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THE END OF AVERAGE

HOW WE SUCCEEDED
in a World That Values Sameness

TODD ROSE



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INTRODUCTION

THE LOOK-ALIKE COMPETITION

In the late 1940s, the United States Air Force had a serious problem: its pilots could not keep control of their planes. Although this was the dawn of jet-powered aviation and the planes were faster and more complicated to fly, the problems were so frequent and involved so many different aircraft that the Air Force had an alarming, life-or-death mystery on its hands. "It was a difficult time to be flying," one retired airman told me. "You never knew if you were going to end up in the dirt." At its worst point, seventeen pilots crashed in a single day.¹

The two government designations for these noncombat mishaps were *incidents* and *accidents*, and they ranged from unintended dives and bungled landings to aircraft-obliterating fatalities. At first, the military brass pinned the blame on the men in the cockpits, citing "pilot error" as the most common reason in crash reports. This judgment certainly seemed reasonable, since the planes themselves seldom malfunctioned. Engineers confirmed this time and again,

testing the mechanics and electronics of the planes and finding no defects. Pilots, too, were baffled. The only thing they knew for sure was that their piloting skills were not the cause of the problem. If it wasn't human or mechanical error, what was it?

After multiple inquiries ended with no answers, officials turned their attention to the design of the cockpit itself. Back in 1926, when the army was designing its first-ever cockpit, engineers had measured the physical dimensions of hundreds of male pilots (the possibility of female pilots was never a serious consideration), and used this data to standardize the dimensions of the cockpit. For the next three decades, the size and shape of the seat, the distance to the pedals and stick, the height of the windshield, even the shape of the flight helmets were all built to conform to the average dimensions of a 1926 pilot.²

Now military engineers began to wonder if the pilots had gotten bigger since 1926. To obtain an updated assessment of pilot dimensions, the Air Force authorized the largest study of pilots that had ever been undertaken.³ In 1950, researchers at Wright Air Force Base in Ohio measured more than 4,000 pilots on 140 dimensions of size, including thumb length, crotch height, and the distance from a pilot's eye to his ear, and then calculated the average for each of these dimensions. Everyone believed this improved calculation of the average pilot would lead to a better fitting cockpit and reduce the number of crashes—or almost everyone. One newly hired twenty-three-year-old scientist had doubts.

Lieutenant Gilbert S. Daniels was not the kind of person you would normally associate with the testosterone-drenched culture of aerial combat. He was slender and wore glasses. He liked flowers and landscaping and in high school was president of the Botanical Garden Club. When he joined the Aero Medical Laboratory at Wright Air Force Base straight out of college, he had never even been in a plane before. But it didn't matter. As a junior researcher,

his job was to measure pilots' limbs with a tape measure.⁴

It was not the first time Daniels had measured the human body. The Aero Medical Laboratory hired Daniels because he had majored in physical anthropology, a field that specialized in the anatomy of humans, as an undergraduate at Harvard. During the first half of the twentieth century, this field focused heavily on trying to classify the personalities of groups of people according to their average body shapes—a practice known as “typing.”⁵ For example, many physical anthropologists believed a short and heavy body was indicative of a merry and fun-loving personality, while receding hairlines and fleshy lips reflected a “criminal type.”⁶

Daniels was not interested in typing, however. Instead, his undergraduate thesis consisted of a rather plodding comparison of the shape of 250 male Harvard students' hands.⁷ The students Daniels examined were from very similar ethnic and sociocultural backgrounds (namely, white and wealthy), but, unexpectedly, their hands were not similar at all. Even more surprising, when Daniels averaged all his data, the average hand did not resemble any individual's measurements. There was no such thing as an average hand size. “When I left Harvard, it was clear to me that if you wanted to design something for an individual human being, the average was completely useless,” Daniels told me.⁸

So when the Air Force put him to work measuring pilots, Daniels harbored a private conviction about averages that rejected almost a century of military design philosophy. As he sat in the Aero Medical Laboratory measuring hands, legs, waists, and foreheads, he kept asking himself the same question in his head: *How many pilots really were average?*

