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The Success Myth

Author David Shenk on why it pays to put mind over genetic matter

By DAVID SHENK

Baseball legend Ted Williams was widely considered the most gifted hitter of his time, endowed with spectacular eye-hand coordination, exquisite muscular grace and uncanny instincts. "Ted just had that natural ability," said Hall of Fame second baseman Bobby Doerr.


David Shenk

But to Williams himself, all that innate miracle-man stuff was just "a lot of bull." He insisted his great achievements were simply the sum of what he had put into the game. "Nothing except practice, practice, practice will bring out that ability," he explained. "The reason I saw things was that I was so intense...It was discipline, not super eyesight."

Such comments may once have been cast aside as a form of false modesty, but now scientists are coming to recognize their essential truth. In recent years, a mountain of scientific evidence has emerged that overwhelmingly suggests a new paradigm of success: not talent scarcity, but latent talent abundance. In this conception, human talent and intelligence are not permanently in short supply like fossil fuel, but potentially plentiful like wind power. The problem isn't our inadequate genetic assets, but our inability, so far, to muster all the necessary resources and attitudes needed to tap into what we already have.

This new paradigm does not herald a simple shift from "nature" to "nurture." (That wouldn't be new at all, but a silly step backward). Rather, it reveals how bankrupt the idea of "nature versus nurture" really is, and demands a whole new consideration of how each of us becomes us—beginning with a new explanation of how genes work.

For an entire century, we've all been taught that we inherit many of our traits straight from our parents' DNA in the same straightforward way that 19th-century Austrian monk

Gregor Mendel seemed to show his pea plants inheriting their pod shape. Early geneticists saw genes as robot actors always uttering the same lines in exactly the same way. In recent years, these early notions about heredity have been thoroughly upgraded, but the public hasn't yet caught on. "The popular conception of the gene as a simple causal agent is not valid," geneticists Eva Jablonka and Marion Lamb bluntly declare in their 2005 book "Evolution in Four Dimensions." "The gene cannot be seen as an autonomous unit—as a particular stretch of DNA which always produces the same effect."

That's because genes interact with their surroundings, getting turned on and off all the time and, even more amazingly, saying different things depending on whom they are talking to. "There are no genetic factors that can be studied independently of the environment," explains McGill University's Michael Meaney, in his article "Nature, Nurture, and the Disunity of Knowledge." "And there are no environmental factors that function independently of the genome. [A trait] emerges only from the interaction of gene and environment."

The implications of this dynamic interaction are enormous; it explodes all of our old notions of "innate" qualities and genetic destiny. The new way to understand genes is that they are a vital actor in a developmental process. "In each case," explains Cambridge University biologist Patrick Bateson in "Cycles of Contingency." "The individual animal starts its life with the capacity to develop in a number of distinctly different ways. Like a jukebox, the individual has the potential to play a number of different developmental tunes... The particular developmental tune it does play is selected by [the environment] in which the individual is growing up."

This new understanding emerged slowly from a multitude of experiments over the last six decades beginning with two amazing discoveries in the late 1950s: one showing that rats bred for very low and very high intelligence displayed virtually the same intelligence when exposed to certain environments (Cooper/Zubek, 1958). The second experiment compared growth among Japanese children raised in Japan to that of Japanese kids raised in California during exact same time period, demonstrating that better nutrition had a dramatic influence on the "genetics" of human height (Greulich, 1957). A slew of other discoveries of environmental influences on "genetic" traits followed. But how could the environment be altering genetic effects?

Eventually, scientists discovered a mechanism: DNA's transcription into RNA, a stage in protein formation, turned out not to be a pure photo-copy process, but one influenced by many things happening inside and outside the cell. Different hormone levels, for example, could influence precisely how the DNA was interpreted. Our biology turns out to have a built-in system for individual adaptation.

Thus, geneticists realized that genes are not, as was originally thought, blueprints with fixed instructions for eye color, thumb size, mathematical quickness, musical sensitivity, etc. Instead, genes are more like volume knobs and switches on a giant control board. Many of those knobs and switches can be turned on and off at any time— by another gene or by any tiny environmental input. This flipping and turning is called "gene expression." It takes place constantly, beginning the moment of conception and continuing through the entire cycle of life. Examples of gene expression are all around us, as vivid as yellow-skinned grasshoppers becoming black skinned when exposed to a blackened (burnt) environment, and as invisible as human adult skeletal muscle tissue converting from one fiber type to another in response to exercise training. Gene expression is also the reason that cloned animals like Rainbow the cat and her University of Texas clone "CC" (for "Carbon Copy) are not even remotely mirror-like copies of one another. Even traits as fundamental as eye color and fur color are subject to gene-environment interaction.

