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# How To Be Creative

*The image of the 'creative type' is a myth. Jonah Lehrer on why anyone can innovate—and why a hot shower, a cold beer or a trip to your colleague's desk might be the key to your next big idea.*

By JONAH LEHRER

Creativity can seem like magic. We look at people like Steve Jobs and Bob Dylan, and we conclude that they must possess supernatural powers denied to mere mortals like us, gifts that allow them to imagine what has never existed before. They're "creative types." We're not.



The myth of the "creative type" is just that—a myth, argues Jonah Lehrer. In an interview with WSJ's Gary Rosen he explains the evidence suggesting everyone has the potential to be the next Milton Glaser or Yo-Yo Ma.

"breathed upon.") Even in modern times, scientists have paid little attention to the sources of creativity.

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applies to particular sorts of problems and is coaxed to action in a particular way.

But creativity is not magic, and there's no such thing as a creative type. Creativity is not a trait that we inherit in our genes or a blessing bestowed by the angels. It's a skill. Anyone can learn to be creative and to get better at it. New research is shedding light on what allows people to develop world-changing products and to solve the toughest problems. A surprisingly concrete set of lessons has emerged about what creativity is and how to spark it in ourselves and our work.

The science of creativity is relatively new. Until the Enlightenment, acts of imagination were always equated with higher powers. Being creative meant channeling the muses, giving voice to the gods. ("Inspiration" literally means

But over the past decade, that has begun to change.

Imagination was once thought to be a single thing, separate from other kinds of cognition. The latest research suggests that this assumption is false. It turns out that we use "creativity" as a catchall term for a variety of cognitive tools, each of which

Does the challenge that we're facing require a moment of insight, a sudden leap in consciousness? Or can it be solved gradually, one piece at a time? The answer often determines whether we should drink a beer to relax or hop ourselves up on Red Bull, whether we take a long shower or stay late at the office.

The new research also suggests how best to approach the



Philip Montgomery for The Wall Street Journal; Illustrations by Serge Bloch

It isn't a trait that we inherit in our genes or a blessing bestowed on us by the angels. It's a skill that anyone can learn and work to improve.

thorniest problems. We tend to assume that experts are the creative geniuses in their own fields. But big breakthroughs often depend on the naive daring of outsiders. For prompting creativity, few things are as important as time devoted to cross-pollination with fields outside our areas of expertise.

Let's start with the hardest problems, those challenges that at first blush seem impossible. Such problems are typically solved (if they are solved at all) in a moment of insight.

Consider the case of Arthur Fry, an engineer at 3M in the paper products division. In the winter of 1974, Mr. Fry attended a presentation by Sheldon Silver, an engineer working on adhesives. Mr. Silver had developed an extremely weak glue, a paste so feeble it could barely hold two pieces of paper

together. Like everyone else in the room, Mr. Fry patiently listened to the presentation and then failed to come up with any practical applications for the compound. What good, after all, is a glue that doesn't stick?

On a frigid Sunday morning, however, the paste would re-enter Mr. Fry's thoughts, albeit in a rather unlikely context. He sang in the church choir and liked to put little pieces of paper in the hymnal to mark the songs he was supposed to sing. Unfortunately, the little pieces of paper often fell out, forcing Mr. Fry to spend the service frantically thumbing through the book, looking for the right page. It seemed like an unfixable problem, one of those ordinary hassles that we're forced to live with.

But then, during a particularly tedious sermon, Mr. Fry had an epiphany. He suddenly realized how he might make use of that weak glue: It could be applied to paper to create a reusable bookmark! Because the adhesive was barely sticky, it would adhere to the page but wouldn't tear it when removed. That revelation in the church would eventually result in one of the most widely used office products in the world: the Post-it Note.

Mr. Fry's invention was a classic moment of insight. Though such events seem to spring from nowhere, as if the cortex is surprising us with a breakthrough, scientists have begun studying how they occur. They do this by giving people "insight" puzzles, like the one that follows, and watching what happens in the brain:

*A man has married 20 women in a small town. All of the women are still alive, and none of them is divorced. The man has broken no laws. Who is the man?*

If you solved the question, the solution probably came to you in an incandescent flash: The man is a priest. Research led by Mark Beeman and John Kounios has identified where that flash probably came from. In the seconds before the insight appears, a brain area called the superior anterior temporal gyrus (aSTG) exhibits a sharp spike in activity. This region, located on the surface of the right hemisphere, excels at drawing together distantly related information, which is precisely what's needed when working on a hard creative problem.