He decided to find out. Using the size data he had gathered from 4,063 pilots, Daniels calculated the average of the ten physical dimensions believed to be most relevant for design, including height, chest circumference, and sleeve length. These formed the

dimensions of the "average pilot," which Daniels generously defined as someone whose measurements were within the middle 30 percent of the range of values for each dimension. So, for example, even though the precise average height from the data was five foot nine, he defined the height of the "average pilot" as ranging from five seven to five eleven. Next, Daniels compared each individual pilot, one by one, to the average pilot.⁹

Before he crunched his numbers, the consensus among his fellow air force researchers was that the vast majority of pilots would be within the average range on most dimensions. After all, these pilots had already been preselected because they appeared to be average sized. (If you were, say, six foot seven, you would never have been recruited in the first place.) The scientists also expected that a sizable number of pilots would be within the average range on all ten dimensions. But even Daniels was stunned when he tabulated the actual number.

Zero.

Out of 4,063 pilots, not a single airman fit within the average range on all ten dimensions. One pilot might have a longer-than-average arm length, but a shorter-than-average leg length. Another pilot might have a big chest but small hips. Even more astonishing, Daniels discovered that if you picked out just *three* of the ten dimensions of size—say, neck circumference, thigh circumference, and wrist circumference—less than 3.5 percent of pilots would be average sized on all three dimensions. Daniels's findings were clear and incontrovertible. *There was no such thing as an average pilot.* If you've designed a cockpit to fit the average pilot, you've actually designed it to fit no one.¹⁰

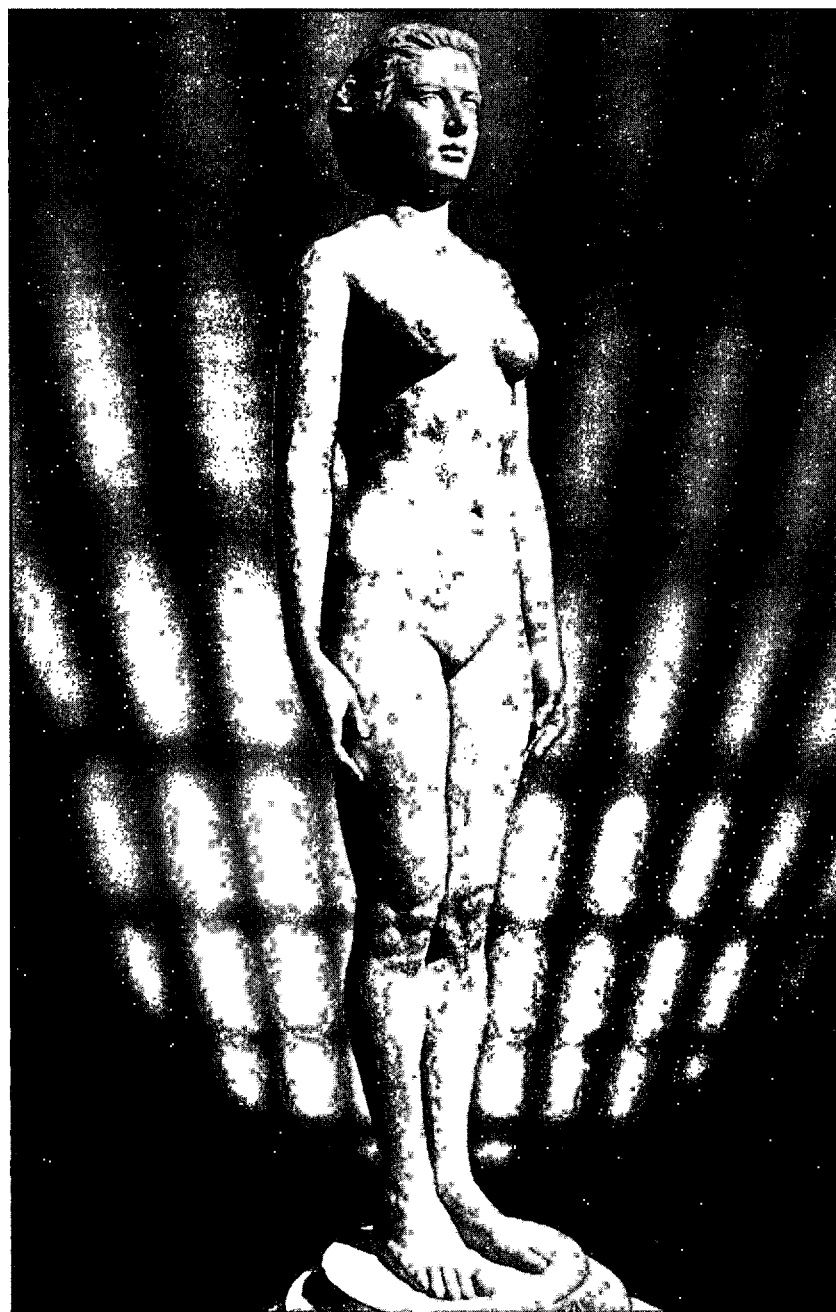
Daniels's revelation was the kind of big idea that could have ended one era of basic assumptions about individuality and launched a new one. But even the biggest of ideas requires the correct interpretation.

