely heavily on acquiring a vast body of tools, techniques, heuristics, biases, motivations, emotions and know-how from other members of our social groups (Boyd, 2017; Henrich, 2016; Laland, 2017). To survive, even as hunter-gatherers living in the kinds of environments in which we genetically evolved, our species depend on a broad body of accumulated cultural know-how to find food, make shelters and care for infants. Our reliance on the products of this cumulative learning process—like fire, cooking, cutting tools and ecological knowledge—extends well back into our evolutionary history, at least hundreds of thousands of years, but probably over a million years. Over this period, our brains, along with their capacity to acquire, store, organize and retransmit cultural information, expanded dramatically, driven by a spiraling accumulation of adaptive practices and technology generated by cultural evolution (Muthukrishna, Doebeli, et al., 2018; Muthukrishna & Henrich, 2016; Street et al., 2017).

To lay a foundation for understanding culture, researchers in the emerging field of cultural evolution begin by asking how natural selection might have shaped our genes to improve the effectiveness of our learning. For example, how might natural selection influence the who, what and when of cultural learning, to more effectively select the most adaptive aspects of other people's behavior, strategies, motivations, beliefs and heuristics (Laland, 2004; Rendell et al., 2011). Testing predictions derived from this evolutionary approach to cultural transmission, a large body of evidence shows that learners rely on cues related to prestige, success, skill, ethnicity, sex and age when deciding 'who' to learn from (Chudek et al., 2013; Harris & Corriveau, 2011), as well as cues that mark 'what' to learn and 'when' to use social learning over personal intuitions or direct experience (Barrett & Broesch, 2012; Morgan & Laland, 2012; Muthukrishna et al., 2016). Most important for our purposes here, laboratory studies have already shown how adults, children and often even infants culturally acquire a number of different aspects of their psychology, including decision-making heuristics (Rosenthal & Zimmerman, 1978), fairness preferences (Blake et al., 2016; Salali et al., 2015), altruistic preferences (Rushton, 1975), perceptual biases (e.g., overconfidence (Cheng et al., 2020)), goals (Hamlin et al., 2008, 2009) and food tastes (Birch, 1987). It's well established that many features of reasoning, motivation, affect, judgment and decision-making can be readily culturally transmitted (Bandura, 1977; Henrich, 2020).

This work has provided both the theoretical and empirical micro-foundations for building mathematical models of cultural evolution and culture-gene coevolution. These models, by aggregating the impacts of individual-level learning processes across a population, provide a bottom-up approach to explaining

sociological phenomena like large-scale cooperation (Boyd et al., 2010, 2011; Henrich & Henrich, 2007), social norms (Chudek & Henrich, 2010), social stratification (Henrich & Boyd, 2008), ethnic groups (McElreath et al., 2003), cultures of honor (McElreath, 2003), status (J. Henrich et al., 2015; J. Henrich & Gil-White, 2001), divination (Hong & Henrich, forthcoming), shamanism (Singh, 2018a), witchcraft (Singh, 2018b), and innovation (Henrich, 2009, 2004; Muthukrishna & Henrich, 2016). Culture, by this account, represents information stored in people's heads that got there via cultural learning or direct experience induced by various cultural products, like norms, technologies, languages or institutions.

Perhaps most important for our discussion here, researchers in this field argue that our large brains, which evolved genetically in a world shaped by norms, institutions, technologies and languages, embody an information-processing plasticity that permits them to adapt ontogenetically and over cultural evolutionary time to the affordances, constraints and incentives created by the culturally-constructed worlds we have long inhabited. That is, we have evolved genetically to have a degree of developmental plasticity (Henrich, 2016; Herculano-Houzel, 2019; Laland, 2017). This cognitive and neurological flexibility, including our late myelination, is a genetic adaptation to confronting a culturally-constructed world (Gómez-Robles et al., 2015; Miller et al., 2012; Sherwood et al., 2012; Sherwood & Gómez-Robles, 2017). We've evolved to be self-programmable to a degree not found in other species.

This evolutionary approach to humans has implications that may be of interest to philosophers:

1. It dissolves the epistemologically troubling 'nature versus nurture' dichotomy, which has often pitted 'evolutionary' or 'biological' explanations against those based on 'culture' or 'learning'. By approaching our capacities for learning as adaptations, which are ultimately traceable to the operation of natural selection, it seats all explanations within an evolutionary framework. Within this framework, explanations will vary in their downstream (more proximate) mechanisms. 'Cultural explanations' are then simply those that specify a substantial role for social learning in a causal chain that accounts for particular phenotypic distributions.
2. From this perspective, culture is part of our biology in two distinct ways: First, many aspects of our genetically evolved physiology, anatomy and cognition have been shaped by selective forces traceable to cultural evolution. As the examples below will make clear, one cannot study either human physiology or our cognitive architecture without considering culture-driven genetic evolution. Second, culture shapes our biology—including our brains and anatomy—through non-genetic inheritance processes—so, even putting aside culture-gene coevolution, aspects of our biology evolve culturally. The means that our brains and psychology have been evolving culturally over historical time (Muthukrishna et al., 2021).
3. Cultural evolution stands alongside natural selection acting on genes as a non-conscious and unintentional process capable of generating adaptive or functional complexity (J. Henrich, 2016).

Unfortunately, dualistic assumptions about minds versus bodies/brains and nature versus nurture/learning still pervade much thinking in many parts of the social sciences and humanities. To address this, we begin our review by looking at how culture shapes (non-genetically) human bodies, literally from head to toe. As you'll see, culture alters our anatomy and physiology, leading medical researchers focused on WEIRD people to make incorrect inferences about basic aspects of human psychology, health, aging and disease. If culture can alter our physiology and anatomy, do we really believe it will leave our reasoning and judgment unaffected? Next, we focus on how culture influences

people's sensory abilities, perceptions, spatial cognition and mentalizing. Each of these represents a fundamental feature of our species that has long been crucial to our survival. Yet, key aspects in these domains vary across populations in important ways. Down shifting into the domain of greater interest to philosophers, we review the research on thinking styles, reasoning, epistemic norms and judgement. Here, we show that not only do these vary among populations, but that WEIRD participants anchor the extreme ends of global distributions. We close our empirical review with some concerns about scholars' overreliance on intuitions and insights rooted in the use of English. English is peculiar along many important dimensions and may be quite unrepresentative of most spoken languages over human history.

Culture shapes humans in profound ways

Scholars often have the intuition that culture can only shape superficial aspects of our minds; or worse, they persist in applying an outdated digital computer metaphor that incorrectly partitions brains and minds into 'hardware,' supposedly studied by neuroscientists and psychologists, and 'software,' allegedly studied by anthropologists and sociologists. This ill-fit metaphor leads them to infer there's some hermetically sealed set of cognitive hardware that can't be influenced by culture.

Our first step in addressing such misconceptions is to illustrate how culture shapes features of human anatomy and physiology, including features that have clearly been the target of natural selection—i.e., our genetic adaptations. We'll further show how medical researchers, physiologists and anatomists have made errors in understanding our species' bodies as a consequence of their readiness to generalize from studies of people from societies that are Western, Educated, Industrialized, Rich and Democratic (WEIRD) to *Homo sapiens*. Reliance on these peculiar populations, who grow up in environments without evolutionary precedence, have led to confusions regarding the nature of "human" body temperature, running form, hormonal life cycles (e.g., testosterone), foot mechanics, and the functioning of our immune systems. Overly enthusiastic generalizations from WEIRD samples have led medical researchers to incorrectly assume that many chronic diseases were the result of aging rather than a specific response to life in particular environments.

Let's start at the bottom. When paleoanthropologists first started to compare the fossilized feet and footprints of Australopithecines to "modern" humans they declared that the Australopiths had "primitive feet," noting for example their high arches. However, decades later, it turned out that the unusual features of Australopith feet could be found in contemporary human populations once researchers stopped focusing on people who grew up wearing hard soled shoes (Tuttle et al., 1990, 1991). Compared to most societies that have ever existed, habitually-shod populations, especially those who don snug-fitting, hard soled shoes, have unusual feet, including fallen arches. WEIRD people even put shoes on their children!

Is the foot a peculiar exception? Well, when researchers began to study 'the human running form,' they also got the wrong answer. The reason is that they studied runners who had adapted their form to wearing cushioned running shoes—essentially strapping pillows to their feet. Equipped with such cushions, runners tend to land on their heels. By contrast, populations who habitually run barefoot, or in any sort of minimalist footwear, develop a running style in which they land on their mid- or forefoot. Analyses of the biomechanics of habitually barefoot runners suggest that humans evolved genetically to run long-distances, and specifically to absorb shocks via a mid or fore-foot strike (where the calf muscle

acts as a shock absorber), not a heel strike. Studying runners who grew up in a world with cushioned running shoes (1975 to 2020?) suggested that people didn't evolve to run because the magnitude of the pounding created by chronic heel strikes leads to knee problems, *plantar fasciitis* and other issues (Bramble & Lieberman, 2004; Lieberman, 2012). Of course, recognizing the potential role played by running shoes is relatively easy compared to recognizing all of the more subtle norms, technologies and aspects of language that shape our thinking, feeling and intuitions in a manner analogous to how sneakers distorted our running form.

