in behavioural science: people are not interchangeable in the same sense in which a sample of gold, whatever its origin, can be taken to the laboratory and treated as representative of gold generally. No one geographical, cultural, or socio-economic subgroup of people (least of all, perhaps, contemporary Western undergraduates) is representative of humanity. This means theories tested only or largely against a narrow range of subjects are likely to be incomplete or outright false. Behavioural scientists, in other words, have engaged in precipitate theorizing: outliers are unlikely to constrain explanatory theories correctly or inspire the right sort of hypothesizing.

To remedy this bias, ideally, we need globally representative samples of subjects in order to generate thorough descriptions of cognitive phenomena, guide hypothesis formation, and rigorously to test theories. The logistical and financial challenges of conducting research on this basis are immense. Overcoming them requires, among other things, changes in the research culture and to academic incentives (here Henrich et al.'s recommendations are spot on). In psychology, for example, the current incentives produce many small, single-institution, low-powered studies aimed at discovering novel effects. What we need, however, is not, say, evidence of yet more ways of modulating implicit associations in American undergraduates. Rather, we need large, prospectively designed, highly powered, cross-cultural studies that can answer specific questions more definitively. Medical research provides a model behavioural researchers would do well to emulate. In general and in outline, before some clinical intervention is approved for use, research must proceed through three stages. This begins with small open-label studies in Phase I; proceeds to larger, single-blind trials in Phase II; and culminates in large, multi-center, randomized, double-blind, placebo-controlled trials in Phase III. Behavioural scientists conduct too many studies in the equivalent of Phases I or II, with too few large, definitive and cross-cultural studies. There is still room for small studies – important novel phenomena undoubtedly await discovery. We merely suggest more "Phase III" research. Pooling resources, exploiting various online collaboration tools (e.g., Nielsen 2008), and shifting editorial policies and research priorities should result in more large, cross-cultural studies being conducted.

That noted, Henrich et al. underplay – to the point of missing – that how the behavioural sciences research community itself is *constituted* introduces biases. That the subject-pool of behavioural science is so shallow is indeed a serious problem, but so is the fact that the majority of behavioural researchers are *themselves* deeply WEIRD. People in Western countries have, on average, a remarkably homogenous set of values compared to the full range of worldwide variability (Inglehart & Welzel 2005), and the data Henrich et al. adduce suggest similarly population-level homogeneity in cognitive styles. Moreover, academics are more uniform than the populations from which they are drawn (as the target article's Contrast 4 suggests), so it is not implausible to think behavioural scientists are even WEIRD-er than their most common subjects. Henrich et al. review a body of studies and experiments that did not strike those who designed and conducted them as focused on outliers. Intelligent scientists acting in good faith conducted, peer-reviewed, and published this research, honestly believing in many cases that it threw light on human nature. This forcefully illustrates the power of the biases on the part of researchers themselves. It also suggests that, besides widening the pool of subjects, there are significant gains to be made by broadening the range of inputs to the scientific process, including in the conception, design, and evaluation of empirical and theoretical work. Given that diverse groups are demonstrably better at some kinds of problem solving (e.g., Hong & Page 2004; Lakhani et al. 2006), as things stand, the WEIRD-dominated literature is robbed of potentially worthwhile perspectives, critiques, and hypotheses that a truly global research community could provide. Clearly, simply increasing the number of behavioural sciences researchers will, in general, be beneficial. Our key contention, though, is that the marginal benefits of additional Western researchers are much smaller than the marginal benefits of more non-Western researchers, among other things, *just because* they are non-Western.

The non-Western world, in short, can contribute not only additional *subjects* to experiment upon – the main focus of the target article's recommendations – but also additional *researchers*, with novel perspectives and ideas and who are less affected by WEIRD biases. (Naturally, these researchers will have biases of their own. Our claim is not that there is some*one* who consistently knows better than WEIRD researchers. It is that diverse groups of investigators can avoid some kinds of error.) Clearly, these researchers will have to be educated, will likely be middle class, and, since science flourishes in politically open societies, they will tend be concentrated in liberal countries. Nevertheless, additional non-Western researchers, even if they are educated and relatively wealthy, could be a boon to the behavioural sciences.

