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THE DARK CORE OF PERSONALITY

Nine factors can
determine how
malevolent you are

PLUS

- A simple trick for self-control
- Detecting consciousness
- The art of the brain





FROM THE EDITOR

Beyond Intelligence

At 14 years old, I switched schools to a much larger, public institution and was required to take intelligence and reasoning tests so the guidance counselors could place me in the appropriate-level courses. I remember little about those tests—perhaps they contained spatial reasoning questions, perhaps basic logic questions. At the end, the results declared my aptitude, and I was channeled into high school life.

For more than a century we've known that under the correct conditions we can accurately determine individual cognitive ability. But in the future, might we also assess a child's nature using newfound tests, such as the one described by Scott Barry Kaufman in "[The Dark Core of Personality](#)"? Would we provide different resources to students who scored high in the malevolence category, for example? Would we steer them away from careers in politics or medicine? For more insight, read Kaufman's piece and take the nine-question quiz to determine how wicked you are.

Elsewhere in this issue, researchers are investigating the power of ritual to alter behavior (see "[Need More Self-Control? Try a Simple Ritual](#)"). Anouk Bercht interviews neuroscientist Steven Laureys about the latest tools for detecting consciousness in comatose patients (see "[How Can We Tell If a Comatose Patient Is Conscious?](#)"). And in one of my favorite features of the year, we present the colorful winners of the Art of Neuroscience competition, an annual contest directed by the Netherlands Institute for Neuroscience (see "[Prize-Winning Images of the Brain](#)"). Human behavior can indeed be smart, ugly, altruistic or mean, but all brains have their beauty.

As always, we love to hear from you!

Andrea Gawrylewski

Collections Editor: editors@sciam.com

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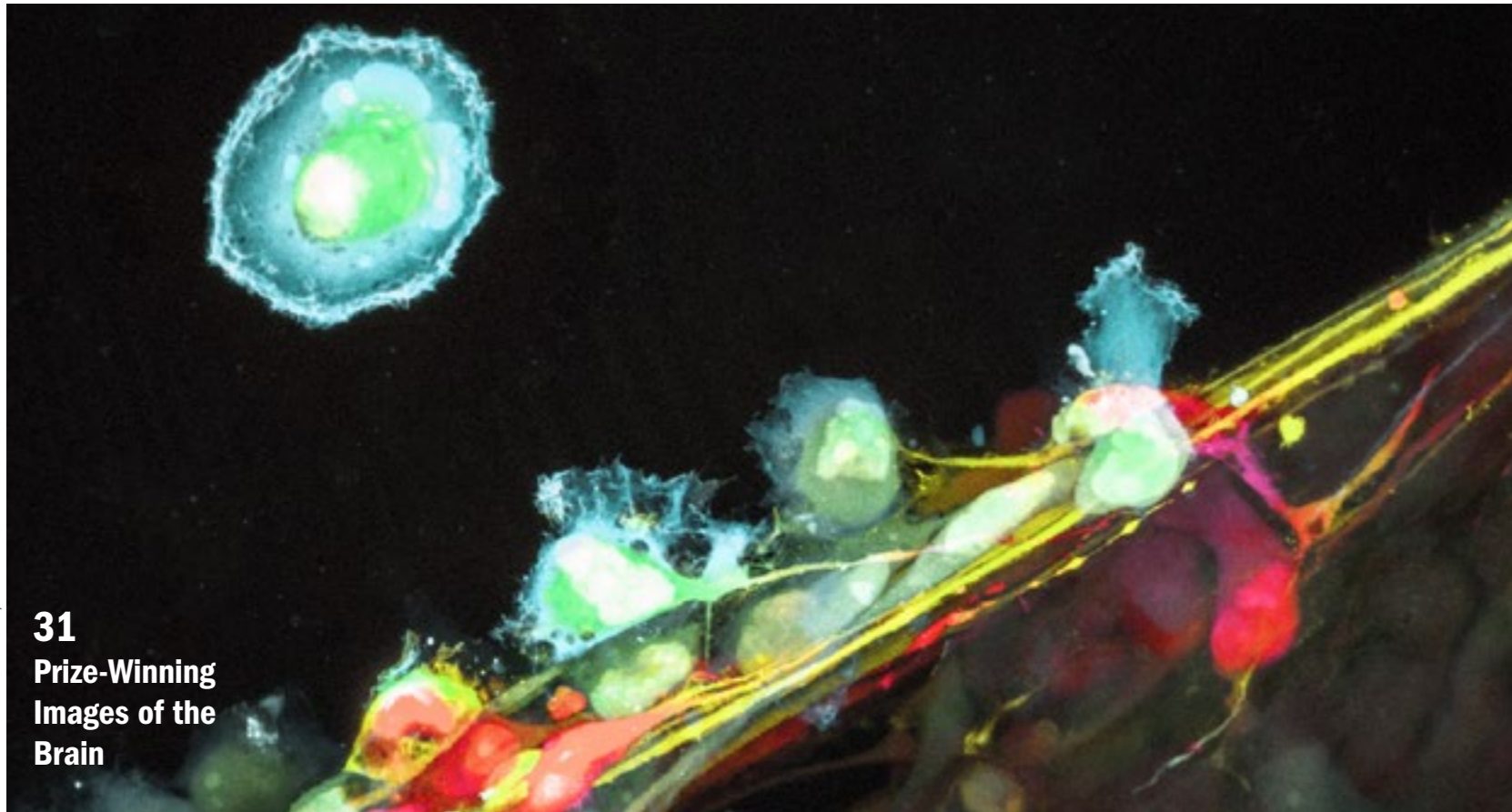
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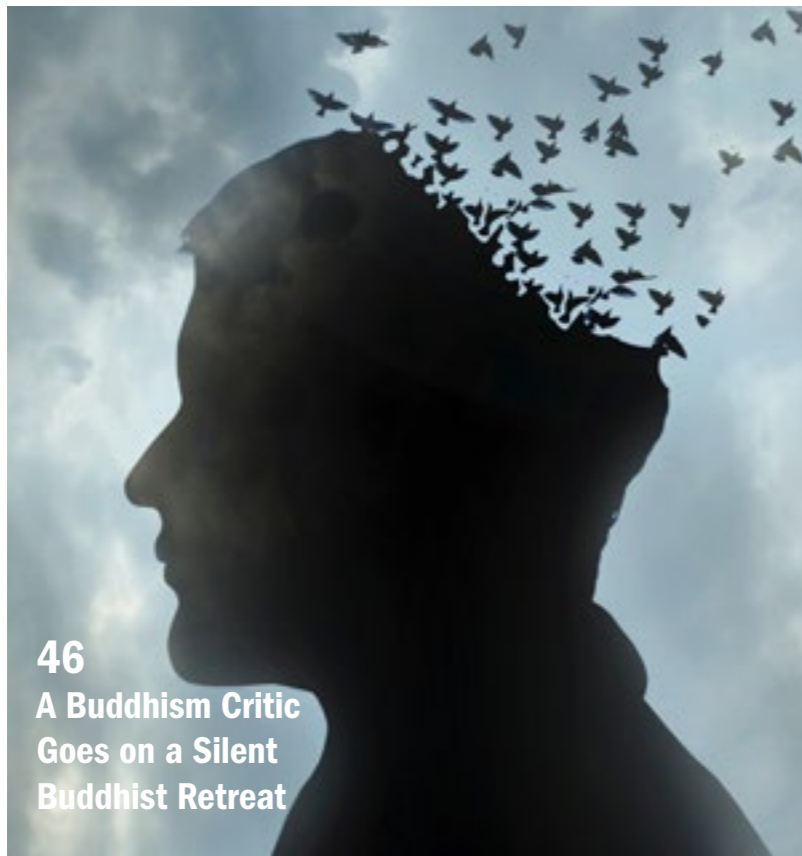
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NEWS

Why Hostility Can Bring People Closer Together

The surprising power of “hostile mediators”

FROM FAMILY FEUDS TO CORPORATE conflicts, when people find themselves in difficult disputes, they often turn to mediation. Manuals on effective mediation suggest that a mediator should listen attentively to each person involved and express empathy with their viewpoints, no matter how different from one another they are. Mediators are advised to avoid appearing to favor the ideas of one side, and to make each person involved feel at ease and confident that they are being understood. Establishing this rapport is a commonly espoused “best practice” for gaining trust and facilitating conflict resolution. Indeed, surveys of professional mediators confirm that they commonly adopt these recommended tactics.

Surprisingly, however, new research that my colleagues and I conducted suggests that, to effectively help people resolve their conflicts, mediators should adopt a hostile attitude rather than a calming one. A hostile mediator, we find, induces better results than a nice one.

Why would adding more negativity to an already hostile situation prove beneficial? Consider how parents typically react when they can't get their children to stop

Why would adding more negativity to an already hostile situation prove beneficial?

quarreling: “I don't care who started it—both of you, go to your rooms!” At first blush, a calmer, more soothing approach seems likely to be more effective. But as anyone with siblings knows, parents' seemingly unsympathetic treatment of the situation can have an unusual effect. Siblings who moments before were threatening each other's lives suddenly become more reasonable in contrast to their tyrannical parents, and even end up playing nicely after their banishment to their rooms. In difficult disputes, a similar recipe—adding a hostile third party to an interaction between two hostile parties—can improve people's willingness to come to agreement, my research finds.

In our experiments, we created situations in which pairs of negotiators were part of a heated conflict. To get help resolving their issues, the negotiators could meet with a mediator. In some cases, the

mediator had a “nice” approach—calm and polite. In others, he was hostile—aggressive and somewhat rude. Across different types of conflicts, we found that negotiators were more willing and able to reach an agreement with their counterpart in the presence of a hostile mediator than in the presence of a nice or neutral one.

For instance, in one study, we gave 246 people one of three roles: the mediator or one of two negotiators. We created 79 groups of three and told mediators in these groups to act in either a nice or hostile way toward both negotiators. Negotiators received information about their roles, and then wrote about the strategies they would adopt in their future interactions. They first discussed their views and arguments in a mediator-led meeting within a virtual chat room during which they also had the option to send private messages to their counterparts. Next, negotiators had a second

opportunity to communicate with their counterpart virtually to discuss any remaining issues without the mediator. Finally, negotiators answered a few questions about their counterpart and the mediator.

Before the negotiation started, mediators sent messages to both negotiators based on the script they received from us. Hostile mediators sent more aggressive and mean-spirited messages (for example, “Now that the two of you have sufficiently wasted my time, I’m relieved I don’t have to hear more about your problems again”) than did nice mediators, who sent more understanding and encouraging messages (for instance, “Thank you for sharing your thoughts with me. I hope this was helpful to the both of you”).

We found that 85 percent of the negotiators who dealt with a hostile mediator reached an agreement with their counterpart, as compared to only 59 percent of those in the presence of a nice mediator.

The main implication of this research is not that hostility and incivility pay off. In fact, recent research in both psychology and management has documented the social costs of negative behavior. For instance, being the target of rude behaviors

“Now that the two of you have sufficiently wasted my time, I’m relieved I don’t have to hear more about your problems again.”

or social exclusion reduces people’s performance on a variety of tasks and their likelihood of helping others. In organizations, people who habitually set off negative emotions in others are perceived so negatively that others are more likely to seek help from a more amiable but less competent person. Similarly, when negotiators show anger, their counterparts view them less favorably, are less willing to interact with them in the future, and feel worse themselves. Other research demonstrates the social benefits of positive behaviors when we interact with others. For instance, negotiators who display positive emotions are more likely to close deals and engage in future business with their counterparts.

