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### The Scientific Method

#### Do Straw Men Have DNA?

*By Natalie Angier*

Not long ago I was a panelist at a seminar with the chirpy title of “Imagination Conversation” and an equally nebulous charge to explore, in three hours without so much as a bathroom break, the Nature of Imagination and How We Use It in Our Lives. I was struggling desperately not to yawn, scowl, wriggle my wrist to steal yet another glance at my watch (hey! I thought time was supposed to be unidirectional!), or jump up and bark at the audience, “You paid good money for this?” when the topic of the heritability of imagination arose. Suddenly, I found myself flanked by innatalists, and the dreary babbleloquium turned bracing.

As my five co-conversers saw it, a rich imagination is something you either have or you don't. You can't learn it, you can't teach it, you can't bid for it on eBay. The blessed few are the ones who write the enduring masterpieces, perform the great one-woman shows, or discover the genetic basis of a great imagination; the rest of us are consigned in perpetuity, by the inherited topography of our brains, to that poignant condition known as “having a flair for the obvious.”

In other words, our audience members had bought an even bigger piece of pyrite than anyone suspected. They were mostly teachers and art educators who presumably had hoped to hear fresh ideas about how to stimulate imaginative thinking in themselves, their students, and the petty tyrants on their administrative boards. Yet up on the lofty, microphonically enhanced mount, the consensus was, very sorry, but it can't be done.

Now, I may be a coward by nature—not to mention by years of painstaking nurture—but at this idea I bristled, I bridled, and I spat. Imagination is born, not brewed? How lazy to think so! I described methods for spurring creativity that have proved surprisingly powerful. I spoke of a report published in the journal *Science*, in which researchers had developed a computer algorithm with instructions for

generating shrewd new advertisements. The researchers wrote a subroutine to perform a “replacement matching template” in which visual elements from two themes are mixed and matched to yield novel combinations. By following the code, the computer ginned up some impressively dexterous pitches. For example, when asked to create an ad to boast of an airline’s on-time performance, the algorithm produced a picture of a cuckoo clock with a tiny airplane where the cuckoo would be. To portray the “user-friendliness” of an Apple computer, the program conceived a desktop terminal with a hand sticking out, proffering a bunch of flowers.

People, too, can be taught the replacement matching template and similar mental subroutines. Gimmicky? Granted. But a Jackson Pollock canvas is also a gimmick. A Cornell box is a gimmick. Flowers and butterflies and an infant’s smile are gimmicks, all designed to lure you in and make you fall in love and do the bidding of the gimcrack gimmicker.

To say that a healthy imagination is a gift rather than a skill, I growled on, is like saying you’re either good in math or you’re not, which is the defense of every American kid who brings home a C in algebra. I mentioned studies exploring the different reasons to which Americans and Asians attribute success in math. Americans talk about talent and an inborn knack for numbers. Asians talk about hard work. Guess which group ends up acing the international competitions?

At which a couple of my co-panelists retorted, oh, sure, Asians do well in math—rote math, anyway. But when it comes to allowing creativity and genius to flower, let’s face it, America rules. The Asian educational system squashes innovation; we serenade it. Hooray for our team! Give a hand to our genes! We are the Imagination Nation!

I admit it. That afternoon, I didn’t persuade anybody of the power of plasticity or the mass marketability of the imagination—including, I hasten to add, myself. Do I really believe that anybody, given a clever creativity flowchart, a robust capacity for work, and a full-fat sense of personal destiny, can be as imaginative as Shakespeare, Leonardo, or George Eliot? No. As far as I’m concerned, those “people,” those immortal something-or-others, are authentic mutants. Members of their species may not have prehensile tails or antenna buds sprouting from their eyebrows, but they still behave like alien life forms, sitting down at the piano in

toddlerhood and composing minuets, or spending a college interregnum discovering the universal laws of motion. These are not normal behaviors. They're once-in-tens-of-millions behaviors, and the genotypes, phenotypes, archetypes, and stereotypes of which they are constructed may have as much to reveal about human nature or human nurture as Bill Gates's net worth has to say about whether my younger brother will ever pay back the money I loaned him.

