

How to be a genius

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By David Dobbs [Pg 1/2]

From Albert Einstein to Tiger Woods, if you want to achieve great things, there's a simple recipe for success.



My mother, **rest her merry**, **brainy soul**, **convinced me early on that I was** - as she liked to put it, **quoting the cartoon character Yogi Bear** - "SMARRR-ter than the average bear!"

I happily assumed that **my Yogi-like intelligence would ensure great things**. **My sense of entitlement grew** when I easily won good marks in school, **then grew some more when three different college professors told me** I had **a talent for writing**. Rising to the top, I gathered, was a matter of natural buoyancy.

The reality check came in my twenties, when nearly a decade of middling effort failed to cast the glow of my writing genius much beyond my study walls.

By my early thirties I saw the obvious: my smarts and "talent" - above average or not - would **count for little** unless I **outworked most of the other writers**. Only when I started **putting in** some extra hours **did I get anywhere**.

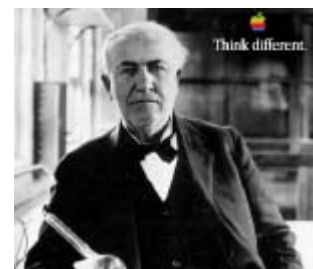
About the time I had my epiphany, **a growing field of scholarship** was **more rigorously reaching the same conclusion**. It seems the ability we're so fond of calling talent or even genius **arises not from innate gifts** but from **an interplay of fair** (but not extraordinary) **natural ability**, **quality instruction**, and **a mountain of work**.

This new discipline - **a mix of psychology and cognitive science** - has now produced its first large collection of expert reviews, the massive **Cambridge Handbook of Expertise and**

Expert Performance.

The book essentially tells us to forget the notion that "genius", "talent" or any other innate qualities create **the greats we call geniuses**.

Instead, as the American inventor Thomas Edison said, genius is 99 per cent perspiration - or, **to be truer to the data**, perhaps **1 per cent inspiration**, **29 per cent good instruction and encouragement**, and 70 per cent perspiration.



Examine closely even the most extreme examples - Mozart, Newton, Einstein, Stravinsky - **and you find more hard-won mastery than gift**. Geniuses are made, not born.

Extraordinary efforts

"It's complicated explaining how genius or expertise is created and why it's so rare," says Anders Ericsson, the professor of psychology at Florida State University in Tallahassee who edited the handbook.

"But it isn't magic, and it isn't born. It happens because some critical things line up so that a person of good intelligence can put in the sustained, focused effort *wich* it takes to achieve extraordinary mastery.

"These people don't necessarily have an especially high IQ, but they almost always have very supportive environments, and they almost always have important mentors. And the one thing *that* they always have is this incredible investment of effort."

This is mixed news, says Ericsson. "It's funny, really. On one hand it's encouraging: it makes me think that even the most ordinary among us should be careful about saying *we can't do great things*, because people have proven again and again that most people can do something extraordinary if they're willing to put in the exercise.

"On the other hand, it's a bit overwhelming to look at what these people have to do. They generally invest about five times as much time and effort to become great as an accomplished amateur does to become competent. It's not something everyone's up for."

Studies of extraordinary performance run a wide gamut, employing memory tests, IQ comparisons, brain scans, retrospective interviews of high achievers and longitudinal studies of people who were identified in their youth as highly gifted.

None bears out the myth of inherent genius.

Take intelligence. No accepted measure of innate or basic intelligence, whether IQ or other metrics, reliably predicts that a person will develop extraordinary ability.

In other words, the IQs of the great would not predict their level of accomplishments, nor would their accomplishments predict their IQs.

Studies of chess masters and highly successful artists, scientists and musicians usually find their IQs to be above average, typically in the 115 to 130 range, where some 14 per cent of the population reside - impressive enough, but hardly as rarefied as their achievements and abilities.

The converse - that high IQ does not ensure greatness - holds as well. This was shown in a study of adult graduates of New York City's Hunter College Elementary School, where an admission criterion was an IQ of at least 130 (achieved by a little over 1 per cent of the general population) and the mean IQ was 157 - "genius" territory by any scaling of IQ scores, and a level reached by perhaps 1 in 5000 people.