Culture also shapes our hormones—specifically men's testosterone (T) changes over the life course. Like many bird species (and lizards), testosterone levels in males rise during mate-seeking, mating and status competition, but then decline after monogamous pair-bonding and with caring of offspring (Hooven, 2021). Laboratory evidence has linked testosterone to status seeking and zero-sum thinking, which often results in impatience, risk-taking, mistrust and reduced responsiveness to learning from pain. The difference between birds and humans is—of course—that human mating and pair-bonding is heavily regulated by norms and institutions, like marriage. Societies vary in their marriage institutions, but from a global and historical perspective, modern monogamous marriage is quite peculiar. Most societies have permitted high status men to marry polygynously, and often placed few or no constraints on their sexual behavior. The available evidence suggests that men's relative testosterone levels over their life course depends on the marriage and child-care norms they confront. In normatively monogamous societies, where fathers are expected to provide some childcare, men's T-levels drop when they marry and again when their first child arrives. This decline often continues as they age, sometimes resulting in chronically "low-T", a recognized clinical condition. By contrast, there's little indication that men's T-levels drop after marriage in polygynous societies (after all, they remain on the marriage and mating market) or after children arrive (since norms in such societies rarely encourage fatherly infant care). Moreover, any age-related declines in men's relative T-levels are mild compared to the more dramatic drops common in WEIRD societies. Once again, the medical establishment erred in thinking that the large T-level declines they observed in WEIRD men were the inevitable products of aging (Henrich, 2020; Henrich et al., 2012). It turns out, there's an interaction between aging and marriage norms that one entirely misses by studying WEIRD people, with their historically peculiar marriage system and consequent cultural endocrinology.

What's the internal temperature of the human body? In 1851, the German physician Carl Reinhold Wunderlich measured the temperature of 25,000 patients and set the modern standard for body temperature at 37° C or 98.6° F. But, is this measurement a feature of human bodies?

Surprisingly, no. It turns out that mean body temperature in the U.S. has been declining by roughly 0.3 degrees per decade since the mid-19th century (Protsiv et al., 2020). Similarly, among the Tsimane, who rely on slash-and-burn agriculture and hunting for their subsistence in the Bolivian rainforest, mean body temperature has been declining by 0.5 degrees per decade since 2000. Why?

The answer remains a bit of a mystery, but part of the decline is likely due to a reduction in parasite loads that most humans have routinely carried until very recently (Gurven et al., 2020). If you study WEIRD people, you even get "human" body temperature wrong. Our body temperature depends, at least in part, on our epidemiological contexts. Clean water, antibiotics, vaccinations and other unidentified factors have left us with low body temperatures, uncharacteristic of those found over our species evolutionary history.

The recent and dramatic reductions in the parasite loads carried by many human populations—a pattern first appearing in WEIRD people—has misled researchers in another way. Medical science has long taken chronic inflammation to be a cause of heart disease. However, these links only appear in populations with very low parasite loads. That is, in populations with high parasite loads, chronic inflammation is not associated with heart disease (Gurven et al., 2009; Gurven et al., 2016; Gurven & Lieberman, 2020). A leading explanation suggests that natural selection may have depended on the reliable presence of helminths, a type of parasite, in our bodies as a means to manage the negative impact of chronic inflammation. Once cumulative cultural evolution devised ways to eliminate helminths from our bodies, chronic inflammation became a new factor contributing to rising rates of heart disease. The lesson here is that studying people living in helminth-free environments led to an impaired understanding of the nature and evolution of heart disease.

Arriving at our heads, this epidemiological process may explain another pattern: the appearance of facial acne varies from zero percent in some small-scale societies up to 95% in urban WEIRD societies (Campbell & Strassmann, 2016). Such data hint that acne was likely rare over much of our species' evolutionary history and suggest that the science of acne that has developed by studying WEIRD people is missing some major risk factors—which are homogenous across WEIRD societies. Acne is cultural.

Natural selection has substantially shaped our bite and teeth relative to other primates (Lieberman, 2011), so is this a reliably developing feature of our anatomy? Today, most contemporary humans display a particular bite configuration – the upper teeth are projected in front of the lower teeth during occlusion ('overbite') spanning a small acute angle in relation to them ('overjet'). This configuration was (and still is) deemed as the normal, healthy bite, emerging early in life and accompanying individuals throughout adulthood (Heikinheimo et al., 2012; Tibana et al., 2004). Many people today also need braces for an orderly smile (Lieberman, 2013). However, researchers studying foraging populations have argued that the type of bite that has characterized most of our species' history has neither overbite nor overjet, and is instead defined by the full occlusion of the upper and lower teeth, creating an edge-to-edge bite (Begg, 1954). This dental pattern likely arose from a developmental response to heavy wear diets, which progressively shaped the bite and the orofacial features of individuals from overbite and overjet in pre-adolescent individuals to an edge-to-edge bite in adults. This is the 'normal development' from an evolutionary perspective.

This seemingly unremarkable change in people's bite configuration had substantial consequences. First, the shift likely led to observable changes in the speech sounds present in the world's languages (Blasi et al., 2019), giving rise to labiodentals like 'f' and 'v' sounds. If you are a linguist, you can't get human phoneme variation correct without understanding how technology shapes the ontogeny of the human bite and how that influences the sounds found in languages. Second, the close alignment of teeth in this edge-to-edge configuration likely inhibited the emergence of cavities and other periodontal diseases compared to contemporary configurations (Kaifu et al., 2003). Chewing tough food and working materials like leather over childhood may also have encouraged the straighter and more uniform spread of teeth, thus avoiding the situation that prompts the use of braces today. Thus, by favoring softer foods and technologies capable of replacing the tasks once done with our teeth, cultural evolution first produced the jumbled smiles and dental problems found in many agricultural populations (Lieberman, 2013). Now, cultural evolution is trying to fix the problem it created with braces and dentists. Thus, the 'human' bite has continued to evolve culturally over history as the task demands on our teeth and jaws have changed.

Sensory abilities and perception

It's a short step from the effects of culture on our anatomy and physiology to its impact on our senses and perceptions. Perhaps the oldest lines of research on this come from studying how culture influences myopia, effectively changing people's visual acuity. Among hunter-gatherer populations, who live in the kinds of environments that dominated most of our evolutionary history, myopia is almost non-existent (Cordain et al., 2002). In contrast, today in the industrialized world, nearly 25% of the population is myopic, and need glasses to correct their vision. Debates persist on the precise causes of this, but key influences include urban environments, time spent indoors and reading during childhood. So, if you study "*human visual acuity*" by focusing on WEIRD people, you might infer that "it's genetic" (because genetic variation does contribute). However, this would be misleading since myopia is now thought to be entirely a gene-environment interaction—if you grow up as a forager, no genes make you more susceptible to myopia because the relevant cultural practices aren't found in these populations. These 'myopia genes' only matter at all in recent environments. Thus, studying WEIRD people means you get human visual acuity wrong and even your inferences about the role of genes could be misleading.

Similarly, a venerable line of research going back to 1901 by W.H.R. Rivers suggests that our susceptibility to various visual illusions also varies across societies (Berry, 1968; Bremner et al., 2016; Jahoda, 1966; Rivers, 1901; Segall et al., 1963, 1966). This includes some of the most common illusions, such as the Horizontal-Vertical, Sander-parallelogram and the Ebbinghaus illusions as well as the famous Mueller-Lyer Illusion. This cross-cultural variation is consistent with older developmental data showing that our susceptibility to particular illusions often changes gradually over our lives (Henrich, 2008) and more recent evidence suggesting that illusions are influenced by how our minds calibrate to the statistical patterns found in our visual environments as they convert the 2-D images projected onto our retinas to 3-D representations (Howe & Purves, 2005).

Curiously, this well-established population-level variation has been ignored in philosophical debates: long after substantial evidence was available, the Mueller-Lyer Illusion was claimed to be a "cognitively impenetrable" creation of the human mind by Jerry Fodor in his debates about modularity with the Churchlands (McCauley & Henrich, 2006). Yet, research done in the 1960s had already revealed substantial variation in the strength of the Mueller-Lyer illusion, with WEIRD people showing the greatest susceptibility and Kalahari hunter-gatherers not seeing the illusion at all.¹

WEIRD intellectuals have long argued that olfaction is the least important of the five senses, and this has been the standard view in psychology and even in anthropology. Yet, this may be a WEIRD bias that we culturally inherited from our farming forebearers. Recent work among both forager-horticulturalists in Bolivia and hunter-gatherers in Malaysia suggests that these populations are superior at identifying scents and possess a richer vocabulary that includes an array of basic (abstract) scent terms (Majid & Kruspe, 2018; Sorokowska et al., 2013). This is striking because some WEIRD intellectuals have suggested that it's impossible to speak abstractly about scents (Majid & Burenhult, 2014), presumably because their languages and cultural routines didn't habituate and automate the application of such concepts (more on this below). While philosophers have recognized some of this important work on olfaction (Barwich, 2020), it's less clear that the field has fully digested the implications of relying on WEIRD neuroscience (Han et al., 2013; Kitayama et al., 2017, 2019).