So what happens if we clip the nethermost tails of the distribution curve and ask of the bulging bell labeled "You're somewhere in here, bub" how much of this normal range of human creativity can be accounted for by "Nature," the category generally considered to encompass genes, evolution, hormones, and other aspects of "biology," and therefore to be hardcore, real meat, no refunds, no exchanges? And how much, contrariwise, is the result of "Nurture," a.k.a. the Environment, that glorious conceptual duffel bag into which we stuff soft things like how you were treated by your parents, peers, and the parish priest; whether anybody bothered to hang a sixty-five-dollar Lamaze mobile over your crib; and whether you spent your childhood summers canoeing in the Adirondacks or sampling paint chips from the floor of your Bronx apartment? Do I deny the importance of category A categorically? Am I one of those blinkered Blank Slaters, an anti-evolution social constructivist who thinks that even pit vipers, with proper rearing, could become happy vegetarians? Or do I accept that genes count, that Charles Darwin was a very smart guy, and that most of the quandaries of human nature can be addressed through comparisons of identical twins reared apart with fraternal twins forced to wear matching pajamas?

Oh, dear, I'm doing it again. I'm lampooning a large and nuanced research enterprise that seeks to understand the biological foundations of We the People. I must get a grip on my lip and uncurl it. I must take a stand. I must choose a number. What percentage of a behavior like creativity would I assign to alleles and cells, what to whistles and bells? Which number is bigger? I mustn't forget that we are living in what has lately, and in many ways rightly, been called the golden age of biology. This year is the fiftieth anniversary of the celebrated paper by James Watson and Francis Crick that announced their discovery of the double-helical structure of DNA. The three billion or so subunits of human DNA have been all but spelled out. Any day now we'll know exactly how many genes are scattered across those billions of bases, and what proteins are encoded by

those genes, and what tasks those proteins perform in the body. You've read the news. You know that the human genome project is important and exciting and a mecca for analogies: it's the Holy Grail, the book of life, a blueprint, a recipe, a fossil record, the Mall of All, the semen stain on the blue dress for the entire human family.

With biology in the ascendance, one might be tempted to think we were on the brink of a veritable revolution in the science of the self. One might also think that experts have largely discarded fusty old Margaret Meadian paeans to culture and now concur on the supremacy of "biology" in dictating the contours of human nature. One might be tempted to think such things, but the truth is (to paraphrase our president), the children isn't learning! Despite the industriousness of our genome troops, and conceptual advances in biology generally, we are scarcely closer to understanding the neuro-chemico-genetico-cheerio infrastructure of our behavior today than we were a century or a millennium ago. There are many hypotheses, and many opinions spoken with mesmeric repetition and thunderous conviction, but what is most noteworthy about fields like behavioral genetics and evolutionary psychology is how often their results fail to stand up to external verification or to the corrosive effects of plausible alternative explanation. Among the nucleic characters to have faded recently from page-one reveille to nonreplicable obscurity are genes linked to novelty-seeking behavior, male sexual orientation, neurosis, schizophrenia, manic-depressive illness, alcoholism, drug addiction, attention-deficit disorder, violence, and the tendency to flash in public.

As for evolutionary psychology, what has this bold new Darwinism done but reheat the chestnuts and verify the verities? To wit: We don't like cheats. We like high status. Children imitate their peers. And we've been like this since we started chipping rocks into sharp, dangerous objects, the better to poke holes into cheats, attain high status, and have lots of kids that everybody else's kids wanted to imitate. Now, I adore evolutionary biology, and I have been writing on the subject since I started my science-writing career in the early 1980s. Much of our behavior clearly has irrational components that may well be the legacy of our prehistoric past—like the overwhelming urge to eat every super-sized portion plunked in front of our face because our wretched forebears might not have faced food again for days.