Though the Hunter graduates were successful and reasonably content with their lives, they had not reached the heights of accomplishment, either individually or as a group, that their IQs might have suggested.

In the words of study leader Rena Subotnik, a research psychologist formerly at the City University of New York and now with the American Psychological Association: "There were no superstars, no Pulitzer Prize or MacArthur Award winners, and only one or two familiar names."

The genius these elite students showed in their IQs remained on paper.

So what does create genius or extreme talent? Musicians have an old joke about this: How do you get to Carnegie Hall from here? Practise.

A sober look at any field shows that the top performers are rarely more gifted than the also-rans, but they almost invariably outwork them. This doesn't mean that some people aren't more athletic or smarter than others.

The elite are elite partly because they have some genetic gifts - for learning and hand-eye coordination, for instance - but the very best rise because they take great pains to maximise that gift.

Take Stephen Hawking, who likes to dismiss questions about his IQ by saying, "People who boast about their IQ are losers," and was a middling student and achiever until his mid-twenties.

Only then did he catch fire - and begin working obsessively - while collaborating with fellow physicist Roger Penrose on black-hole theory.

Pete Sampras didn't possess more talent than Andre Agassi, but he won 14 grand slams to Agassi's eight because he worked harder and more steadily. And as cellist Yo-Yo Ma once said, the most proficient and renowned musicians are not necessarily those who outshone everyone as youths, but rather those who had "fire in the belly".

Decade of dedication

This has led scholars of elite performance to speak of a 10-year rule: it seems you have to put in at least a decade of focused work to master something and bring greatness within reach.

This shows starkly in a 1985 study of 120 elite athletes, performers, artists, biochemists and mathematicians led by University of Chicago psychologist Benjamin Bloom, a giant of the field who died in 1999.

Every single person in the study took at least a decade of hard study or practice to achieve international recognition. Olympic swimmers trained for an average of 15 years before making the team; the best concert pianists took 15 years to earn international recognition.

Top researchers, sculptors and mathematicians put in similar amounts of time.

The same even goes for those few who seem born with supreme talent.

Mozart was playing the violin at 3 years of age and received expert, focused instruction from the start. He was **precocious**, writing symphonies at age 7, but he didn't produce the work that made him a giant until his teens. [Photo: Tom Hulce in 'Amadeus']



The same is true for Tiger Woods. He seems magical on the golf course, but he was swinging a golf club before he could walk, got great instruction and practised constantly from boyhood, and even today outworks all his rivals.

His genius has been laboriously constructed.

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Study so intense requires resources - **time and space to work**, **teachers to mentor** - and the subjects of Bloom's study, like most elite performers, almost invariably **enjoyed plentiful support in their formative years.**

Bloom, in fact, came to see **great talent** as less an individual trait than **a creation of environment and encouragement.** "We were looking for exceptional kids," he said, "and **what we found were exceptional conditions.**"

He was intrigued to find that **few of the study's subjects** had shown **special promise when they first took up the fields they later excelled in**, and **most harboured no early ambition for stellar achievement.**

Rather, they were encouraged as children **in a general way to explore and learn**, then **supported in more focused** ways as **which they began to develop** an area they particularly liked.

Another retrospective study, of leading scientists, similarly found that **most came from homes where learning was revered for its own sake.**

Finally, **most retrospective studies, including Bloom's, have found that almost all high achievers were blessed with** at least one crucial mentor as they neared maturity.



[Photo: Denzel Washington and other actors from movie The Great Debaters.]

When Subotnik looked at music students at New York's elite Juilliard School and winners of the high-school-level Westinghouse Science Talent Search, he found that the Juilliard students generally realised their potential more fully because they had one-on-**one relationships with mentors who prepared them for the challenges they would face after their studies ended.**

Most of the Westinghouse winners, on the other hand, went on to colleges where they failed to find mentors to nurture their talent and guide them through rough spots. Only half ended up

pursuing science, and few of them with distinction.