A direct and powerful way to remedy both sources of bias – too many WEIRD subjects and too few non-WEIRD researchers – is to foster research capacity in the non-Western world. Non-WEIRD researchers tend to study non-WEIRD subjects, so increasing their number will deepen the subject pool and widen the range of inputs to the scientific process at the same time. Building research capacity, however, should not merely involve collaborations led by WEIRD researchers; it should aim to generate studies led and initiated by non-Western researchers. Committed and long-term inter-institutional collaboration between Western and non-Western universities focused on remedying the deficits in the behavioural sciences literature should include internships at Western universities for non-Western researchers, stints at non-Western universities for WEIRD researchers, and extensive student exchange programmes (especially for graduate students). Unlike many existing scholarship and exchange programmes in the sciences, a key point of the necessary programmes should be for the learning to proceed in both directions.

Development: Evolutionary ecology's midwife

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Abstract: We agree with Henrich et al. that documenting cultural universality and variability provides an indispensable window into human nature. We want to stress the mediating role development plays between evolution and culture. Moving beyond the mere documentation of universality or variability, developmental approaches can provide mechanistic explanations, linking ecology to phenotype. Combining phylogeny and adaptationism, evolutionary approaches can explain the properties of developmental systems.

The target article epitomizes a growing appetite for interdisciplinary research, bridging balkanized fields such as psychology, economics, anthropology, and biology. This integration requires "a research program that can explain the manifest patterns of similarity and variation by clarifying the underlying evolutionary and development processes" (sect. 7.2, para. 2). Development must be a foundation stone upon which this new program is built – if not, to stretch our titular metaphor, the conceived integration will be stillborn.

Confronted with a catalogue of human universals (e.g., social exchange) and cultural variation (e.g., rituals), social scientists traditionally link universals with evolutionary processes and variation with developmental ones. Echoing Henrich et al., we believe this is a false choice. Among other reasons, developmental mechanisms, including the learning abilities giving rise to cultural transmission, are products of natural selection; universality can arise for several reasons, natural selection being one of them (Jablonka & Lamb 2005); and, evolutionary processes can result in *adaptive plasticity*, developmental systems capable of constructing a range of adaptive phenotypes, contingent on the local ecology.

To illustrate how natural selection can tailor development to local conditions, let us consider the soapberry bug, a half-inch-long, seed-eating insect dwelling in the Southeastern United States (Carroll 1993; Carroll & Corneli 1995). While it takes a male soapberry bug only ten minutes to copulate with a female, he may spend hours more anchored to her by means of specially designed genital hooks. This mate guarding increases fitness by preventing rival males from copulating with a female before she lays her eggs. However, guarding comes at a price – males could be copulating with additional females. The local sex ratio arbitrates this opportunity cost: fewer females leads to more mate guarding.

In Oklahoma, where sex ratios vary between populations, males exhibit adaptive plasticity, calibrating the amount of mate guarding to the sex ratio experienced during development. By contrast, in Florida, where sex ratios don't vary, male soapberry bugs engage in a fixed amount of mate guarding, and, when raised in lab conditions with variable sex ratios, are incapable of calibrating. Soapberry bugs teach us why natural selection and development should not be seen as opposites. Natural selection designs developmental mechanisms, and these mechanisms give birth to phenotypes adapted to their local ecologies. When environments routinely vary, natural selection can engineer developmental mechanisms that use experience to facultatively adjust behavior.

