

IQ

A Smart History of a Failed Idea

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Chapter 1

The Problem with Testing

When Tim was just three years old his mother, Janet, knew he was going to have problems getting into one of the elite private schools in Washington, D.C. Tim's father had gone to one of the best and was eager for his son to go there, too, but the competition among the children of Washington politicians, scientists, lawyers, and business families was fierce. Janet worried most about the IQ test Tim would have to take to get into kindergarten.

"There's something about [testing] three-year-olds that makes you feel dirty being involved," said Janet, an easygoing, pretty woman in her late thirties.

Worse than feeling dirty, Janet got an inkling early that Tim was a bad test-taker when she took him to an independent school consultant, an expert who would guide Tim's family through the complicated process of applying to private schools. Such consultants charge thousands of dollars, promising to evaluate the tiny candidates and explain the differences in philosophies among the schools. They also often administer an IQ test—or at least bits of one—to see how the child is going to perform and then recommend schools they think would be a good match. The higher the score, the fancier and more competitive the school. At the very outset of the process, IQ test scores are dictating where the children will apply.

The consultant asked Janet to leave her office while she tested Tim. After about half an hour, she called Janet back in with some bad news. The only school she could recommend for Tim was one

for children with language disorders in the remote suburbs. To a family like Janet's—all East Coast—educated at the best schools—it was like shooting for the Ivy League but ending up studying agriculture at a satellite campus of the University of Nebraska.

“I felt terrible,” Janet said, remembering the experience. “I cried for three days. She told me he was a moron,” she said, unwittingly using a term that long ago entered the vernacular from technical, IQ-based classifications. Then Janet paused and realized that the consultant hadn't actually said Tim was a moron; it just felt as if she had. “She basically told me he was kind of limited in intelligence.”

The consultant had also recommended that Tim should be in speech therapy, so while Tim was still in preschool Janet signed him up for it twice a week. Early on in his therapy the therapist asked Tim to make up a story, but he was completely stumped, coming up with nothing. And when he did speak, the “ums” flowed like bullets from a Gatling gun.

“Um, no, no, um, um, um, um, my, um, I, I don't have a farm. Yeah, yeah, I have a farm at my house. Yeah. Um, no. Know what?! I have a, um, um, I have a um, um, um, um a, I have a no, no no farm.”

Even an articulate kid of that age can sound like a cold motorcycle in need of repeated kick-starts, especially when answering questions from someone he doesn't know (and about a farm, of all things). But Tim often had problems expressing himself, and on a test of verbal ability administered by the therapist he scored in the 2nd percentile—just a wee step from those scoring the worst. This boded ill for Tim, and Janet knew it, for in Washington, private schools rely heavily on IQ tests for admissions. And for a hundred years, IQ tests have largely been based on verbal ability, so the outlook for Tim wasn't good.

Washington parents receive mixed messages from school administrators about the importance of tests in the elementary school admissions process. On the one hand, they're told to relax: IQ scores aren't that important, there are many factors in admissions. At the same time, administrators tell parents not to take their

child in for testing if she is sick, grumpy, or sad on the day of testing—a clear implication that the tests matter. In fact, test scores matter more than parents are told, but school administrators know that parents will become tense if their fears are not assuaged. To the schools, relying heavily on IQ scores makes institutional sense. After all, most of the very young children applying are well groomed, well spoken, and bright, and come from white, wealthy, and hypereducated families. How else are these schools supposed to “weed out,” as one local psychologist put it, the overabundant attractive and able three- and four-year-olds?

A parent’s nightmare is if her child simply isn’t in the mood to play along with the psychologist administering the test, as exemplified by Mary, a brown-haired young girl in Washington, D.C. Mary walked out of a psychologist’s office and into the waiting room, with a therapist in her early thirties in tow.

“Mary, what’s the difference between a horse and a pony?” the therapist asked earnestly.

Mary paid her no attention, but simply sat down on a couch to play with her doll next to me as I waited for an interview.

“Mary, what’s the difference between a horse and a pony?” she was asked again, but Mary knew the value of selective hearing better than someone married for thirty years. There’s no convincing a stubborn young girl that although the pony-horse distinction may seem frivolous, this is a test, and it’s important. By the time the psychologist doggedly posed her taxonomic question a third time, Mary had had enough. She turned to me and said, proffering her playmate in a pointed snub to the tester, “Will you put a diaper on my doll?”

Who knows how Mary’s score was affected? For tests that are supposed to measure innate ability in large part, it’s an open secret that a child’s mood will affect her score. For generations, critics of IQ tests have worried that it’s the good kids, those willing to follow adult rules, who do well on the tests. Good psychologists try to take a child’s mood and energy level into account when administering these tests, but there’s only so much they can do when they see her only once.

As Tim's speech therapy moved along, Janet was unsure how it was progressing. She thought the therapist was good, "but not a warm and fuzzy woman. Once [the therapist] was watching him draw and she said, right in front of him, 'That's not normal.'"

"They want you to draw a stick figure at a certain age and he couldn't," Janet explained. So Janet sent Tim to an occupational therapist to do fine and gross motor skill work as well, although she found it a little odd. She had heard that occupational therapy helps, but she wasn't convinced it had been "scientifically proven." The therapist gave her a brush to use on Tim's skin, essentially so he would get comfortable in his own skin. Janet and her husband were supposed to do it every day, but they wondered at its efficacy and didn't do it very often.