So what do elite performers attain through all that deliberate practice and sensitive mentoring? What makes a genius? The creme de la creme appear to develop several important cognitive skills.

The first, called "chunking", is the ability to group details and concepts into easily remembered patterns.

Chess provides the classic illustration. Show a chess master a game in progress for just 5 seconds and they will memorise the board so well that they can recreate most of it - 20 pieces or more - an hour later. A novice will be able to place just four or five pieces.

Yet chess masters don't necessarily have a better memory than novices. Their clustering skills begin and end at the chessboard. Show a master and a novice a random list of 20 digits, and a few minutes later neither will be able to recall more than seven or eight of them in sequence.

In a chess game, by contrast, the master sees not the 20 pieces that confront the novice but clusters of pieces, each of which is familiar from experience.

Interestingly, the chess master will remember about as many clusters - four or five - as a novice will individual pieces. The better the master, the larger the clusters he'll remember.

We all exercise such clustering skills when we read. Learning to read means coming to recognise chunks of letters as words, then chunks of words as phrases and sentences, and - at a deeper level - sentences and paragraphs as components of a work's larger meaning.

This chunking puts individual words into logical, recallable contexts. As a result, we'll remember almost all of a logical 20-word sentence and only four to seven words from the same 20 words ordered randomly.

Apart from chunking, the elite also learn to identify quickly which bits of information in a changing situation to store in working memory so that they can use them later.

This lets them create a continually updated mental model far more complex than that used by someone less practised, allowing them to see subtler dynamics and deeper relationships.

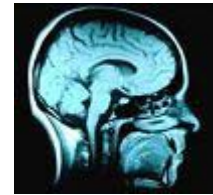
Again, this is something skilled readers do with good novels. However, it appears more striking - more suggestive of "genius" - when we see these skills used by Garry Kasparov to simultaneously beat 30 grandmasters or Zinedine Zidane to spot a killer through-ball that no one else saw.

Such masters seem to operate on another plane, yet the rest of us can take solace in knowing that their mastery rarely extends beyond their discipline.

It is a fair bet that Roger Federer would beat you at both tennis and ping-pong, but not as soundly in the latter. The gap will shrink as you move further away from his field of expertise.

Michael Jordan, widely considered to be one of the world's greatest athletes, struggled horribly when he moved from basketball to baseball, where he was routinely flummoxed by minor league pitchers. Likewise, if you ever met Kasparov over a poker table, you might well hold your own.

While the study of elite performance has been based mainly on observational and interview techniques, its models agree nicely with what neuroscience has discovered about how we learn.



Eric Kandel of Columbia University in New York, who won a Nobel prize in 2000 for discovering much of the neural basis of memory and learning, has shown that both the number and strength of the nerve connections associated with a memory or skill increase in proportion to how often and how emphatically the lesson is repeated.

So focused study and practice literally build the neural networks of expertise. Genetics may allow one person to build synapses faster than another, but either way the lesson must still be learned. Genius must be built.

Studies of elite performance also chime with another recurrent theme in modern neuroscience and genetics. These disciplines all but insist that the traditional distinction between nature and nurture is obsolete.

What we call talent or genius illustrates vividly what the past 25 years have taught us about gene expression - that our genetic potentials are activated and realised only through environment and experience. Natural buoyancy merely gets you off the bottom. You rise to the top by pumping yourself up.

So is the ideal of innate genius dead? If not, should we kill it? Certainly a clear-eyed analysis shows that "genius" is really a set of exceptional skills cultivated through disciplined study.

We should probably shelve the notion of genius as an innate, almost irrepressible gift and speak instead of expertise, talent or even greatness - terms that hint at the work underlying supreme accomplishment.

Granted, this isn't as fun, and recognising the work factor is sobering.

It is disappointing to realise all your mom's blather about how smart you are doesn't mean jack, and that you have to work demonically regardless.

But as something to believe in, genius is not looking so smart. You want to play the big stage, you got to put in the time.

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