Some of the variation across human cultures may be due to calibration, analogous to mate guarding in soapberry bugs. For example, women growing up in harsh environments – where life-expectancies are lower – exhibit earlier onset of menarche and younger age of first birth than women growing up in safe environments (Ellis et al. 1999). The explanation for this accelerated reproductive strategy, seen in other animals as well, may be a quantity/quality trade-off: When long life is a given, organisms invest in prolonged growth and development, resulting in fewer but higher quality offspring; when life is short, organisms forgo further growth and development, focusing instead on maximizing the number of offspring (Belsky et al. 1991). The developmental system, in this case determining the timing of reproduction, can thereby produce a correlation between ecology and behavior. Variation in cultural practices, such as coming of age rituals, may then partially reflect the interaction between evolved developmental processes and the state of the environment.

Of course, humans are more complex than soapberry bugs. In addition to calibration, human developmental systems can be "open," enabling the acquisition of novel skills and information. When combined with culture, a repository of wisdom accumulated across generations, novel skills and information can be passed directly to other individuals, bypassing genetic transmission (Richerson & Boyd 2005). Infants and children are thus tasked with extracting adaptive cultural information in order to become competent adults; while adults are tasked with teaching them. The lesson, here, is not that social learning precludes evolutionary explanation; instead, the psychological mechanisms subserving cultural transmission should be viewed as adaptations (e.g., Csibra & Gergely 2009).

However, culture is more than a consequence of social learning adaptations; culture can impose selection pressures on developmental processes, altering their genetic compositions (i.e., gene-culture coevolution; Richerson & Boyd 2005). As Henrich et al. discuss, the ability of some people to consume milk into adulthood, particularly those from European and some African populations, provides a clear-cut example: A cultural adaptation, pastoralism, and its consequence, the prevalence of milk, created a novel selection pressure on genes, prolonging the production of lactase, an enzyme needed to digest milk sugars. Research on how coevolutionary processes shaped human cognition and development is still in its infancy.

Although Henrich et al. survey the rich breadth of the human experience, it is worth underscoring just how special we are: No other animal occupies as many different ecologies, no other animal deploys a comparable range of subsistence techniques, and no other animal exhibits as wide a range of social structures. The propensity for this plasticity makes sense only in the light of evolution. Fear not: An evolutionary explanation need not be simplistic; a thorough explanation of human plasticity requires, at a minimum, phylogenetic, paleo-ecological, cross-cultural, and adaptationist considerations. For example, recent research on past climates points not to a static evolutionary ecology, but to one in which climate change was the norm (reviewed in Richerson et al. 2001). Further, the timescale of this climatic variation was short, particularly during the late Pleistocene (120,000 to 10,000 years ago) when environments changed radically on the order of hundreds to thousands of years, a situation best tracked by cultural adaptation, rather than genetic evolution (too slow) or individual learning (too error prone). Our human nature, housing a rich array of evolved developmental mechanisms capable of open-ended, facultative adaptation, may have been conceived in this nurturing cradle of change.

Learning precisely how the human mind emerged from the evolutionary process poses a challenge that some believe insurmountable (e.g., Lewontin 1998). We remain optimistic. Progress will be made as research becomes increasingly interdisciplinary. Scholars interested in developmental processes will benefit from attending to cross-cultural studies, as processes often reveal themselves through their manifestations in different ecological contexts. An understanding of developmental processes will benefit students of culture, as development links ecology to behavior. An evolutionary perspective can illuminate why humans have the particular developmental mechanisms they do, given our species' evolutionary history.

ODD (observation- and description-deprived) psychological research

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Abstract: Most psychological research consists of experiments that put people in artificial situations that elicit unnatural behavior whose ecological validity is unknown. Without knowing the psychocultural meaning of experimental situations, we cannot interpret the responses of WEIRD people, let alone people in other cultures. Psychology, like other sciences, needs to be solidly rooted in naturalistic observation and description of people around the world. Theory should be inductively developed and tested against real-world behavior.

We applaud Henrich et al. for their cogent demonstration of the need for more representative samples in psychological research