'We like to believe that facts speak for themselves, but they most assuredly do not. After all, Gilbert Daniels was not the first person to discover there was no such thing as an average person.

A MISGUIDED IDEAL

Seven years earlier, the *Cleveland Plain Dealer* announced on its front page a contest cosponsored with the Cleveland Health Museum and in association with the Academy of Medicine of Cleveland, the School of Medicine, and the Cleveland Board of Education. Winners of the contest would get \$100, \$50, and \$25 war bonds, and ten additional lucky women would get \$10 worth of war stamps. The contest? To submit body dimensions that most closely matched the typical woman, "Norma," as represented by a statue on display at the Cleveland Health Museum.¹¹

Norma was the creation of a well-known gynecologist, Dr. Robert L. Dickinson, and his collaborator Abram Belskie, who sculpted the figure based on size data collected from fifteen thousand young adult women.¹² Dr. Dickinson was an influential figure in his day: chief of obstetrics and gynecology at the Brooklyn Hospital, president of the American Gynecological Society, and chairman of obstetrics at the American Medical Association.¹³ He was also an artist—the "Rodin of obstetrics," as one colleague put it¹⁴—and throughout his career he used his talents to draw sketches of women, their various sizes and shapes, to study correlations of body types and behavior.¹⁵ Like many scientists of his day, Dickinson believed the truth of something could be determined by collecting and averaging a massive amount of data. "Norma" represented such a truth. For Dickinson, the thousands of data points he had averaged revealed insight into a typical woman's physique—someone normal.



NORMA

USED BY PERMISSION OF THE CLEVELAND MUSEUM OF NATURAL HISTORY.

In addition to displaying the sculpture, the Cleveland Health Museum began selling miniature reproductions of Norma, promoting her as the “Ideal Girl,”¹⁶ launching a Norma craze. A notable physical anthropologist argued that Norma’s physique was “a kind of perfection of bodily form,” artists proclaimed her beauty an “excellent standard,” and physical education instructors used her as a model for how young women *should* look, suggesting exercise based on a student’s deviation from the ideal. A preacher even gave a sermon on her presumably normal religious beliefs. By the time the craze had peaked, Norma was featured in *TIME* magazine, in newspaper cartoons, and on an episode of a CBS documentary series, “This American Look,” where her dimensions were read aloud so the audience could find out if they, too, had a normal body.¹⁷

On November 23, 1945, the *Plain Dealer* announced its winner, a slim brunette theater cashier named Martha Skidmore. The newspaper reported that Skidmore liked to dance, swim, and bowl—in other words, that her tastes were as pleasingly normal as her figure, which was held up as the paragon of the female form.¹⁸

Before the competition, the judges assumed most entrants’ measurements would be pretty close to the average, and that the contest would come down to a question of millimeters. The reality turned out to be nothing of the sort. Less than 40 of the 3,864 contestants were average-size on just five of the nine dimensions and none of the contestants—not even Martha Skidmore—came close on all nine dimensions.¹⁹ Just as Daniels’s study revealed there was no such thing as an average-size pilot, the Norma Look-Alike contest demonstrated that average-size women did not exist either.