"So at one point," Janet said, "he was going to speech therapy twice a week and occupational therapy twice a week." Either despite or because of all this therapy, Tim began to stutter. "His face would get all contorted," she said raising both hands near her face, so she asked the speech therapist to work on stuttering as well.

The IQ test outlook was really not looking good for Tim. Nevertheless, most families like Tim's don't view the Washington public school system as a tenable option for their children. The schools are mainly for the working class, and their statistics are often depressing: fewer than half of the students are at grade level in reading and mathematics, and only about 60 percent make it to high school graduation. And so, amid all this therapy and with considerable trepidation, Janet made an appointment with a local psychologist for an IQ test. A few months before his fifth birthday, Tim's first IQ test was the WPPSI, pronounced "whipsee" and standing for the Wechsler Preschool and Primary Scale of Intelligence, which is the standard exam for young children.

"He was immediately talkative and curious about what we were going to do together, and rapport was easily established," the psychologist found. She asked him commonsense questions such as, What happens to water when it gets cold? She gave him a puzzle and a timed pegs-in-the-holes test. She asked him to name animals in pictures and build with blocks; she noted the size of his vocabulary.

Although Tim was at first open and enthusiastic, things quickly turned sour for him. “As items became tougher, particularly during question-and-answer periods, [Tim] was reluctant to take a guess, and frequently struggled to find words. At those times he became very frustrated, asking his mother if they could go home ‘now,’ and on at least two occasions [Tim] became tearful, throwing himself in his mother’s arms and responding to comforting from her,” the psychologist wrote about the meeting.

In the end, Janet’s fears about Tim’s IQ turned out to be well founded. Already at age four, Tim was very good with computers, but computer skills aren’t on IQ tests. Ever since their inception, IQ tests for little kids have emphasized language and motor skills. In these two areas, compared to other kids his age (which is how IQ tests measure intelligence), Tim was bad. He scored in the 34th percentile, an improvement over the 2nd percentile on his verbal test, for sure, but by no means Washington private school caliber.

“If you’re trying to get into one of the private schools and if [your children] don’t do well on these tests, forget about it. You don’t get in with a 34th percentile,” said Janet. Most parents feel that for their children to attend one of the top schools they’ve got to be scoring in the nineties. School admission officers don’t talk about whether there is a threshold, but there probably is. As one psychologist put it, if Sidwell Friends (one of the best private schools in the country and located in Northwest D.C.) “can have their pick of the kids who are in the 90th percentiles . . . they fill it with kids like that. I don’t know why they wouldn’t. The people that I know that go there are very well connected people who are the cream of the crop of the city.”

After receiving his test scores, Tim’s parents didn’t bother applying to his father’s alma mater for kindergarten; they just sent him to a public elementary school that doesn’t have such a bad reputation. The facilities were not as nice as the private schools’, and parents had to pool together their own funds to hire a music teacher. For years the administration had been asking the city for physical improvements, to no effect. But there were some excellent

teachers, some of the best, Janet thought, especially in the lower years. Just before Tim started kindergarten, Janet decided to take him out of all his therapy.

“I will say that the therapy worked, but he might have just outgrown his problems, too,” she said. Whatever the case, Tim stopped stuttering after leaving therapy. Nevertheless, when she met Tim’s kindergarten teacher for the first time, Janet warned her that her son was a great kid but that he had lots of learning issues. A few weeks later, the same teacher made a point of taking her aside and telling Janet that she had got it wrong. “He doesn’t have a lot of problems,” said the teacher. Tim was just a normal kid. The relief Janet felt, and the frustration with the experts, were palpable when she recounted this story. All fears that Tim actually was a moron had melted away.

“He’s pretty much thrived ever since,” Janet said of Tim. One year, Tim’s public school teachers wrote in his report card that he “continues to be extremely strong in all academic subjects such as reading, math and writing. In addition, we have noticed that [Tim] really seems to enjoy science. He is very inquisitive and is getting comfortable mastering the scientific process.”

Tim was happy at the public elementary school, and Janet was happy to have him there. Besides, she felt sure Tim would “get in somewhere” when the time came for the inevitable switchover to private school, but her husband still wanted him at his alma mater as quickly as possible. There’s a perception in Washington that the longer families wait to send their kid to the private school, the harder it is to get in. So Janet took Tim to a new psychologist and he retook the WPPSI test when he was six. This time he got in the 79th percentile, still not a stellar score, but perhaps within fancy private school striking distance, especially since the family had a legacy. Nevertheless, Janet and her husband decided to keep him in public school and have him tested a year later.

When Tim was seven, Janet took him back again, this time for the WISC (the Wechsler Intelligence Scale for Children, an exam for the next age group up from the WPPSI). In the four years since

he had first started speech therapy, Tim had come a long way from his initial days of “um-ing” through an exam. The psychologist found him to be “intent, focused and eager to do his best, he was serious about his performance, determined and sometimes a little impatient with himself.” Tim excelled, especially at nonverbal tasks such as duplicating designs with colored blocks and completing pictures.

On the WISC, Tim scored in the 98th percentile overall, fully 64 percentile points up from just three years previously. With this score, Tim was ready to apply to the fanciest schools around, and in a recent early spring he was accepted at his father’s old school. The Ivy League, although years away, had just gotten a whole lot closer.

Tim had some verbal developmental problems, but he was the same kid when he scored in the 34th percentile and the 98th percentile. Such differences in scores are uncommon, say psychologists, although they admit that IQ scores generally don’t “settle” until children are in adolescence.

