common reader, perhaps because such a contemplative mental enterprise comes so naturally to each author when reading. Perhaps individual differences do exist between those able to be touched and healed by simply reading texts, whether or not ancient.

This volume does not answer definitely its central question. Nor does it really return again to it, except to describe the bewailing torment characteristic of a particular time. The repeated echoes from time immemorial to time historical are what emerge holistically from reading this entire text. There is at least similarity, if not continuity, between chapters and ages.

Each period felt unrest. Each period actively addressed with action that unrest. Each moved into a relatively peaceful time . . . until the next moment (or moments) of turmoil visited . . . . Some spiraling basic-ness may exist. Editor Lois Barker notes that this fluidity of time is ignored at peril. Yet as noted by Lao-Tzu, nature has its own agenda and is not really concerned with our petty outlook or desires; so as the Bible's *Eccelesiastes* (9:7–10) succinctly summarizes in this volume, "Life may not be fair, but since it is the only life you have, use it to the fullest while it is yours" (p. 121).

***The Genius in All of Us: Why Everything You've Been Told About Genetics, Talent, and IQ Is Wrong* by David Shenk, Doubleday, 2010, 320 pp. ISBN 978-0-385-52365-3. $26.95**

Disquisitiones Ingenia: Reviewed by John Protzko, New York University; and Scott Barry Kaufman, Center Leo Apostel, Free University of Brussels, and New York University
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With a title like "The Genius in All of Us: Why Everything You've Been Told About Genetic, Talent, and IQ is Wrong", we admit we were eager to read every word. After tearing through 300 pages (half of which are endnotes) in only a few hours, however, we were left mostly disappointed, feeling as though major parts of the story remain untold.

Let's be clear, Shenk's book makes you feel good. He explains (correctly) that the story of genes as blueprints is wrong; they don't solely determine abilities. Instead, genes are reactive to the environment in what is a constant interaction between nature and nurture. Shenk argues that talent is not born but instead develops through lots of hard work and deliberate practice. To Shenk, this means there is no such thing as genetic determinism given that genes can turn on with the right environmental stimuli. There is also no such thing as innate talent; most evidence we have shows that child prodigies tend to fizzle out and not achieve greatness in adulthood. Those prodigies who do succeed as adults have done so primarily because of their early and intense environments. Also, some people do not blossom until later in life and are thereafter considered to be one of the utmost elite. Shenk also believes that IQ is a poor predictor of many measures of intelligent behavior; therefore, it is an invalid predictive construct. He also believes that there are ways you can make yourself and your children great, and he attempts to show you how.

We have heard many of these points before in two other recent bestsellers: *Talent Is Overrated: What Really Separates World-Class Performers From Everybody Else* by Geoff Colvin and *The Talent Code: Greatness Isn't Born. It's Grown. Here's How* by Daniel Coyle. Consumers are eating up these books, and for good reason: They make you feel like anything is possible and the world is your oyster. But are all of these claims true? Or at the very least, does the evidence that Shenk presents support his main arguments? We take up each line of argument in turn.

Genes

Shenk argues that the latest research shows that genes do not act alone, but instead are reactive to environments. Shenk notes, "Genes are involved, of course. They're a dynamic part of the process as they come activated" (p. 56). This is surely true, but the more relevant question for a book that claims there is a genius in all of us is whether *individual differences* in genetic makeup contribute to this constant interaction of nature and nurture. Some genotypes may be more reactive to particular environments than other genotypes. This point is particularly applicable to Shenk's discussion of the heritability of IQ, a paradigm that intentionally controls for genes in order to assess the contribution of the environment.

The work on heritability comes to us not through biological testing of genomes, but from the study of people, twins to be specific. Shenk backs himself into a paradox by ignoring the implications of the behavioral genetic research on genetic expression and the heritability of IQ. According to Shenk, if you put a pair of fraternal twins in a wealthy home where they are given every opportunity to grow their intellectual abilities, for example, a home where 30 million more words are spoken to them than if they grew up poor (Hart & Risley, 2003), this wealthy home should help make each twin smarter.