Yet for all the intrinsic party-trick appeal of Darwinism, evolutionary psychologists take the fun out of it by being bullies, and

self-pitying ones at that. If they come up with a premise about human behavior and somebody disagrees or presents conflicting data, evolutionary psychologists attack the critic as a flat-earther. David Buss, one of the big spears in the business, took exactly this mature approach last October when confronted with a report that contradicted his beloved thesis on the differences between male and female jealousy. Buss has long argued that a man gets jealous at the thought of his mate cuckolding him—what fellow wants to support another man’s bastard?—while a woman is comparatively more upset by the thought of her man falling in love with another woman and thus taking his resource-acquisition skills elsewhere. So how did Buss respond to a study by researchers at Northeastern and Yale universities that found no sex differences in jealousy, and an equal tendency among men and women to find the thought of a partner sleeping with somebody else more distressing than the thought of a partner having an extracurricular crush? “People have always been resistant to evolution,” he complained to my colleague at the New York Times, Erica Goode. “We’re in the midst of a scientific revolution in psychology.” And yet everywhere the benighted old guard resists. Ah, but there are noble precedents for the suffering of Buss. “It took the Catholic church four hundred years to forgive Galileo,” he sighed. “Will it take longer for this?”

But what, exactly, is “this”? What sort of evolution does an evolutionary psychologist believe in? Not cultural evolution, the signature of our species. It doesn’t take a Galileo or his telescope to see that human cultures evolve at a much brisker pace than does genetic evolution. Languages evolve, economies evolve, religions, shampoos, and toothpastes all evolve at a dizzying pace, while our aggregate DNA can barely manage a single base pair substitution every thousand years or so. Cultural evolution is something we do, and that gets done to us, all the time, no matter how much we whinny and pine for the past.

This is hardly a radical notion, yet it is almost entirely absent from the literature of evolutionary psychology. Take one recent example from the journal *Human Nature*, in which Spanish researchers sought insight into the fundamental modules of mate choice by analyzing personals ads in Spanish newspapers. Again, some of the pet theories of evolutionary psychology failed to find confirmation in the results. The researchers discovered that whereas the older women who placed ads expressed a desire for a partner

with high socioeconomic status, the younger women were much more concerned with a man's looks than with his portfolio. How could this be? Didn't the younger women realize that the EP model says they have an evolved need for a man of means, and that men are supposed to be the ones demanding a pretty face, as well as an acceptable waist-to-hip ratio? And didn't the señoritas realize that this finance fixation was thought to be sufficiently hammered into the feminine genome as to rank as one of the intransigent universals? The scientists had no choice. They had to go out on a limb. Perhaps the fact that younger women are earning their own living and no longer need or expect a man to provide for them "is changing their mate choice focus," they wrote. "Our hypothesis is that evolution makes possible some behavioral plasticity of individuals for fine-tuning their preferences in response to changes in their social and economic circumstances."

"*Our hypothesis*"? Or should I say "*our hypothesis*"? Can there really be a theory of mind that does not allow for "some behavioral plasticity" in response to changes in the environment, particularly when it comes to choosing a mate? Isn't the very concept of choice contingent on having the capacity to weigh the pluses and minuses among various options, and then going ahead and *choosing*?

I am back to thinking about the imagination and what it might mean to say it is an innate trait and that some people have a lot more than others and life isn't fair, is it, woe, woe, woe. First is the obvious problem of how we define and measure a "good imagination." Is a person who writes witty screenplays more or less imaginative than the person who invented the ergonomically correct snow shovel? For that matter, why did we evolve a comparatively florid imagination in the first place—for business, for pleasure, to embarrass our parents? Well, where do you think the trait came from? Use your imagination! Failing that, ask an evolutionary psychologist.

Yet another problem with trying to divine the ultimate source of imagination is its maddening unreliability. Some personal traits appear to be shockingly stable over a lifetime. Cranky children grow into grouchy adults, born optimists get taken to a hospice and start a yoga class and a book club. But if you want to see an example of extreme trait lability, just take a peek at a novelist working on the follow-up to her critically acclaimed blockbuster. How blanched is her mien, how paralyzed her fingers, how unblemished her computer

screen! Even our stock geniuses occasionally misplace the keys to the kingdom, which is why a lot of Handel's music sounds like a lot of Handel's other music, which in turn can sound disturbingly like the music of his great English predecessor, Henry Purcell.