“Any IQ estimate before the age of five is obviously going to be unstable because children are going through such rapid cognitive development,” said Diane Coalson, who is senior research director at Harcourt Assessment, the company that produces the WPPSI and the WISC. According to Coalson, it’s not until adolescence, “let’s say age sixteen and up [that] IQ is more stable.”

How did schools, businesses, and governments decide that these rough, narrow estimates of innate intelligence, these stress-producing tests consisting of a series of discrete little problems, are the best way to decide who is worthy and unworthy in countless settings? In a word, puffery.

Chapter 2

The Origins of Testing

The science of modern intelligence tests and the theory that underlies much of the field started with a remarkable upper-class Englishman who liked to count and measure in almost any circumstance in which he found himself. Francis Galton is now a distant, obscure figure, but in the Victorian era he was a famous polymath, a cousin of Charles Darwin on his mother's side and on the other a descendant of a great-grandfather who made money in guns. His penchant for math and measuring in various forms led him to original contributions in geography, weather systems, genetics, statistics, criminology, and anthropometry, the field of measuring humans. Galton was intellectually tremendously fecund, and he contributed, even defined, many of the debates, tools, and constructs of modern psychology.

“Whenever you can, count,” Galton would often say, an attitude perfectly designed to found a field about counting, ranking, and measuring people.

Galton also was highly strung. As a young man, he suffered a nervous breakdown after studying mathematics at Cambridge University, when he discovered there were better mathematical minds than his. His father wanted him to return to his medical studies, which Galton had done in his teens, but he didn't have much heart for it, and when his father died and left him a fortune, Galton quit university life altogether.

All of a sudden, and like rich people everywhere, Galton was blessed with the caviar curse of not having to make a living, and he

waffled in the years after university, unsure what to do with his life. He took a trip down the Nile with some Cambridge friends, went shooting in Scotland, and generally partied and caroused. In embarrassment many years later, he claimed it was a period of deep thought, in which he read a lot of great books, but there is little indication of this. Finally, in his late twenties and tired of being directionless, Galton saw a phrenologist (a head shape and size expert) in London who told him he wasn't really suited for a life of the mind.

"As regards the learned professions I do not think this gentleman is fond enough of the midnight lamp to like them, or to work hard if engaged in one of them," the phrenologist concluded.

The phrenologist was wrong about Galton's intellect and capabilities, but after the visit Galton decided to become an African adventurer. Instead of just rambling around that continent showing a white face where there hadn't been many before, Galton turned his measuring nature to cartography. In 1850 he made a serious mapping expedition to Damaraland, in what is now in Namibia, in southern Africa. Even in a subsequent best-selling travel book, *Narrative of an Explorer in Tropical South Africa*, Galton was unable to leave out the subject of measuring. At one point he recalled admiring a young Hottentot woman who was married to a missionary's "sub-interpreter." Her figure was so remarkable that it sent him into a frenzy.

"The sub-interpreter was married to a charming person, not only a Hottentot in figure, but in that respect a Venus among Hottentots. I was perfectly aghast at her development, and made inquiries upon that delicate point as far as I dared among my missionary friends."

Galton thought she was stunning, but his inclination was to obtain her measurements, not to woo her. He could hardly go up and ask to measure her, though, for he didn't speak her language and the request would have come across as odd, anyway. Being a man of scientific bent, and on a map-making expedition, he quickly seized upon his sextant, which would allow him to size her up remotely.

“The object of my admiration stood under a tree, and was turning herself about to all points of the compass, as ladies who wish to be admired usually do. . . . I took a series of observations upon her figure in every direction, up and down, crossways, diagonally, and so forth, and I registered them carefully upon an outline drawing for fear of any mistake; this being done, I boldly pulled out my measuring-tape, and measured the distance from where I was to the place she stood, and having thus obtained both base and angles, I worked out the results by trigonometry and logarithms.”

Galton’s travel book became a best seller, and his mapping and exploration earned him membership in the coveted Royal Geographic Society. Galton was therefore successful by his late thirties, but he was still fairly conventional and not known as a great thinker. In 1859, however, his cousin Charles Darwin published a book, *On the Origin of Species*, that changed all that. The book would eventually cause Galton to analyze human mental abilities in terms of evolution and, in a logical extension, want to manipulate natural selection to improve the human race. That is, Galton wanted to breed people.

Before Galton read *On the Origin of Species*, he was a devout Anglican with no interest in biology. After reading it, Galton’s entire worldview changed profoundly, although not quite as quickly as he later claimed. As an old man, Galton wrote that *On the Origin of Species* made him an agnostic at “a single stroke,” like a plot point in a Thomas Hardy novel, but it wasn’t true. The ideas in the book, and those of other scientists around him, actually did transform Galton, but the process was long and grueling.

The unorthodox ideas that began to form in Galton’s mind after reading *On the Origin of Species* caused a three-year nervous breakdown. He convalesced at home, obsessive and anxious, barely able to work, and unable to meet friends for dinner in public. So when Galton wrote late in life that Darwin’s book made “a marked epoch in my own mental development,” it was an understatement: it was sufficiently life-altering to keep him home for three years.