Spatial Navigation

Going well back into our evolutionary history, humans have confronted the need to think about space in a variety of ways. Like other animals, human spatial navigation and memory present crucial cognitive challenges that have been linked to a variety of cognitive abilities, and human foragers have long needed to navigate through space and remember the details of their home ranges to avoid predation, find mates, and remember the location of objects or past events (Milton, 1988; Powell & Mitchell, 2012). Some of the most commonly studied spatial cognitive abilities include (1) spatial memory and navigation (which allows us to store and retrieve information about our surroundings, remember where objects are located, or where an event took place), (2) spatial perspective-taking (how objects in the environment are oriented in relation to another), and (3) mental rotation (the ability to imagine how an object that has been seen from one perspective would look if it were rotated in space or viewed from the new perspective). Decades of research have explored the degree to which these cognitive features are products of innately available representations (R. F. Wang & Spelke, 2002), how basic spatial processes interact with the symbolic world (Stokes, 2018), and what the role of individual differences is (Hegarty & Waller, 2005; Proulx et al., 2016).

Though spatial reasoning and associated cognitive abilities, such as spatial memory and mentalizing, improve throughout children's development (Hart & Moore, 1973; Vasilyeva & Lourenco, 2012), there remain substantial performance gaps within and across populations that remain largely unexplained. For example, in an investigation of navigational ability between two WEIRD populations in Padua, Italy and Salt Lake City, Utah, USA, Barhorst-Cates et al. (2021), found that adults in Padua, who have substantially lower pointing error within their own city when compared to Utahans, were no more accurate at pointing to familiar distant targets outside their cities >10 km away than participants in Utah (~37° error).

Compare these WEIRD populations to traditional societies in Africa and Amazonia. In Amazonia, forager-horticulturalists—the Tsimane—in Bolivia were asked to point from their home village to distant communities over 60 km away that are only accessible by canoe, traveling along a sinuous Amazonian tributary. Here, Tsimane adults average just 20 degrees of error (Davis et al., in press) and children average only ~40° pointing error (Davis & Cashdan, 2019). On the other side of the globe, in the arid regions of Namibia, Twa pastoralist-forager children (M = 11.6 years old, SD = 3.4 years) point to distant locations up to 90km away with considerable accuracy, averaging only 20° error (Davis et al., 2021), which is on par with adults in their communities and Tsimane adults, but is twice as accurate as the navigationally-challenged adults sampled in Padua and Salt Lake.

Though considerable prior work has aimed to identify and relate individual differences, surprisingly little work has focused on the characteristics of a navigator's home environment, as well as on the cultural and daily navigational requirements, as an explanation for why individual differences may be observed. However, a few classic studies, along with a wide range of recent evidence from the Spatial Cognition and Navigation (SCAN) lab have demonstrated how local environments, economic demands and particular ecologies, and social norms and cultural institutions shape human's spatial cognitive abilities (Barhorst-Cates et al., 2021; Cashdan et al., 2016; Crittenden et al., 2021; Davis & Cashdan, 2019). First, in the Padua and Salt Lake City study, Barhorst-Cates et al. (2021) found through interviews focused on daily activities and city mapping that the greatest influence on navigation strategies and accuracy

between the two WEIRD populations was home environmental experiences. Padua adults, who live in a winding city filled with bridged moats and arcaded streets, were twice as accurate when pointing to within city targets when compared to Americans in Salt Lake City, who live on a metropolitan grid with few proximal cues but some distinct distal geological markers. The study further suggests that mode of travel and street network entropy may further improve or inhibit the development of navigational skills. This conclusion is further supported among the Tsimane and Twa. Among the Tsimane, labor demands require navigating dense tropical canopies with frequent cloud coverage that obscures distal cues. Though there are ecological risks, children are given considerable latitude to explore without adult supervision and are expected to contribute to household labor (Davis & Cashdan, 2019). Likewise, among the Twa, men and boys have historically traveled long distances to find grazing lands and water for their herds while women foraged nearby for medicinal and edible plants.

Similar links between ecology, social norms, and navigational ability have been identified in other studies among non-WEIRD children. For example, among the Mbendjele BaYaka in the Republic of Congo, children spend considerable time in work and play away from home beginning at an early age (Lew-Levy et al., 2020), and on a similar pointing task their navigational error was found to be as low as 7° (Jang et al., 2019). Likewise, in a seminal study among Alaskan school children (Kleinfeld, 1971), children of native Alaskan descent demonstrated far greater visual spatial memory than their European-descent peers. Building on earlier findings from Berry (1966), Kleinfeld attributed the differences in the two populations to the freedom to explore granted to children in Inuit populations. While children from both the Tsimane of Bolivia and Twa of Namibia performed well on tasks of spatial memory and navigation, they also showed highly developed spatial perspective taking skills, with only around 66° error when asked to imagine that they were in a known location far way and navigate from that mentalized location to a third target location. Compared to the Tsimane and Twa, studies in WEIRD populations suggest lower overall performance on spatial perspective taking (Vander Heyden et al., 2017), as well as large intra-population differences, which may in part be culturally influenced (Tarampi et al., 2016).

Given the role that ecology and socialization practices play on navigational and pointing ability, it is critical to reassess how some previously assumed genetic differences may be amplified by, or even the product of, social norms or cultural institutions. Sex differences have long been a focus of spatial cognitive research in WEIRD populations (Linn & Petersen, 1985; Voyer et al., 1995). Many studies report that men (compared to women) learn spatial environments faster and can recall routes with fewer errors (Coluccia & Louse, 2004; Galea & Kimura, 1993). Overall, sex differences in mental rotation remains among the most widely studied spatial skills that favor men (Voyer et al., 1995). And, although there is still some debate about the age that differences in spatial abilities are first observed; most WEIRD studies suggest that they emerge during middle childhood, around 9 or 10 years old (Neuburger et al., 2011). Given the consistency of these observed differences, evolutionary hypotheses have been proposed to explain why biological sex differences in spatial ability might exist (Geary, 2010). These hypotheses focus on the benefits males gain from meeting various navigational challenges, including mate seeking (Gaulin et al., 1990; Geary, 1995; Jones et al., 2003) or the emergence of the sexual division of labor in humans during the Pleistocene (Silverman et al., 2007).

Consistent with these arguments, it has been observed in both WEIRD societies (Hart, 1979; Matthews, 1987) and small-scale societies (Whiting & Edwards, 1992) that children first demonstrate significant sex differences in range size during middle childhood, when they begin participating in sex specific tasks and

start spending more time with same-sex peers. These differences are argued to increase after adolescence, when boys enter their mate seeking years (Miner et al., 2014). For example, Vashro and colleagues (2016; 2015) found that among Twa pastoralists the average daily range size for Twa men was greater than that of Twa women. They also demonstrated that men had (1) lower average error on a navigational pointing task compared to women and (2) greater accuracy on a mental rotation task. Supporting an evolutionary account, Twa men with larger ranges were also found to have fathered more children by more women—they had higher fitness.

However, sex differences in navigational cognition don't always emerge. In East Africa, sex differences in navigational abilities were not found among participants still living a traditional foraging lifestyle; instead, they only arose among participants from communities located closer to the market towns, where people tended to be less mobile and had smaller range sizes (Cashdan et al., 2012). Likewise, among Tsimane adults, where men and women both travel far for food, sex differences in navigational ability were not observed (Trumble et al., 2015). Instead, Tsimane's daily mobility, wayfinding/pointing error, and mental rotation were related to differences in age, participation in the wage labor market and more years of formal education (Davis et al., in press). This raises questions about the role mobility patterns, market exposure, and formal schooling play in spatial cognitive development.

Illustrating the power of institutions to have unintended cognitive consequences, consider the impact of boarding schools for the Twa, where sex differences have been consistently observed among adult men and women (as mentioned above). When both boys and girls began traveling on foot weekly to government funded boarding schools, they demonstrated precocious navigational skills and no sex differences with increased mobility. Notably, boys and girls outperformed most adult women who had not had access to formal schooling growing up and whose mobility has been traditionally constrained by childcare and domestic work close to camp (Davis et al., 2021). In contrast, among tropical forager-horticulturalists, where mobility patterns vary by age but not gender, children who spent more time attending local village schools traveled less than their peers and performed worse on navigational tasks (Davis & Cashdan, 2019), though they were still precocious compared to children in WEIRD societies. Additionally, children in both populations showed higher performance on tasks of mental rotation (the ability to imagine what an object would look like if it were rotated about its axis) with more formal schooling. Children even outperformed their parents and other adults in their community with less schooling as early as 7 years old (Davis et al., in press). Altogether, this cross-cultural evidence suggests that early childhood environments, including the cultural institutions they're exposed to, play a crucial role in the development of spatial cognitive abilities. Broadly, schooling improves some cognitive abilities while eroding others.