In sum, I have no idea what percentage of creativity can be attributed to biology and what to environment, and if I hear a figure, I will be deeply skeptical. I brood constantly over the more frustrating, cruel, and self-destructive aspects of human nature: the thrill we get from vicious gossip; the quickness with which we mount a soapbox to hector others; the fact that so much human creativity throughout history has been devoted to the design of weapons; the fact that babies become children, children become teenagers, and then, just as you're ready to kill them, they abandon you first. I'm convinced that science has something to say about the stained-glass shack of the self, and we shouldn't decry the whole enterprise simply because it has been, to date, so disappointing. I'm confident that the tedious old lawsuit of Nature v. Nurture will soon be tossed out of court with the contempt it deserves. It's a sham dichotomy and always has been. Many scientists have been claiming as much for years, and the good ones have meant it—and tried to be true interactionists, tried to get beyond blathering about how everyone knows nature needs nurture and to explore what that interaction means.

I'll give a couple of examples of how we might begin to understand the embrace between self and setting, the original helical twist. Think, most simply, of the immune system. The immune system is almost magical. Give it a new microbe, something it's never encountered before, something shaped like a star, a pentagon, a soccer ball, a pinch of straw. No matter: the immune system will within minutes design the right tool to attack it, an antibody that fits its adversary as snugly as Baryshnikov fills his Lycra. We don't have enough genes to specify immune proteins to confront every rotten rhinovirus with a Napoleon complex, and we don't need those tens of thousands of genes and their proteins. The immune system builds its troops by cutting and pasting together a few starter proteins, short chains and long chains, V chains and J chains. When a creation works, when it fits the foe, the immune system makes more of that combination, plumes of it. The immune system is evolution in microcosm—manic diversity, let's try anything and fast, followed by a selection of the most successful motif and its mass amplification. The immune system is designed to confront an ever-shifting environment.

That supreme flexibility and responsiveness, and that alone, is what is “hardwired” into the genome.

As with the immune system, so with our behavior: a bon mot here, a feather boa there, square your shoulders, slap on a smile and take it for a test run. Discard if they jeer, amplify if they cheer. Do we not behave like this? Do we not watch ourselves as we watch others watching us, and do we not loop back and tweak the knobs, and giggle and lurch forward or play poker, feign excitement, duck and cover, all the while wishing we could act natural, be ourselves, but getting very bored when nothing changes and resolving to be better tomorrow? When you think about it, doesn't every new social encounter feel like an immune response: friend or foe, histocompatible soul mate or sugar-coated parasite?

In fact, the border between outside and inside, you and universe, is always porous, and always negotiating, haggling, wooing, puckering up its lips. Here is an example from the order Rodentia. Rats breed early and often, which means that soon after a mother rat gives birth, while she is still suckling the pups, she goes out and gets pregnant again. If the twelve or so young in the nest survive and keep nursing, the next batch of pups to emerge will be a fairly even mix, six males, six females. But should the mother lose some of the suckling pups, her follow-up dozen will consist mostly of daughters. How is this possible? If the rat is already pregnant when her nest is harrowed, how can the embryos-in-waiting adjust themselves and emerge as a murine sisterhood? The mother's body, it turns out, is like a giant whisker, absorbing what the world has to tell it. She carries a few extra embryos. With the sensation of all teats fully occupied, males as well as female embryos are given biochemical leave to implant. But if some of the nipples go untugged for a while, the mother's body cuts off the blood supply to the male embryos, and the extra females implant in their stead. Daughters, you see, are the sex you want in troubled times. Daughters are the surer lash to the future.

What counts most in this story is the precision with which its steps have been mapped, the nodes noted, the cross-talk between body and behavior transcribed and translated. Do such conversations occur in the course of human conception or pregnancy? Do we bear sons or daughters depending on signals like our health, the relative muskiness of our husband's sweat, or what the neighbors are doing? I ask myself this every time I take my daughter to her bus stop and

observe that though her school is co-ed, every kid waiting with her from the neighborhood is also a daughter. When the bus arrives, a unisexual conga line of nine niñas bounds aboard. For whatever reason, back in 1996 the women in my immediate neighborhood all gave out a big blast of girls. Was it the water, the bagels, high-pressure fronts, the pressure of peers? Oh, probably not. Why bother with nature-nurture narratives when plain blind luck will do?