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- Ideas
- The Saturday Essay

The Lessons of Leonardo: How to Be a Creative Genius

History's most creative genius, Leonardo da Vinci, was not superhuman, writes Walter Isaacson—and following his methods can bring great intellectual rewards to anyone

By: Walter Isaacson

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Around the time that he reached the unnerving milestone of turning 30, Leonardo da Vinci wrote a letter to the ruler of Milan listing the reasons why he should be given a job. In 10 carefully numbered paragraphs, he touted his engineering skills, including his ability to design bridges, waterways, cannons and armored vehicles. Only at the end, as an afterthought, did he add that he was also an artist. "**Likewise in painting, I can do everything possible**," he wrote.

Yes, he could. He would go on to create the two most famous paintings in history, the "Mona Lisa" and "The Last Supper." But in his own mind, he was just as much a man of science and engineering, pursuing studies of anatomy, flying machines, fossils, birds, optics, geology and weaponry. His ability to combine art and science—made iconic by "Vitruvian Man," his drawing of a perfectly proportioned man (possibly a self-portrait) spread-eagled inside a circle and square—is why so many consider him history's most creative genius.

Fortunately for us, Leonardo was also a very human genius. **He was not the recipient of supernatural intellect in the manner of, for example, Newton or Einstein, whose minds had such unfathomable processing power that we can merely marvel at them. His genius came from being wildly imaginative, quirkily curious and willfully observant. It was a product of his own will and effort, which makes his example more inspiring for us mere mortals and also more possible to emulate.**

More than 7,000 pages of Leonardo's notebooks still exist, and there we find plenty of evidence that he was not superhuman. He made mistakes in arithmetic. He had a deep feel for geometry but was not adroit at using equations to codify nature's laws. He left many artistic projects unfinished and pages of brilliant treatises unpublished. He was also prone to fantasy, envisioning flying machines that never flew and tanks that never rolled.

To some extent, these tendencies were failings. Vision without execution is hallucination. But Leonardo's ability to blur the line between reality and imagination, just like his fumato technique for blurring the lines of a painting, was a key to his creativity. He envisioned what innovators would invent centuries later, and by refusing to churn out works that he had not perfected, he sealed his reputation as a genius rather than a master craftsman.

We will never be able to match Leonardo's talents, but we can try to cultivate, in ourselves and in our children, the skills that he used to put imagination to productive use. **All of us have something to learn from him about how to lead a more creative and intellectually satisfying life.**

Be curious about everything. Leonardo's most distinctive trait was his passionate, playful and occasionally obsessive curiosity. He made lists in his notebooks of hundreds of subjects, both marvelous and mundane, that he wanted to explore, from what causes people to yawn to methods for squaring a circle. He instructed himself to investigate the placenta of a calf, the jaw of a crocodile, the muscles of the human face, the glow of the new moon and the edges of shadows.

'He simply wanted to know.'

Some of his curiosity involved phenomena so commonplace that we rarely pause to wonder about them. "Why is the fish in the water swifter than the bird in the air when it ought to be the contrary, since the water is heavier and thicker than the air?"

Best of all are the questions that seem completely random. "Describe the tongue of the woodpecker," he instructed himself on one notebook list. It isn't something that Leonardo needed to figure out in order to paint a picture or to understand the flight of birds. He simply wanted to know. He never outgrew the child's need not just to admire the beauty of a blue sky but to ask why it is that color.

Nor was Leonardo's curiosity constrained by the distinctions we make today among different disciplines and fields. **His mind wandered merrily across the arts, sciences, engineering and humanities. His knowledge of how light strikes the retina informed the perspective in "The Last Supper," and a page of his anatomical drawings depicting the dissection of lips is topped by the first sketch of the Mona Lisa's smile. He knew that art was a science and that science was an art.** Whether drawing a fetus in the womb or the swirls of a deluge, he blurred the distinction between the two.

Some people are geniuses in a particular arena, such as Mozart in music or Euler in math, but Leonardo's passion was to know everything there was to know about everything that could be known. This gave him a profound feel for nature's crosscurrents and a reverence for the harmony of its patterns. In his notebooks, he would record curls of hair, eddies of water and whirls of air, along with some stabs at the math that might underlie such spirals.

There have been many insatiable polymaths, and even the Renaissance produced other Renaissance Men. But none painted the "Mona Lisa," or did so while at the same time producing

unsurpassed anatomical drawings based on multiple dissections, coming up with schemes to divert rivers, explaining the reflection of light from the Earth to the moon, designing musical instruments, choreographing pageants, using fossils to dispute the biblical account of the deluge—and then drawing the deluge.

Observe attentively. His curiosity was aided by the sharpness of his eye, which focused on things that the rest of us barely notice. One night he saw lightning flash behind some buildings and for that instant they looked smaller, so he launched a series of experiments to verify that objects look smaller when surrounded by light. When he saw four-winged dragonflies hovering over a moat, he observed exactly how their wing pairs alternated in motion. Water flowing into a bowl? He studied how the eddies formed, and then wondered why.