Despite the widespread social benefits

of positive behaviors and costs of negative ones, hostility can pay off in certain contexts when it is used to create a common enemy for people who are not seeing eye to eye. Finding a common enemy can help bring us together.

—FRANCESCA GINO



NEWS

How to Recover from Romantic Heartbreak

Use “negative reappraisal,” and understand you have work to do—time alone may not be enough

MELISSA AND J.J. MET ON THE FINISH line of an obstacle course race. “We were both winded and covered in mud, yet we still managed to flirt. It felt weirdly authentic,” Melissa told me in our first psychotherapy session. “He was into triathlons and obstacle courses like I was. We had very similar lifestyles.” Melissa and J.J. moved in together after eight months. A year and a half into the relationship, Melissa began raising the issue of marriage. J.J. didn’t feel ready. Soon thereafter, he broke up with her.

Melissa was a wreck. She cried for days and could barely function at work: “I’ll never find a better match for me. It was the best relationship I ever had.” Melissa came to see me after several months had passed, and J.J. was still all she could think about. “Aren’t my feelings supposed to fade?” She asked me. “Why does it still feel so painful?”

We’ve been experiencing heartbreak for millennia, and yet most of us still use the same coping and recovery mechanisms we did thousands of years ago: time, social support and, unfortunately, substances (for example, alcohol, drugs, food). Despite recent advances in our scientific understanding of how we are impacted by heartbreak,

“We were both winded and covered in mud, yet we still managed to flirt.”

little has changed in how we go about recovering from this emotionally devastating experience. As I describe in my book *How to Fix a Broken Heart*, the biggest mistake we make is that we go on “autopilot” and assume the only thing we can do to recover is give it time. Yes, time helps, as does social support, but new studies are verifying that there are all kinds of other steps we can and should take to soothe the emotional pain we feel and expedite our recovery.

A recent study in the *Journal of Experimental Psychology* examined cognitive and behavioral strategies for recovering from heartbreak. The premise of the study was that to recover from heartbreak we need to diminish our feelings of love for our ex-partner. While that might seem terribly obvious, consider that heartbreak often makes most of us do the opposite: We enact thoughts and behaviors that actually reinforce our love feelings (for example, stalking

our ex on social media, reliving our best moments, poring over old images and video of happy times). The goal of the study was to examine three kinds of emotional regulation strategies to see which of them would help heartbroken subjects reduce their love feelings.

In the first condition, subjects focused on negative reappraisals of their ex-partner (for example, by responding to prompts about their ex’s annoying habits). In the second condition, they were asked to reframe their loving feelings as less problematic (for example, by endorsing prompts such as “It’s okay to love someone I’m no longer with”). The last condition used distraction (for example, questions about the subjects’ favorite food) to get the participants’ mind off their heartbreak. The researchers found that only negative reappraisals were truly effective in reducing love feelings. Yet, doing so did increase

feelings of unpleasantness.

Unfortunately, it is those very feelings of “unpleasantness” that make it challenging to use negative reappraisals as a way to recover from heartbreak. We might accept, on an intellectual level, that by focusing on our ex’s faults we’re doing something important, but it can still *feel* wrong (unpleasant), unbalanced, unfair and even disloyal.

As a clinician, I’ve found that there are two things we can do to minimize these feelings of unpleasantness and thus feel freer to practice negative reappraisals of our ex. First, we need to frame the task differently. Specifically, we need to consider that when we are heartbroken, our mind is likely to bombard us with highly idealized snapshots, memories and thoughts both about our ex and about our relationship. We tend to remember only the best times and our ex’s best qualities. In other words, our mind is already creating unbalanced and inaccurate perceptions that are highly skewed to the positive. Therefore, our introduction of negative reappraisals does not create an imbalance; it corrects an existing one.

Second, negative reappraisals should include not just our perceptions and memories of our ex but of the *relationship* as well.

We tend to idealize the relationship just as much as we do the person and think almost exclusively of the good times and the happy moments. We are far less likely to consider the compromises we had to make, the fights that hurt our feelings or frustrated us, or our unmet emotional needs. People often grieve both the person and the relationship itself—the experience of being a couple, having a significant other, the companionship and partnering. Therefore, it is necessary to address idealized perceptions of the relationship by introducing negative reappraisals of our couplehood, as well as of our ex as a person, to more effectively reduce feelings of attachment and love.

If you are trying to get over heartbreak, make a list of the person’s faults as well as of the shortcomings of the actual relationship and keep that list on your phone. Whenever you find yourself having idealized thoughts and memories, whip out your phone and read a few reminders to balance your perceptions and remind yourself that your ex was not perfect and neither was the relationship.

One crucial aspect of recovery from heartbreak that was not covered in the current study is that breakups leave all kinds of

voids in our lives. Our social circle gets diminished, our activities change, our physical space changes (for example, their “stuff” is no longer there), some of the things we did as couples we no longer do, and the list goes on. A significant part of the emotional pain we feel after a breakup is related to these other losses, the ripple effects that go beyond the loss of the actual person. Finding ways to recognize these voids and fill them is an important task of recovery from heartbreak and one that is often neglected.

Heartbreak is a form of grief and loss that can cause insomnia, changes in appetite, depression, anxiety, and even suicidal thoughts and behavior, and as such it should be taken very seriously, as should our efforts to recover. But, to do so, we have to assert control and consciously and willfully prevent ourselves from making mistakes that will set us back (like staying in touch or trying to be friends while we’re still heartbroken) and encourage ourselves to take steps that might feel unpleasant or counterintuitive but that will ultimately diminish our emotional pain and expedite our recovery.

—GUY WINCH



NEWS

Why It's So Hard to Junk Bad Decisions— Edging Closer to Understanding “Sunk Cost”

Humans, rats and mice all exhibit the decision-making phenomenon, but new research suggests not all choices are equally vulnerable to it

IT WAS MAY 27, 2017—ANOTHER LATE NIGHT for Brian Sweis. The 26-year-old M.D./Ph.D. neuroscience student had been running lines of code and analyses on tens of thousands of rows of data, dating back to experiments conducted in 2012. The goal: to better understand “sunk cost,” the idea that the more you invest in something, the harder it becomes to abandon it, even in cases when it is in your best interest to do so. A long-term relationship gone awry, for example, is harder to leave than a short-term one. Even when inadvertently choosing a longer line at the grocery store, people struggle to back out of the decision and move into a shorter one.

Sweis and his colleagues at the University of Minnesota were specifically interested in how sunk cost impacts decision making—not just in humans, but in rats and mice, too. Alex Kacelnik, a behavioral ecologist at the University of Oxford who was not involved in the study, puts it this way: “If you find that one species makes a systematically bad choice, you can argue it’s an accident of history. But if you find a very different species does the same thing—then, come on, there must be some reason why evolution doesn’t eliminate

“If you find that one species makes a systematically bad choice, you can argue it’s an accident of history.”—Alex Kacelnik

this form of behavior.”

Sweis and his team decided to investigate the phenomenon in different species. Some of their most recent findings, published in July in *Science*, show rats, mice and humans all exhibit sunk cost behavior. Their analyses also suggest both rodents and humans have separate decision-making processes that are not all susceptible to sunk cost. The time one spends making a decision, whether or not to leave that relationship or grocery line, is not considered part of the sunk cost; only time invested after the decision is made is taken into account. When Sweis made this realization, he emailed his adviser late that night in May, calling the findings “flipping huge.”

But it all began several years ago, when Adam Steiner, then a neuroscience gradu-

ate student at Minnesota, devised an experiment to see how rats make decisions. Dubbed “Restaurant Row” by the researchers, the experiment presented rats with four meal options with different flavors. The rats scurried around the food-court-style maze and chose whether to wait a certain amount of time to get a specific food or continue onward to another “restaurant” with a shorter wait time. Once a rat had made a decision, it was given the option to change its mind and leave the area if it no longer felt the wait was worthwhile.

As the team considered how best to analyze their results and test similar decisions in humans, studies on sunk cost landed on the front pages of some of the field’s most prestigious journals. Some found rodents are susceptible to this phenomenon;

others found they are not. Research in other species, including in birds, also yielded mixed results. For the Minnesota team, the key was not only to test sunk cost in rodents but to gauge how these decisions played out in humans as well. “The goal of the field is ultimately to improve human behavior, so being able to translate rodent findings across to humans is sort of a gold standard,” says Shelly Flagel, a behavioral neuroscientist at the University of Michigan who was not involved in the study.

Three years, at least four failed study designs and countless hours of insignificant analyses later the team found what it had been waiting for: “Kitten videos,” says Samantha Abram, a graduate student in psychology at Minnesota and a co-author of the study. Just as rats and mice forage for food, Abram says, humans forage for entertainment and information online. The researchers presented undergraduates with four video options, and watched as each student navigated the selection and decided whether to wait longer for a video they preferred. Some videos took longer to load than others, and the students had the chance to leave the video-loading page if after their initial choice they decided the

“There are always going to be caveats, especially when drawing parallels between rodent and human behavior.”—Shelly Flagel

wait was not worth the reward. On average, people hesitated to leave a video even if it did not match their interest because of the time they had already invested in waiting for the reward.

Taken together, the findings of the experiments suggest rats, mice and humans are all vulnerable to sunk costs. If they made a decision that did not match their preferences, it was a struggle for each individual to reverse course quickly. This raised the question of whether the process is irrational or is, in some way, a purposeful evolutionary advantage. The findings also indicated that sunk cost is not applied to all aspects of a decision. “A lot of explanation for the sunk cost effect has been that people don’t like wasting precious resources,” Sweis says. “But what we found is that no

matter how much time was wasted during the initial decision, once the offer was accepted, that initial amount invested had no effect on your likelihood to stay committed once waiting.”

Flagel and others find the results exciting. But they warn against drawing sweeping conclusions from the study. “There are always going to be caveats, especially when drawing parallels between rodent and human behavior,” Flagel says. One of the central limitations of this research is that it doesn’t look at consistent behaviors across humans, mice and rats. Although foraging for online information and food might be related activities, they are distinct—making the translation from rodent to human less certain. There is also the gender component: the mice studied were all male,

whereas females made up a majority of participants in the human study.

The Minnesota researchers remain wary as well. “A study is a data point. This is one data point,” says David Redish, a neuroscience professor at the school who co-authored the paper. Redish and his colleagues have, however, published five studies based on the restaurant row and video gallery experiments, some that further demonstrated commonalities between rodents and humans in decision making. A *Nature Neuroscience* study in 2014 found evidence rats experience regret; another in *PLOS Biology* in February showed, as the title says, “Mice learn to avoid regret.”

Other work has corroborated the idea of distinct decision making processes that are not all vulnerable to sunk cost. Sweis, Redish and another colleague published a study in June in *Nature Communications* that examined how withdrawal from cocaine and morphine impacts decision-making in mice. The results showed cocaine alters deliberative behavior, whereas morphine disrupts the reevaluation of the initial choice. “This actually has implications for other things, like addiction,” Sweis says. If there are two distinct processes, fur-

ther research could illuminate which one is active in relapse, and how to then modify treatment to address that nuance.

The team is also looking to do more work on the neural activity underlying this behavior. “Can we actually go into the brain and chase these processes down?” As brain-related technology advances, Redish sees a chance to intentionally target—and potentially alter—these decision-making processes. But he says it is up to society to decide whether it is responsible to do so.

—MAYA MILLER

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NEWS

Global Warming Linked to Higher Suicide Rates across North America

A 1 degree Celsius rise corresponded to a 1.4 percent increase in suicides

SUICIDE RATES AND TEMPERATURES ARE both on the rise, but are these two occurrences connected? A new study suggests maybe so. The research revealed hotter-than-average months corresponded to more deaths by suicide—and the effect isn't limited to the summer; even warmer winters show the trend.