When he recovered, Galton began to argue in published papers and in public that people inherit good or bad mental characteristics

that dictate their success or failure in life. He would devote the rest of his life to this idea. To Galton, applying theories about physical attributes in animals to psychological ones in humans made perfect sense. After all, most families shared recognizable physical similarities—tall fathers, for instance, tended to produce tall sons. Since these physical characteristics were passed along from one generation to the next, Galton assumed that psychological characteristics, such as intelligence or laziness, were as well. The debate still rages about the degree to which this is true, but Galton's work laid the groundwork for modern controversies, beliefs, and even methodology.

Galton internalized *On the Origin of Species* by thinking about his personal experiences. "I began by thinking over the dispositions and achievements of my contemporaries at school, at college, and in after life, and was surprised to find how frequently ability seemed to go by descent," Galton wrote.

Even his travels in Africa bolstered Galton's view that blacks were innately inferior to whites, a subject that academic psychology is still interested in, often jarringly to those outside the field. Perhaps harking back to an encounter with a tribal African leader he had written about in *Narrative of an Explorer*, Galton believed that when European men and "native chief[s]" confront each other in the bush "the result is familiar enough—the white traveler almost invariably holds his own in their presence. It is seldom that we hear of a white traveler meeting with a black chief whom he feels to be the better man."

In short, Galton had no real evidence and instead relied on personal experience and even hearsay to prove the black-white ability differences. He wrote: "The number among the negroes of those whom we should call half-witted men is very large. Every book alluding to negro servants in America is full of instances. I was myself much impressed by this fact during my travels in Africa. The mistakes the negroes made in their own matters, were so childish, stupid, and simpleton-like, as frequently to make me ashamed of my own species."

In 1869, ten years after publication of *On the Origin of Species*, Galton decided to test statistically the idea that ability ran in the

family in a book called *Hereditary Genius*. It was a radical use of statistics, for while they had been applied to physical human characteristics before, Galton was the first to apply them to mental abilities. The central inquiry of *Hereditary Genius* was whether “eminent” men were more likely than run-of-the-mill types to be related to other eminent men. If they were, Galton believed this would bolster his claim that ability is inherited. To test his hypothesis, Galton gathered names of men who had been recognized in various biographical dictionaries as having made positive contributions to society, ending up with a list of judges, military commanders, statesmen, poets, athletes, and many other worthies.

After analyzing their family trees, Galton discovered that an astonishing 10 percent of the pool—just shy of a thousand people—were related to one another, and that most of these relatives were from the same nuclear families. Although the vast majority of people in his study were not related to each other, the percentage of relatives was much higher than one would expect from a randomly selected group. Those who were related to eminent men also tended to achieve success, or at least a reputation (as evidenced by their appearance in the biographical dictionaries), in the same area as their relatives had, which Galton thought supported his argument that ability is inherited.

A man, wrote Galton, must “inherit capacity, zeal, and vigour; for unless these three, or, at the very least, two of them, are combined, he cannot hope to make a figure in the world.” This explained why remote descendants of eminent judges, for instance, were less likely than the judge’s immediate relatives to be successful. After “three successive dilutions of the blood, the descendants of judges appear incapable of rising to eminence,” Galton concluded.

For centuries, European philosophers had been debating whether attributes such as intelligence were innate or learned. The argument was hardly settled in Galton’s time, and the balance between environment and biology is not close to being settled today. Moreover, many of the successful and related men in Galton’s study presumably lived in the same house (at least at some point during their lives) and helped one another’s careers, as family

members do. But for Galton, who came from a successful family, environment had very little effect on one's place in life. Look at America, he said, where they educate their middle and lower classes more than England does. And yet, despite this environmental difference, "America most certainly does not beat us in first-class works of literature, philosophy or art. The higher kind of books, even of the most modern date, read in America are principally the work of Englishmen. The Americans have an immense amount of the newspaper-article-writer, or the member-of-Congress stamp of ability; but the number of their really eminent authors is more limited even than with us."

Galton's privileged background could have led him to believe that the effects of environment matter more than heredity, but it did not. Francis was the youngest sibling of seven, not so odd in itself, but he was raised in large part by his sister Adele, who was twelve years older than he and an invalid who suffered from a debilitating spinal disorder. After Francis's birth, she contrived to have his crib brought into her room, threw her attentions on him, and commenced to tutor him at a very early age. Galton's odd upbringing created a precocious child. At age eight he could explain how the ancient Saxons had built their ships, and, according to family lore, he once reprimanded his mother for mistaking locusts for cockchafers, which he pointed out belong to different entomological orders. For Galton, however, his family's blood mattered more than how they had raised him.

Along with the belief that mental ability is inherited often comes the conclusion that society is structured the way it is for natural reasons, and so it was for Galton. For him, women, blacks, and the lower classes occupied inferior positions because of their lack of innate talent, and he published graphs illustrating this. On the far left of his bell curve lived people of low genetic worth; they were the "criminals, semi-criminals, loafers and some others." People with slightly more genetic ability, and higher up on the bell curve, were "very poor persons who subsist on casual earnings, many of whom are inevitably poor from shiftlessness, idleness or

drink.” Those who composed the bulk of the bell curve, in the middle, were the “respectable” working class: not too bright, but solid types. Finally, and inevitably, “the brains of our nation lie in the higher of our classes,” at the far right end of the curve.

From this belief that social position resulted from innate worth, Galton made a most astonishing segue into public policy suggestions that reverberate even now. Galton believed that only those on the extremely gifted end of the curve—those who could “found great industries . . . and amass large fortunes for themselves”—should be allowed to have children. Those three years hiding at home and mulling over Darwin’s *On the Origin of Species* paid off for Galton: the biggest idea of his life was purposefully to apply natural selection to human breeding.

