

LEARNING FROM LEONARDO

RENAISSANCE TITAN LEONARDO DA VINCI WAS A VERY HUMAN GENIUS WHOSE WORK HOLDS LESSONS FOR US ALL (EVEN IF WE'LL NEVER PAINT A MONA LISA)

BY WALTER ISAACSON

YES, LEONARDO DA VINCI WAS A GENIUS: WILDLY imaginative, passionately curious and creative across multiple disciplines—painting, sculpture, architecture, anatomy, aeronautics, engineering. Yet the word “genius” oddly minimizes him by making it seem as if he were touched by lightning. His early biographer, Giorgio Vasari, a 16th-century artist, made this mistake: “Sometimes, in supernatural fashion, a single person is marvelously endowed by heaven with beauty, grace, and talent in such abundance that his every act is divine and everything he does clearly comes from God rather than from human art.” In fact, the self-taught Leonardo’s genius was wrought by his own will and ambition. It did not come from being the divine recipient, like Newton or Einstein, of a mind with so much processing power that we mere mortals cannot fathom it.

Part of what made Leonardo a genius, what set him apart from people who are merely extraordi-

narily smart, was creativity, the ability to apply imagination to intellect. His facility for combining observation with fantasy allowed him, like other creative geniuses, to make unexpected leaps that related things seen to things unseen. “Talent hits a target that no one else can hit,” wrote the German philosopher Arthur Schopenhauer. “Genius hits a target no one else can see.” Because they “think different,” creative masterminds are sometimes considered misfits, but in the words that Steve Jobs helped craft for an Apple advertisement, “While some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world are the ones who do.”

Leonardo was also a very human genius—quirky

Leonardo da Vinci, by Lattanzio Querena (1768–1853). As a young man, da Vinci was known for his handsome features and powerful physique.

and obsessive and playful and easily distracted. He made mistakes. He went off on tangents, literally, pursuing math problems that became time-sucking diversions. He left a trail of unfinished projects, among them an Adoration scene and a battle mural that were abandoned, flying machines that never flew, tanks that never rolled, a river that was never diverted and pages of brilliant treatises that piled up unpublished. "Tell me if anything was ever done," he repeatedly scribbled in notebook after notebook. "Tell me. Tell me. Tell me if ever I did a thing. . . Tell me if anything was ever made."

His flawed humanity makes Leonardo more accessible. Even though we may never be able to match his talents, we can learn from him and try to be more like him. His life offers a wealth of lessons.

Be curious, relentlessly curious.

"I have no special talents," Einstein once wrote to a friend. "I am just passionately curious." Leonardo actually did have special talents, as did Einstein, but his distinguishing and most inspiring trait was his intense curiosity. He wanted to know what causes people to yawn, how they walk on ice in Flanders, methods for squaring a circle, what makes the aortic valve close, how light is processed in the eye and what that means for the perspective in a painting. He instructed himself to learn about the placenta of a calf, the jaw of a crocodile, the tongue of a woodpecker, the muscles of a face, the light of the moon and the edges of shadows. Being relentlessly and randomly curious about everything around us is something that each of us can push ourselves to do, every waking hour, just as he did.

Seek knowledge for its own sake.

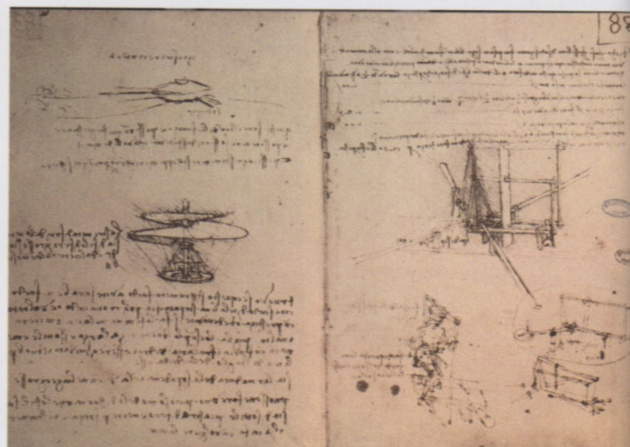
Not all knowledge needs to be useful. Sometimes it should be pursued for pure pleasure. Leonardo did not need to know how heart valves work to paint the *Mona Lisa*, nor did he need to figure out how fossils got to the top of mountains to produce *Virgin of the Rocks*. By allowing himself to be driven by pure curiosity, he got to explore more horizons and see more connections than anyone else of his era.

Retain a childlike sense of wonder.