The upshot is that a narrow focus on WEIRD participants has resulted in a distorted picture of our species' navigational cognition that can be seen in adult cognitive phenotypes, developmental patterns and apparent sex differences. An inclination to generalize from WEIRD people to "humans" persists among developmental psychologists and cognitive scientists despite a long history of such studies, stretching back into the 1960s.

Mentalizing

Theory of mind—the ability to mentalize, or infer others' beliefs, intentions, and desires—is likely an important feature of our species' evolved psychology. Many researchers have suggested that sophisticated mentalizing abilities provided a selective advantage to individuals living in large social

groups, either by facilitating success in competitive relationships or by sharpening their cultural learning abilities. Supporting this view, mentalizing abilities emerge early in development across diverse populations (Baillargeon et al., 2016; Barrett et al., 2013; Callaghan et al., 2005; Hamlin et al., 2008, 2009; Hamlin, 2013a, 2013b; Robbins et al., 2017).

However, just because humans everywhere reliably develop mentalizing abilities does not mean that they do so to the same extent or in the same contexts. Instead, growing evidence suggests that social norms and institutions can shape theory of mind, giving rise to cross-cultural variation in mentalizing inclinations. WEIRD people appear to be “hyper-mentalizers”, lying at the extreme end of the global spectrum (Barrett et al., 2016; Curtin et al., 2020). Although children everywhere reliably develop theory of mind, the trajectory of this development varies across societies. Notably, there is cross-cultural variation in the order of acquisition of theory of mind concepts: while WEIRD children tend to understand that others can have different beliefs before they understand that others can have different knowledge, Chinese and Turkish children show the opposite pattern, potentially reflecting cultural differences related to individualism versus collectivism (Selcuk et al., 2018; Wellman et al., 2006). In addition, growing evidence suggests that Western-style formal schooling may foster an earlier development of theory of mind (Kuntoro et al., 2013; Vinden, 1999, 2002; Wang et al., 2016). For example, students at Chinese-style schools in Hong Kong show delays in theory of mind relative to children at British-style schools in the same city even after controlling for socioeconomic factors (Wang et al., 2016). These findings raise the possibility that Western-style formal schooling may foster an emphasis on mentalizing.

Cross-cultural variation in conceptions of the mind may also shape the extent to which people engage in mentalizing across contexts (Willard & McNamara, 2019). Anthropologists have identified six different “theories of mind” from across the ethnographic spectrum. Beyond the well-known Western secular conception, which situates the mind as an entity separate from, but causally important to, the physical world, there are a diversity of non-WEIRD approaches. Other conceptions of mind vary across multiple dimensions (Luhmann et al., 2011, 2021), including

- (1) Porousness: can minds enter other minds? (underpinning phenomena like spirit possession)
- (2) Causality: do intentions play a causal role in the physical world? (underpinning many witchcraft and evil eye beliefs)
- (3) Relational access: is it socially acceptable to make inferences about others’ minds?

Illustrating the role of relational access, anthropologists have documented Opacity of Mind norms—rooted in the belief that other minds are fundamentally unknowable—in small-scale societies throughout the South Pacific and elsewhere (Luhmann et al., 2011; Robbins & Rumsey, 2008). Where Opacity of Mind norms operate, people feel that it is inappropriate to speculate about others’ minds and children are actively socialized to deemphasize internal states and focus instead on external behaviors (e.g., crying rather than sadness: Luhmann et al., 2011; Schieffelin, 1990, 2008). Beyond simply modulating behavior, these norms shape people’s tendency to engage in theory of mind. For example, compared to either Americans or Indo-Fijians (whose ancestors arrived from India as indentured servants), indigenous Fijians are less likely to use inferences about a person’s false beliefs to predict their future behavior. They also report thinking less about others’ internal mental states— and this accounts for the difference in performance on the false-belief task compared to Americans (McNamara et al., 2019, 2021).

Of special interest to philosophers, studies have begun to reveal striking cross-cultural variation in one specific facet of mentalizing: the tendency to consider intentions and other mental states when making moral judgements. If someone took your bag after mistaking it for their own, would you judge their action as harshly as if they had purposefully stolen it? If you're WEIRD, almost certainly not. WEIRD people place heavy emphasis on an actor's intentions, even judging attempted (but unsuccessful) harms more harshly than accidental (but actual) ones (Young et al., 2007; Young & Saxe, 2008, 2009). To the WEIRD mind, it is intuitive and obvious that intentions should be central— and this is reflected in Western legal codes, which trace back to the High Middle Ages (Berman, 1983; Henrich, 2020).

When we look elsewhere in the world, however, the generalizability of WEIRD people's laser-like focus on mental states comes into question. Using vignettes featuring theft, physical harm, poisoning, and food taboo violations, Barrett et al. (2016) uncovered substantial variation in this tendency across a diverse sample of 10 societies. Anchoring the extremes, participants from Los Angeles and rural Ukraine judged high-intent harms much more severely than low-intent ones, while participants from Namibia and Fiji judged them to be equally bad and worthy of punishment (Barrett et al., 2016). Follow-up work confirmed that indigenous Fijians place more emphasis on outcomes than intentions when making moral judgments (McNamara et al., 2019, 2021). Interestingly, priming Fijians to think about thoughts shifts their judgments to be more intention-focused. This suggests that, under normal circumstances, Fijians may be less attuned to mental states than Westerners in making moral judgements. Deviations from the WEIRD pattern of moral judgement have also turned up in industrialized Asian societies, with Japanese participants placing less weight on intentions than US participants (Hamilton & Sanders, 1992).

Although cross-cultural experimental research on this topic is rare, the ethnographic record suggests that a tendency to weigh outcomes over mental states in moral judgment has been widespread. A recent, systematic review of ethnographies found that notions of strict liability— where outcome rather than intent or motive is the primary factor in determining culpability— and corporate guilt—where guilt for crimes depends on being in the same clan or kin group as the perpetrator— appear in societies around the globe and across the spectrum of subsistence strategies (Curtin et al., 2020).

Although more research is needed to understand the sources of variation in attention to mental states during moral judgment, recent evidence indicates that kin-based institutions play a role. Researchers use the term "kinship intensity" to describe variation in how central kinship is to the formation of personal identity and social networks, noting that WEIRD societies have extremely weak kin-based institutions (Curtin et al., 2020; Henrich, 2020; Schulz et al., 2019). Reanalyzing Barrett et al.'s (2016) cross-cultural data, Curtin et al. (2020) found that as kinship intensity rises, people's reliance on mental states in moral judgment declines.

Together, this body of research indicates that the WEIRD obsession with intentions when making moral judgements is not representative of humans everywhere. On the contrary, WEIRD people may lie on the extreme end of this spectrum. Consequently, scholars from WEIRD societies, or even those educated in WEIRD institutions, should distrust the generalizability of their intuitions on such matters. From this perspective, efforts to define the epistemic conditions of "moral responsibility" in philosophy (Rudy-Hiller, 2019) look like formalized versions of WEIRD folk psychology. Are many philosophers doing cultural philosophy?

Thinking styles

John Locke famously claimed, without evidence, that reasoning is an innate, universal human faculty (Locke, 1690). Yet, at the same time, researchers have also long recognized a vital role for culture in shaping thinking and reasoning since at least the dawn of psychology (see Cole, 2003 for a valuable historical overview). Notably, the philosopher Wilhelm Wundt (1916), often considered one of the fathers of modern psychology, explicitly advocated for *two* psychologies – one concerning the properties of the mind universal to all humans, the other focused on the role of different cultural contexts in shaping psychological phenotypes. While Wundt’s original efforts to trace the differences in reasoning among populations to the impact of “civilization” reflected the Euro-centric superiority of his era, the question of how culture impacts reasoning has persisted.

More recently, research that began in the 1960s focused on the effects of formal schooling on cognition (see Cole, 1990, 2003; Rogoff, 1981 for reviews). This work, which expanded on Luria’s (1976) pioneering efforts in the early 20th century, demonstrated that while there were by and large no differences in the *capacities* for reasoning across populations, habitual patterns of thought did vary markedly across populations and, particularly, across educational statuses (schooled v. unschooled). For instance, unschooled populations are highly unlikely to operate using abstract categories in solving a variety of problems, whether in clustering to-be-recalled items by semantic category, identifying which items do or do not belong in a set (e.g. not excluding ‘log’ from the set ‘hatchet-log-hammer-saw’ on the basis of it not being a tool) and learning rules—e.g., if in one task the correct basis of discrimination is by color, the next task is likely to also involve color discrimination (Cole, 1971; Sharp et al., 1979). Moreover, even the notion of providing a definition for common objects is largely rejected by non-schooled participants (Luria, 1976). While unschooled populations have been shown to be *capable* of using abstract categories (after some training or scaffolding), the fact that this is a highly counter-intuitive approach for groups without the peculiar experience of formal (Western) schooling. In other words, while many (if not all) of the operations available for *reasoning* may be universal, what counts as a *reasonable way of thinking or the best way of thinking* varies (Buchtel & Norenzayan, 2008) and these differences have important effects not only on how people approach and solve problems but also on how they conceptualize the world.