And now the paradox: Fraternal twins from these households are only weakly similar to each another (correlating only about .3) on measures of verbal IQ and vocabulary when they are adults (Akerman & Fischbein, 1992; Rijsdijk, Vernon, & Boomsma, 2002). One of two points must be conceded; either these environmental effects have a minor lasting impression on the children as they grow into adulthood (which Shenk vehemently disavows), or the enriched environment would have to turn on "vocabulary genes" in one of the twins who had the gene and not the other. There is no doubt that genes can interact with the environment, but this finding and the little evidence that exists for such an interaction in the heritability of intelligence (Fischbein, 1980; Turkheimer et al., 2003) do not support the position of ignoring the fact that these effects of the home, including all the other opportunities wealthy parents give their children, wash out as the children grow into adulthood.

In fact, there is actually no evidence for a G $\times$ E (Genes $\times$ Environment) interaction in the heritability of IQ. The work of Fischbein (1980) and Eric Turkheimer and his colleagues (2003), on which Shenk bases some of the data on such interactions, does not provide evidence for such an interaction. From the studies mentioned, all we see is a difference in the *heritability* of twin sets at different levels of socioeconomic status. We do not actually have evidence that the direct genetic effects of intelligence are being altered; we *do* have evidence that the heritability score is being altered. As Shenk continually wishes to remind us, heritability is not a synonym for genes; it is the confluence of direct and

indirect genetic expression (Dickens, 2010; Dickens & Flynn, 2001; Harris, 2009). This point is often forgotten when we refer to behavioral genetic studies as involving genes, as opposed to involving sets of twins, people who we use as a proxy to capture the strength and effects of genes.

Shenk also criticizes the likely similar environments that identical twins reared in different homes will still encounter, arguing that they frequently grow up in similar neighborhoods where the environments are likely to interact with each child's genes in the same way. Although this criticism is valid, Shenk ignores these effects on fraternal twins. Once again, two fraternal twins separated at birth will likely grow up in roughly the same social environment (Pedersen, Plomin, Nesselroade, & McClearn, 1992), but do not end up very similar at all—correlated about .3 with each other on measures of IQ. If the similarities in rearing environment were so powerful, then both twins would be more similar to one another, but no such evidence exists.

Talent

The Genius in All of Us, like other recent bestsellers, relies extensively on the work of K. Anders Ericsson. We do think Ericsson's work on expertise acquisition is topnotch and important. Ericsson's work does indeed show that obtaining the highest level of expertise requires a certain amount and type of practice.

This is the critical question, however: Is practice not only necessary but also *sufficient* for genius? Unfortunately, Shenk does not really address this issue head on, because for all of his talk about the importance of G × E interactions, he focuses more on the "E" than the "G" part of the equation. He states that "It would be folly to suggest that anyone can literally do or be anything" (p. 43), but his conclusion is that "With humility, with hope, and with extraordinary determination, greatness is something to which any kid—of any age—can aspire" (p. 10). In this regard, Shenk contradicts himself. The question of whether *any* kid at *any* age can be a genius is an empirical one, however, and one Shenk does not address in his book.

Shenk could certainly have dedicated more space for a scholarly discussion of other perspectives and criticisms of the Ericsson paradigm. One criticism is in Ericsson's research; he usually compares world-class experts with novice experts when investigating the role of innate talent in expertise acquisition. This is problematic given that only individuals who may have passed an important talent bottleneck will be investigated. This restricted range of participants may seriously underestimate the genetic contribution to elite performance (Kaufman, 2007).