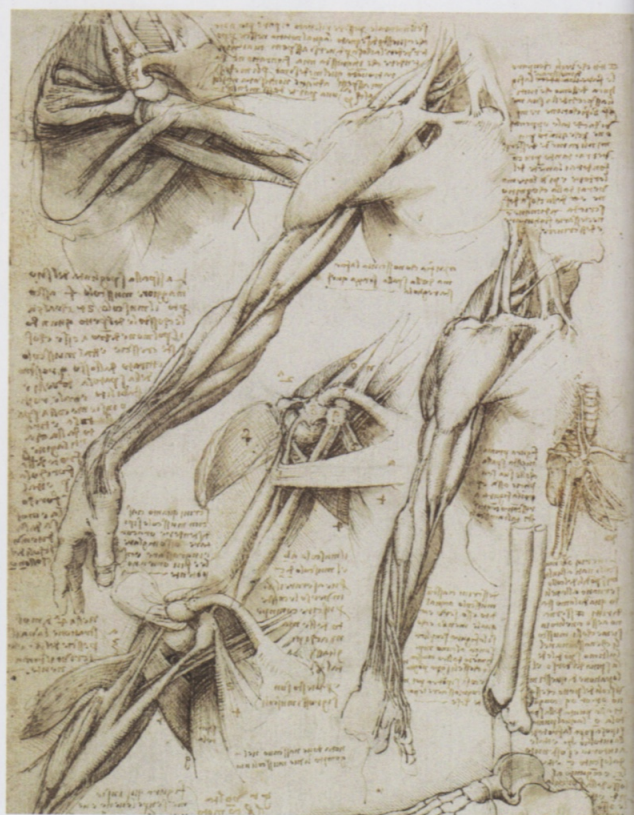
At a certain point in life, most of us quit puzzling over everyday phenomena. We might savor the beauty of a blue sky, but we no longer bother to wonder why it is that color. Leonardo did. So did

Da Vinci's Notebook

Written backward (his reasons remain unclear) and vividly illustrated, it reveals a restless, insatiably curious mind with an almost limitless range available.



Above, Leonardo's rendition of a flying machine; below, anatomical drawings of the shoulder, arms and foot





Einstein, who wrote to another friend, “You and I never cease to stand like curious children before the great mystery into which we were born.” We should be careful to never outgrow our wonder years or to let our children do so.

Observe.

Leonardo’s greatest skill was his acute ability to observe things. It was the talent that empowered his curiosity, and vice versa. It was not a magical gift but a product of effort. When he visited the moats surrounding Sforza Castle, he looked at the four-winged dragonflies and noticed how the wing pairs alter-

nate in motion. When he walked around town, he observed how the facial expressions of people relate to their emotions, and he discerned how light bounces off different surfaces. He saw which birds move their wings faster on the upswing than on the downswing, and which do the opposite. This, too, we can emulate. Water flowing into a bowl? Look, as he did, at exactly how the eddies swirl. Then wonder why.

Start with the details.

In his notebook, Leonardo shared a trick for observing something carefully: Do it in steps, starting with each detail. A page of a book, he noted, cannot be



The Last Supper (also below in a preliminary sketch) was painted in Milan for Leonardo's patron Duke Ludovico Sforza.



absorbed in one stare; you need to go word by word. "If you wish to have a sound knowledge of the forms of objects, begin with the details of them, and do not go on to the second step until you have the first well fixed in memory."

See things unseen.

Leonardo's primary activity in many of his formative years was conjuring up pageants, performances and plays. He mixed theatrical ingenuity with fantasy. This gave him a combinatory creativity. He could see birds in flight and also angels, lions roaring and also dragons.

Go down rabbit holes.

Leonardo filled the opening pages of one of his notebooks with 169 attempts to square a circle. In eight pages of his *Codex Leicester*, he recorded 730 findings about the flow of water; in another notebook, he listed 67 words that describe different types of moving water. He measured every segment of the human body, calculated their proportional relationships, and then did the same for a horse. He drilled down for the pure joy of geeking out.

Get distracted.

The greatest rap on Leonardo was that he'd become scattered—say, doing scientific experiments instead of painting *The Adoration of the Magi*. But every passion he had deepened his appreciation for the patterns of nature. Leonardo teaches us the value of being focused on things that fascinate us but also, at times, being distracted and pursuing some shiny new idea you happen to stumble upon.

Respect facts.

Leonardo was a forerunner of the age of observational experiments and critical thinking. When he came up with an idea, he devised an experiment to test it. And when his experience showed that a theory was flawed—such as his belief that the springs within the earth are replenished the same way as blood vessels in humans—he abandoned his theory and sought a new one. This practice became common a century later, during the age of Galileo and Bacon. It has, however, become a bit less prevalent in this era of “alternative facts.” If we want to be more like Leonardo, we have to be fearless about changing our minds based on new—and real—information.

Procrastinate.

While painting *The Last Supper*, Leonardo would sometimes stare at the work for an hour, finally make one small stroke, and then leave. He told Duke Ludovico creativity requires time for ideas to marinate and intuitions to gel. “Men of lofty genius sometimes accomplish the most when they work least,” he explained, “for their minds are occupied with their ideas and the perfection of their conceptions, to which they afterwards give form.” Most of us don't need advice to procrastinate; we do it naturally. But procrastinating like Leonardo requires work: it involves gathering all possible facts and ideas, and only then allowing the collection to simmer.

Let the perfect be the enemy of the good.

