

[title] **Who You Really Are**

[subtitle] *DNA ancestry tests may be marketed as the key to your genetic fate, but the truth is that a myriad of environmental factors influence the way your DNA is expressed and inherited.*

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"International Biosciences offer a broad range of DNA Testing [services](#) designed to provide indisputable answers to emotional questions...." <http://www.ibdna.com/regions/UK/EN/?page=blackAmericans>

"Your story awaits – go find it..." www.ancestry.com

"Welcome to you." www.23andMe.com

Oh the happy marketplace for genetic information! The hunt is on: From royal roots to hidden baby-daddies, to making sure you're not accidentally related to any of those many, many Kardashians. The very definition of "ancestry" is freighted with social meaning. "Tracking" it tempts one to imaginary flights about inheritance, wealth, esteem, identity, purity of lineage – and correction! How we all long to be redeemed by such searches, released from the unfairly limited befoggery of what we actually know of ourselves. What bliss instead to follow our most deliciously arrogant, nakedly ambitious fantasies of some Mystery Me, some hitherto unspoken-of chromosomal configuration that will distinguish and redeem. Given that hunger, it isn't hard to market DNA as a product, like cement, designed to fill in the gaps, and provide stick-um for the jigsaw puzzle of ourselves. Within that marketplace, the definition of DNA is not confined by science but rendered connotatively huge, larger than galaxies, unconfined, a universe of wildest imagination. Yearning. Cure. Immortality. Control. A golem created from the skeletons of the past to address anxiety about what will happen to the present body.

Yet the boring bottom line is that we are all doomed to be embarrassed by the vulgar commonality of our humanity. We are all alone, orphans, bastards, individuals, adopted, adapted, lost, sold down the river, rediscovered like Moses in the bulrushes. We are, not one of us, descendants of a pure untainted line.

There's a narrative at the heart of the fascination with DNA ancestry tracking. It evokes the solving of mysteries, of finding home, and ultimate belonging. In the past, it has been the role of ritual to provide a sense of continuity, to connect the lessons of the past to the promise of the future. If until recently we have reenacted the words of our ancestors and lived by their texts, now we scour our DNA for heavenly indications of freedom from wondering, wandering and want. We hunt for the signs of our continuance. There is comfort in all that, but one will notice it is not a scientific enterprise. Rather, it is the deployment of metaphor and analogy and simile. How are we like or unlike "them, or "my tribe," or a longed-for twin or a much-feared doppelganger? We search for origin myths; it is the essence of human endeavor.

Yet what is purchased with ancestry or DTC kits is not, as the advertisements crow, "you" or your "identity" or "the answer" to "emotional questions" or belonging. The science is much less romantic: DNA tests can show with fair certainty inclusive relation to near family. It can exclude relation where paternity is

contested or in the analysis of forensic evidence. It can show with varying degrees of probability relation to certain haplotype groupings and population clusters. It can predict with accuracy a very small handful of heritable disorders, like Huntington's Disease. It may one day be able to provide reliable information about our propensities for a wide range of other illnesses, but that is currently not the case. Indeed, the rush to "predict" health from reading the tea leaves of our DNA has been of such concern that the FDA recently shut down that sector of 23andMe's service. And as readers of *GeneWatch* well know, there have been state investigations, federal hearings, as well as a host of consumer lawsuits contesting proffered test results that range from the altogether inaccurate to the statistically unsustainable. This lack of accountability of ancestry tracking companies – and particularly direct-to-consumer so-called "health" offerings – seems lost amid the warm fuzzy storytelling of their ads.

In effect, there's a kind of bait and switch going on. The real asset of these enterprises is the collective data siphoned from individual consumers. The wealth that will be the return on corporate investment is premised on building large enough data sets – from millions of individuals ideally – to extract much more accurate associations, trends, patterns. The goal is to be able to sell insights about large-scale population genetics. Unfortunately, this much has little to do with what purchasers of the kits think they are getting. In the meantime, companies seem happy to have gotten consumers to actually *pay them* by handing over the gold of their DNA in exchange for often largely unsubstantiated surmise about relation to ancient princesses or the consistency of one's earwax.