In the study, published in *Nature Climate Change*, the investigators looked at all of the suicides that occurred in the U.S. and Mexico over several decades (1968 to 2004 for the U.S. and 1990 to 2010 for Mexico), comprising 851,088 and 611,366 deaths, respectively. They then observed how monthly temperature fluctuations over these periods in every county or municipality in both countries correlated to the suicide rates for that region. They discovered that for every 1 degree Celsius (1.8 degree Fahrenheit) rise in temperature, there was a 0.7 percent increase in suicide rates in the U.S. and a 2.1 percent increase in Mexico, averaging a 1.4 percent increment across both countries. That is, over the years, a given county would see more deaths by suicide in warmer-than-average months.

Notably, the average temperature of the county did not matter; for example, Dallas

“Climate change in terms of suicide is not going to generate winners and losers, it’s just going to generate losers.”—Marshall Burke

and Minneapolis saw a similar rise in suicide rates. The effect did not depend on the month either—it made no difference whether it was January or July. There was also no difference between gender, socioeconomic status, access to guns, air-conditioning and whether it was an urban or rural region. Across the board, when temperatures rose in a given place, so did the number of suicides.

“A lot of times when you hear about climate change and climate change impacts, you hear this catch phrase ‘climate change is going to generate winners and losers,’” says study author Marshall Burke. “Some people could benefit from climate change, the idea being if you live in a really cold location, sometimes things improve when you warm it up a little bit. We do not find that for

suicide.” He continues, “Climate change in terms of suicide is not going to generate winners and losers, it’s just going to generate losers. Everyone, as far as we can tell—no matter whether you live in a cold place or live in a hot place—everyone is going to be harmed in terms of suicide risk when we increase the temperature.”

If climate change continues on its current trajectory with an estimated temperature increase of 2.5 degrees C (4.5 degrees F) by 2050, Burke, who is an assistant professor of earth system science at Stanford University, projects suicide rates would rise by 1.85 percent, resulting in an additional 21,770 deaths by suicide across the U.S. and Mexico. For comparison, economic recession is thought to increase suicide rates by 0.8 percent whereas news of ce-

lebrity suicides accounts for a 4.6 percent bump in rates.

Not everyone is convinced by these projections, though. Jill Harkavy-Friedman, vice president of research at the American Foundation for Suicide Prevention, says, “I think it’s an interesting and provocative idea. These two things may be co-occurring. You know, it’s possible that the rate of suicide is going up as the temperature is going up. But we don’t know that there’s anything causal about that.”

In their study the researchers speculate there could be some biological effect linked to temperature regulation in the brain that alters mental health and could underlie the correlation. In an attempt to connect mental well-being with temperature change more generally, they examined more than 600 million Twitter posts for depressive language over a 14-month period. The researchers again found hotter months corresponded to a higher probability of using depressive language. Prior work by the researchers also saw a similar trend in interpersonal conflict, with a 4 percent rise in violence attributed to climate change.

Burke acknowledged suicide is a complex phenomenon, and temperature is cer-

tainly not the only or even the most important factor affecting mental health. “What studies like ours contribute is just saying on average, as you increase temperature, what’s going to happen to suicide rates? So that won’t tell you with utmost certainty what’s going to happen in specific locations, but it will tell you okay on average this is what we should expect. Our view is it would be foolhardy to ignore the evidence,” he notes.

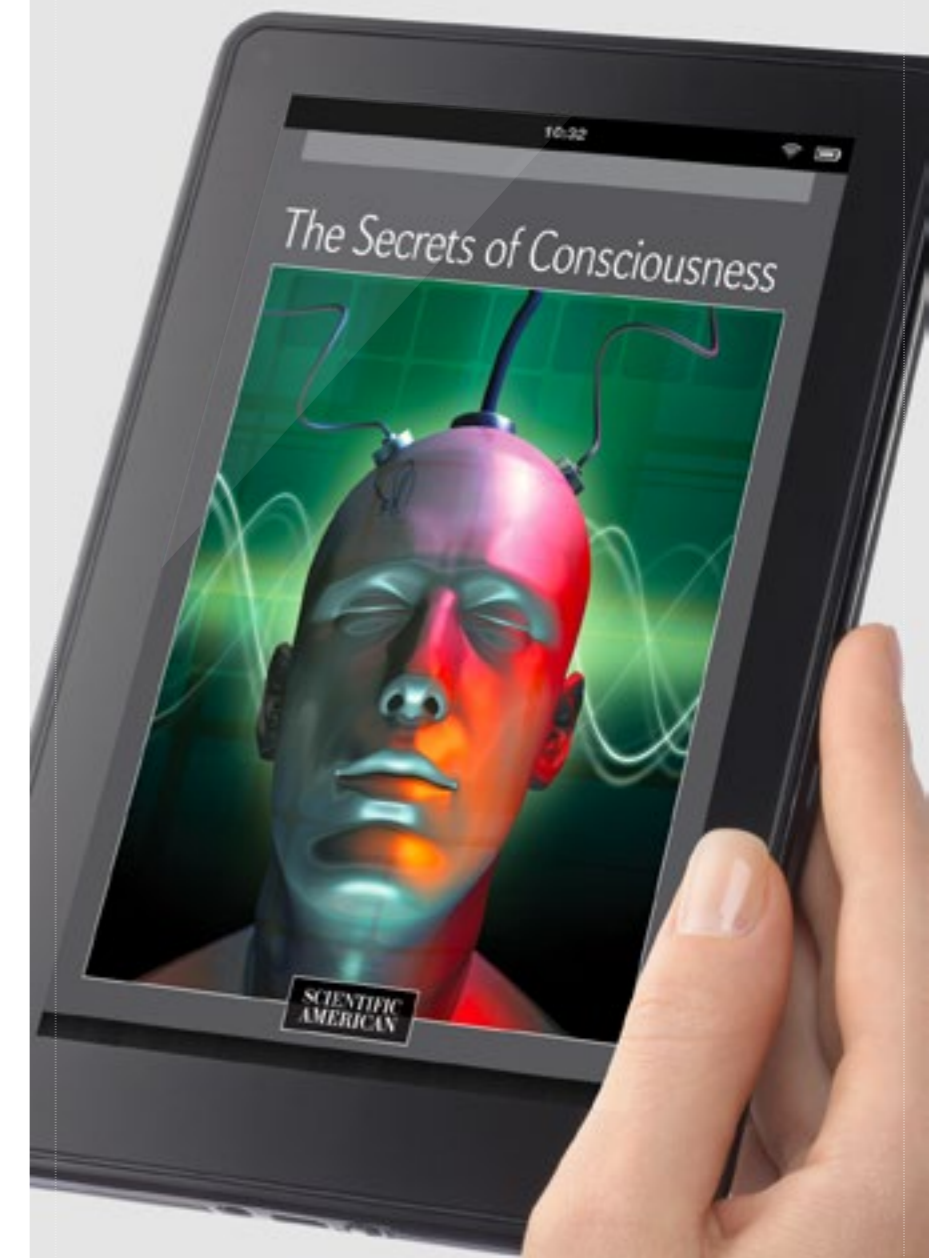
Radley Horton, an associate research professor at Columbia University who was not involved in the research, says the study is a good reminder of how fundamental temperature is and how widespread its impacts are. “The deeper we look, the more likely we are to uncover ways that temperature directly impacts things we care about,” he says. “Climate uncertainty is not our friend. The further we push things, the greater the risk.”

—DANA G. SMITH

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THE DARK CORE OF PERSONALITY

Nine factors can
determine how
malevolent you are

By Scott Barry Kaufman

OVER 100 YEARS AGO CHARLES Spearman made two monumental discoveries about human intelligence. First, a general factor of intelligence (*g*) exists: people who score high on one test of intelligence also tend to score high on other tests of intelligence. Second, Spearman found that the *g*-factor conforms to the principle of the “indifference of the indicator”: It doesn’t matter what test of intelligence you administer; as long as the intelligence test is sufficiently cognitively complex and has enough items, you can reliably and validly measure a person’s general cognitive ability.

Scott Barry Kaufman is a psychologist, author and podcaster who is deeply interested in using psychological science to help all kinds of minds live a creative, fulfilling and meaningful life. Kaufman has over 60 scientific publications on intelligence, creativity, personality and well-being. In addition to writing the column Beautiful Minds for *Scientific American*, he also hosts The Psychology Podcast. He is also the author and editor of eight books. Kaufman received a Ph.D. in cognitive psychology from Yale University, and an M. Phil. in experimental psychology from the University of Cambridge. You can find out more at <http://ScottBarryKaufman.com>.

Fast forward to 2018, and a hot-off-the-press paper suggests that the very same principle may not only apply to human cognitive abilities, but also to human *malevolence*. New research conducted by a team from Germany and Denmark suggests that a General Dark Factor of Personality (*D*-factor) exists among the human population, and that this factor conforms to the principle of indifference of the indicator. This is big news, so let’s take a look.

The Proposed *D*-Factor

We all know people who consistently display ethically, morally and socially questionable behavior in everyday life. Personality psychologists refer to these characteristics among a subclinical population as “dark traits.” An understanding of dark traits has become increasingly popular not only in psychology, but also in criminology and behavioral economics.

Even though psychologists have studied various dark traits, it has become increasingly clear that these dark traits are related to each other. This raises the question: *Is there a unifying theme among dark traits?*

Study lead author Morten Moshagen of

Ulm University and his colleagues proposed that a *D*-factor exists, which they define as *the basic tendency to maximize one’s own utility at the expense of others, accompanied by beliefs that serve as justifications for one’s malevolent behaviors*. In their definition, utility refers to goal achievement. For those scoring high on the *D*-factor, utility maximization is sought despite running contrary to the interests of others or even for the sake of bringing about negative outcomes in others.

Utility in this definition does not refer to utility maximization that is irrelevant of the effect on others—such as engaging in sports to improve one’s health, engaging in consensual sex, or taking part in recreational activities. Also, it should be noted that those scoring high on the *D*-factor aren’t always uncooperative, as they can be very strategic in choosing when to cooperate. Their key prediction is that those scoring high on the *D*-factor will not be motivated to increase the utility of others (helping others in need) without benefiting themselves, and will not derive utility for themselves from the utility of others (for example, being happy for the success of others).

The researchers acknowledge that the *D*-factor can be manifested in a large number of ethically, morally and socially questionable attitudes and behaviors. However, they propose that any single dark trait will boil down to at least one of the defining features of the *D*-factor. For instance, those scoring high on narcissism might be particularly justifying of the belief that they are superior, whereas those scoring high in sadism may place a stronger emphasis on deriving utility from actively provoking disutilities for others. Nevertheless, they argue that any single dark trait will be related to at least one (and typically several) of the defining aspects of the *D*-factor; in other words, there is a substantial common core underlying individual differences on all measures of dark traits.

Again, the *g*-factor analogy is apt: while there are some differences between verbal intelligence, visuospatial intelligence, and perceptual intelligence (in other words, people can differ in their pattern of cognitive ability profiles), those who score high on one form of intelligence will also tend to statistically score high on other forms of intelligence.

So what did they actually find?

The Actual *D*-Factor

Across four studies, the researchers found support for the existence of their proposed *D*-factor. To capture a reasonable *D*-factor, they administered nine different tests measuring a particular dark trait that has been well studied in the psychological literature. These are the nine traits that comprised their *D*-factor:

Egoism. The excessive concern with one's own pleasure or advantage at the expense of community well-being.

Machiavellianism. Manipulativeness, callous affect and strategic-calculating orientation.

Moral Disengagement. A generalized cognitive orientation to the world that differentiates individuals' thinking in a way that powerfully affects unethical behavior.