Interestingly, Mr. Beeman and his colleagues have found that certain factors make people much more likely to have an insight, better able to detect the answers generated by the aSTG. For instance, exposing subjects to a short, humorous video—the scientists use a clip of Robin Williams doing stand-up—boosts the average success rate by about 20%.

Alcohol also works. Earlier this year, researchers at the University of Illinois at Chicago compared performance on insight puzzles between sober and intoxicated students. The scientists gave the subjects a battery of word problems known as remote associates, in which people have to find one additional word that goes with a triad of words. Here's a sample problem:

*Pine Crab Sauce*

In this case, the answer is "apple." (The compound words are pineapple, crab apple and apple sauce.) Drunk students solved nearly 30% more of these word problems than their sober peers.

What explains the creative benefits of relaxation and booze? The answer involves the surprising advantage of not paying attention. Although we live in an age that worships focus—we are always forcing ourselves to concentrate, chugging caffeine—this approach can inhibit the imagination. We might be focused, but we're probably focused on the wrong answer.

And this is why relaxation helps: It isn't until we're soothed in the shower or distracted by the stand-up comic that we're able to turn the spotlight of attention inward, eavesdropping on all those random associations unfolding in the far reaches of the brain's right hemisphere. When we need an insight, those associations are often the source of the answer.

This research also explains why so many major breakthroughs happen in the unlikeliest of places, whether it's Archimedes in the bathtub or the physicist Richard Feynman scribbling equations in a strip club, as he was known to do. It reveals the wisdom of Google putting ping-pong tables in the lobby and confirms the practical benefits of daydreaming. As Einstein once declared, "Creativity is the residue of time wasted."

Of course, not every creative challenge requires an epiphany; a relaxing shower won't solve every problem. Sometimes, we just need to keep on working, resisting the temptation of a beer-fueled nap.

There is nothing fun about this kind of creativity, which consists mostly of sweat and failure. It's the red pen on the page and the discarded sketch, the trashed prototype and the failed first draft. Nietzsche referred to this as the "rejecting process," noting that while creators like to brag about their big epiphanies, their everyday reality was much less romantic. "All great artists and thinkers are great workers," he wrote.

This relentless form of creativity is nicely exemplified by the legendary graphic designer Milton Glaser, who engraved the slogan "Art is Work" above his office door. Mr. Glaser's most famous design is a tribute to this work ethic. In 1975, he accepted an intimidating assignment: to create a new ad campaign that would rehabilitate the image of New York City, which at the time was falling apart.

Mr. Glaser began by experimenting with fonts, laying out the tourist slogan in a variety of friendly typefaces. After a few weeks of work, he settled on a charming design, with "I Love New York" in cursive, set against a plain white background. His proposal was quickly approved. "Everybody liked it," Mr. Glaser says. "And if I were a normal person, I'd stop thinking about the project. But I can't. Something about it just doesn't feel right."

So Mr. Glaser continued to ruminate on the design, devoting hours to a project that was supposedly finished. And then, after another few days of work, he was sitting in a taxi, stuck in midtown traffic. "I often carry spare pieces of paper in my pocket, and so I get the paper out and I start to draw," he remembers. "And I'm thinking and drawing and then I get it. I see the whole design in my head. I see the typeface and the big round red heart smack dab in the middle. I know that this is how it should go."

The logo that Mr. Glaser imagined in traffic has since become one of the most widely imitated works of graphic art in the world. And he only discovered the design because he refused to stop thinking about it.

But this raises an obvious question: If different kinds of creative problems benefit from different kinds of creative thinking, how can we ensure that we're thinking in the right way at the right time? When should we daydream and go for a relaxing stroll, and when should we keep on sketching and toying with possibilities?

The good news is that the human mind has a surprising natural ability to assess the kind of creativity we need. Researchers call these intuitions "feelings of knowing," and they occur when we suspect that we can find the answer, if only we keep on thinking. Numerous studies have demonstrated that, when it comes to problems that don't require insights, the mind is remarkably adept at assessing the likelihood that a problem can be solved—knowing whether we're getting "warmer" or not, without knowing the solution.

This ability to calculate progress is an important part of the creative process. When we don't feel that we're getting closer to the answer—we've hit the wall, so to speak—we probably need an insight. If there is no feeling of knowing, the most productive thing we can do is forget about work for a while. But when those feelings of knowing are telling us that we're getting close, we need to keep on struggling.

