

GOING WITH THE FLOW

You can rev your creative engines with the heightened focus of the flow state. Here's how to get there.

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BY JASON TEICH

Studies show that creativity is the most important skill for success in the 21st century, yet training people to be creative has proven surprisingly difficult. What can ordinary people do to boost their creativity and give themselves the best chance to succeed in this modern world? Important answers come from Steven Kotler, research director of the Flow Genome Project and coauthor, with psychologist Jamie

Wheal, of *Stealing Fire: How Silicon Valley, the Navy SEALs, and Maverick Scientists Are Revolutionizing the Way We Live and Work*. The special groups covered in his book, Kotler states, are trained to enter “flow states”—moments of heightened focus, ingenuity, insight and creativity. And now, with a series of techniques from daily reading to constant feedback from others, the rest of us can strive for true creative leaps and mastery as well.



Those light-bulb moments of pure creativity often require a state of deep focus and immersion.

Q Can you explain what flow is?

The psychological definition, which has existed forever, is an “optimal state of consciousness,” one in which we feel and perform our best. More specifically, it refers to those moments of rapt attention and total absorption, where we get so focused on the task at hand that everything else just disappears: Your sense of self vanishes; time passes strangely, either speeding up or slowing down. Concentration becomes focused on the here and now, and all aspects of performance, both mental and physical, go through the roof.

Q What specific brain processes make flow happen?

This is open to debate, but I tend to agree with Arne Dietrich, who wrote a great book on the neuroscience of creativity. He thinks that there are three different systems for creativity, with flow being one them. If you look at the neurobiology of flow, two things happen that are really important. The first is deactivation of large swaths of the prefrontal cortex. This was shown with EEG [brain wave] studies on chess players back in the '70s and was well-validated by Charles Limb's imaging work with improv jazz musicians at Johns Hopkins. The same study was redone with rappers, based on really good imaging data from fMRI [functional

magnetic resonance imaging]. What happens during flow is that large swaths of the prefrontal cortex, including the dorsolateral prefrontal cortex, are deactivated. This is a big deal, because the inner critic—that defeatist voice in your head—essentially lives in your dorsolateral prefrontal cortex.

Q So self-criticism is damped down?

In flow, huge nonessential portions of the prefrontal cortex come offline and wink out in flow. It's an efficiency exchange: In flow, we trade away energy that would normally go to run other systems so that the brain can put more and more energy into keeping attention focused on the task at hand. One thing that happens as a result of this is that creativity goes through the roof, because you no longer judge every idea you have and can instead go from idea to idea to idea.

Q Are we seeing changes in brain chemistry as well?

You get a huge boost neurochemically. Increases in neurotransmitters norepinephrine and dopamine, in endorphins, anandamide and, possibly, serotonin and oxytocin all show up in flow. These chemicals surround the brain's information-processing machinery. Creativity is a recombinatory skill. It's what happens when the brain takes in novel information and combines it with older stuff in new

ways to create something startlingly new. That's essentially the mechanistic definition of creativity, and neurochemicals surround this system.

Q Is the brain working faster?

In this state, we take in more information per second, so data acquisition goes up. We pay more attention to that incoming information. We find faster connections between that incoming information and older ideas, so pattern recognition increases.

Q Can you discuss the history of the flow state?

Flow has been associated with heightened creativity

going all the way back to the 1890s. Psychologists William James and Abraham Maslow and others talked about how creativity spiked with flow. But the first rigorous experiments on flow were performed by Peter Brugger at the University of Zurich. He discovered that during flow, you generate dopamine and norepinephrine, the brain's primary focusing chemicals, which heighten pattern recognition. That's why flow is such a big deal in creativity, since creativity itself is pattern recognition. When you link ideas together, like figuring out a crossword answer, it's a flow trigger, because you get a little rush of