We have each, separately, written before in these pages about the imbalance and unfairness of such exchange and about the risks of reading social category onto the chemistry of DNA. Yet our collaboration here is to specifically tackle the dangers of treating ancestry tracking as though it were a party drug or an astrological chart of one's destiny. Our concern is that such play feeds and perpetuates the overly deterministic fantasies of a culture longing for easy answers. If we imagine ourselves as solely the product of our genes, then we buy not just into a fatalism that underestimates the role of fortune, free will, and the distantly repercussive flapping of butterfly wings, but we also minimize the role of other molecular and biological processes. In particular, it blinkers all of us – scientists, policy makers and legislators – by inviting us to overlook the strong evidence of environment's power to alter DNA's expression.

In fact, rapidly emerging insights about epigenetic functioning unsettles much of even very recent molecular biology. Until the last decade or so, our understanding of genetic differences relied on models of gene expression that operated in an all-or-nothing way, so that different versions of the same DNA stretch were thought to result in inevitably different structures of proteins and inevitably different networks of regulation of protein construction and activation. These genetic differences were also thought to be inherited in an all-or-nothing way – a given version of a DNA stretch chosen or not by the sperm or egg that begin the next generation. The flaw in this flat Mendelianism is that its accuracy in explaining only a part of Darwinian inheritance leaves the residue of what some have interpreted as a scientific justification – genetic difference – for eugenic atrocities from slavery to the Shoah. But we humans are enormously plastic organisms, and the marginalization of "nurture" as something separate or apart from our biology has too often allowed us to ignore or deny the *social* burden of our species' late-maturing neural circuitry.

Since about the year 2000, moreover, research has been accumulating that epigenetic differences are expressed in a tuneable way. Biologists have revealed a quicksilvered dynamism of gene transcription, vastly increasing our understanding of the dense and myriad complexities of the relation between genotype and phenotype. Columbia University Professor Frances Champagne has observed: "Across a variety of species, there is evidence for the effect of social experiences occurring across the lifespan on epigenetic pathways leading to broad phenotypic effects, including stress responsivity, learning/memory, and reproductive behavior." [1] In other words, life's experiences chemically alter the chromatin carrying a DNA sequence, tuning the degree to which that gene's product or regulatory function will be turned on or off for some length of time. Some of these epigenetic differences appear to be heritable, when the chemical alterations in a DNA stretch are also applied to the DNA of the cells that differentiate into sperm or egg.

A word of caution: Even this latter notion, the potential heritability of epigenetic interaction, can be misinterpreted much too easily as cultural, racial or ethnic destiny. But that thinking carries forward precisely the genetic essentialism that this research unsettles. It is habit to think of "inheritance," for example, as the definition of a person's inalterable genetic fate. But the vulnerability of transcriptional activity and cellular differentiation to environment renders that accounting intrinsically incomplete and therefore simply wrong. We are alterable in a million-billion ways that defy any political moment or ideological overlay, for we are alterable around a common base line. For example, a recent global cross-sectional study published in *The Lancet*, of 60,000 newborns in Brazil, China, India, Italy, Kenya, Oman, Britain and the U.S., shows that "Babies' growth in the womb and their size at birth, especially their length, are strikingly similar the world over – when babies are born to healthy, well-educated and well-nourished mothers.... These new results show that race and ethnicity are not the primary factors. What matters more is the educational, health and nutritional status of the mothers, and care provided during pregnancy." [2] Observes Professor Jose Villar, lead author of the study: "Currently we are not all equal at birth. But we can be ... Don't say that women in some parts of the world have small children because they are predestined to do so. It's simply not true."