Beginning in the late 1990s, researchers in psychology and cognitive science have found that—schooling aside—culture plays an essential role in how people reason in domains that include ecology (Busch et al., 2018), social conflicts (Peng & Nisbett, 1999), causal attributions (Choi et al., 1999; Li et al., 2012), stock prediction, categorization (Norenzayan et al., 2002) and moral cognition (Awad et al., 2018; Sachdeva et al., 2011). Among these, the most often discussed aspect of cross-cultural variation is undoubtedly the holistic versus analytic spectrum. Broadly speaking, this dimension captures a set of interrelated perceptual, cognitive, and reasoning differences among populations (Nisbett et al., 2001). For reasoning in particular, analytic thinking is formal (rule-based) and abstract whereas holistic thinking is relational and experience-based (Nisbett et al., 2001; Scribner, 1975; Scribner & Cole, 1973). Analytical thinkers look for categories with necessary and sufficient conditions, and assign properties to individuals and objects based on category membership. By contrast, holistic thinkers focus on the relationships among individuals or objects, consider background and context, and judge similarity based on family resemblance or gestalt relationships.

Figure 1 shows the country-level variation in analytic versus holistic thinking found using the Triad Task in online samples from around the world (Henrich, 2020). The Triad Task asked participants to state whether a series of targets, usually shown in images, 'go with' one of two other options. For example, participants might see a 'rabbit' and have to say whether it goes with either the 'dog' or the 'carrot.' More analytically inclined thinkers tend to put the mammals together (rabbits and dogs) while more holistically inclined people prefer the functional relationship (rabbits eat carrots). The results show substantial variation around the world, ranging from about 20% analytical responses among Serbians to nearly 80% among the Dutch. In WEIRD countries, a majority of responses favored the analytic option,

while elsewhere, most other populations were holistically inclined.

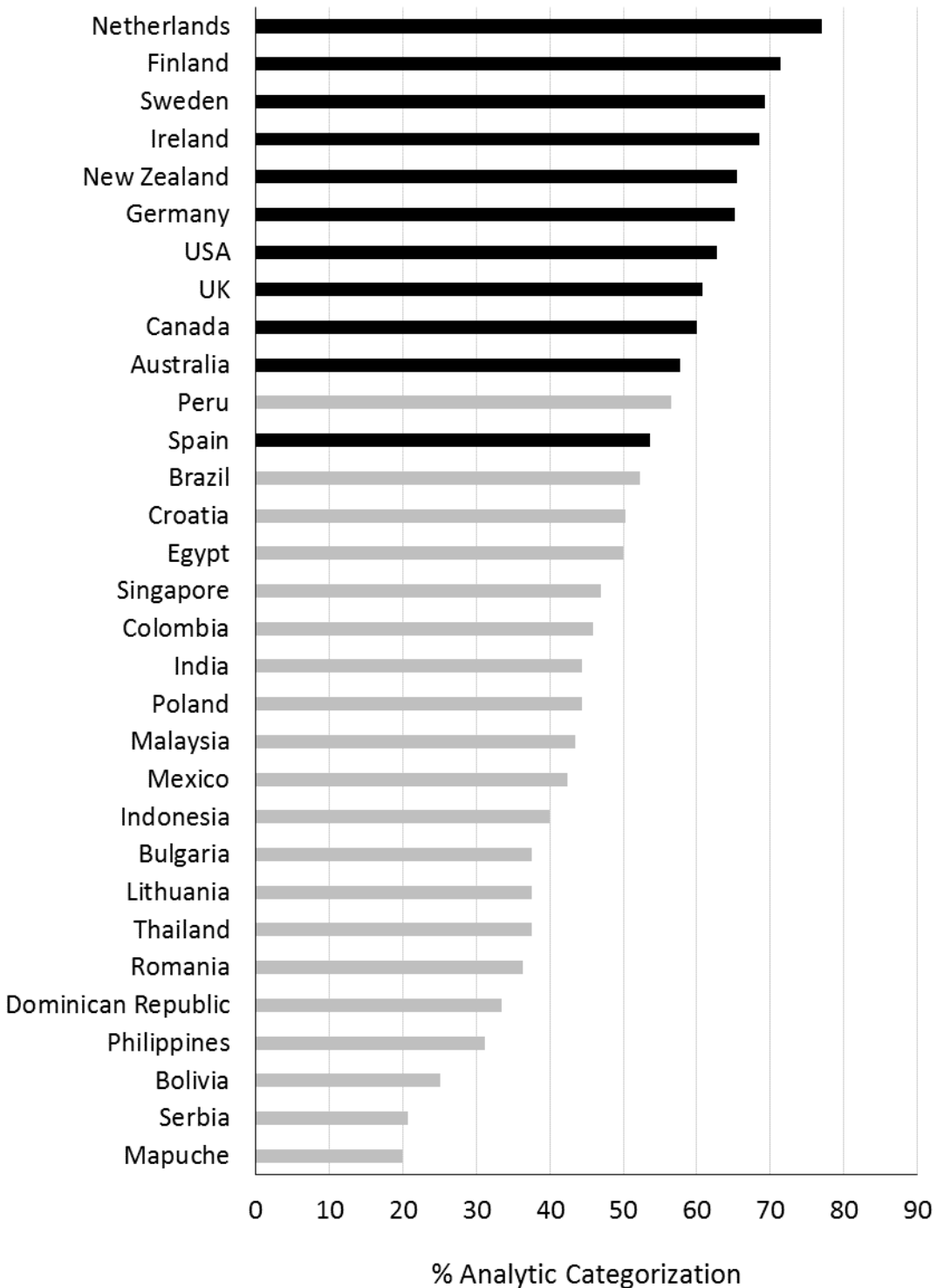


Figure 1. Variation in the frequency of analytic (versus holistic) responses across 31 populations. Except for the Mapuche, all participants responded online to the same Triad Task at yourmorals.org. The Mapuche data was collected using a similar triad task in one-on-one interviews. Drawn from Henrich (2020) with thanks to Thomas

Talhelm. The black bars mark the populations most commonly sampled by researchers in the experimental behavioral sciences, though sampling is dominated by Americans, Dutch, Canadians and Brits.

Like Locke, and for psychological reasons we'll explain below, most Western intellectuals implicitly assume that their intuitions, motivations, preferences, emotions and ways of thinking generalize across all of humanity. But, while this is sometimes the case, we don't yet have reliable theories that tell us when and where such generalizations are safe. Philosophers should proceed with caution. What if many aspects of our reasoning abilities and judgments are influenced by cultural evolution?

Epistemic norms

Epistemic norms shape what people (1) attend to when seeking out information, (2) count as evidence and (3) consider as a persuasive argument (Henderson, 2020; Kauppinen, 2018; Littlejohn & Turri, 2014; Tomasello, 2020). Epistemic norms are so-called because they govern not actions or decisions, but the identification of relevant information, the weighting of different kinds of evidence, and the evaluation of various forms of argument. This influences the formation and updating of beliefs. Some norms apply to particular epistemic activities, such as how one ought to make inferences. For example, epistemic norms regulate how one should deal with inconsistencies, interrogate the entailments of, and conflict among, one's own beliefs, and update one's beliefs in light of new observations. Other epistemic norms govern more social aspects of information handling (Brady & Fricker, 2016; Goldman & O'Connor, 2019), such as how much confidence to have in the testimony of different individuals or in different kinds of people based on their social identity and group membership ("respect the wisdom of your elders," "believe women," or "distrust strangers"). Others prescribe how much to trust the claims made by different institutions and their leaders, and how much authority or deference should be given to experts of different kinds: e.g., "conservatives should be skeptical of information in the mainstream media," "trust digital natives," "when it comes to vaccines, physicians and health care professionals know best").

In the modern world, Stahl et al (2016) found that some people see reliance on "logic and evidence" in the maintenance of beliefs as a moral issue, while others do not. Those norms that govern the more social aspects of epistemic activity are perhaps most familiar. Partisan groups often adopt norms that recommend placing different levels of trust in various institutions and experts (e.g., *The New York Times* versus *Fox News*) and have different leaders that they hold in various levels of esteem (e.g., Biden versus Trump). Indeed, publicly rejecting or avowing certain beliefs can serve as an important way for individuals to visibly display their identity and signal their commitment to a particular group and its values. Such performances can serve to solidify one's standing as a group member and to enhance one's reputation and credibility within it, especially when such displays are costly in some way (Henrich, 2009; Kahan et al., 2017; Schaffner & Luks, 2018). Thus, there can be a tension between epistemic norms that reliably lead to true beliefs and those that effectively perform important tribal signaling functions associated with social identity and group membership

In 21st century philosophy, tensions between epistemic norms tends to emerge in the context of contemporary political differences (Edenberg & Hannon, 2021; Nguyen, 2020; Raymond & Kelly, forthcoming; Rini, 2017), but the cultural evolution of epistemic norms is an ancient problem: epistemic norms vary substantially across diverse populations and back into history. Henrich (2020), for example, discusses global variation in people's willingness to defer to elders, traditional authorities and ancient sages, and argues that these norms have shifted dramatically over the last millennium in some

populations. Dovetailing with Henrich's (2020) account, the philosopher Michael Strevens (2020) has argued that the success of modern science is built around its irrational focus on the use of empirical evidence to adjudicate theories in published discourse. While authority, elegance, intuition and other epistemic sources no doubt influence scientists themselves, epistemic norms bar them from deploying these sources in formal scientific communiques.