But while Daniels and the contest organizers ran up against the same revelation, they came to a markedly different conclusion about its meaning. Most doctors and scientists of the era did not interpret the contest results as evidence that Norma was a misguided ideal. Just the opposite: many concluded that American women, on the

whole, were unhealthy and out of shape. One of those critics was the physician Bruno Gebhard, head of the Cleveland Health Museum, who lamented that postwar women were largely unfit to serve in the military, chiding them by insisting "the unfit are both bad producers and bad consumers." His solution was a greater emphasis on physical fitness.²⁰

Daniels's interpretation was the exact opposite. "The tendency to think in terms of the 'average man' is a pitfall into which many persons blunder," Daniels wrote in 1952. "It is virtually impossible to find an average airman not because of any unique traits in this group but because of the great variability of bodily dimensions which is characteristic of all men."²¹ Rather than suggesting that people should strive harder to conform to an artificial ideal of normality, Daniels's analysis led him to a counterintuitive conclusion that serves as the cornerstone of this book: *Any system designed around the average person is doomed to fail.*

Daniels published his findings in a 1952 Air Force Technical Note entitled *The "Average Man"?*²² In it, he contended that if the military wanted to improve the performance of its soldiers, including its pilots, it needed to change the design of any environments in which those soldiers were expected to perform. The recommended change was radical: the environments needed to fit the individual rather than the average.

Amazingly—and to their credit—the air force embraced Daniels's arguments. "The old air force designs were all based on finding pilots who were similar to the average pilot," Daniels explained to me. "But once we showed them the average pilot was a useless concept, they were able to focus on fitting the cockpit to the individual pilot. That's when things started getting better."²³

By discarding the average as their reference standard, the air force initiated a quantum leap in its design philosophy, centered on a new guiding principle: *individual fit*. Rather than fitting the individual

to the system, the military began fitting the system to the individual. In short order, the air force demanded that all cockpits needed to fit pilots whose measurements fell within the 5 percent to 95 percent range on each dimension.²⁴

When airplane manufacturers first heard this new mandate, they balked, insisting it would be too expensive and take years to solve the relevant engineering problems. But the military refused to budge, and then—to everyone's surprise—aeronautical engineers rather quickly came up with solutions that were both cheap and easy to implement. They designed adjustable seats, technology now standard in all automobiles. They created adjustable foot pedals. They developed adjustable helmet straps and flight suits. Once these and other design solutions were put into place, pilot performance soared, and the U.S. Air Force became the most dominant air force on the planet. Soon, every branch of the American military published guides decreeing that equipment should fit a wide range of body sizes, instead of standardized around the average.²⁵

Why was the military willing to make such a radical change so quickly? Because changing the system was not an intellectual exercise—it was a practical solution to an urgent problem. When pilots flying faster than the speed of sound were required to perform tough maneuvers using a complex array of controls, they couldn't afford to have a gauge just out of view or a switch barely out of reach. In a setting where split-second decisions meant the difference between life and death, pilots were forced to perform in an environment that was already stacked against them.

THE HIDDEN TYRANNY OF THE AVERAGE

Imagine the good that would have resulted if, at the same time the military changed the way it thought about soldiers, the rest of

our society had followed suit. Rather than comparing people to a misguided ideal, they could have seen them—and valued them—for what they are: *individuals*. Instead, today most schools, workplaces, and scientific institutions continue to believe in the reality of Norma. They design their institutions and conduct their research around an arbitrary standard—the average—compelling us to compare ourselves and others to a phony ideal.