Narcissism. An all-consuming motive for ego reinforcement.

Psychological Entitlement. A stable and pervasive sense that one deserves more and is entitled to more than others.

Psychopathy. Deficits in affect, callousness, self-control and impulsivity.

Sadism. Intentionally inflicting phys-

ical, sexual or psychological pain or suffering on others in order to assert power and dominance or for pleasure and enjoyment.

Self-Interest. The pursuit of gains in socially valued domains, including material goods, social status, recognition, academic or occupational achievement, and happiness.

Spitefulness. A preference that would harm another but that would also entail harm to oneself. This harm could be social, financial, physical or an inconvenience.

Here is a summary of their main findings:

First, they found that all of the dark traits were substantially positively related to each other (what Spearman referred to as a "positive manifold")—although some traits were more strongly correlated with each other than others. The strongest correlations were found among measures of Egoism, Machiavellianism, Moral Disengagement, Psychopathy, Sadism and Spitefulness.

Second, the pattern of items that were most strongly related to the *D*-factor related to aspects of their theoretical

model: *utility maximization* (“I’ll say anything to get what I want”), *inflicting disutility on others* (“There have been times when I was willing to suffer some small harm so that I could punish someone else who deserved it”), and *justifying malevolent beliefs* (“I honestly feel I’m just more deserving than others”).

Third, they found that those scoring high on the *D*-factor were more likely to keep money for themselves when given the opportunity, and were more likely to display unethical behavior (cheating to maximize one’s gain).

Fourth, the *D*-factor was related to a number of outcomes you would expect, including *positive* associations with self-centeredness, dominance, impulsivity, insensitivity, power, aggression and *negative* associations with nurturance, internalized moral identity, perspective taking, sincerity, fairness, greed avoidance and modesty.

Fifth, they found support for Spearman’s principle of the indifference of the indicator. The *D*-factor captured the dark core of many different dark traits without crucially relying on any

one measure. In fact, they found that even after omitting 50 percent of the items at random, and repeating this process 1,000 times, still resulted in extremely high correlations among all of the *D*-factors ($> r=.93$).

What’s Your Dark Core Score?

If you’ve made it this far, you’re probably eager to see whether you score high on the *D*-factor. This nine-item test should be sufficient to estimate to a reasonable degree where you would score on the *D*-factor. The more you are in strong agreement with multiple items on this scale, the higher the likelihood you would score high on the *D*-factor. If you are in strong agreement with just one item on this scale, I wouldn’t be so confident that you would score high on the *D*-factor. However, if you are in extremely strong agreement on many of these items, there’s a high likelihood that you would indeed score high on the *D*-factor (in other words, you’re a humongous asshole, objectively measured):

The Dark Core Scale

1. It is hard to get ahead without cutting corners here and there.

2. I like to use clever manipulation to get my way.
3. People who get mistreated have usually done something to bring it on themselves.
4. I know that I am special because everyone keeps telling me so.
5. I honestly feel I’m just more deserving than others.
6. I’ll say anything to get what I want.
7. Hurting people would be exciting.
8. I try to make sure others know about my successes.
9. It is sometimes worth a little suffering on my part to see others receive the punishment they deserve.

*Note: The Dark Core Scale was adapted from the larger test battery. I selected the items on an ad-hoc basis for entertainment purposes, but I do not recommend using the scale to make any sort of diagnosis. For more on the *D*-factor, go to www.darkfactor.org. To take the self-assessment created by the researchers of the dark factor study, go to: <http://qst.darkfactor.org>. **M***

Need More Self-Control?

Try a Simple Ritual

Study finds an unusual technique for eating less

By Francesca Gino



MANY OF OUR MOST VEXING problems, from overeating to not saving enough for retirement to not working out enough, have something in common: lack of self-control. Self-control is what gives us the capacity to say no to choices that are immediately gratifying but costly in the long term—that piece of chocolate cake (instead of an apple), that afternoon in front of the couch (instead of a visit to the gym). Despite our best intentions, we often fail to meet our lofty goals.

The problem of self-control has puzzled psychologists and behavioral scientists for decades. A great deal of research has identified situations in which self-control failures are likely to happen and tools to help people exercise better control. For instance, research has found that people persist for longer on tasks that require self-control

Francesca Gino is a behavioral scientist and the Tandon Family Professor of Business Administration at Harvard Business School. She is the author of *Rebel Talent: Why It Pays to Break the Rules at Work and in Life* as well as *Sidetracked: Why Our Decisions Get Derailed, and How We Can Stick to the Plan*.

when they know they'll be paid for their efforts, or when they are told that their work will benefit others (such as helping find a cure for Alzheimer's disease). These motivating incentives can increase our self-control, at least up to a point.

Entrepreneurs have also become interested in self-control, as is evident from the many diet and exercise apps and gadgets on the market. To take one notable example, on the commitment contract Web site stickK.com, users put down some money (say, \$200) and state a goal they want to achieve (such as to lose ten pounds in a month). They also need to state what will happen to the money if they don't stick to their commitments (for example, it'll go to a friend or to a charity they do not like). If they meet their goal, they earn their money back. If they don't, they lose the money.

Tools like stickK.com can be effective, but they are often difficult to implement; you may need to enlist someone to help monitor your efforts. New research my colleagues and I conducted point to a different solution that may be easier to implement: using rituals.

A ritual is a series of steps we take while attaching some kind of symbolic meaning.

Players in all sorts of sports have rituals that involve actions such as eating the same foods in exactly the same order before a game or listening to the same pre-ordered playlist a given number of times. From the way some prepare their coffee to the way people celebrate important life events, like weddings or graduations, rituals are a part of our daily life. And though they may seem useless, or even silly, research has found that rituals are powerful.

In the past, my colleagues and I have found that rituals reduce anxiety before stressful tasks, and improve performance. They allow us to enjoy our family holidays more. And they also give us a greater sense of control after experiencing a loss, whether a loved one or in a lottery. Given the power of rituals, we thought we might test their effectiveness in resisting temptation.

In one study, we tested the power of rituals to help with a common self-control problem: eating less. We visited a university gym and recruited undergraduate females who already had a goal of losing weight. We told half of them to be mindful about their food consumption for the next five days. We taught the other half a three-step pre-eating ritual and told them to

complete it every time they ate something. The ritual, which we created rather randomly, did not require participants to eat less food and did not directly interfere with consumption. Here's the ritual:

First, cut your food into pieces before you eat it. Second, rearrange the pieces so that they are perfectly symmetric on your plate. That is, get the right half of your plate to look exactly the same as the left half of your plate. Finally, press your eating utensil against the top of your food three times. In order to be in the study, you must do the three steps of this ritual each time you eat.

To track daily food and beverage intake, we asked participants to download the “MyFitnessPal” food-tracking app onto their phone. MyFitnessPal allows users to list exactly the type and amount of food or beverage they consume, including brands of grocery products and meals from chain restaurants. Three times per day, participants' phones would remind them to log their food intake, and the experimenter had access to these online food diaries.

As we expected, participants who enacted the pre-eating ritual consumed fewer calories (about 1,424 calories for each day,

on average) as compared to those who simply were mindful about their eating (who consumed about 1,648). Those who performed the ritual also ate less fat and less sugar. The ritual helped them exercise the self-control needed to achieve their weight loss goals. Interestingly, at the end of the study, our participants said they thought the ritual was not very helpful and reported they were unlikely to continue it.

In another study, we examined whether simple rituals could also help people make healthier choices when tempted with unhealthy ones. We invited college students to the laboratory and told them they would complete a taste test of carrots and chocolate. They received four bags from the experimenter: three that each contained one baby carrot, and a fourth that contained a Lindt chocolate truffle.

We divided participants in three groups: those engaging in a ritual, those making random gestures (all polite ones!), and those who simply ate carrots (our control condition). Those in our ritual condition were given a series of steps to perform before eating each carrot:

Make a fist with your right hand. Using your knuckles, knock on the table twice.

Now, take out the first [second] [third] plastic bag and put it in front of you.

Then, use your right hand and knock twice again on the table.

Now, take a deep breath and close your eyes for two seconds.

Before they ate the third carrot, they answered two questions about eating the third carrot and finally learned they had a choice between eating the third carrot or a chocolate.

Those in our random-gestures condition completed a different set of steps before eating each carrot; they too were given a choice between eating the carrot (the healthy option) or the chocolate (the tempting, unhealthy one).

In the third subgroup (the control condition), participants simply ate the first two carrots, answered the same two questions, and were given the final choice without performing any additional steps.

About 58 percent of the participants in our ritual condition chose the carrot over the chocolate, as compared to only about 35 percent of those in the control condition and 46 percent of those in the random-gestures condition. Thus, participants who enacted a ritual while eating carrots

subsequently made healthier choices as compared to those in the other groups. The results suggest that following a stringent set of steps, however strange, before eating may be a better weight-loss strategy than adhering to a stringent diet.

It is important to note that rituals like the ones we created and used in our research can be taken too far. When a repeated set of actions that restrict food consumption start to become mindlessly followed, as by habit, they can lead to problematic behaviors such as eating disorders, research finds. But undertaken conscientiously and carefully, such practices can also promote well-being.

Psychology research has found that our behaviors lead us to conclusions about ourselves: donating money to the homeless causes us to view ourselves as caring, and giving up our seat on the subway leads us to believe we're polite, for instance. Following a series of steps over and over again, which happens when we use rituals, requires some good self-discipline. So, we reasoned, when we see ourselves engaging in a ritual, we code that behavior as a sign that we are people with self-control. And thanks to that self-control, we choose the

apple (or carrot) over the chocolate and thus reduce our caloric intake.

Classical Confucian philosophy places a lot of emphasis on ritual. It may be no surprise, then, that evidence suggests that East Asians from highly ritualized Confucian cultures have stronger self-regulation skills than people from Western cultures. Likewise, the military lifestyle across cultures is known to induce both self-discipline and behavioral regulation, perhaps in part due to its many rituals, including marching, chanting and other regimented behaviors that ensure order and high levels of motivation. At the outset, these rituals may seem like a waste of time. Yet, as our research suggests, they are quite powerful. Even when they are not embedded in years of tradition, simple rituals can help us build personal discipline and self-control. With a simple ritual, that piece of chocolate cake may not look as tempting. **M**

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How Can We Tell If a Comatose Patient Is Conscious?

Neurologist Steven Laureys looks
for signs of consciousness
in unresponsive patients

By Anouk Bercht and
Steven Laureys



STEVEN LAUREYS GREETES ME with a smile as I enter his office overlooking the hills of Liège. Although his phone rings constantly, he takes the time to talk to me about the fine points of what consciousness is and how to identify it in patients who seem to lack it.

Doctors from all over Europe send their apparently unconscious patients to Laureys—a clinician and researcher at the University of Liège—for comprehensive testing. To provide proper care, physicians and family members need to know whether patients have some degree of awareness. At the same time, these patients add to Laureys’ understanding. The interview has been edited for clarity.

Anouk Bercht is a science writer based in the Netherlands. She writes frequently about psychology.

Steven Laureys is a professor of neurology at the University of Liège and leads the Coma Science Group at Liège University Hospital Center. He has received numerous awards, among them the 2017 Francqui Prize, the most important Belgian science award.

What is consciousness?

It is difficult enough to define “life,” even more so to define “conscious” life. There is no single definition. But of course, in clinical practice we need unambiguous criteria. In that setting, everyone needs to know what we mean by an “unconscious” patient. Consciousness is not “all or nothing.” We can be more or less awake, more or less conscious. Consciousness is often underestimated; much more is going on in the brains of newborns, animals and coma patients than we think.