When Leonardo could not make the perspective in *The Battle of Anghiari* or the interaction in *The Adoration of the Magi* work perfectly, he abandoned them rather than produce a work that was merely good enough. He carried around masterpieces such as his *Saint Anne* and the *Mona Lisa* to the end, knowing there would always be a new stroke he could add. Likewise, Steve Jobs was such a perfectionist that he held up shipping the original Macintosh until his team could make the circuit boards inside look beautiful, even though no one would ever see them. Both he and Leonardo knew that real artists care about the beauty even of the parts unseen. Eventually, Jobs embraced a countermaxim, “Real artists ship,” which means that sometimes you ought to deliver a product even when there are still improvements that could be made. That is a good rule for daily life. But there are times when it's nice to be like Leonardo and not let go of something until it's perfect.

Think visually.

Leonardo was not blessed with the ability to formulate math equations or abstractions. So he had to visualize them, which he did with his studies of proportions, his rules of perspective, his method for calculating reflections from concave mirrors and his ways of changing one shape into another of the same size. Too often, when we learn a formula or a rule—even one so simple as the method for multiplying numbers or mixing a paint color—we no longer visualize how it works. As a result, we lose our appreciation for the underlying beauty of nature's laws.

Avoid silos.

At the end of many of his product presentations, Steve Jobs displayed a slide of a sign that showed the intersection of “Liberal Arts” and “Technology” streets. He knew that at such crossroads lie creativity. Leonardo had a free-range mind that merrily wandered across all the disciplines of the arts, sciences, engineering and humanities. His knowledge of how light strikes the retina helped inform the perspective in *The Last Supper*, and on a page of anatomical drawings depicting the dissection of lips, he drew the smile that would reappear in the *Mona Lisa*.

Lisa Gherardini (1479–1542), a merchant's wife, likely posed for the world's most famous painting.

In Vitruvian Man (1490), Leonardo blended anatomy with geometry to show ideal human proportions.

He knew that art was a science and that science was an art. Whether he was drawing a fetus in the womb or the swirls of a deluge, he blurred the distinction between the two.

Let your reach exceed your grasp.

Imagine, as he did, how you would build a human-powered flying machine or divert a river. Even try to devise a perpetual-motion machine or square a circle using only a ruler and a compass. There are some problems we will never solve. Learn why.

Indulge fantasy.

Leonardo's fantasies pervaded everything he touched: his theatrical productions, plans to divert rivers, designs for ideal cities, schemes for flying machines, and almost every aspect of his art as well as engineering. At first glance his susceptibility to fantasia might seem to be a failing, one that reveals a lack of discipline and diligence that was related to his propensity to abandon artworks and treatises unfinished. To some extent, that is true. Vision without execution is hallucination. But Leonardo's ability to blur the line between reality and fantasy—just like his sfumato techniques for blurring the lines of a painting—was actually a key to his creativity. Skill without imagination is barren. Leonardo knew how to marry observation and imagination, which made him history's consummate innovator.

Create for yourself, not just for patrons.

No matter how hard the rich and powerful marchesa Isabella d'Este begged, Leonardo would not paint her portrait. But he did begin one of a silk merchant's wife named Lisa. He did it because he wanted to, and he kept working on it for the rest of his life, never delivering it to the silk merchant.

Collaborate.

Genius is often considered the purview of loners who retreat to their garrets and are struck by creative lightning. Like many myths, that of the lone genius has some truth to it. But there's usually more to the story. The Madonnas and drapery studies produced in Verrocchio's studio, and the versions of *Virgin of the Rocks* and *Madonna of the Yarnwinder* and

other paintings from Leonardo's studio, were created in such a collaborative manner that it is hard to tell whose hand made which strokes. *Vitruvian Man* was produced after Leonardo shared ideas and sketches with friends. His best anatomy studies came when he was working in partnership with Marcantonio della Torre. And his most fun work came from collaborations on theatrical productions and evening entertainments at the Sforza court. Genius starts with individual brilliance. It requires singular vision. But executing it often entails working with others. Innovation is a team sport. Creativity is a collaborative endeavor.

Make lists.

And be sure to put odd things on them. Leonardo's to-do lists may have been the greatest testaments to pure curiosity the world has ever seen.

Take notes, on paper.

Five hundred years later, Leonardo's notebooks are around to astonish and inspire us. Fifty years from now, our own notebooks, if we work up the initiative to start writing them, will be around to astonish and inspire our grandchildren, unlike our tweets and Facebook posts.

Be open to mystery.

Not everything needs sharp lines. The 15th century of Leonardo and Columbus and Gutenberg was a time of invention, exploration and the spread of knowledge by new technologies. In short, it was a time like our own. That is why we have much to learn from Leonardo. His ability to combine art, science, technology, the humanities and imagination remains an enduring recipe for creativity. So, too, is the ease with which he was a bit of a misfit: illegitimate, gay, vegetarian, left-handed, easily distracted and at times heretical. Florence flourished in the 15th century because it was comfortable with such people. Above all, Leonardo's relentless curiosity and experimentation should remind us of the importance of instilling, in both ourselves and our children, not just received knowledge but also a willingness to question it—to be imaginative and, like talented misfits and rebels in any era, to think different.

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