By contrast, philosophers in many societies thought it made good sense to invoke ancient authorities or sages with "time-tested" wisdom to convince others. For example, the Confucian philosopher Xunzi, in arguing against the use of a person's physical appearance to judge their personal characteristics or fate, starts by pointing out that physiognomy did not exist in antiquity and that learned scholars in ancient times did not talk about it (Knoblock, 1988). Notably, Xunzi did later invoke empirical arguments, but the precedence of and emphasis on authority is telling: the sentence "physiognomy did not exist in antiquity" is repeated three times in the first paragraph.²

Nowadays, arguments from authority are often categorized as fallacious, even by textbooks on logic and critical thinking (Copi et al., 2018; Hansen, 2015; Rudinow, 2008; Walton & Koszowy, 2014). The average lay person in contemporary WEIRD societies, though not necessarily aware of the details of the scientific processes in specific disciplines, nonetheless has a vague understanding that some kind of empirical inquiry is needed to generate genuine knowledge (National Science Board, 2018).

Of course, one of the central consequences of adaptive cultural evolution is that venerable traditions and stable customs are indeed often imbued with implicit knowledge and a kind of wisdom. As explained above, evolutionary approaches to culture argue that humans have evolved learning mechanisms that are often *selective*, guided by strategies and heuristics that dispose individuals to acquire some behaviors and ideas rather than others (Cheung et al., 2011; Evans et al., 2018; Heyes, 2016; Koenig & Sabbagh, 2013; Laland, 2004). While these selective learning abilities can generate errors in isolated episodes of individual decision-making, both empirical and theoretical work reveal how they produce adaptive practices, strategies and heuristics over generations. Cultural evolution can generate an increasingly adaptive body of practices, customs, techniques and strategies without anyone really understanding the details of how or why these "work." Consequently, traditions often embody an implicit wisdom (Boyd & Richerson, 2005) that the participants themselves don't understand.

Recent philosophical work has taken up these scientific lines of thought in at least two ways. First, philosophers have asked whether or not these kinds of selective social learning heuristics can be assimilated to traditional perspectives on rationality and epistemic virtue (Funkhouser, 2020; Levy & Alfano, 2020; Peters, 2020). Not surprisingly, humans seem to calibrate their learning heuristics in somewhat different ways in different places (Giuliano & Nunn, forthcoming; Mesoudi et al., 2014). Second, philosophers focused on institutions and moral progress have begun to consider the implications of this picture for politically conservative and progressive approaches to social change (Brownstein & Kelly, 2019; Buchanan & Powell, 2018; Kling, 2016)

What counts as evidence?

Would you consider a dream in which your teeth fell out as evidence that a close relative of yours is going to die? This is a common belief in Southwestern China. However, if you are from a WEIRD society, chances are that you would not—in fact, most Americans barely remember their dreams as they do not view dreams as providing relevant information for future events (Kracke, 1992). In stark contrast, both

historical and anthropological evidence indicates that dreams have often been considered a valuable source of information that has been, and continues to be in some places, a guide to future decisions and actions (Bourguignon, 1972; Hollan, 1989; Lincoln, 2003; Tedlock, 1987). Even in societies with sophisticated literary and philosophical traditions, including both pre-modern China and ancient Greece, deciphering dreams for hidden information developed into the serious art of oneiromancy (Hong, 2021; Hughes, 2000). The Zhou dynasty (1046 BCE – 256 BCE), for example, had official positions for oneiromancers, and the historical record indicates that during the Han dynasty, when different divination methods didn't yield the same result, oneiromancy took precedence (from the *Han Shu*, Yiwenzhi (Treatise on Literature)).

Alongside dreams, the use of divination technologies has played a significant role in many, if not most, historically- and archeologically-known societies (Flad, 2008; Fodde-Reguer, 2014; Yi-long, 2020). Although many reading this article likely view divination as a silly superstition, many philosophers and other scholars across history—from ancient Greece and Egypt to Persia and China, have viewed it as a legitimate way of gaining knowledge (Annus, 2010) and the “signs” used in various divinatory practices were treated as genuine evidence for something that is going to happen. Today, among the Yi in southwest China, people use the burnt cracks on sheep shoulder blades as an indication for whether sacrificing particular animals would appease a malicious spirit and cure an illness. Some shamans even refer to the crack signs as *zhengju* 证据 (Mandarin), which translates exactly as “evidence” in English (Hong & Henrich, 2021). The great value that people place on divination is captured by their willingness to pay diviners substantial sums of money for their services.

What's *WEIRD* across human societies and back into history is *not* using dreams and divination as epistemic sources for important decisions. The use of dreams and divination technologies has frequently been endorsed by the elite and has been frequently used by Emperors and generals in statecraft and war.

“Human” Judgment and Reasoning?

Decades of research in cognitive science have suggested that “human reasoning” is systematically biased away from rational expectations in a variety of ways (Kahneman, 2011). However, rarely does the size or direction of these biases remain constant across societies, although this fact is rarely mentioned in popular accounts, textbooks or even journal publications. Let's illustrate this with a bias that psychologists have dubbed the “Fundamental Attribution Error (Gilbert & Malone, 1995), which turns out not to be so fundamental.

Consider this personal description of a motorcycle accident in India witnessed by a participant in a psychological study.

This concerns a motorcycle accident. The back wheel burst on the motorcycle. The passenger sitting in the rear jumped. The moment the passenger fell, he struck his head on the pavement. The driver of the motorcycle—who is an attorney—as he was on his way to court for some work, just took the passenger to a local hospital and went on and attended to his court work. I personally feel the motorcycle driver did a wrong thing. The driver left the passenger there without consulting the doctor concerning the seriousness of the injury—the gravity of the situation—whether the passenger should be shifted immediately—and he went on to the court. So ultimately the passenger died.

Why do you think the driver left the passenger at the hospital without staying to consult about the seriousness of the passenger's injury? One middle-class American explained, "The driver is obviously irresponsible; the driver was in a state of shock; the driver is aggressive in pursuing career success."

Now, contrast the American's description with that of a middle-class Hindu participant in the city of Mysore, in southern India: "It was the driver's duty to be in court for the client whom he's representing; secondly, the driver might have gotten nervous or confused; and thirdly, the passenger might not have looked as serious as he was."

The Hindu participant focused on the lawyer's roles and responsibilities, while considering situational factors that might explain his behavior. By contrast, the American focused more on the lawyer's internal, dispositional states—he's "irresponsible" and "aggressively" overambitious. By the Hindu's account, the lawyer leaves the injured cyclist because of his responsibilities to his client—a relationship and responsibility. For the American, the lawyer departs out of concern that dillydallying might damage his professional advancement—his personal achievements.

This story was part of an investigation by the psychologist Joan Miller (1984). Miller asked people in Chicago and Mysore to describe two situations in which someone they knew well did something that they (the participant) considered wrong. Participants were also asked to explain why it was wrong. Joan's research team coded the contents of these narrations according to whether people used (a) contextual factors like social norms or relationships or (b) dispositional characteristics, such as references to personality traits, attributes (honesty) or competence. In both Mysore and Chicago, participants were middle-class adults as well as children and adolescents, ages 8, 11 and 15 years old.³

Figure 3 shows the development of both contextual/relational and dispositional attributions for the situations described by people from both cities. In middle childhood, children in both cities are pretty similar, although the 8-year-old Chicago kids are already producing dispositional attributions about 15% of the time compared to 8% for their peers in Mysore. However, despite their similar starting points, the developmental trajectories for the two populations then diverge sharply. In Chicago, the frequency of dispositional attributions—like 'dishonest', 'sincere' or 'aggressive'—balloons to 45%. For the same developmental period, the frequency of contextual references remains relatively flat, going from 11% in the 8-year-olds to 14% in adults. Meanwhile, in Mysore, contextual attributions rise from 12% in 8-year olds to 32% in adults while dispositional attributions only increase from 8% to 15%.