The idea makes some sense at an intuitive level. Dogs have different attributes and can be bred for them; humans have different attributes and should be bred for them, too.

“Some dogs are savage, others gentle; some endure fatigue, others are soon exhausted; some are loyal, others are self-regarding. . . . So it is with men in respect to the qualities that go towards forming civic worth, which it is not necessary at this moment to define particularly, especially as it may be a blend of many alternative qualities. High civic worth includes a high level of character, intellect, energy, and physique, and this would disqualify the vast majority of persons from that distinction,” Galton said in one lecture.

Through such reasoning, Galton created a new applied science of human breeding, which he called eugenics, a term he coined from Greek roots meaning “well” and “born.” But one of the biggest problems for eugenics, Galton noticed early on, was recognizing people with talent when they are young enough to procreate. Most of the people listed in the biographical dictionaries Galton studied for his book *Hereditary Genius* were of middle age or older, which, from a breeding point of view, was a missed opportunity.

What Galton needed was an exam to figure out which young adults and schoolchildren were genetically worthy to reproduce. In a paper published in 1865, six years after the publication of *On the*

Origin of Species, Galton wrote of the need to create “public examinations, conducted on established principles.” And those who scored well on his tests should be encouraged to marry and should be given proper respect in society. Young men should be paired with slightly younger women who had been tested for “grace, beauty, health, good-temper, accomplished housewifery, and disengaged affections, in addition to the noble qualities of heart and brain.” If these high-scoring men and women chose to marry, they would be presented with £5,000, an astonishing sum at the time, and their children’s maintenance and educational costs would be “defrayed.”

“The Sovereign herself will give away the brides at a high and solemn festival . . . in Westminster Abbey,” Galton wrote.

Galton’s main problem was that neither he nor anybody else knew what tests of innate mental ability “conducted on established principles” looked like. IQ tests, or at least their precursors, the “mental tests,” as they would later be called, were about to be born.

Francis Galton was the man to create such tests. Back home from Africa, he had continued to count and measure in a strange cocktail of the profoundly useful, useless, and idiosyncratic. He counted fidgets at dull Royal Geographic Society lectures to measure boredom, of all things. But he also created Britain’s first weather map and was a pioneer in the use of fingerprints in criminal investigations.

He was not just an original thinker, but also a capable tinkerer who devised novel tools and devices to meet his own needs. When working on a “beauty map” of Great Britain, Galton created a number of little wooden and paper caps rigged with metal points that he would place on a finger to count and rate women as he traveled around the country. These small counting devices allowed him to keep a hand in his pocket and secretly poke cross-shaped pieces of paper he had prepared beforehand. Good-looking women would earn a prick on the top of the cross and average women on the arm of the cross; ugly ones were shoved down to the bottom. The results showed London with the best-looking women and northerly Aberdeen with an overabundance of unattractive ones.

All of his quirky yet sometimes genius ideas as well as his ability to build his own tools came into play when he devised the first mental test. At the London International Health Exhibition of 1884, twenty-five years after the publication of *On the Origin of Species*, Galton stuffed a little six-by-thirty-six-foot booth with seventeen devices to test physical abilities. He eventually tested nine thousand people there, and they even paid him for the pleasure: threepence each, which they gave to the doorman upon entering.

People loved it. They lined up for hours to be scrutinized, mainly orderly and curious, with only an occasional drunken visitor, swigging from his personal stone beer bottle of the kind that working-class men brought with them, requiring the boot. Galton's booth, just one among many at the exhibition, was a smashing success, so busy at times that people walked away, dissuaded by the long lines. But most visitors waited out the long lines, their curiosity magnified by what they spied through the outer latticework wall: men, women, and children of all ages and classes from around the country deliberating over, striking, staring at, and breathing into the weirdest of devices.

Whatever could they be doing? The big enigmatic sign in block letters above Galton's booth—"Anthropometric Laboratory"—probably didn't mean much to most visitors, although it sounded impressively scientific. In the poor lighting of the vast exhibition hall, people picked up and squinted into a sickle-shaped wooden box and read out snippets of scripture while a man took notes. He tested their hearing among the din of thousands of tourists by asking them to put a cylinder to their ears and then striking a coin at the other end. He weighed people, measured their height, and, oddly enough, the middle finger of their left hand, all the while taking notes on little cards.

At one point people had to punch the padded end of a rod to test the swiftness of their blows. One quick, straight jab was all that was required of them, but many bungled it, striking the rod on the side, breaking it, and damaging their knuckles and wrists in the process.

These bunglers led the tremendously competent Galton to remark exasperatedly, "It was a matter of surprise to myself, who

was born in the days of pugilism, to find that the art of delivering a clean hit, straight from the shoulder, as required by this instrument, is nearly lost to the rising generation.”

Galton thought that these measurements of physical ability and size offered insight into who had the most “natural ability.” The more gifted the person, Galton argued, the more neurologically efficient he would be. Therefore Galton thought the way to discern who was talented and who was not was to devise tests that measured people’s physical energy, reaction times, and sensory acuity.

“The only information that reaches us concerning outward events appears to pass through the avenue of our senses,” Galton wrote, “and the more perceptible our senses are of difference, the larger the field upon which our judgment and intellect can act.”