From the cradle to the grave, you are measured against the ever-present yardstick of the average, judged according to how closely you approximate it or how far you are able to exceed it. In school, you are graded and ranked by comparing your performance to the average student. To get admitted to college, your grades and test scores are compared to the average applicant. To get hired by an employer, your grades and test scores—as well as your skills, years of experience, and even your personality score—are compared to the average applicant. If you do get hired, your annual review will quite likely compare you, yet again, against the average employee in your job level. Even your financial opportunities are determined by a credit score that is evaluated by—you guessed it—its deviation from the average.

Most of us know intuitively that a score on a personality test, a rank on a standardized assessment, a grade point average, or a rating on a performance review doesn't reflect your, or your child's, or your students', or your employees' abilities. Yet the concept of average as a yardstick for measuring individuals has been so thoroughly ingrained in our minds that we rarely question it seriously. Despite our occasional discomfort with the average, we accept that it represents some kind of objective reality about people.

What if I were to tell you that this form of measurement—the average—was *almost always* wrong? That when it comes to understanding individuals, the average is most likely to give incorrect and misleading results? What if, like the cockpit designs and Norma statues, this ideal is just a myth?

The central premise of this book is deceptively simple: *no one is average*. Not you. Not your kids. Not your coworkers, or your students, or your spouse. This isn't empty encouragement or hollow sloganeering. This is a scientific fact with enormous practical consequences that you cannot afford to ignore. You might be thinking I am touting a world that sounds suspiciously like Lake Wobegon from Garrison Keillor's *Prairie Home Companion*, a place where "All the children are above average." Some people *must* be average, you might insist, as a simple statistical truism. This book will show you how even this seemingly self-evident assumption is deeply flawed and must be abandoned.

It is not that the average is never useful. Averages have their place. If you're comparing two different *groups* of people, like comparing the performance of Chilean pilots with French pilots—as opposed to comparing two *individuals* from each of those groups—then the average can be useful. But the moment you need *a* pilot, or *a* plumber, or *a* doctor, the moment you need to teach *this* child or decide whether to hire *that* employee—the moment you need to make a decision about any individual—the average is useless. Worse than useless, in fact, because it creates the illusion of knowledge, when, in fact the average disguises what is most important about an individual.

In this book, you will learn that just as there is no such thing as average body size, there is no such thing as average talent, average intelligence, or average character. Nor are there average students or average employees—or average brains, for that matter. Every one of these familiar notions is a figment of a misguided scientific imagination. Our modern conception of the average person is not a mathematical truth but a human invention, created a century and a half ago by two European scientists to solve the social problems of their era. Their notion of the "Average Man" did indeed solve many of their challenges and even facilitated and shaped the Industrial

Age—but we no longer live in the Industrial Age. Today we face very different problems—and we possess science and math far better than what was available in the nineteenth century.

Over the past decade, I have been part of an exciting new interdisciplinary field of science known as the *science of the individual*.²⁶ The field rejects the average as a primary tool for understanding individuals, arguing instead that we can only understand individuals by focusing on individuality in its own right. Cellular biologists, oncologists; geneticists, neuroscientists, and psychologists have recently begun to adopt the principles of this new science to fundamentally transform the study of cells, disease, genes, brains, and behavior. Several of the most successful businesses have begun to implement these principles, too. In fact, the principles of individuality are starting to be applied just about everywhere except for the one place where they will have their greatest impact—in your own life.

I wrote *The End of Average* to change that.

In the chapters that follow, I'll share with you three principles of individuality—the *jaggedness principle*, the *context principle*, and the *pathways principle*. These principles, drawn from the latest science in my field, will help you understand what is truly unique about you and, more importantly, show you how to take full advantage of your individuality to gain an edge in life. You no longer need to fly a World War II aircraft in an age of jet fighters, and you no longer need to weigh yourself against a non-existent Norma.

THE PROMISE OF INDIVIDUALITY

We are on the brink of a new way of seeing the world, a change driven by one big idea: individuality matters. You might think it is overly simplistic to believe that such a basic notion could produce profound practical consequences. But just consider what hap-

pened when another big idea was introduced to the world: the idea of germs.