So how is it possible to study something as complex as consciousness?

There are a number of ways to go about it, and the technology we have at our disposal is crucial in this regard. For example, without brain scanners we would know much, much less than we now do. We study the damaged brains of people who have at least partially lost consciousness. We examine what happens during deep sleep, when people temporarily lose consciousness. We’ve also been working with Buddhist monks because we know that medi-



Steven Laureys

tation can trigger alterations in the brain; connections that are important in the networks involved in consciousness show changes in activity. Hypnosis and anesthesia can also teach us a great deal about consciousness. In Liège, surgeons routinely operate on patients under hypnosis (including Queen Fabiola of Belgium).

Just as under anesthesia, the connections between certain brain areas are less active under hypnosis. And finally, we are curious to understand what near-death experiences can tell us about consciousness. What does it mean that some people feel they are leaving their bodies, whereas others suddenly feel elated?

What processes in the brain create consciousness?

Two different networks seem to play a role: the external, or sensory, network and the internal self-consciousness network. The former is important for the perception of all sensory stimuli. To hear, we need not only ears and the auditory cortex but also this external network, which probably ex-

ists in each hemisphere of the brain—in the outermost layer of the prefrontal cortex as well as farther back, in the parietal-temporal lobes. Our internal consciousness network, on the other hand, has to do with our imagination—that is, our internal voice. This network is located deep within the cingulate cortex and in the precuneus. For us to be conscious of our thoughts, this network must exchange information with the thalamus.

What happens in a comatose person?

The brain is so heavily damaged that neither of the networks functions correctly anymore. This malfunction can occur as a result of serious injury, a brain hemorrhage, cardiac arrest or a heart attack. At most, a coma lasts for a few days or weeks. As soon as patients open their eyes, they are said to “awaken” from the coma. This does not, however, mean that a person is conscious. Most patients who awaken from a coma soon recuperate. But a minority will succumb to brain death; a brain that is dead is completely destroyed and cannot recover. But some patients who are not brain-dead will never recover either.

How do we know whether a coma patient who has awakened is conscious?

For that we use the Glasgow Coma Scale. The physician says, “Squeeze my hand.” Or we observe whether the patient responds to sounds or touch. If patients do not respond, the condition used to be called “vegetative”; they appear to be unconscious. If a patient responds but is unable to communicate, we categorize the consciousness as “minimal.” Such patients may, for example, follow a person with their eyes or answer simple questions. If we pinch their hand, they will move it away. But these signs of consciousness are not always evident, nor do we see them in every patient. A patient who awakens from a coma may also develop a so-called locked-in syndrome, being completely conscious but paralyzed and unable to communicate, except through eye blinks.

So the difference between unresponsiveness, minimal consciousness and locked-in would seem to be hard to determine.

That’s right. If there is no response to commands, sounds or pain stimuli, this does not necessarily mean that the patient is

unconscious. It may be that the patient does not want to respond to a command or that the regions of the brain that process language are so damaged that the person simply doesn’t understand me. Then there are cases in which the brain says, “Move!” but the motor neural pathways have been severed. Family members are often quicker than physicians to recognize whether a patient exhibits consciousness. They may perceive subtle changes in facial expression or notice slight movements that escape the physician’s attention.

Patients are brought to Liège from all over Europe to undergo testing. How do you determine whether they are conscious?

Well, of course, the physician will say, “Squeeze my hand”—but this time while the patient is in a brain scanner. If the motor cortex is activated, we know that the patient heard and understood and therefore is conscious. We also want to determine the chances of recovery and what the physician or the patient’s family can do. With different brain scanners, I can find out where brain damage is located and which connections are still intact. This information tells family

members what the chances of recovery are. If the results show that there is no hope whatsoever, we then discuss difficult topics with the family, such as end-of-life options. Occasionally we see much more brain activity than anticipated, and then we can initiate treatment aimed at rehabilitation.

One well-known case was that of Rom Houben.

That's right. He was a very important patient for us: as far as anyone could tell, he had been left completely unresponsive for 23 years after a car accident. But in the mid-2000s we placed him in a brain scanner and saw clear signs of consciousness. It is possible that he experienced emotions over all those years. He was the first of our patients who was given a different diagnosis after such a long time. We subsequently conducted a study in several Belgian rehab centers and found that 30 to 40 percent of unresponsive patients may exhibit signs of consciousness.

I've heard that Houben was eventually able to type words with the help of his communication facilitator.

Yes, but his facilitator was the only per-

son who seemed able to understand and translate his minimal hand signals. She probably typed words of her own unconsciously. This form of communication doesn't generally work, and our team was wrongly connected with it. It is a complex case that the media has failed to report adequately. They were more interested in telling sensational, simplistic human-interest stories. Nonetheless, it's a good example of why we must be extraordinarily careful in diagnosing this condition.

How can minimal consciousness be distinguished from locked-in syndrome?

Minimally conscious patients can barely move and are not completely aware of their surroundings. In other words, their motor and mental abilities are limited. Locked-in patients can't move either, but they are completely conscious. They have suffered a particular type of injury to the brain stem. Their cerebral cortex is intact but is disconnected from their body. All they can move is their eyes—something that neither the patient nor the physician is aware of at the beginning. This is why diagnosis is so difficult. Just because pa-

tients cannot move does not mean they are unconscious. This is a classic fallacy; consciousness does not reside in our muscles but in our brains.

How can a person who cannot move manage to communicate?

To communicate with a minimally conscious patient for the first time here in Liège, we placed him in a scanner. Of course, the scanner cannot tell us directly whether someone is saying yes or no. But there are a couple of tricks. For example, we can tell the patient, "If you want to say yes, imagine that you are playing tennis. If you intend to say no, make a mental trip from your front door to your bedroom." "Yes" answers activate the motor cortex; "no" answers engage the hippocampus, which plays a role in spatial memory. Because these two regions of the brain are located far apart from each other, it is pretty easy to tell the difference between yes and no. From that point on, we can ask the patient pertinent questions.

What other potential techniques do you have in the pipeline?

In the future, it may be possible to read

brain signals using scalp electrodes and a brain-computer interface. This would make communication much quicker and less costly than with a brain scanner. We have also found that it is possible to examine a person's pupils: we ask patients to multiply 23 by 17 if they intend to say yes. This difficult problem causes the patients to concentrate, and their pupils will dilate slightly as a result. If we direct a camera at their eyes and a computer analyzes the signals, we can determine quite quickly whether the intended answer is positive or negative.

Anything else?

Think of the movie *The Diving Bell and the Butterfly* about Jean-Dominique Bauby, the editor of the French fashion magazine *Elle*. He suffered a stroke that left him with locked-in syndrome. He wrote an entire book—on which the movie was based—by blinking his one remaining functional eye. We are now able to place an infrared camera over patients' eyes, which enables them to chat or write relatively easily.

Can consciousness be stimulated?

Yes, by transcranial direct-current stimulation. Using scalp electrodes, we can

stimulate particular regions of the brain. By careful placement, we can select the region responsible for speech, which is connected with consciousness. If I stimulate this region of the brain, the patient may hear and understand what I say. In some cases, a patient has been able to communicate transiently for the first time after a 20-minute stimulation—by, for example, making a simple movement in response to a question. Other patients have been able to follow a person with their eyes. Although consciousness does not reside in our muscles, stimulating patients may enable them to move muscles consciously.

This technique works in about half of patients with minimal consciousness. In my opinion, this represents the future of treatment, even though we do not yet know precisely which regions of the brain are the most responsive to stimulation or whether they should be stimulated on a daily basis. But I don't want to give people false hope. We are still faced with the question of the minimum acceptable quality of life. This is a major philosophical and ethical problem that will be answered differently by different people. I would recommend that everyone discuss these

issues in advance with a trusted person. Then you will know that, if you are ever in that position, your desires and values will be taken into account.

Do you think that consciousness can be reduced to the brain alone?

We already know quite a bit about the brain processes that underlie attention, perception and emotions. There is no point in throwing this knowledge out the window. As a neurologist, I see the consequences of brain damage every day. It remains to be discovered whether the brain is the entire story. Scientific research has to be conducted with an open mind. The topic of consciousness is rife with philosophical implications and questions. As a physician, it is my aim to translate this knowledge into practice. It may be frustrating that we currently lack the tools to measure the hundreds of billions of synapses with their tangled mass of neurotransmitters. Nonetheless, I think it is a mistake to infer from this that we can never understand consciousness. **M**

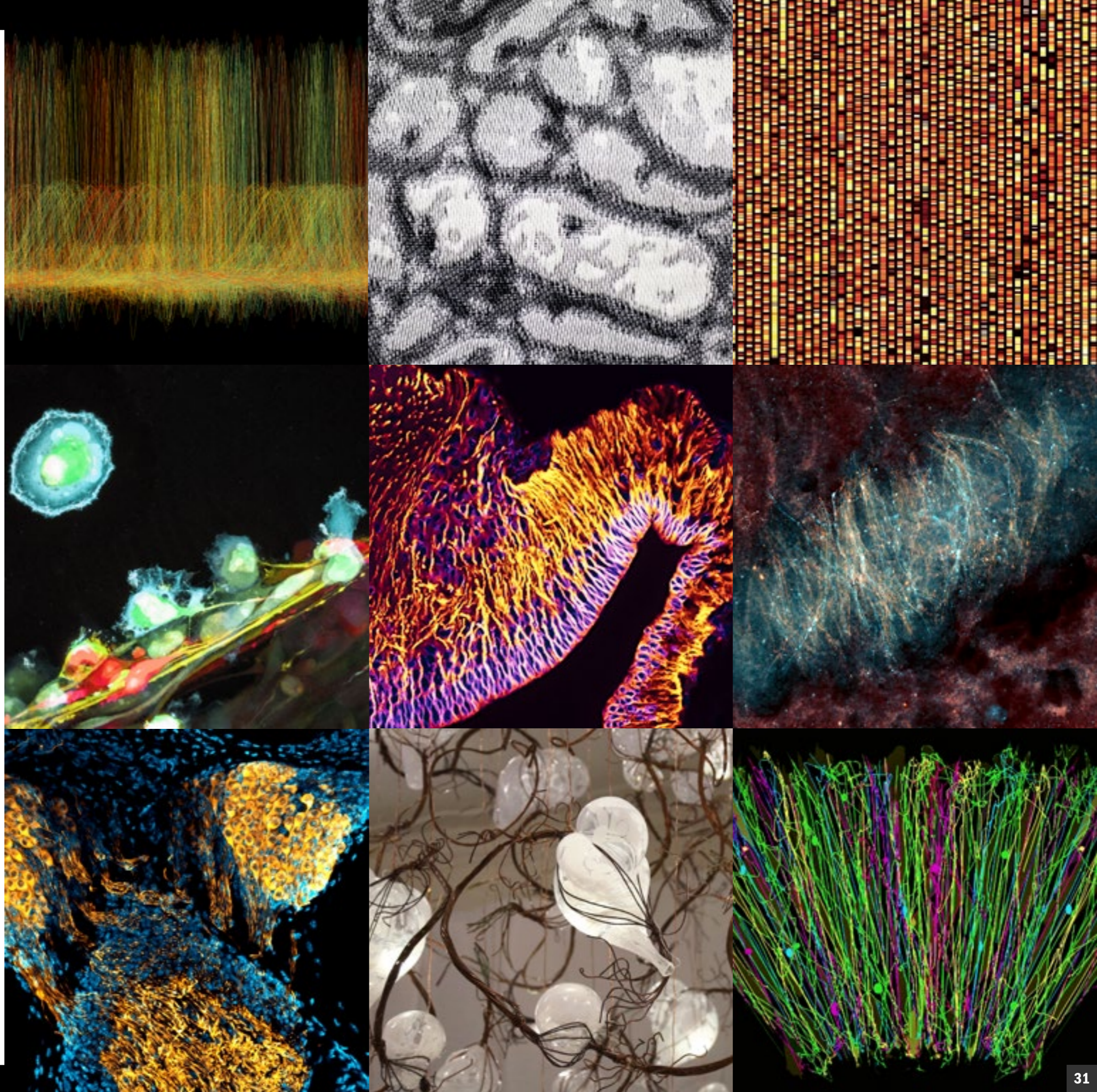
Prize-Winning Images of the Brain

Check out this year's
winners of the Art of
Neuroscience competition

SOMETIMES THE LANGUAGE OF science falters in conveying the staggering complexity and profound beauty of the brain. Cue art. The [Art of Neuroscience competition](#), an annual contest directed by the Netherlands Institute for Neuroscience, pushes researchers and artists to break from the rigid structure of the academic paper and cast the brain in a creative light. This year's entrants blended color, sound, light and—in one case—human blood to celebrate the intricacies of humanity's most mysterious organ. Below, *Scientific American* presents the winning entry and honorable mentions, along with our editors' top picks.*