Shenk also does not help matters by the examples he presents throughout the book to support his points. He talks quite a bit about how we each can reach new heights, soar above others, and become great at what we do, but his examples are not of great or even elite individuals. Instead, they are of *geniuses*—people who fundamentally altered the landscape of the field they participated in. He does not speak of the second violist of the Charleston Philharmonic, a position one individual may occupy for a lifetime, making a nice career out of playing his or her passion. This second violist undoubtedly was surrounded with music from an early age, put in 10,000 hours of practice, and had parents who likely pushed the violist to greatness. But Shenk does not talk about a career violist in a philharmonic; his examples for music are Mozart and Yo-Yo Ma.

As an example, Caroline Weber is the best female gymnast to ever come out of Austria, being the only one that nation has sent to the Olympics. This also makes her the second best Austrian gymnast ever (after Julius Lenhart, 1904 Gold and Silver medalist in artistic gymnastics). She undoubtedly possesses raw talent, mixed with much determination and resilience, and likely worked harder than any other Austrian gymnast she knew. She also put in her 10,000 hours of practice at gymnastics, the amount of time it takes to become an expert (Ericsson, Krampe, & Tesch-Römer, 1993). Still, she took 17th place in the 2008 Olympics and did not advance. To be sure, the fact that she is an Olympian is indeed a major accomplishment and her sheer talent is far beyond what the vast majority in the world can accomplish, but it was not enough for any medal.

A common theme running throughout Shenk's book is that abilities do not come fully formed at birth but instead require development. Shenk writes, "Our abilities are not set in genetic stone. They are soft and sculptable, far into adulthood" (p. 10). We are happy to see Shenk dispel the myth of instant genius that some of his readers may erroneously believe. Indeed, the consensus among giftedness researchers is that abilities require the proper environmental support and practice to development. As a case in point, in response to Ericsson's target article in the journal *High Ability Studies*, Subotnik, Jarvin, and Rayhack (2007) remark that "Some scholars and practitioners argue that innate talents or gifts are necessary for eventual significant performances or ideas. But no serious scholar argues that innate abilities *are also sufficient* for greatness" (p. 85).

Most giftedness researchers view genes as contributing to ability, not completely determining it. Simonton (2008) estimated that the genetic contribution to scientific training and performance is substantial, within the range of Cohen's $d = 0.67–1.0$, an estimate Simonton argues is most likely an *underestimate*. Simonton is in the process of investigating the genetic contribution to other forms of exceptional achievement such as artistic creativity (which he believes will reveal higher criterion heritabilities than he found for scientific achievement). According to Simonton, "In time, the nature–nurture issue that Galton (1874) first raised with respect to scientific talent may be successfully resolved for all forms of exceptional achievement" (p. 43).

What Shenk does not seem to like is the concept of talent or the idea that talent could in any way make a serious contribution to genius. However, Shenk does not seem to accept that talent can still be an important contributor to greatness for one person even if absence of talent is not necessarily a limiting factor for another person. In his own response to Ericsson, Simonton (2007) eloquently makes the point that

> The concept of talent does not require the existence of "innate constraints to the attainment of elite achievement." On the contrary, genetic endowment may merely influence the rate at which domain-specific expertise is acquired without imposing any upper or lower bounds on attainment . . . . Talented persons may "get more bang for the buck" out of a given quantity of declarative and procedural knowledge. But, again, this enhancement effect does not amount to the imposition of any "innate constraints." (p. 83)

Shenk's discussion of prodigies also does not tackle the issue of the contribution of innate proclivities. When Shenk uncovers a prodigy who goes on to acclaim as an adult, his or her early abilities are not attributed to any innate ability but to intense environmental pressures. It seems that prodigies cannot exist in this book unless they fizzle out and lead relatively uninteresting lives. Mozart's and Yo-Yo Ma's abilities, even though attributed by their own families to genetic gifts, are attributed by Shenk to early and intense exposure to music. Does Shenk believe that the Mozart family and the Ma family are the only ones to provide their children with such intense environments? Does he really believe no other families put their children through concentrated early enrichment experiences in attempts to create superhumans in many fields? The harsh reality is this: There is only one Mozart. There is only one Yo-Yo Ma, only one Michael Jordan. Although many families try to create these abilities in their children, these early effects frequently themselves fizzle out. The reason the world isn't full of Mozarts, why every parent who plays classical music to their prenatal child and still does not produce a Yo-Yo Ma is that these intense training and exposure experiences are necessary, but they are not sufficient for such levels of greatness.