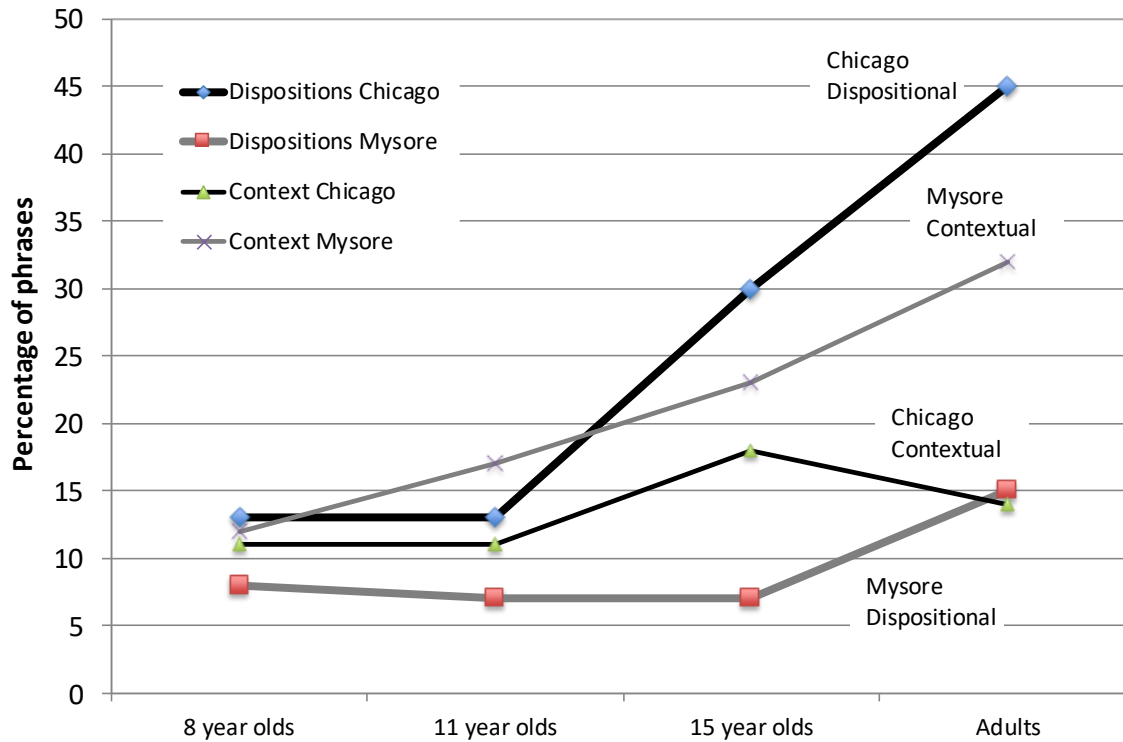


Figure 3. The development of dispositional versus contextual attributions for wrongdoing in Mysore (India) and Chicago (US). The black lines mark Chicago populations while grey indicates Mysore. The thicker lines indicate dispositional attributions while the thinner mark contextual attributions. These data were gleaned from Miller (1984).

What's going on? Is this some Indian peculiarity? No. It's the people in Chicago who are peculiar when placed in a global and historical perspective. A wide range of other evidence, much of it collected since Miller's early work, confirms that WEIRD people are particularly inclined toward dispositional inferences (Chiu et al., 2000; Heine, 2016; Nisbett, 2003; Smith & Apicella, 2020). The centrality of dispositions in the social sciences, using acontextual traits like 'extroverted', 'inequality averse,' or 'moral', reflect WEIRD biases in thinking.⁴

Dispositional attributional biases are just the tip of an iceberg of cognitive variation in this domain. Most of the decision-making and judgment heuristics and biases heralded by psychologists and behavioral economists (Kahneman, 2011) vary across societies, with some disappearing entirely or even reversing direction. These include overconfidence (Yates et al., 1997, 1998), risk aversion (Vieider et al., 2015), the gambler's fallacy (Ji et al., 2015), the hot hand fallacy, the representativeness heuristic (Spina, Ji, Tiejuan Guo, et al., 2010), neglecting regression to the mean (Spina, Ji, Ross, et al., 2010), functional fixity (Pope et al., 2018) and the endowment effect. Among WEIRD participants, for example, overconfidence biases in which participants overrate their own abilities are robust, persistent and well-replicated. However, across both behavioral domains and diverse populations, researchers have found that population-level variation includes cases of underconfidence (Muthukrishna, Henrich, et al., 2018). Similarly, not only does the strength of risk aversion vary across populations for the identical monetary gambles (Falk et al.,

2018), but some societies are risk *prone* (not risk averse) in absolute terms (Henrich & McElreath, 2002). Similarly, the famous endowment effect, in which participants place greater value on things they themselves own, does not appear in Tanzanian hunter-gatherers living their traditional lifestyle (Apicella et al., 2014) and is substantially muted among Japanese participants compared to Americans (Maddux et al., 2010). All of these patterns hold when real money or other goods are at stake and decisions impact people's payoffs.

In summary, faced with the identical information in relatively simple, incentivized problems, people from different societies deploy different heuristics and biases to arrive at different judgments and decisions. In fact, while many heuristics and biases have not been studied cross-culturally in any serious way, it is difficult to find examples that do not show important variation.

WEIRD languages?

A growing body of evidence suggests that language shapes our attention, habits of thought, categorizations, mental abilities and perceptions (Deutscher, 2010). Languages, of course, also provide us with a wide range of cognitive tools—e.g., concepts and categories—that influence how we parse the world and solve problems. Languages, for example, vary in how they reference direction and orient speakers and listeners in space. Some languages require speakers to track absolute directions—as in north, south, east and west—for all spatial references. Other languages provide multiple coordinate systems, including object-centered systems like 'right' and 'left', and relative coordinate systems that include the observer ("she's on the left of the flagpole"). Growing up immersed in languages with different reference systems creates quite different cognitive demands, which cultivate impressive cognitive skills that are not easily mastered later in life by those who grew up elsewhere (Haun et al., 2006; Levinson, 2003).

Categories and concepts matter. Compared to agriculturalists living in the same environment, hunter-gatherers possess a rich repertoire of 'basic' olfactory categories that allow them to abstractly describe and distinguish a wide range of scents (Majid & Kruspe, 2018). At the same time, it's not uncommon for such small-scale societies to have between 0 and 3 basic color terms, and no explicit term or concept for 'color' as a separate dimension (no easy way to say, 'what color is it?'). If they do have 2 color terms, they are expansive versions of black and white. If they have a third, it's usually an expansive red (Everett, 2005; Kay & Regier, 2003, 2006; Lindsey et al., 2015; Wierzbicka, 2013). Of course, while nearly all human populations perceive color variation (Sacks, 2012),⁵ the presence of terminological distinctions does impact performance in various cognitive tasks (Goldstein et al., 2009, 2009; Lucy, 1996). All this suggests that a hunter-gatherer philosopher would be unlikely to claim that scent was the least important of the senses—her language would likely have few or no abstract color terms but many abstract scent terms.

Grammar shapes what we pay attention to because different grammars variously require speakers to track other people's social status (e.g., choosing between formal and informal pronouns), gender (and how many genders?), time (e.g., mandatory future tense), number (e.g., 'we' involving 2, 3 or 4?), absolute direction and evidentiality (e.g., did you see it or just hear about it?). Like any daily training routine, such pervasive cognitive demands automate our attention and ingrain particular ways of processing information. At the same time, different vocabularies highlight particular concepts and provide ready ways of parsing and interpreting the world. While debates persist regarding the impact of language on thought, a growing body of evidence that stretches across several disciplines is revealing

how certain features of language influence important domains of behavior. As unlikely as it may seem, economists have argued that languages with a mandatory future tense induce people to think about the future more, resulting in greater saving and investments for the future (Chen, 2021; Roberts et al., 2015). Similarly, evidence suggests that gendered languages inhibit the participation of women in the labor force (Gay et al., 2018) and shape how people characterize non-animate referents (like furniture, celestial bodies or tools) (Williams et al. 2021). Meanwhile, cognitive scientists have long argued that languages influence how we think about time (Boroditsky, 2011, 2018) and agency (Fausey & Boroditsky, 2010; Fausey & Boroditsky, 2010). Broadly, understanding how grammar shapes our attention and thinking would seem crucial to philosophical debates about language, policy and social change (Dembroff & Wodak, 2018).

While some of the variation across languages might be a by-product of language-specific dynamics, there is evidence for extra-linguistic factors steering the evolution of languages (Henrich, 2016), including ecological conditions (Everett et al., 2015; Forker, 2020), religious taboos, social transmission (Blasi et al., 2017) and social structure (Foley, 1997; Lupyan & Dale, 2010). This further reinforces the association between the non-linguistic traits that characterize WEIRD societies with the linguistic properties of their languages (Galor & Sarid, 2018).

Such evidence suggests that if scholars relied heavily on one language or perhaps a set of related languages, biases could arise in how they approach and analyze many kinds of questions, and even what questions they ask. Many concepts, like “morality” and “right and wrong” don’t have corresponding concepts in other languages (Wierzbicka, 2013). Of course, reliance on such concepts is especially worrisome if “research” involves probing and refining one’s own (native speaker) intuitions about such concepts (Stich & Mizumoto, Masaharu, forthcoming)—probe your intuitions about the importance of scents versus colors?