By Daniel Ackerman and Liz Tormes

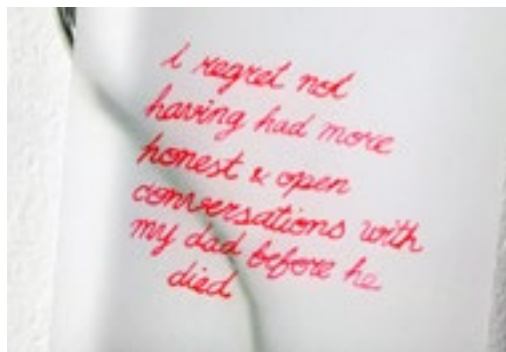
***Editor's note:** Liz Tormes served as one of the judges in this year's competition.



Winner

FOR ALL SAD WORDS OF TONGUE AND PEN, THE SADDEST ARE THESE: “IT MIGHT HAVE BEEN.”

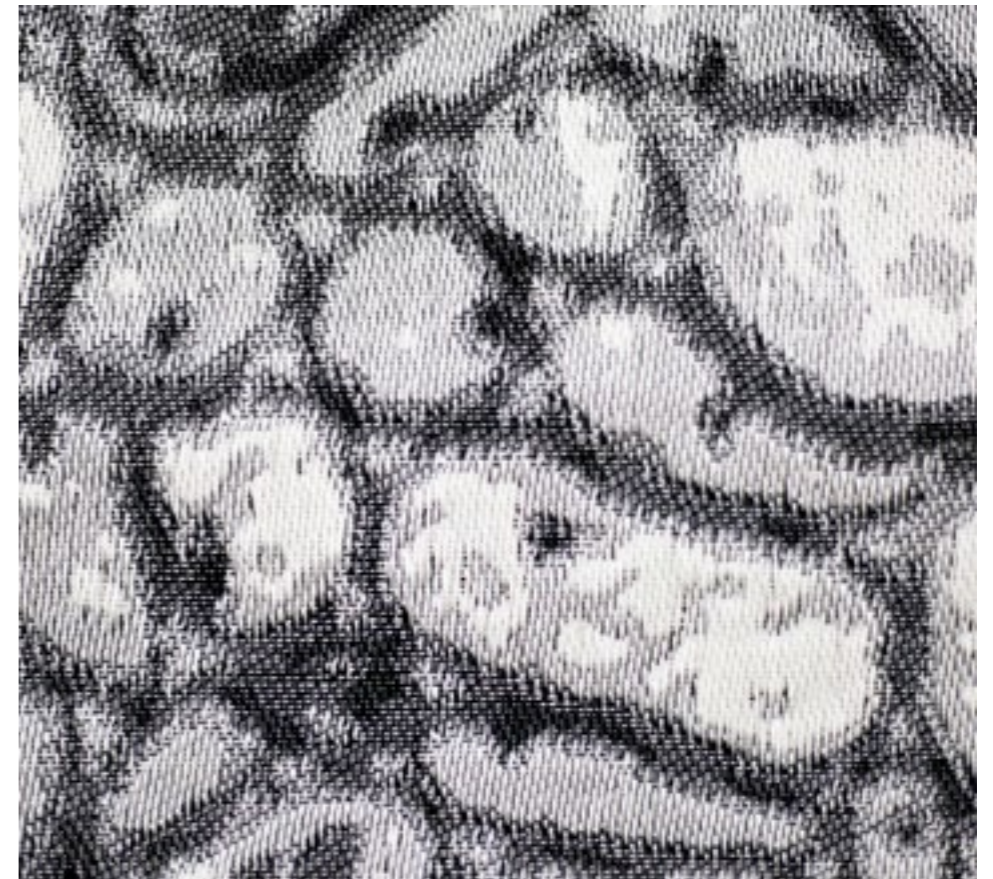
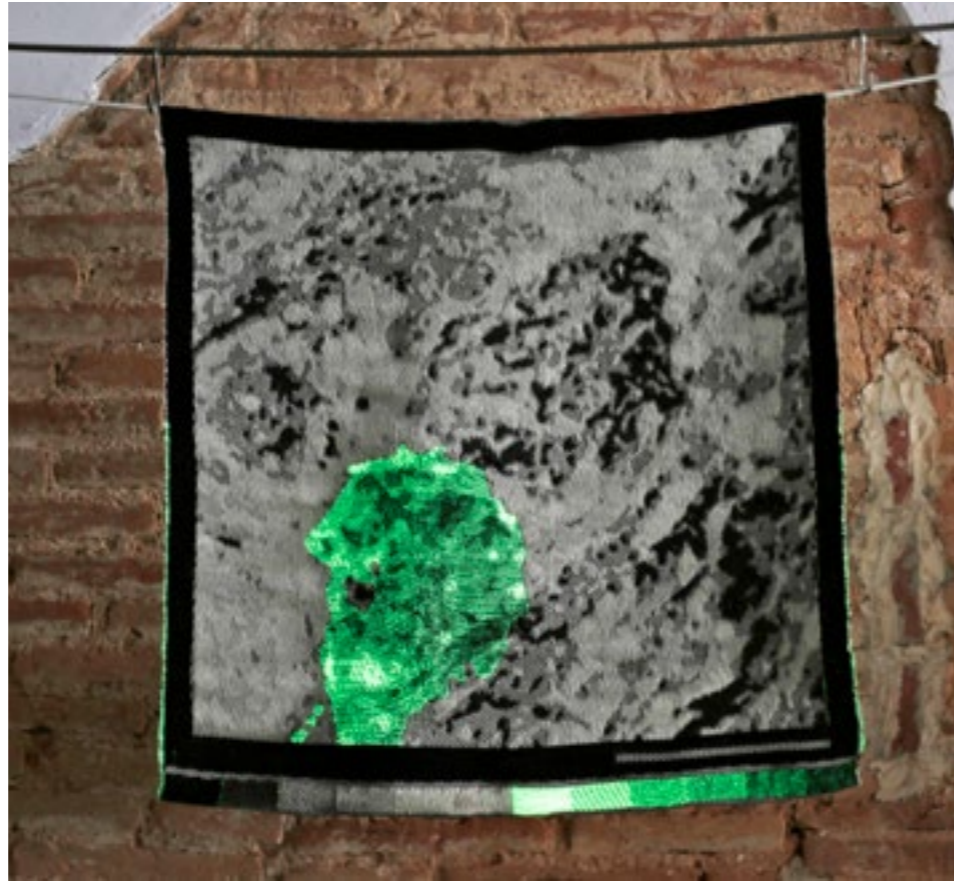
In this performance piece artist Lynn Lu presents blood as a vital pathway connecting body, brain and emotion. Stress-induced blood inflammation slows neuron formation in the brain, which can trigger depressive symptoms, according to research by Carmine Pariante of King's College London. Lu asked participants to recount a personal regret as she drew a drop of their “inflamed” blood onto a petri dish. In exchange Lu offered contributors a crimson shot of anti-inflammatory beet juice. As scarlet petri dishes piled up and juice vials emptied, Lu tiled the wall with anonymous transcriptions of her participants’ regrets—a stark lament of what “might have been.”



Honorable Mentions

THE FABRIC OF THOUGHTS— RECOGNIZING AN ODOR

These tapestries evoke bird's-eye scenes of a verdant island on a dark sea or of waterways winding through marshland. But rather than Earth from above, the fabrics depict microscopic “neuronal landscapes” within the glomerulus, the brain structure that encodes our sense of smell. Carles Bosch Piñol, scientist at the Francis Crick Institute, teamed up with Francesca Piñol Torrent, artist at Barcelona’s Escola Massana, to weave these hypnotic compositions. In some cases the artist used luminous green thread to capture the fluorescence of cellular structures seen in the scientist’s work.



Honorable Mentions

SPIN GLASS

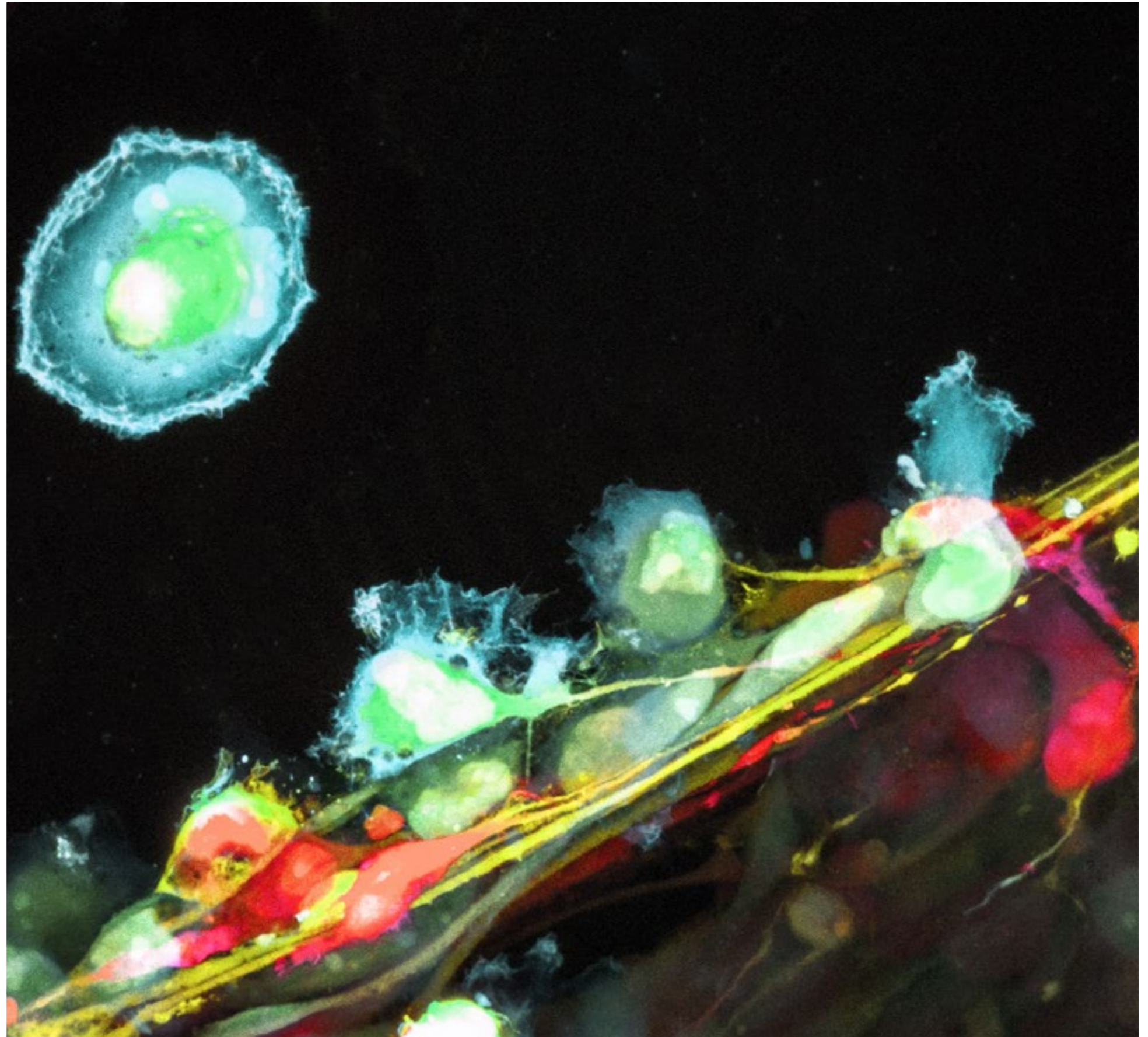
What forms an animal's sense of direction as it explores the world? Each turn of a rat's head activates neural pathways unique to a particular direction. In this glass-and-wire installation inspired by the research of Kate Jeffery of University College London, the flicker of lightbulbs represents the stimulation of these directional pathways as the rat looks around the lab. Each neural chain is coupled to a musical chord, yielding a mesmerizing view into the inquisitive brain of one of our animal cousins. Artist Jenny Walsh created the piece with Jeremy Keenan.