As with his views of blacks and the shape of society, Galton’s theories about sensory acuity came from his personal experience. Men, he opined, were more able than women, and, surely not coincidentally, men’s senses were sharper, too. Why else would there be no women in wine tasting and wool sorting jobs? “Ladies rarely distinguish the merits of wine at the dinner-table, and though custom allows them to preside at the breakfast-table, men think them on the whole to be far from successful makers of tea and coffee,” Galton wrote.

Before the exhibition, Galton spent months masterfully designing and crafting many of the wood and iron instruments himself. He gauged people’s keenness of sight with the sickle-shaped box people peered into, with passages from the Bible placed progressively farther away inside. He tested people’s ability to distinguish different shades of green with bits of fabric. He measured their power to breathe and ability to hear, their power to pull and squeeze, and their “swiftness of blow.” He had two men working full-time in the booth taking bodily measurements, noting people’s scores and determining the size, shape, and abilities of Britons.

Speaking to a crowd at London’s Anthropological Institute after the close of the health exhibition, Galton admitted that he might have failed to take one necessary measurement.

“One omission in the laboratory has been noticed by many,” he said. “I had decided, perhaps wrongly, after much hesitation, not to measure the head.”

Galton was unsure about the relationship between head size and intelligence. Many of the men he admired had unusually large heads. Women, he noted, tended to have smaller heads than men; that women were not as capable he was quite sure. Galton himself, though, had a smaller than average head and, well, how could that be? He had been a child prodigy, able to read children’s stories and print his name at two and a half. By four he was learning Latin and French. As a young man he had a seat on the prestigious council of the Royal Geographical Society; he had created Britain’s first weather map and had discovered the anticyclone. Francis Galton was a man of no mean ability, but he did have a small head, which had also quickly become bald as he entered manhood, but for the mutton-chop sideburns he always kept. (In keeping with good British genes, too, Galton had extremely thin lips, which gave the flesh between nose and mouth a prominent, simian appearance.) Galton eventually decided that head size must interact with other attributes to produce a man’s abilities, but that it wasn’t the sole deciding factor.

Dignitaries stopped by the lab in South Kensington to be measured and tested, including Prime Minister William Gladstone, a great Liberal leader of the nineteenth century. Galton chose to treat the prime minister rather snippily when the subject of head size came up. Gladstone insisted that hatters often told him that he had a head large enough to be referred to as an “Aberdeenshire . . . a fact, which you may be sure I do not forget to tell my Scottish constituents.” He then asked Galton if he had ever happened upon a head as large as his, to which Galton replied tersely, “Mr. Gladstone, you are very unobservant,” implying, apparently, that there were many larger craniums around.

Along with Prime Minister Gladstone, four million Britons visited the London International Health Exhibition, which was sponsored by Queen Victoria and set in London’s intellectually vibrant neighborhood of South Kensington—its vast halls erected between

Royal Albert Hall and the Natural History Museum. As odd as it may seem today, the exhibition celebrated the new field of “sanitary science,” which fascinated Victorians. Visitors attended lectures on health and pressed about mock shop windows and stalls, admiring physical objects at least putatively related to sanitation: clothing, shoes, ambulances, baths, heating and cooking appliances, all contrasted with older and presumably unhealthier versions. People toured an “insanitary house,” realizing how similar it really was to theirs, and a “sanitary house” next door, which offered ways of making their homes healthier.

Among all of this, the tiny Anthropometric Laboratory had its place, for Galton was very much concerned with the health and well-being of Englishmen. But Galton’s booth differed from the rest of the shops and exhibits in that it was not intended to educate the public, which, because of his belief in innate ability, he thought was a waste of time. As entertaining as it seemed to thousands of people, the lab was mainly a way to gather biometric information.

From the outset, his belief in eugenics often led to harsh views about how to solve social problems. Galton believed that what people traditionally think of as charity—say, tending to the sick and needy—was actually counterproductive. After all, these people are innately weak, and no amount of help will change that; charity may even help them to propagate, making matters worse. Instead, Galton thought, people with charitable hearts should encourage the gifted to marry by offering financial incentives. While traditional recipients of charity might continue to receive aid, it should be contingent upon their agreement to forbear having children, which would greatly reduce society’s human impediments within just a few generations. Similarly, if ability—and therefore success—are biologically predetermined, then universal public education, like charity, is a waste of resources.

Galton also pointed out that those worthy of breeding were far outnumbered by those who were not: just look at the bell curve. One method of improving the situation would be to promote marriages between the meritorious, but another way would be to deter

people of average and substandard ability from having children. This darker side of Galton's science was to become known as "negative eugenics" and, as can be imagined, would have disastrous consequences. But at the time, Galton idealistically believed that when common people learned about the inheritability of talent, they would voluntarily cease to have children. He also believed that people should be treated with "all kindness" as long as they forsook procreation. If they did not, however, "such persons would be considered as enemies to the State, and to have forfeited all claims to kindness."

Until the end of his life, in 1911, Galton continued to publish papers and speak publicly proselytizing for eugenics. He was such a gifted communicator that he captured the imagination and fervor of scientists, policymakers, notable figures, and regular citizens. In 1904, Galton concluded a lecture to the Sociological Society held at London University by saying that academics should eventually accept the tenets of eugenics "as a fact" and then give "serious consideration" to the practical development of the field. Eugenics, he said, should enter the "national conscience, like a new religion . . . for eugenics co-operate with the workings of nature by securing that humanity shall be represented by the fittest races. What nature does blindly, slowly, and ruthlessly, man may do providently, quickly, and kindly."