As for Shenk's advice for creating an environment of high achievement, almost all of the research he cites is correlational, meaning no causal connections can properly be inferred. They are also genetically uninformed; we don't know if smart parents who give their children beneficial environments produce children who are smart because of the environment, because of their smart parent's genes, or (most likely) both.

Regardless of these shortcomings, little ill can come from his recommendations for fostering greatness in your children. Such recommendations include nurture delayed gratification, appreciate hard work, have role models and heroes, and do not praise children only when they succeed. Even if it is doubtful this will turn a future violinist into a Joshua Bell, little but good could come of such parenting tactics. And it is this point—that we do not know at any point in time an individual's ultimate level of potential—that is well taken and we commend Shenk for making.

IQ

The Genius in All of Us is filled with numerous examples of how IQ can predict very little of "smart behavior." It is with these examples that Shenk hopes to dethrone intelligence as a construct with predictive power. He cites the example of "carton intelligence" (Scribner, 1984) where the ostensibly least intelligent workers in a dairy plant (floor workers) would perform feats of great mental "calculus" in figuring out how to minimize their amount of bending over to pick up milk cartons. When their bosses would work the floor, they were inept at this skill, expending more energy than necessary.

We suspect that Shenk has not had to do serious manual labor for long periods of time for gainful employment. You can always tell the rookie hires by how much work they do, whereas the veterans look as if they do the least but, in the end, get the most done. In manual labor, the name of the game is to accomplish as much while exerting as little as possible. This is learned either through trial-and-error, or is taught by senior workers who become exhausted watching rookies exert too much effort. Mental math does not factor into the equation, trial-and-error and social learning do.

In terms of the predictive validity of IQ, there also seems to be a misunderstanding; IQ is our best single predictor of educational outcomes and future earnings. To these, IQ is correlated on the order of .4 (Strenze, 2007). In other words, it explains less than 20% of the phenomenon being predicted; this leaves the vast majority unexplained. Somewhere it appears that this predictive ability has been confused with determinism, as though there were no room for exceptions. On the contrary, exceptions are the rule. The majority of Shenk's arguments involve presenting case studies of prodigies who fizzled out (Terman's Termites) and superstars who did not blossom until later (Michael Jordan). Any prodigy who happens to achieve as an adult (Mozart, Yo-Yo Ma) has his or her precocity attributed to early environments, which Shenk believes somehow negates the idea of innate abilities. The reality is, the predictive power of IQ, or any measure for that matter, only goes on to explain a part of the predicted outcome, not the entirety. Because almost always more than half of the outcome is left unexplained, this leaves plenty of room for late bloomers and fizzle effects. We do appreciate Shenk highlighting the potential for becoming a late bloomer or the potential for talent loss, but this does not negate the predictive validity of psychological constructs.

As we see it, somewhere correlations got confused with causal, determinant roles, and it is this point that is troubling. Shenk notes that "Becoming great at something requires the right combination of resources, mentality, strategies, persistence, and time; these are tools theoretically available to any normal functioning human being" (p. 56). The fact remains that *all* psychological dispositions, including self-belief and persistence, have a heritable basis (Greven, Harlaar, Kovas, Chamorro-Premuzic, & Plomin, 2009; Strelau, Oniszczenko, Zawadzki, Bodunov, & Angleitner, 1995). Motivation for a particular domain most likely also has a sizable genetic contribution (Kaufman, 2009; Winner, 2000).