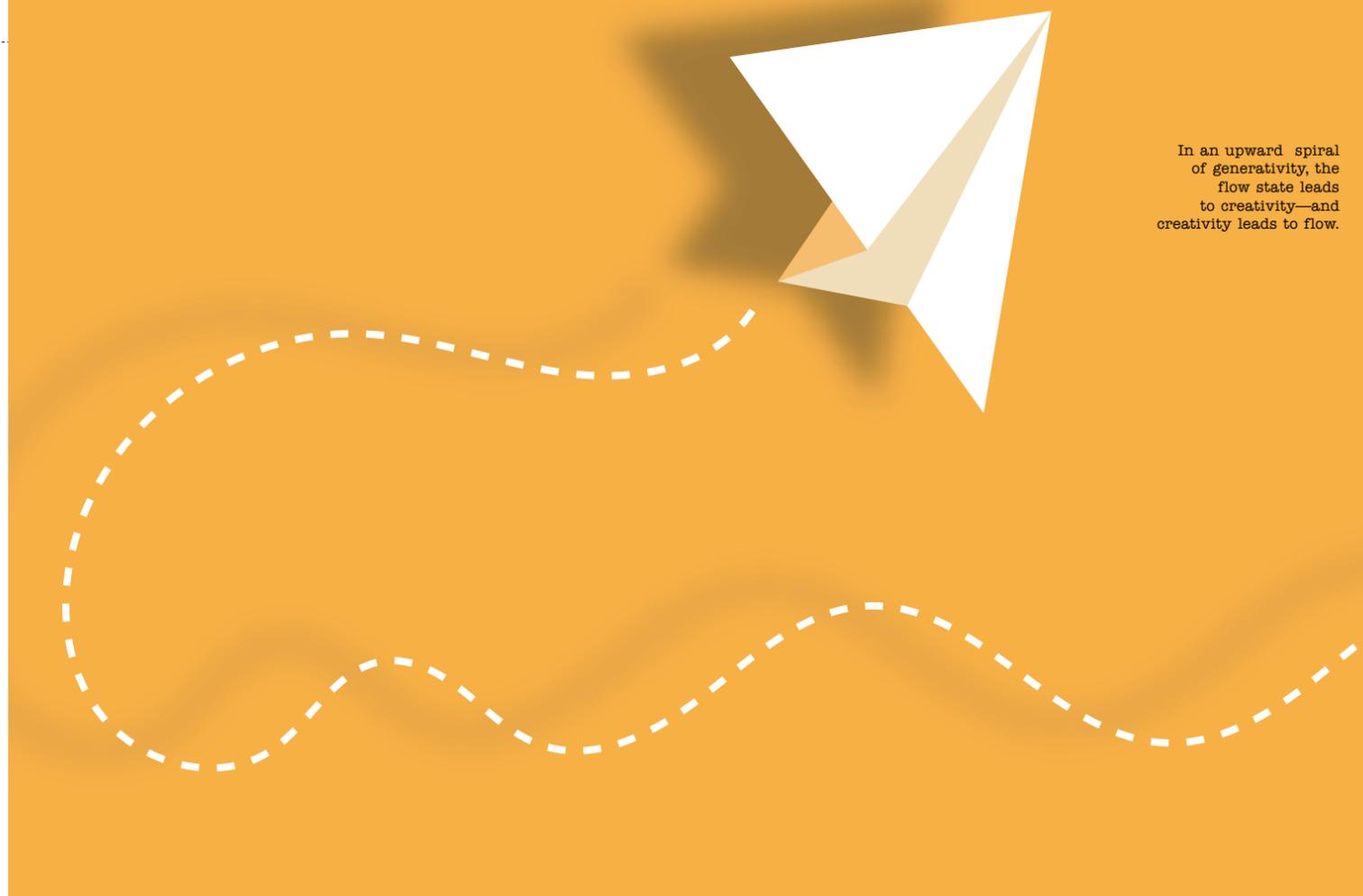
pleasure—of dopamine. Once it gets into your system, it amplifies focus, so you see more patterns. That's why creative ideas spiral...and why figuring out a crossword answer usually leads to figuring out a couple more right after that. That's dopamine-enhancing pattern recognition. This means that flow produces creativity and creativity produces flow, in a positive feedback loop.

Q How has the flow state been tested experimentally?

At the University of Sydney, in 2012, Alan Snider and Richard Chi did a study using the classic Nine Dot Problem, asking subjects to connect

nine dots with four lines in 10 minutes, without lifting their pencil from the paper. They used transcranial direct-current stimulation—electric pulse—to temporarily knock out the prefrontal cortex and induce a partial flow state that lasted 20 to 40 minutes. Zero subjects solved the problem outside flow state; but in the group that got shocked with flow, more than 40 percent, 14 out of 33, solved the problem—many of them in record time. That's a 460 percent problem-solving boost in flow. It's startling. The United States Department of Defense found that the target-acquisition skills of snipers improved by 230

In an upward spiral of generativity, the flow state leads to creativity—and creativity leads to flow.



When you enter flow, time can speed up or slow down.

percent when they entered the flow state.

Q Can you paint a deeper picture of what is happening in the brain? You've said that brainwaves play a role.