H. G. Wells, who published comments on Galton's remarks, claimed to have more faith in negative than in positive eugenics. "The way of nature has always been to slay the hindmost, and there is still no other way, unless we can prevent those who would become the hindmost being born." Rather ominously and prophetically, Wells went on to add, "It is in the sterilization of failures, and not in the selection of successes for breeding, that the possibility of an improvement of the human stock lies."

George Bernard Shaw expressed his support for eugenics, too, although he was less keen on the negative type. "It is worth pointing out that we never hesitate to carry out the negative side of eugenics with considerable zest, both on the scaffold and on the battlefield.

We have never deliberately called a human being into existence for the sake of civilization; but we have wiped out millions. We kill a Tibetan regardless of expense, and in defiance of our religion, to clear the way to Lhasa for the Englishman; but we take no really scientific steps to secure that the Englishman when he gets there, will be able to live up to our assumption of his superiority.”

Galton hoped that his Anthropometric Laboratory moved him closer to achieving his eugenic visions. By the 1880s, he was arguing that mobile laboratories should be set up throughout the country, testing students and young men and women, wading through the human chaff to find those worthy of reproduction.

Rather than the actual testing methods and tools developed for the Anthropometric Laboratory, Francis Galton’s greatest contribution was to statistics. He had been developing novel statistical methods long before his lab, but the task of working through the mountain of data it produced helped him to work through mathematical problems he had been struggling with for years. In 1889 he published the book *Natural Inheritance*, which laid out his statistical work of the previous dozen years: most notably the mathematics underlying regression analysis and the correlation coefficient.

Confronted by complicated data sets with variables he presumed to be interdependent and related (for instance, people’s physical measurements; and the ability to hear, see, and strike), Galton found mid- to late-nineteenth-century statistics of little help. While statistics certainly existed at that time, it was not a stand-alone field as we know it today, nor did the word *statistics* necessarily have the same mathematical connotation it does now. Of the European countries this was particularly true in Britain, where Galton worked. True, there was a London Statistical Society, but it was more intent on gathering political information than on pursuing mathematically based analyses. And while scientists on the Continent did use statistics in the mathematical sense, they had very different research goals from Galton’s. European physicists and astronomers, for instance, mainly employed statistics to make sophisticated estimates

of errors when measuring something they did not have direct access to, such as planets and stars. They could usually, however, take repeated measurements of the celestial body in question, and thus their statistics could estimate a “probable error,” usually by taking the mean of these measurements.

Galton had the statistics of probable error at his disposal, but his need for statistics was very different from the other Europeans'. While those on the Continent were trying to nail down error to get a truer measurement of celestial bodies, Galton was actually interested in the very differences—the variations or “errors”—his lab measurements produced. In other words, he was interested in how abilities were distributed among people, which he assumed was the result of genetics, not error.

Galton also wanted to understand, with mathematical precision, how ability was inherited, something that had not been attempted before. To do this, he had to measure the tendency of variables to be related. Surprisingly, no one had ever tried to do this. A scientist interested in genetics, though, would see the need immediately; after all, everyone knows that tall men tended to produce tall sons, but how strong was that tendency?

Ultimately, Galton wanted to prove that people's success in life correlated with their performance in his lab. By the 1880s, Galton had already introduced novel and handy statistical ideas—for instance, the rank ordering of subjects and percentiles—but he needed something more sophisticated to compare the variables produced by the Anthropometric Laboratory. He knew how swiftly people could strike an object and the strength of their pull, for instance. He knew, as well, the examinees' professions, because they had filled out biographical information on cards at the International Health Exhibition booth. But he did not know whether there was any correlation between performing well on the seventeen tasks and success in life, or even if each of the tasks was correlated with another. A strong correlation between success and the tasks in the booth was the linchpin of Galton's neurological efficiency theories, and without proving it statistically he simply had a

pile of measurements of unknowable worth. Who is to say that differentiating between shades of green is a worthwhile measurement unless the people who are good at it are more successful in life than those who are not?

The tools of error theory would not help, but Galton's genius for math would lead him to develop the ideas that could, most notably the correlation coefficient. Although it took Galton's disciples to perfect the correlation coefficient, this mathematical invention allowed scientists and statisticians to measure the relatedness of two variables for the first time. Galton was so ahead of his time that it took decades for the scientific world to understand the import of his shift in focus from error theory to the study of the relatedness of variables. In fact, from the 1860s to the 1890s Galton toiled alone on his new statistics, with only the occasional help of mathematicians he managed to press into service.

Ironically, however, Galton's statistical inventions would be the downfall of the field he had created. They would prove that the physiological tests of the sort Galton had used in his Anthropometric Laboratory were not correlated with each other or with measures of worldly success. Less than twenty years after the Anthropometric Laboratory, the correlation coefficient would bring the entire field of "mental testing," as it became known, to an ungainly end.

One of Galton's most ardent supporters was James Cattell, an American who received his Ph.D. in Leipzig, Germany, in the 1880s and who met Galton while studying medicine for a brief time at Cambridge University. Galton hugely impressed Cattell—he called him "the greatest man I have ever known"—and Cattell was very taken with his Anthropometric Laboratory. Cattell had spent three years in Leipzig measuring people's reaction times, but almost mindlessly, for he hadn't extracted any psychological meaning from the test results. He was measuring for measuring's sake. The Anthropometric Laboratory and the study of human differences, as Galton's field became known, offered Cattell a way to put three years of mechanical measuring to use.