Thus, while genes powerfully influence the formation of all traits, from foot size thickness to intelligence, they rarely dictate precisely what those traits will be. From the moment of conception, genes constantly interact with nutritients, hormones, sensory input, and other genes to produce a unique human being custom-tailored for his/her own unique circumstances.

How does genetic expression change our understanding of individual abilities? The first and most important lesson is that intelligence and talent are not innate or static. Fixed abilities are not biologically possible. Instead, all abilities (while strongly genetically influenced) are dynamic skills that get developed over time.

Let's be careful not to overstate this point. Genetic differences do matter, of course, and they ultimately lead to important trait differences, often bringing real advantages or disadvantages with respect to certain abilities. As Steven Pinker has forcefully argued, the extreme-environmental "blank slate" notion that all human beings are born perfectly equal has long been obliterated. But in the final analysis, each of us is a creature of development. Genetic differences don't translate directly into trait differences. Everything that we are, from the first moment of conception, is a result of this nature-nurture interactivity. Genes guarantee that differences will exist, but the actual end-result will emerge from a dynamic developmental process.

Separately, there's also strong recent evidence to suggest that few of us ever reach our true genetic limits. The vast majority of us do not come close to tapping what scientists call our "unactualized potential."

This is a big idea to swallow, considering how much effort has gone into persuading us that each of us inherit a fixed amount of intelligence, and that most of us are doomed to be mediocre. The notion of a fixed IQ has been with us for almost a century. Yet the original inventor of the IQ test, Alfred Binet, had quite the opposite opinion, and the science turns out to favor Binet. "Intelligence," Tuft's Robert Sternberg declared in 2005 after many decades of study, "represents a set of competencies in development." Talent researchers Mihály Csikszentmihályi, Kevin Rathunde and Samuel Whalen (based, respectively, at Claremont Graduate University, the University of Utah and the University of Illinois at Chicago) concur. "High academic achievers are not necessarily born 'smarter' than others," they write in their book "Talented Teenagers," "but work harder and develop more self-discipline." James Flynn of the University of Otago has documented how IQ scores themselves have steadily risen over the century—which, after careful analysis, he ascribes to increased cultural sophistication. In other words: We've all gotten smarter as our culture has sharpened us. Most profoundly, Stanford's Carol Dweck has demonstrated that students who understand intelligence is malleable rather than fixed are much more intellectually ambitious and successful.

The same dynamic applies to talent. Something crazy happened to the world's violinists in the 20th century: they got better faster than their peers had in previous centuries. We know this because we have lasting benchmarks, like the effervescent Paganini Violin Concerto No. 1 and the concluding movement of the Bach Violin Partita No. 2 in D Minor—14 minutes of virtually impossible violin work. Both pieces were considered nearly unplayable in the 18th century but are now played routinely and well by a large number of violin students. (The Bach is now routinely included in the repertoires of music schools and competitions).

Meanwhile, our runners and swimmers have become so much faster, and chess and tennis players so much more skillful. The explanation is simple: All of these abilities are dependent on a slow, incremental process which various micro-cultures have figured out how to improve. Until recently, the nature of this improvement was merely intuitive and all but invisible to scientists and other observers. But in recent years, a whole new field of "expertise studies," led by Florida State University psychologist Anders Ericsson, has emerged which is cleverly documenting the sources and methods of such tiny, incremental improvements. Mr. Ericsson and colleagues have endeavored to examine high achievement from every possible angle: memory, cognition, practice, persistence, muscle response, mentorship, team dynamics, innovation, attitude, response to failure, and on and on. They've studied golfers' attention focus, surgeons' self-assessment, novelists' pre-writing strategies, cricketers' stroke selection, soccer players' parental expenditures, typists' eye-hand spans, violinists' time-management, chess players' handedness, air-traffic controllers' team skills and ballet dancers' self-imagination and proprioception (sense of the orientation of one's limbs in space). Much of their scholarship is catalogued in the recent 900-page "Cambridge Handbook of Expertise and Expert Performance," published in 2006. Bit by bit, they're gathering a better and better understanding of how different attitudes, teaching styles, and precise types of practice and exercise push people along very different pathways.

Does your child have the potential to develop into a world-class athlete, a virtuoso musician, or a brilliant Nobel-winning scientist? It would be folly to suggest that anyone can literally do or become anything. But the new science tells us that it's equally foolish to think that mediocrity is built into most of us, or that any of us can know our true limits before we've applied enormous resources and invested vast amounts of time. Our abilities are not set in genetic stone. They are soft and sculptable, far into adulthood (as documented well in Sharon Begley's recent book "Train Your Mind, Change Your Brain"). With humility, with hope, and with extraordinary determination, greatness is something to which any kid—of any age—can aspire. The better we understand what greatness is really made of, the more of it we can grasp—as individuals, as families and as a talent-promoting society.

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