Of course, this possibility does not say much about the malleability of a trait; just that both genes and the environment matter, a point Shenk seems to misunderstand when he asks, "The big question is, can it be taught? Can persistence be nurtured by parents and mentored? Boston College's Ellen Winner (2000) insists not. Persistence, she argues, 'must have an inborn, biological component'. But the evidence indicates otherwise" (p. 113). Actually, the evidence does not indicate otherwise; Winner is right. And as we just mentioned, just because persistence is a heritable trait does not mean that it cannot be nurtured by parents and mentors. To be fair, Shenk is surely right that tools such as persistence and mentality are available to any normal functioning human being, but if individual differences in genetics really do contribute to the variance in genius (a conclusion supported by the evidence), then the deeper implication is that these tools may not be available to everyone *in the same degree*. This is a fascinating implication, and unfortunately one that Shenk does not delve into deeper in a balanced, scholarly fashion.

As a whole, Shenk's book, along with other recent bestsellers like it, caricatures intelligence, talent, and behavioral genetics researchers as believing in a sort of complete determinism. Nothing could be farther from the truth. The most prominent and careful researchers in the field are fully aware of the complexity of the issues and are aware of the need to go beyond the "nature or nurture" false dichotomy.

What really matters at the end of the day is just how much control we have to obtain our goals in life. That's the real issue that

lies at the heart of Shenk's book. In a recent review called "Beyond Heritability: Twin Studies in Behavioral Research," some of the world's most accomplished behavioral geneticists came together and made this point (Johnson, Turkheimer, Gottesman, & Bouchard, 2009). In addition to arguing for the need to go beyond estimates of genetic influences and the potential for twin studies to distinguish selection from environmental causation to unpack the genetic and shared environmental "lump," they argue,

> The discovery that all behavior is partially heritable transformed psychology . . . . Once we accept that basically everything—not only schizophrenia and intelligence, but also marital status and TV watching—is heritable, it becomes clear that specific estimates of heritability are not very important . . . .The real implications of heritability lie not in questions of relative biological determinism but in revealing the need to understand both the mechanisms through which the individual, whether consciously or not, directs his or her own life course and his or her power to do so. (Johnson et al., 2009, p. 220)

The fact that the main ideas in Shenk's book come across as revolutionary and shocking to everyday folk is telling. Maybe we as a scientific community should do a better job influencing how our findings are presented to the general public. Shenk certainly makes an attempt, but for the reasons mentioned in this review, he offers an imbalanced review of the literature. Although in his introduction Shenk admits, "It would be folly to suggest that anyone can literally do anything, and such is not this book's intent," we contend it is misleading to use examples of such extraordinary ability as Michael Jordan when your point (we suspect) is that one can become a low-level professional basketball player. There must be a way for researchers to present the latest research in the field that shows all sides of the issue—the contribution of genetics, the role of deliberate practice, the environments in which some genotypes are most likely to convert to particular phenotypes, and so forth—a way that resists the urge to only front one side of the argument. We thank Shenk for taking an important step in this direction, but look forward to more progress along these lines.

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IQ Testing 101 **by Alan Kaufman, Springer, 2009, 360 pp. (paperback). ISBN-13: 9780826106292. $20.00**

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The recent publication of the book IQ Testing 101 by Alan Kaufman is a timely addition to the paucity of literature available that addresses the historical aspects of the construct of IQ in light of current scientific and psychometric thought. This volume joins other titles in the *Psych 101* Series by Springer Publishing. The series is designed to include numerous topics that are presented in a short, reader-friendly venue. These topics range from broad areas of study such as leadership and creativity, to specific psychological disorders such as anxiety. The series is designed mainly for students, but it also provides a concise resource for busy psychologists and clinicians, and makes for an excellent secondary text to courses on intellectual assessment, history of psychology, and measurement.

This essentially tiny volume manages to cover the history of intelligence measurement, genetic versus environmental sources of