Honorable Mentions

HUMAN ASTROCYTOMA CELLS

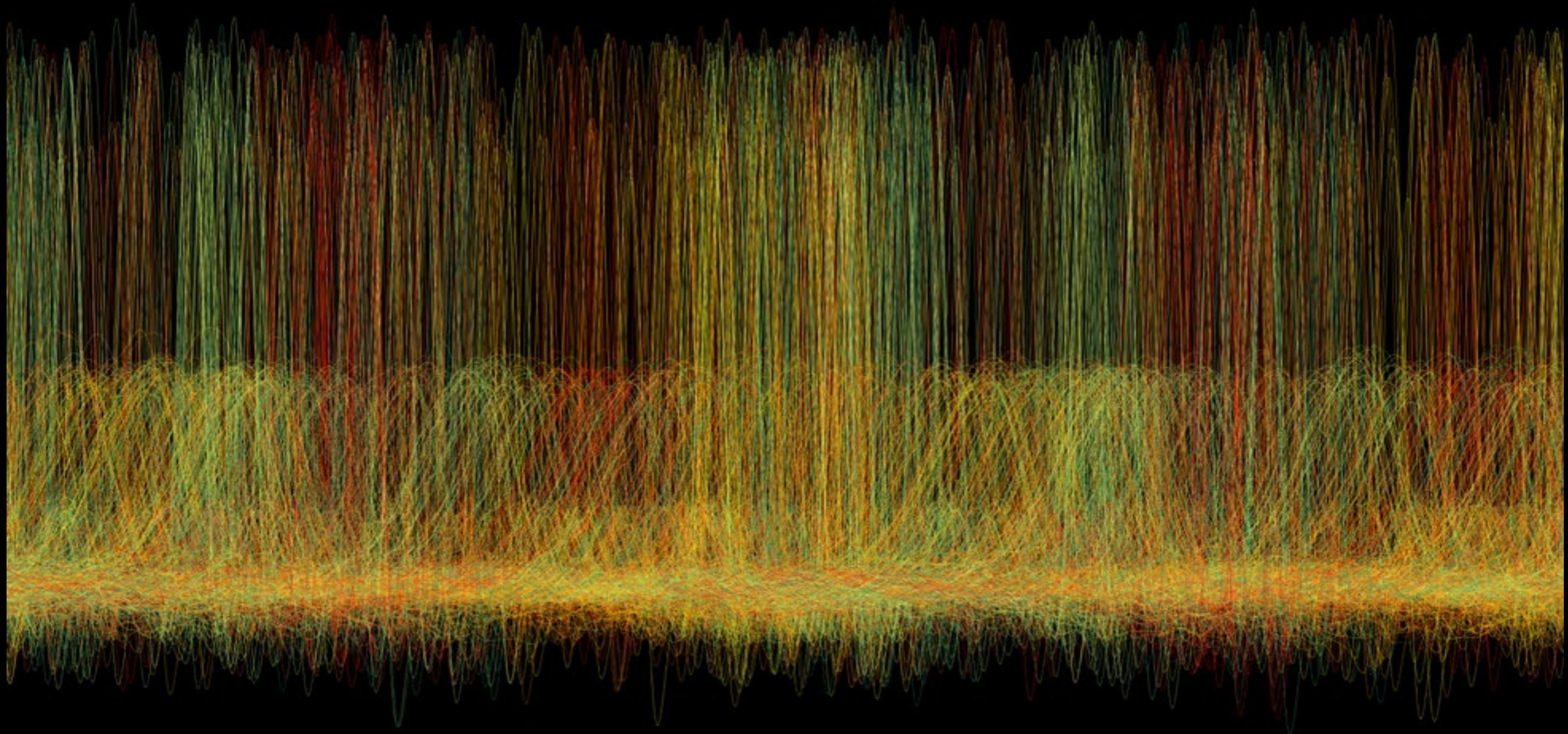
Alwin Kamermans, a researcher at VU University Medical Center in Amsterdam, uses color to represent a third dimension—depth—in this intimate portrait of human brain tumor cells. The image is a composite of 64 individual photographs, each captured in a unique hue and at different focal distance. Structures in blue are farthest from the viewer; red is closest. A depth of less than two hundredths of a millimeter spans the two color extremes.



Honorable
Mentions

COMPLEX RHYTHM SUSTAINING COMPLEX LIFE

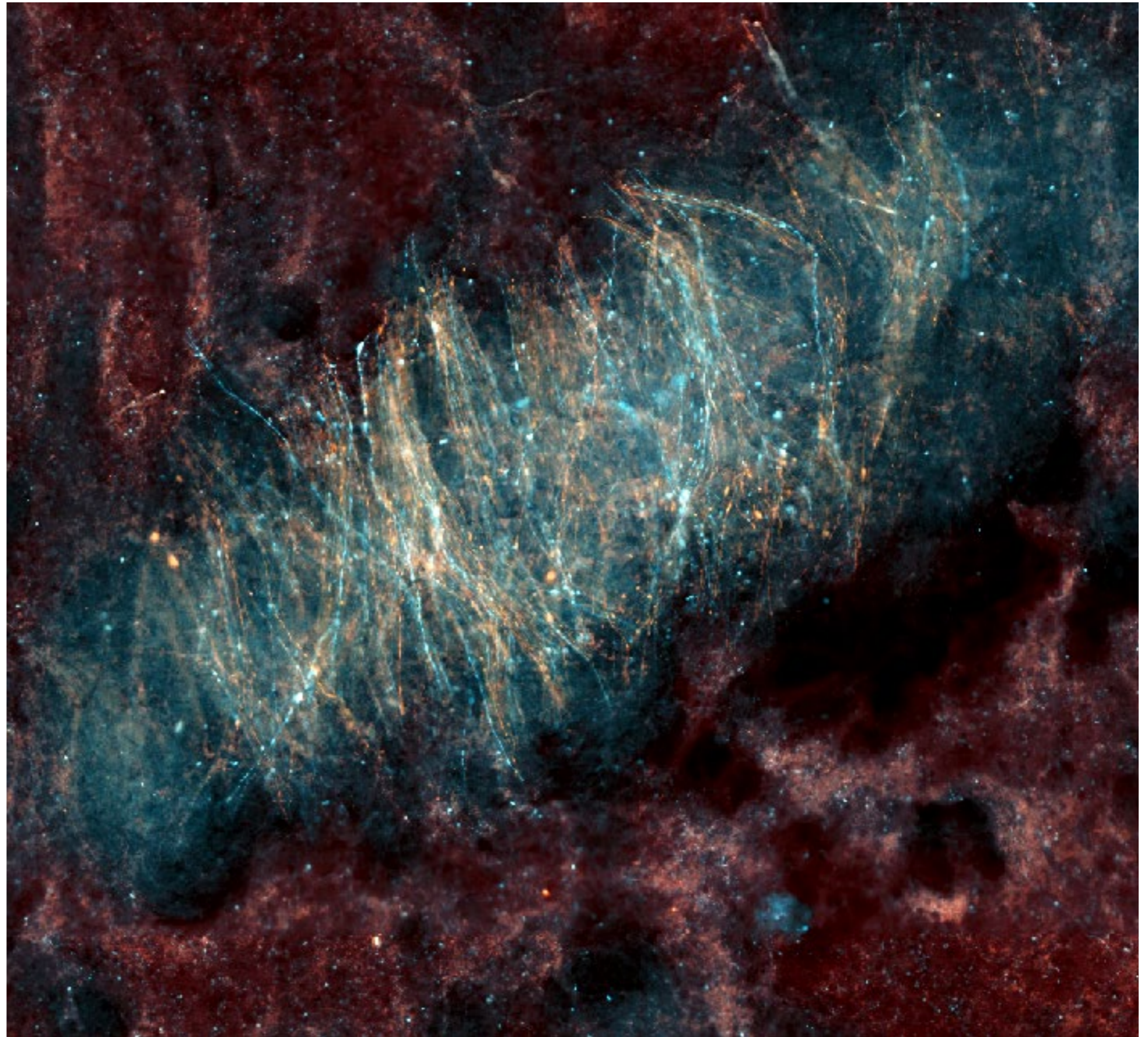
Our bodies' most vital movements are ones we do not consciously control. The autonomic nervous system keeps our hearts pumping day and night. But it doesn't pound out a perfectly periodic rhythm, not even when we sleep, according to researcher Yishul Wei of the Netherlands Institute for Neuroscience. Wei's image overlays consecutive, equal-length electrocardiogram readings of heart activity in a slumbering subject over the course of 15 minutes. The sloppy spread of peaks and troughs across the canvas highlights the heart's variable pacing—in a rigidly regular beat, the curves would fall into tidy alignment.