Your brainwaves drop from beta waves, which are normal brain waves, down to the borderline of alpha and theta waves. Alpha is daydreaming mode, where you're going from thought to thought, without much internal resistance. Theta, which is a level below alpha, is where you're in REM [dream] sleep. If you're in alpha and you think about a green sweater, it may remind you that you have to do laundry. But if you're in theta and you think about a green sweater, it may suddenly become a green elephant, then a green planet, then the cosmos, with no internal resistance. Even though flow takes place on the borderline between alpha and theta, you go back up to beta whenever you make a decision. But people in deep flow always drop back down to the alpha-theta borderline after a decision has been made.

Q What is the aha moment?

The aha moment is the laying down of new neural pathways. Here, gamma waves are coupled with theta waves that normally occur during dream sleep. Gamma shows up when a bunch of far-flung ideas come together for the first time and carve a new neural pathway in your

brain. But you can access gamma only if you're already in theta. And waking-state theta waves are rare, unless you're a monk with years of meditation practice or are in the middle of falling asleep. That's why Thomas Edison used to fall asleep in a chair with silver balls in his hand—as soon as the balls dropped out of his hand and hit the floor, he'd run to his desk and start writing. He was trying to access theta waves, because that's where you get deep insights. Flow takes place on the alpha-theta borderline, making it the only state of consciousness where you are neurobiologically perched on the edge of an aha moment at every second... which is really amazing.

Q So should we just seek aha moments and trust the intuitions and epiphanies that come from flow?

No. Study after study suggests you shouldn't trust your intuition unless you're an expert, because without expertise, you'll never get around your own cognitive biases. In flow, you are at certain disadvantages with the prefrontal cortex deactivated: Long-term planning and a lot of your logical left-brain decision making are shut down. And you have so much dopamine in your system, you think every idea is a great idea, which is dumb. So your creativity spikes, but

Flow sans a chaser of logic can hurt a plan.

there are limits. You certainly don't want to creatively plan your future in flow without revising that plan out of flow. When I teach writing in flow, I always tell people: Write in flow if you can but edit out of flow, because in flow, every idea seems great.

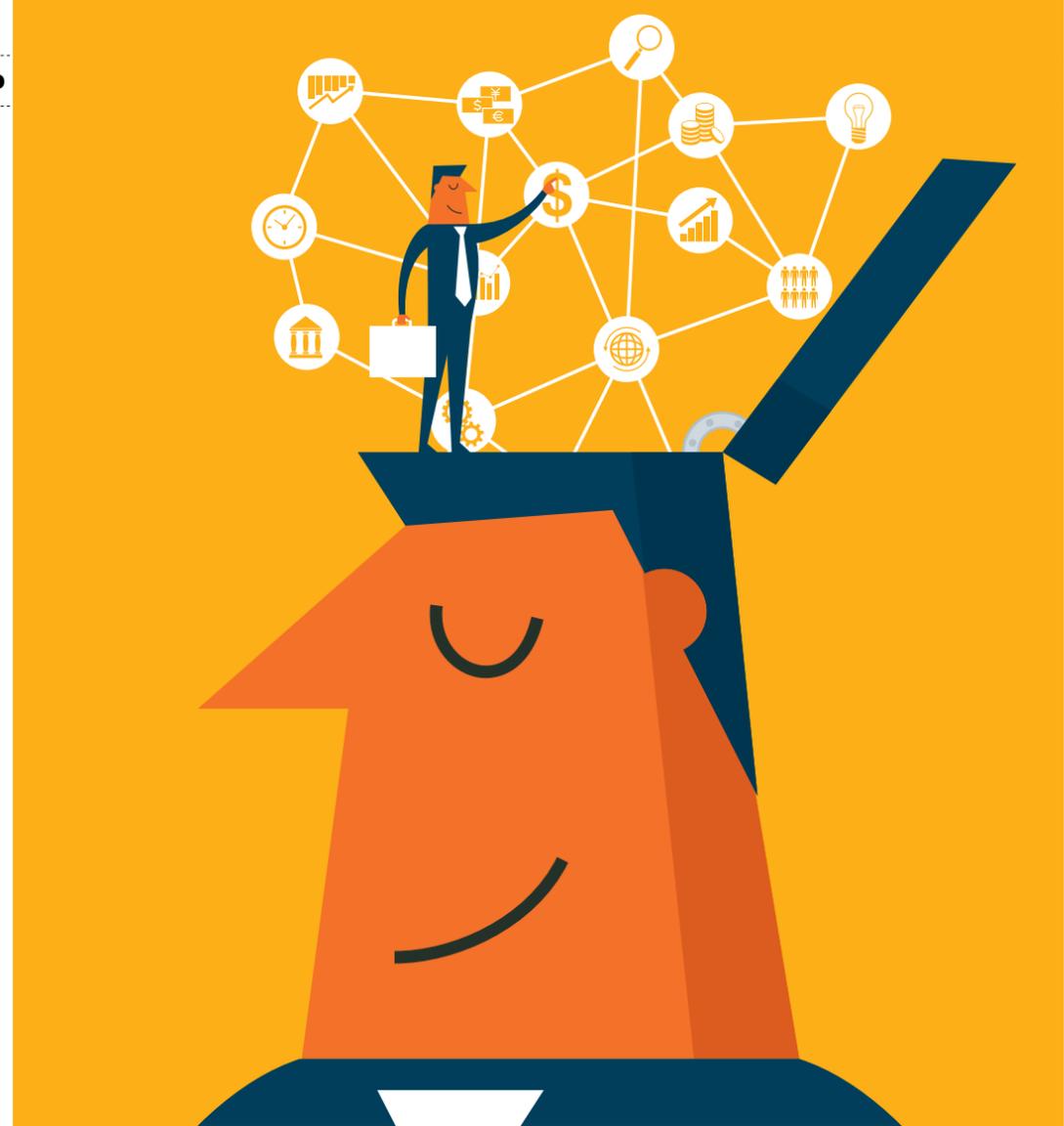
Q How long does the heightened creativity of the flow state last?