Of course, both moment-of-insight problems and nose-to-the-grindstone problems assume that we have the answers to the creative problems we're trying to solve somewhere in our heads. They're both just a matter of getting those answers out. Another kind of creative problem, though, is when you don't have the right kind of raw material kicking around in your head. If you're trying to be more creative, one of the most important things you can do is increase the volume and diversity of the information to which you are exposed.

Steve Jobs famously declared that "creativity is just connecting things." Although we think of inventors as dreaming up breakthroughs out of thin air, Mr. Jobs was pointing out that even the most far-fetched concepts are usually just new combinations of stuff that already exists. Under Mr. Jobs's leadership, for instance, Apple didn't invent MP3 players or tablet computers—the company just made them better, adding design features that were new to the product category.

And it isn't just Apple. The history of innovation bears out Mr. Jobs's theory. The Wright Brothers transferred their background as bicycle manufacturers to the invention of the airplane; their first flying craft was, in many respects, just a bicycle with wings. Johannes Gutenberg transformed his knowledge of wine presses into a printing machine capable of mass-producing words. Or look at Google: Larry Page and Sergey Brin came up with their famous search algorithm by applying the ranking method used for academic articles (more citations equals more influence) to the sprawl of the Internet.

How can people get better at making these kinds of connections? Mr. Jobs argued that the best inventors seek out "diverse experiences," collecting lots of dots that they later link together. Instead of developing a narrow specialization, they study, say, calligraphy (as Mr. Jobs famously did) or hang out with friends in different fields. Because they don't know where the answer will come from, they are willing to look for the answer everywhere.

Recent research confirms Mr. Jobs's wisdom. The sociologist Martin Ruef, for instance, analyzed the social and business relationships of 766 graduates of the Stanford Business School, all of whom had gone on to start their own companies. He found that those entrepreneurs with the most diverse friendships scored three times higher on a metric of innovation. Instead of getting stuck in the rut of conformity, they were able to translate their expansive social circle into profitable new concepts.

Many of the most innovative companies encourage their employees to develop these sorts of diverse networks, interacting with colleagues in totally unrelated fields. Google hosts an internal conference called Crazy Search Ideas—a sort of grown-up science fair with hundreds of posters from every conceivable field. At 3M, engineers are typically rotated to a new division every few years. Sometimes, these rotations bring big payoffs, such as when 3M realized that the problem of laptop battery life was really a problem of energy used up too quickly for illuminating the screen. 3M researchers applied their knowledge of see-through adhesives to create an optical film that focuses light outward, producing a screen that was 40% more efficient.

Such solutions are known as "mental restructurings," since the problem is only solved after someone asks a completely new kind of question. What's interesting is that expertise can inhibit such restructurings, making it harder to find the breakthrough. That's why it's important not just to bring new ideas back to your own field, but to actually try to solve problems in other fields—where your status as an outsider, and ability to ask naive questions, can be a tremendous advantage.

This principle is at work daily on InnoCentive, a crowdsourcing website for difficult scientific questions. The structure of the site is simple: Companies post their hardest R&D problems, attaching a monetary reward to each "challenge." The site features problems from hundreds of organization in eight different scientific

categories, from agricultural science to mathematics. The challenges on the site are incredibly varied and include everything from a multinational food company looking for a "Reduced Fat Chocolate-Flavored Compound Coating" to an electronics firm trying to design a solar-powered computer.

The most impressive thing about InnoCentive, however, is its effectiveness. In 2007, Karim Lakhani, a professor at the Harvard Business School, began analyzing hundreds of challenges posted on the site. According to Mr. Lakhani's data, nearly 30% of the difficult problems posted on InnoCentive were solved within six months. Sometimes, the problems were solved within days of being posted online. The secret was outsider thinking: The problem solvers on InnoCentive were most effective at the margins of their own fields. Chemists didn't solve chemistry problems; they solved molecular biology problems. And vice versa. While these people were close enough to understand the challenge, they weren't so close that their knowledge held them back, causing them to run into the same stumbling blocks that held back their more expert peers.

It's this ability to attack problems as a beginner, to let go of all preconceptions and fear of failure, that's the key to creativity.

The composer Bruce Adolphe first met Yo-Yo Ma at the Juilliard School in New York City in 1970. Mr. Ma was just 15 years old at the time (though he'd already played for J.F.K. at the White House). Mr. Adolphe had just written his first cello piece. "Unfortunately, I had no idea what I was doing," Mr. Adolphe remembers. "I'd never written for the instrument before."