In the nineteenth century, the most respected health and medical experts all insisted that diseases were caused by "miasma," a fancy term for bad air.²⁷ Western society's system of health was based on this assumption: to prevent diseases, windows were kept open or closed, depending on whether there was more miasma inside or outside the room; it was believed that doctors could not pass along disease, because gentlemen did not inhabit quarters with bad air. Then the idea of germs came along.²⁸

One day, everyone believed that bad air makes you sick. Then, almost overnight, people started realizing there were invisible things called microbes and bacteria that were the real cause of diseases. This new view of disease brought sweeping changes to medicine, as surgeons adopted antiseptics and scientists invented vaccines and antibiotics. But, just as momentously, the idea of germs gave ordinary people the power to influence their own lives. Now, if you wanted to stay healthy, you could do things like wash your hands, boil your water, cook your food thoroughly, and clean cuts and scrapes with iodine.

That shift in thinking about the world is similar to how I want you to think about the old world of averages and the new world of individuality. Today we have the ability to understand individuals and their talents on a level that was not possible before. This new idea will have a profound impact on our institutions—instead of viewing talent as a scarce commodity, schools will be able to nurture excellence in every student, and employers will be able to hire and retain a wider range of high-impact employees. People who feel they have unrecognized and untapped potential, who are not getting the chance to show what they are truly capable of, will be able to live up to their own unmet expectations.

Perhaps your child has been labeled a poor reader, but rather than

simply being diagnosed, his school realizes that he is following an alternative, equally valid pathway to reading and adjusts your child's instruction accordingly. Perhaps one of your employees whose performance is suffering has been labeled as "difficult to work with" by her colleagues; but rather than fire her, you are able to identify the contexts that make her act out, helping her strengthen her relationships and drastically improve her performance, and allowing you to discover a hidden gem in your department. Once you see the profound changes that can take place when you apply the principles of individuality, you won't be able to see averages in the same way again.

It's unacceptable that in an age when we can map the human genome and tweak genetic coding to improve our health, we haven't been able to accurately map human potential. My work—and the message in this book—is geared toward helping us fix that. Human potential is nowhere near as limited as the systems we have put in place assume. We just need the tools to understand each person as an individual, not as a data point on a bell curve.

I know this firsthand.

I first became interested in the idea of individuality because I was crashing over and over again in my own life, and I couldn't figure out why. No matter what I tried, it seemed like everything ended up in failure. When I was eighteen, I dropped out of high school with a 0.9 GPA—that's a D-minus average. Before I was old enough to drink, I had held ten different minimum-wage jobs while trying to support a wife and son. Another son arrived when I was twenty-one. At the lowest point in my life, I was on welfare and working as an in-home nursing assistant performing enemas for \$6.45 an hour.

Almost everyone said the problem was me, that I was lazy, stupid, or—most frequently—a "troublemaker." More than one school official told my parents that they would have to temper their expectations about what I would be able to achieve in life. But even during

my lowest moments, I always felt that something wasn't right with this analysis. I felt sure I had something to offer; it just seemed like there was a profound mismatch between who I really was and the way the world saw me.

At first, I felt like the solution was to strive to be the same as everyone else—but that usually ended up in disaster. I failed class after class, and departed job after job. Eventually, I decided to stop trying to conform to the system and instead focused on figuring out how to make the system fit to me. It worked: fifteen years after I dropped out of high school, I was on the faculty at the Harvard Graduate School of Education, where I am now the director of the Mind, Brain, and Education program.

My own success did not happen because I awakened some secret talent overlooked by the world. It was not simply because one day I buckled down and started working hard, or because I discovered some kind of abstract new philosophy. I didn't have time for abstract: I needed to get off welfare, provide for my children, and find a pragmatic path to a rewarding career. No, I was able to change the course of my life because I followed the principles of individuality, intuitively at first, and then with conscious determination.

I wrote *The End of Average* to share these principles with you and show you how they can help you improve your performance in school, work, and your personal life. The hardest part of learning something new is not embracing new ideas, but letting go of old ones. The goal of this book is to liberate you, once and for all, from the tyranny of the average.