We write this at a moment when an entire generation of Syrian children are suffering the ravages of an horrendous war. Child soldiers in the Central African Republic are starving and traumatized. And in the United States, generations of children grow up addled, unloved, undereducated – if very well-armed – and addicted to a drug trade whose circularity contributes to the displacement of generations of Central American children whose situation has become so desperate that, unaccompanied, they cross deserts and continents, seeking entry to the United States in order to escape the murderous reign of drug lords who themselves are the traumatic reiterations of earlier, similarly-murderous banana-republic regimes.

Because epigenetic reflections of socialized life are, for better and for worse, sometimes passed on to the next generation as well, we now have a data-driven mechanism to explain why, for example, kindness can repair the damage done by cruelty, both in one generation and through the generations. We have, in other words, good science to document how governments, corporations, oligarchies, syndicates or other formations can propagate – or not – the fate of millions: whether by maintenance of civil society or by acts of outright war; whether by comprehensive education or by refusing to fund reparative safety-nets of food and shelter for all young children; whether by ethics of fairness and respect or by the perpetuation of

racial hatred or gendered indignity. Regardless of epigenetic burden, we now understand that social structure has a significant role in the remediation of even organic trauma. Human development assures that with regard to the most interesting aspects of a person's identity – those that attach to hope – DNA versions are not at all as important as the luck of life with others. This luck is not encoded, but it is imposed by others as if it were.

We live in urgently depleted ecological times. Our planetary population is more rapidly diasporic than at any time in known history. Much of that displacement is generated by war and desperate want. As never before, there are legions of orphans among us. Yet there are fewer extant rituals reassuring us that studying our past will teach us the way to any future at all, never mind that of beloved community. Given the mess, it is not unpredictable that the human organism desires connection by any means possible. Even among the most technologically advanced citizens on earth, there seems to be a tendency to look to fundamentalisms as truth, whether in religion or biology. (Surely it's not an accident that, in the United States for example, the most frequent users of DNA ancestry tracking services – Jews and African-Americans – are those with long histories of displacement.) But looking to DNA for the healing of our traumas and losses is a rhetorical, even prayerful enterprise. It is neither a rational nor a scientific one. As Professor Zulfiqar Bhutta, a co-author of the *Lancet* study, has stated: "The fact that when mothers are in good health, babies grow in the womb in very similar ways the world over is a tremendously positive message of hope ... But there is a challenge as well. There are implications in terms of the way we think about public health: This is about the health and life chances of future citizens everywhere on the planet."

For all the fun and fancy of reading ourselves through a DNA test kit, therefore, we need to constantly remind ourselves that identity, family, one's sense of belonging – indeed, just the basic right to exist – can never be purchased from fortune-telling that plumbs our bodies to know our souls. Nothing can take the place of a more just and generous society.

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ENDNOTES

1. <http://champagnelab.psych.columbia.edu/docs/Adv%20Genetics%202012.pdf>

2. José Villar, Aris T Papageorghiou, Ruyan Pang, Eric O Ohuma, Leila Cheikh Ismail, Fernando C Barros, Ann Lambert, Maria Carvalho, Yasmin A Jaffer,

Enrico Bertino, Michael G Gravett, Doug G Altman, Manorama Purwar, Ihunnaya O Frederick, Julia A Noble, Cesar G Victora, Zulfiqar A Bhutta, Stephen H Kennedy. **The likeness of fetal growth and newborn size across non-isolated populations in the INTERGROWTH-21st Project: the Fetal Growth Longitudinal Study and Newborn Cross-Sectional Study.** *The Lancet Diabetes & Endocrinology*, 2014; DOI: 10.1016/S2213-8587(14)70121-4 University of Oxford. "Babies born to healthy moms worldwide are strikingly similar in size." ScienceDaily. ScienceDaily, 7 July 2014. <www.sciencedaily.com/releases/2014/07/140707092701.htm>.