Teresa Amabile did a study at Harvard showing that the heightened creativity outlasts the flow state by a day or two. Not only does creativity spike in flow, but the state

actually trains the brain to think more creatively over the long haul.

Q What can we do to achieve flow without getting our brains zapped or taking drugs?

According to our preliminary pilot study, done with Mike Gervais at USC, there are three flow triggers—three things everyone needs to do. One is to focus intensely on the present moment: No distractions, cell phones off, Internet off. The research suggests we need 90 to 120 minutes without disruptions to maximize creative flow.



Q What's the second flow trigger?

The second flow trigger is immediate and frequent feedback. One example is writers working with editors. If I'm writing a book or story, I'm lucky if I get my editor's attention twice over the course of the whole process. I'm twice as lucky if they actually give me their undivided attention and I receive the highest-quality feedback possible. That's why I have a guy on my staff who reads everything I write two days after I write it. I write it. I edit it. He reads it, because I need as much immediate feedback as I can get, since that lets me stay in flow over the long haul.

Q What's the third flow trigger?

The third flow trigger is challenge-skills balance. We produce the most flow when the challenge of the task at hand slightly exceeds our skill set. Stretch but don't snap. For example, I tell writers who are facing a deadline to write it in the voice of an author they love. It raises the challenge level, which raises focus, which drives flow.

Q Are there any other ways for ordinary people to achieve and to maximize flow?

I advise people to read 25 to 50 pages a day of nonfiction outside their discipline but in fields that they're interested in and curious about. This feeds your

pattern-recognition system. It primes your brain with the raw materials to make connections between ideas. Books are best for this, because their information density is simply greater than blogs or magazine articles.

Q Why is it so important for us to study flow in the current era?

Creativity is the most important skill for success in the 21st century, and it's at the top of things your kids need to know to thrive in school. IBM did a survey of 1,400 CEOs in 2014 about the quality most important in a CEO. Creativity topped almost everybody's list. But we absolutely suck at training people to be more creative, because we keep trying to train sets of skills instead of states of mind. That's been the issue, and it's changing. We're starting to figure out that if you want to amplify creativity, you have to alter consciousness.

There are lots of ways to do this: technological, pharmacological and psychological. The psychological techniques are the ones I prefer. If you're creative for a living, you don't want your creativity to depend on a technology or a substance. What if you can't get the substance or the technology? That's insane—so I always train the people I work with to use psychological triggers for achieving flow, because everybody has them all the time.

The Ultimate Flow Chart

The psychological concept of the flow state was framed in 1975 by the Hungarian American psychologist Mihaly Csikszentmihalyi, whose ideas were expressed in his best-selling book, *Flow: The Psychology of Optimal Experience*. It was Csikszentmihalyi and collaborators who depicted an essential aspect of the experience through the basic chart below. Here, skill level runs from low to high along the bottom, or X, axis; challenge level—the degree of difficulty above and beyond your skill—runs from low to high up the left, or Y, axis. This chart speaks for itself. Low skill and high

challenge result in nothing but anxiety, worry and apathy. Low skill paired with low challenge leads to boredom, as one would expect. In fact, just one triangle of the eight colored spaces shown lead us into flow—the zone, that state of hyperfocus where skill has already been honed and challenge leads us higher without throwing us off-course. But keep in mind: passive activities, like streaming a movie or watching the sunset may soothe us, but they're not likely to catapult us to flow. For that, we should actively be creating something with specific intent, Csikszentmihalyi explains.