Mr. Adolphe had shown a draft of his composition to a Juilliard instructor, who informed him that the piece featured a chord that was impossible to play. Before Mr. Adolphe could correct the music, however, Mr. Ma decided to rehearse the composition in his dorm room. "Yo-Yo played through my piece, sight-reading the whole thing," Mr. Adolphe says. "And when that impossible chord came, he somehow found a way to play it."

Mr. Adolphe told Mr. Ma what the professor had said and asked how he had managed to play the impossible chord. They went through the piece again, and when Mr. Ma came to the impossible chord, Mr. Adolphe yelled "Stop!" They looked at Mr. Ma's left hand—it was contorted on the fingerboard, in a position that was nearly impossible to hold. "You're right," said Mr. Ma, "you *really* can't play that!" Yet, somehow, he did.

When Mr. Ma plays today, he still strives for that state of the beginner. "One needs to constantly remind oneself to play with the abandon of the child who is just learning the cello," Mr. Ma says. "Because why is that kid playing? He is playing for pleasure."

Creativity is a spark. It can be excruciating when we're rubbing two rocks together and getting nothing. And it can be intensely satisfying when the flame catches and a new idea sweeps around the world.

For the first time in human history, it's becoming possible to see how to throw off more sparks and how to make sure that more of them catch fire. And yet, we must also be honest: The creative process will never be easy, no matter how much we learn about it. Our inventions will always be shadowed by uncertainty, by the serendipity of brain cells making a new connection.

Every creative story is different. And yet every creative story is the same: There was nothing, now there is something. It's almost like magic.

—Adapted from "Imagine: How Creativity Works" by Jonah Lehrer, to be published by Houghton Mifflin Harcourt on March 19. Copyright © 2012 by Jonah Lehrer.

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## *10 Quick Creativity Hacks*

### *1. Color Me Blue*

A 2009 study found that subjects solved twice as many insight puzzles when surrounded by the color blue, since it leads to more relaxed and associative thinking. Red, on other hand, makes people more alert and aware, so it

is a better backdrop for solving analytic problems.

## 2. Get Groggy

According to a study published last month, people at their least alert time of day—think of a night person early in the morning—performed far better on various creative puzzles, sometimes improving their success rate by 50%. Grogginess has creative perks.



Serge Bloch

#3 Don't Be Afraid to Daydream



Serge Bloch

When people are exposed to a short video of stand-up comedy, they solve about 20% more insight puzzles.



Serge Bloch

According to a new study, volunteers performed significantly better on a standard test of creativity when they were seated outside a 5-foot-square workspace, perhaps because they internalized the

## 3. Daydream Away

Research led by Jonathan Schooler at the University of California, Santa Barbara, has found that people who daydream more score higher on various tests of creativity.

## 4. Think Like A Child

When subjects are told to imagine themselves as 7-year-olds, they score significantly higher on tests of divergent thinking, such as trying to invent alternative uses for an old car tire.

## 5. Laugh It Up

When people are exposed to a short video of stand-up comedy, they solve about 20% more insight puzzles.

## 6. Imagine That You Are Far Away

Research conducted at Indiana University found that people were much better at solving insight puzzles when they were told that the puzzles came from Greece or California, and not from a local lab.

## 7. Keep It Generic

One way to increase problem-solving ability is to change the verbs used to describe the problem. When the verbs are extremely specific, people think in narrow terms. In contrast, the use of more generic verbs—say, "moving" instead of "driving"—can lead to dramatic increases in the number of problems solved.

## 8. Work Outside the Box

According to new study, volunteers performed significantly better on a standard test of creativity when they were seated outside a 5-foot-square workspace, perhaps because they internalized the metaphor of thinking outside the box. The lesson? Your cubicle is holding you back.

## 9. See the World

According to research led by Adam Galinsky, students who have lived abroad were much more likely to solve a classic insight puzzle. Their experience of another culture endowed them with a valuable open-mindedness. This effect also applies to professionals: Fashion-house directors who have lived in many countries produce clothing that their peers rate as far more creative.

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Your cubicle is holding you back.

## *10. Move to a Metropolis*

Physicists at the Santa Fe Institute have found that moving from a small city to one that is twice as large leads inventors to produce, on average, about 15% more patents.

—Jonah Lehrer

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