Cattell returned to the United States and is largely responsible for bringing Galton's work in anthropometry to America. At the University of Pennsylvania and later Columbia University, where he was a professor in the 1890s, Cattell created batteries of tests based on Galton's Anthropometric Laboratory and urged students and the public alike to take them. He improved upon Galton's devices and dropped many of the simple body measurements that had been included in the health exhibition lab. Cattell included the dynamometer, which measured hand-squeezing strength. Among other tasks, he asked examinees to judge ten-second intervals without reference to a watch or a clock and to bisect a fifty-centimeter line simply by eyeballing it. He even pressed a rubber tip against examinees' foreheads with progressive force until they showed or reported signs of pain, theorizing that people who were more sensitive to pain were more neurologically efficient (and therefore more naturally able).

At the end of the nineteenth century, the United States was ready for Cattell and his mental tests. In the antebellum years, there had been a tradition of itinerant phrenologists who would travel the country offering their services. For a fee they would analyze a client's head—its shape, size, and unique bumps—and offer advice on career and marriage. They would tell a client of the strengths and weaknesses of his character, and they were often sought after to give expert opinion when a family needed it, much like a therapist or guidance counselor today.

Although phrenology paved the way for physiologically based mental testing, by the 1890s Americans largely believed phrenologists to be quacks. And by the turn of the century, many Americans were searching for structural solutions to their societal problems, rather than seeking the individual advice phrenologists peddled. While some psychologists were therapists to individuals, in the late nineteenth century an American experimental and scientific psychology emerged based on a German model. Psychology began to market itself as a field that could be relied on to solve societal problems—in schools and ports of immigration and on the streets.

Psychologists claimed to have the tool—the mental test—that could help sort people in a newly industrialized, complicated society, and businessmen and educators began paying attention. As a result, a cottage industry of mental testing laboratories arose in Europe and in the United States in the 1880s and 1890s. The problem was, most psychologists—at least the cautious and prudent ones—were not quite sure how mental tests worked. They tested something, but were mental exams really that helpful?

James Cattell assumed that psychologists were on to something; they just had to figure out what. He compared their situation to that of the men working in electricity fifty years previously; at that time, investigators “believed that practical applications would be made, but knew that their first duty was to obtain more exact knowledge.”

Other testers more outrageously proclaimed the usefulness and predictive powers of the physiological tests. One Boston man established a career guidance school and promised to match young men to careers by testing their “delicacy of touch, nerve, sight and hearing reactions, association time, etc.”

Eventually, though, psychologists began to question the usefulness of mental tests based on physical tasks. Galton’s correlation coefficient, too, had become refined by the 1890s, giving scientists a means to judge statistically whether the exams were testing anything worthwhile. The growing skepticism and improved statistics spelled doom for mental tests of the physiological sort. In fact, it was one of Cattell’s graduate students who delivered the fatal blow. Cattell himself was, if not quite innumerate, pretty close to it: he would often add and subtract incorrectly. He knew, though, that his idol, Francis Galton, had created statistical tools that could be useful in analyzing his mental test data. Therefore at the end of the 1890s (after a decade of meticulously testing Columbia students and members of the public), Cattell confidently asked a graduate student named Clark Wissler to study the correlations between his physical tests and mental ability. Complying, the mathematically adept Wissler examined whether students who had performed well

on Cattell's mental tests were also good students, the most reliable indicator of mental ability around.

Devastated does not do justice to how Cattell must have felt upon hearing Wissler's findings. After years of research and an entire career and professional reputation based on experimental psychology, he learned from Wissler that there was no significant relationship between his mental tests and academic performance.

By the turn of the century, correlations were represented numerically, as they are today, with $+1$ equaling a perfect positive relationship and -1 defining a perfect negative relationship between variables. A result of zero (0) indicates that there is no relationship between the variables at all, and of course there are many degrees of relationship between $+1$ and -1 . People in the hard sciences, such as physics, tend to look for higher correlations than they do in the social sciences, but Wissler's numbers were too low for even psychologists to argue that the various measurements were meaningfully related. "Class standing correlated $-.02$ with reaction time, $+.02$ with color naming, and $-.08$ with" hand strength. These are trivial levels of correlation, and likely to have been produced by mere chance when in fact there is no correlation. Wissler even analyzed student head size, and it was no better at predicting academic success. In fact, mental tests did not even correlate with each other. The correlation between reaction time and color naming, for instance, was $-.15$. The correlation between color naming and hand movement speed was $+.19$.

Like a group of flat-Earth advocates in the age of satellite imagery, mental testers were doomed by advances in science—advances that Galton himself had put into motion. Wissler, having devastated the field, perhaps wisely opted to become an anthropologist. Cattell, for his part, gave up experimental psychology, relegating himself to administration, editing *Science* magazine, and running a company he called the Psychological Corporation.

Despite the demise of his testing methods before his death, however, Francis Galton remained widely respected and admired. One day in June 1909, when Galton was an infirm old man at

home alone, Prime Minister Herbert Asquith—like Gladstone, another great British Liberal—sent him a confidential letter saying that Galton was to “receive the honour of Knighthood on his Majesty’s approaching birthday.”

In a letter of his own to a niece, Galton joked, “I have to live until November 9 and then shall blossom.” Francis Galton managed to live two years more, but eugenics and one of its prime tools, the intelligence test, would continue to flourish well into the future.