In his notebooks, Leonardo set out his simple method for truly observing a scene: Look separately at each detail. He compared it to looking at the page of a book. It was meaningless when taken in as a whole and had to be examined word by word**. "If you wish to have a sound knowledge of the forms of objects," he advised, "begin with the details of them, and do not go on to the second step until you have the first well fixed in memory."**

Leonardo knew that true observation requires not only the discipline of looking very closely at something but also the patience to process observations and patterns. While painting "The Last Supper," he would sometimes stare at the work for an hour, finally make one small stroke, and then leave. He told the duke of Milan that creativity requires time and patience. "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 to be encouraged to procrastinate. We do it naturally. But procrastinating like Leonardo requires work: It involves gathering all the possible facts and ideas, and only after that allowing the various ingredients to simmer.

As the offspring of a long line of notaries, Leonardo knew that skillful observation was aided by the act of recording it. In the early 1480s, shortly after his arrival in Milan, he began his lifelong practice of keeping notebooks.

Fortunately, he could not afford to waste paper, so he crammed every inch of his pages with miscellaneous drawings and looking-glass jottings that seem random but provide intimations of his mental leaps. The jumble might include math calculations, sketches of his devilish young boyfriend, birds, flying machines, theater props, blood valves, weapons, riddles, to-do lists and studies for paintings. The cross-disciplinary brilliance whirls across every page, providing a delightful display of a mind dancing with nature.

Paper is a wonderful technology for the storage and retrieval of observations. **Five hundred years later, many of Leonardo's notebooks are still around to astonish and inspire us.** Fifty years from now, our own notebooks, if we work up the initiative to start keeping them, can be around to astonish and inspire our grandchildren, long after our tweets and Facebook posts have been forgotten.

Indulge fantasy. Leonardo's primary activity for much of his career was conjuring up pageants, performances and plays for his aristocratic patrons. Just as he blurred the boundaries between art and science, he blurred the line between reality and fantasy. He could envision birds in flight but also angels; lions roaring but also dragons.

His designs for the stage taught him the tricks of accelerated perspective, illusory depth and theatrical gesture—and he deployed this knowledge to create "The Last Supper," one of history's most dramatic paintings. For his theatrical productions, he devised ingenious props and mechanisms, some of which he later replicated for the real world.

Many people have seen the famous drawings of his aerial screw contraption, and some think it was a design for a real helicopter. I suspect that it was a piece of fantasy for the theater, intended to propel people's imaginations rather than their bodies. But eventually it led Leonardo to apply himself to designing human-powered flying machines—work that inspired engineers for the next five centuries.

Leonardo was a grown-up who never stopped indulging in the sort of fantasy and speculation that we now associate with childhood. There's a lesson for us in that, amid all the practical demands of our modern lives. We, too, can try to imagine, as he did, how to divert a river, or build a human-powered flying machine, or square a circle using only a ruler and a compass. We are unlikely to solve these problems, but even by failing in the attempt we can stretch our imaginations.

Today we live in a world that encourages specialization, whether we are students, scholars, workers or professionals. We also tend to exalt training in technology and engineering, believing that the jobs of the future will go to those who can code and build rather than those who can be creative.

But the true innovators tend to be those like Leonardo who make no distinction between the beauties of the arts and the beauties of the sciences. When Einstein was stymied in his pursuit of the field equations for general relativity, he would often pull out his violin and play Mozart. The music, he said, helped to connect him to the harmonies of our cosmos. At the end of many of his product presentations, Steve Jobs would display a slide that showed the intersection of streets labeled "Liberal Arts" and "Technology." He knew that at such crossroads lay creativity.

There is a flip side for those of us who love the arts and humanities. Like Leonardo, we must be able to see and embrace the beauty of a mathematical equation or a scientific theory. Cultural critics who complain that today's students fail to learn Shakespeare or civics or history should not be complacent about their own cluelessness when it comes to, say, what a transistor does or how a circuit processes logical sequences. All of these topics are valuable and enriching, especially when we can connect them to one another.

The best reason to learn from Leonardo, however, is not to get a better job but to live a better life. Having immersed myself in his world for several years, I have resolved to be more observant of phenomena that I used to ignore. When I see sunlight hitting drapes, I push myself to pause and look at the way the shadows caress the folds. I notice how the glint of a lustrous spot on a shiny surface moves when I tilt my head. When I can't understand a math concept, I do the best I can to visualize it.

The rewards have a very real human dimension as well. At a supper with a group of compelling guests, I now try to study the relationship of their motions to their emotions, as if having to capture them on a canvas. And when I see the hint of a smile come across the lips of an acquaintance, I try for a moment, as Leonardo would, to fathom her inner mysteries.

This essay is adapted from Mr. Isaacson's new biography, "Leonardo da Vinci," which will be published in October by Simon & Schuster. His previous books include "Steve Jobs," "Einstein: His Life and Universe," and "Benjamin Franklin: An American Life."

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