Of course, research must be done in some language, so perhaps the languages used by philosophers and others are as representative as any other language? Well, it turns out that English is unusual among Germanic languages and Germanic languages are unusual among Indo-European languages (McWhorter, 2008). Modern English has by far the largest vocabulary of any language, but a relatively simple grammatical morphology even compared to other European languages (Bentz et al. 2016; Henrich 2016). For example, English grammar includes borrowed features, including elements from Celtic (probably) like the ‘meaningless do’ (**Do** you want to go to the store?). Illustrating its simplicity, English has grammaticalized distinctions only between simple and perfect past tense (watched/had watched), but in about 20% of the world’s languages past tense usage depends on the relative time interval between the utterance and the topic. For instance, in the Peruvian Amazon, Yagua has five such distinctions: the grammar distinguishes between events that have happened a few hours, one day, a few weeks, a few months, or in a distant past of the time in which the utterance is produced (Haan, 2010). The same holds for other domains such as spatial reference: while English uses a simple *this-that* distinction for overall proximity, many languages code for proximity in both the horizontal and vertical dimensions (Forker, 2020). For number, English differentiates singular from plural in the form of nouns while many other languages include dedicated forms for two, three or a few referents as well (Acquaviva, 2017). Finally, English has a relatively large number of phonemes and vowels as well as among the highest informational content per word of European languages (Muthukrishna & Henrich, 2016).

Of course, the lack of a grammaticalized distinction does not mean that English speakers are unable to craft more specific references. For example, nuanced temporal distinctions can be introduced through adverbs and adverbial phrases (“I worked until late **yesterday**”) and number can be conveyed through numerals (“They came across with **three** lions in their safari”). However, mounting evidence suggests the presence or absence of mandatory grammatical distinctions have observable cognitive and behavioral implications because they compel our attention (Almoammer et al., 2013; Thoma & Tytus, 2018).

Some have even argued that English may be among the least representative languages vis-à-vis the kinds of languages that our species has been using throughout our deep evolutionary history (J. Henrich, 2016). For example, there’s both empirical and theoretical reasons to suspect that the sizes of speaker communities and the number of adult language learners will impact features like phoneme inventories, complex inflectional morphologies and vocabulary sizes (Atkinson, 2011; Hay & Bauer, 2007). English has, as noted, the largest community of speakers for any language in human history, with Mandarin in second place, trailing with several hundred million fewer speakers. By contrast, there’s little reason to suspect that ancestral languages had more than a few thousand speakers. Similarly, for a variety of reasons, the languages of small-scale societies tend to have few or no color terms, few numerals and, often, no explicit embedding tools (but used concatenation and context). Historical linguists have shown how embedding tools have evolved culturally over recent millennia and, more recently, have been shaped by literacy and schooling (Deutscher, 2005; Henrich, 2016). In the modern world, English speakers possess an unbounded counting system, a rich array of embedding tools and a package of 11 basic color terms (but no basic scent terms). The age at which American children master their color terms has been declining over the last seventy years—going back as far as the data stretches. However, by contrast with most English speakers (urbanites), people in horticultural-foraging societies tend to possess richer olfactory and biological species taxonomies (Atran et al., 2004). Finally, ecological patterns suggest that the earliest human languages were tonal, which makes them distinct from all major European language (Everett et al., 2015). Thus, there are a variety of reasons to be particularly skeptical about the generalizability of any linguistic, psychological or philosophical intuitions rooted in English.

Conclusion

In the emerging interdisciplinary field of Cultural Evolution, a rising tide of theoretical and empirical work that has emerged over the last four decades makes a strong case that humans are a cultural species, that both our minds and bodies arose as products of the interaction between genes and culture over hundreds of thousands or even millions of years. Cultural evolutionists have argued that our capacities for cumulative cultural evolution, the hallmark of our species, produces many of the tools, techniques and heuristics that we think and reason with—ready examples include number systems, fractions, physical concepts (e.g., elastically stored energy and wheels) and perceptual categories (abstract color and scent terms). Social norms and daily demands mean that people habitualize the use of these in ways that recede into the background and become part of how we automatically perceive and process the world. Specifically, humans have evolved genetically to mold our minds and brains to culturally-constructed worlds—adapting to their diverse incentives, affordances, and constraints. In this paper, we provided an introductory review of work in this field, highlighting domains that might be of particular interest to philosophers. However, readers should bear in mind that this has been a selective

review that represents only the tip of an empirical iceberg that continues to grow (Apicella et al., 2020; Heine, 2016; Henrich, 2020).

Perhaps the most important development in this field has been the production and testing of theories to explain contemporary psychological variation and, methodologically, the integration of quantitative historical data into these analyses (Muthukrishna et al., 2021). For example, Schulz et al. (2019) and Enke (2019) have linked a wide range of psychological outcomes, including analytic thinking, trust in strangers and individualism, to kin-based institutions—family organization. Talhelm et al. (2020; 2014) have examined the role of paddy rice agriculture in explaining analytic thinking, interpersonal loyalty and self-concepts. Focusing on variation in gender inequality and other sex differences, economists have isolated the influence of large-animal pastoralism, plough-based agriculture and matrilineal kinship (Alesina et al., 2013; Becker, n.d.; Giuliano, 2018; Gneezy et al., 2009; Gong & Yang, 2012; Hoffman et al., 2011). By providing theories, rooted in historical processes, these approaches effectively address lingering concerns that the observed psychological variation developed recently or simply represents ‘shallow’ responses to experimental protocols or interview questions. If these effects were shallow and/or ephemeral, how is it that we can explain important swaths of the variation with historical data from centuries past?

While the evolutionary approach discussed here leaves ample room for innate or reliably developing features of human psychology, both the theory and evidence synthesized here undermine the view that many aspects of our minds are cognitive-impenetrable (Fodor, 1983). In the domain of perception alone, ample evidence indicates that cultural evolution has made us myopic (literally, they need glasses), reduced our underwater visual acuity (Gislen et al., 2003), decreased our sensitivity to odors, sharpened our color identification, altered our objective judgments of lines (Park et al., 2016), elevated our susceptibility to some visual illusions (Segall et al., 1966), and nearly eliminated lateral mirror invariance (seeing “b” and “d” as the same; J. Henrich, 2020). Culture has also shaped the heuristics and biases that influence our decision-making and manipulated our motivations and preferences related to everything from food, pain and sexual attraction to fairness, trust and cooperation with strangers (Ensminger & Henrich, 2014; J. Henrich, 2016).

It’s now clear that much of what we find in social and developmental psychology textbooks is simply the “cultural psychology” of WEIRD people and represents a quantitative ethnographic description of how a particular population thinks, remembers, feels and reasons rather than a systematic study of human nature or our species’ evolved psychology. Philosophers, by confronting the WEIRD people problem and harnessing the tools found in Cultural Evolution, can avoid perpetuating a peculiar brand of “cultural philosophy,” rooted in WEIRD intuitions, and instead begin to construct a philosophy for *Homo sapiens*.

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¹ While the evidence showing variation in the strength of these illusions across populations remains largely unchallenged, researchers working with nine newly-sighted children have argued that the default, pre-experience, visual calibration in humans generates some detectable susceptibility to the Mueller-Lyer and Ponzo illusions (Gandhi et al., 2015). This may well be the case, but our point is that the perception of, and associated strength of some illusions, varies across populations—not that all illusions are produced *only* by experience. Nevertheless, this study is beleaguered by relying on a tiny sample, reporting only a crude measure of illusion susceptibility, and failing to explore how long these nearly blind children were sighted earlier in their lives.

² Of course, in Europe, we also observe that authority and tradition often implicitly or explicitly served as the justification for particular beliefs and practices. The claim that garlic can diminish the magnetic power of magnets, for example, was passed down over millennia primarily because great ancient Roman philosophers and naturalists wrote about it (Wootton, 2016). When it was eventually questioned in the 17th century, as modern experimental science was taking shape, we still see a strong epistemic reliance on authority: “...yet I *cannot* believe that so many

famous Writers who have affirmed this property of the garlick, could be deceived; therefore I think that they had some other kinde of Load-stone, then that which we have now." (Ross 1652). Here, in an attempt to preserve the veracity of ancient writers, Ross invokes the auxiliary hypothesis that it must have been a different kind of load stone that the ancients were referring to. By contrast, the political theorist Hannah Arendt (1951, 1961) points out that one defining characteristic of modernity is the loss of authority. Similarly, Strevens argues that since the scientific revolution in the 17th century, great emphasis has been placed on experience as the ultimate way to validate knowledge claims and as a result the appeal to other epistemic sources has declined (Wootton, 2016).³ Miller observed similar effects for prosocial situations, though dispositional attributions are generally less pronounced. See Heine (2012) for discussion.

⁴ Interestingly, Miller did find that a Christian community of Indians in Mysore did make more dispositional attributions (30%) than either lower or middle-class members of the Hindu majority. In fact, they were about halfway between the Hindu majority and Chicago. Several researchers have argued that some forms of Christianity encourage dispositional thinking (Cohen & Rozin, 2001; Henrich, 2020; Li et al., 2012).

⁵ Interestingly, there may be genetic variation that influences our ability to perceive specific regions of the color spectrum and this may impact the presence of color terms for 'blue' (Brown & Lindsey, 2004).