Editors' Picks

STRIATAL SPINDLE

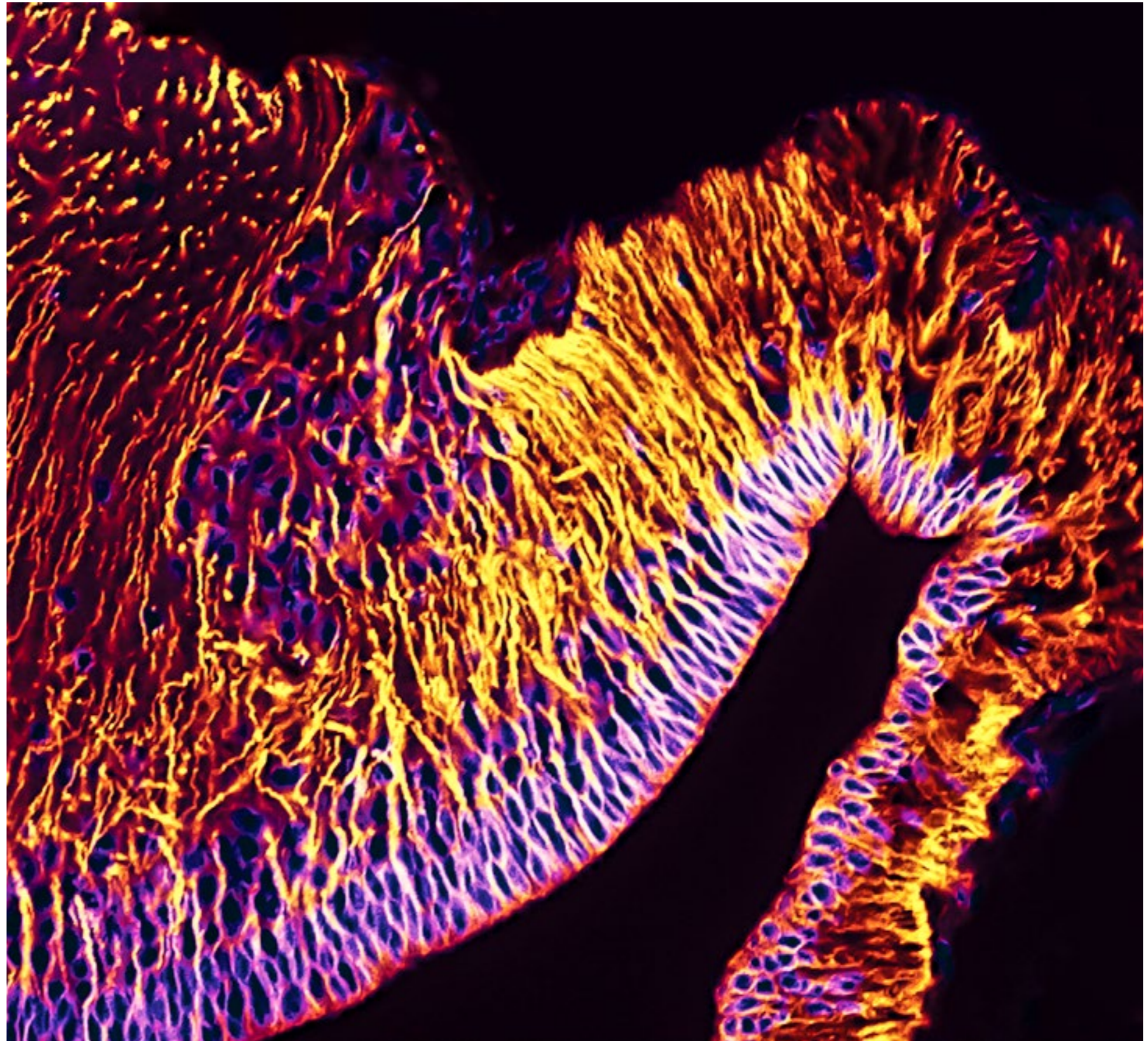
This seemingly galactic photograph was snapped not by telescope but by microscope. A superhighway of axons—the brain's spindly signal carriers rendered in blue and orange—barrels through the maroon haze of the striatum near the brain's center. As extensions of some of the body's longest cells, axons conduct electrical information across vast expanses of the brain. Neuroscientist Karoline Hovde of the Norwegian University of Science and Technology captured this stellar scene.



Editors' Picks

FLAMES OF EMINENCE

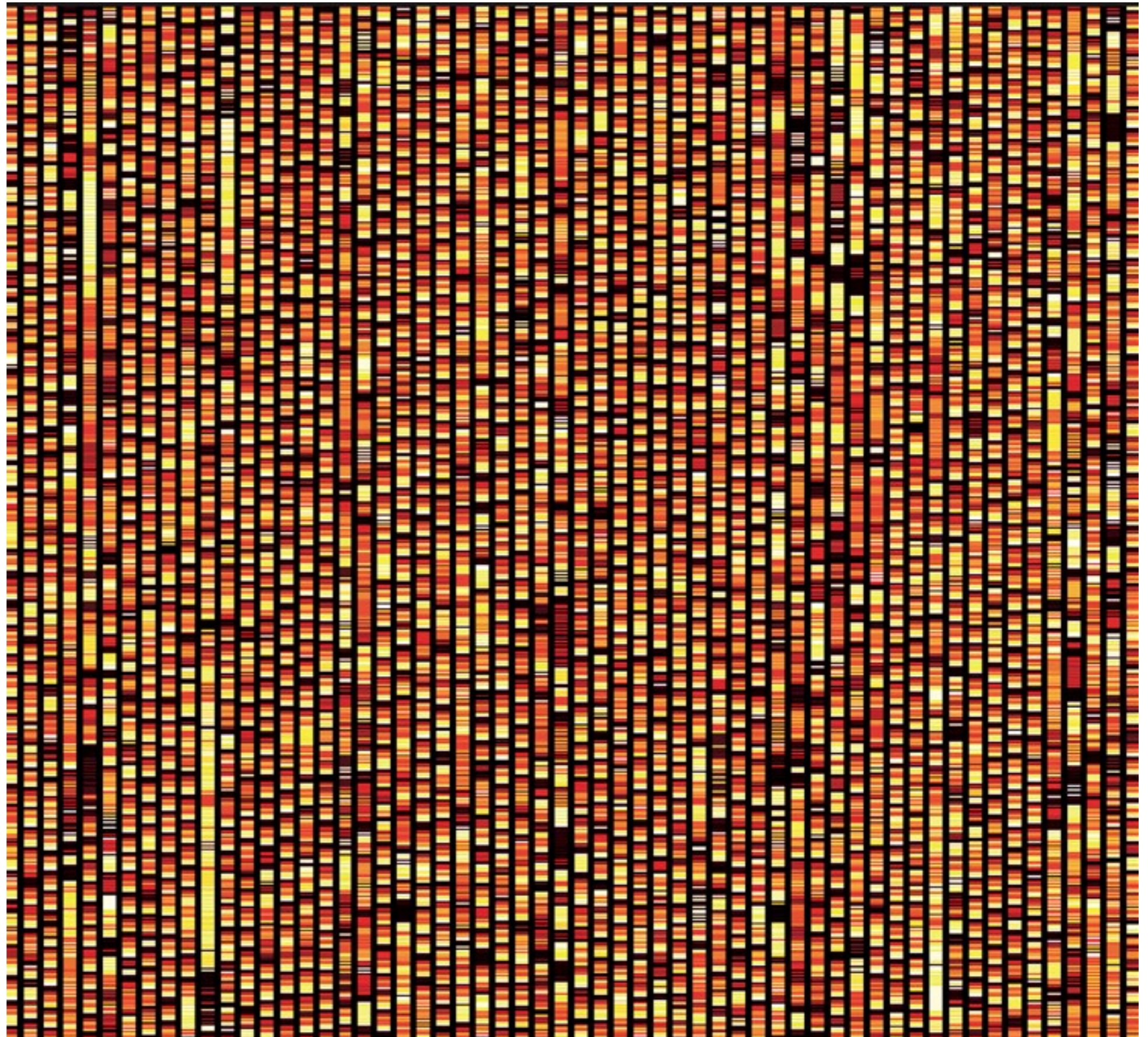
Leopard geckos have the remarkable ability to regenerate lost limbs. They may also be able to regenerate parts of their brain damaged by injury, according to research by Rebecca McDonald of University of Guelph in Ontario. To test this idea, McDonald identifies possible neural stem cells that could become brain builders in the event of injury. McDonald created this glowing photograph of these potential stem cells in a leopard gecko brain using two fluorescent stains: purple for the nuclei and a fiery orange for the filaments.



Editors' Picks

SEQUENCING THE WORM'S ETHOME

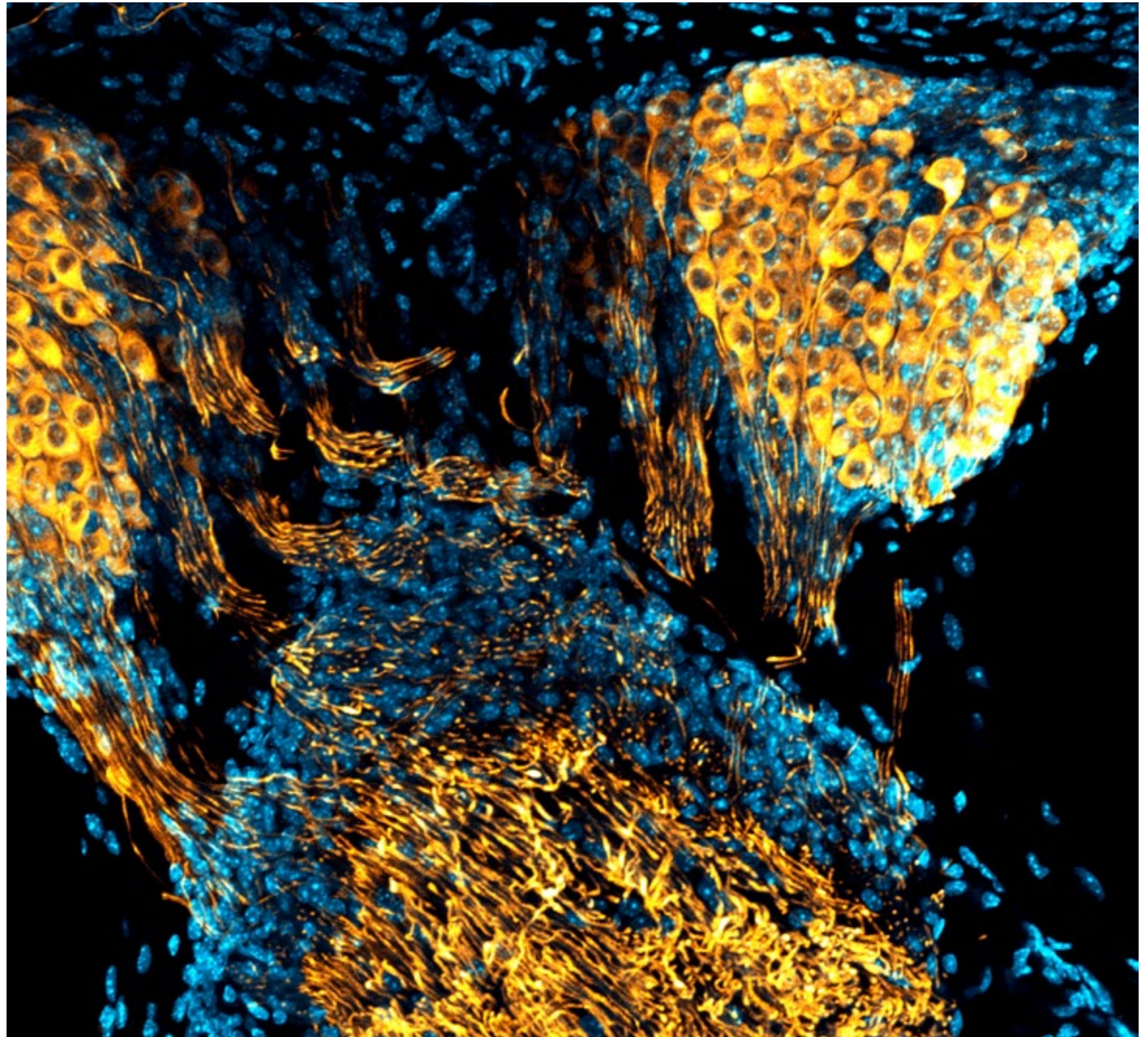
Read from top to bottom, each column of this fiery array describes the movement of a roundworm. Alex Gomez-Marin, a researcher at the Neuroscience Institute of Alicante in Spain, mapped each of 90 unique body postures to a specific hue. Echoes of color indicate repeated sequences of posture, which often occur as the roundworm inches through its environment. Gomez-Marin is drawn to the figure's duality. Although packed with rigorous scientific data, its warm aesthetic and tonal rhythm could equally well pattern a living room rug.



Editors' Picks

LIQUID GOLD

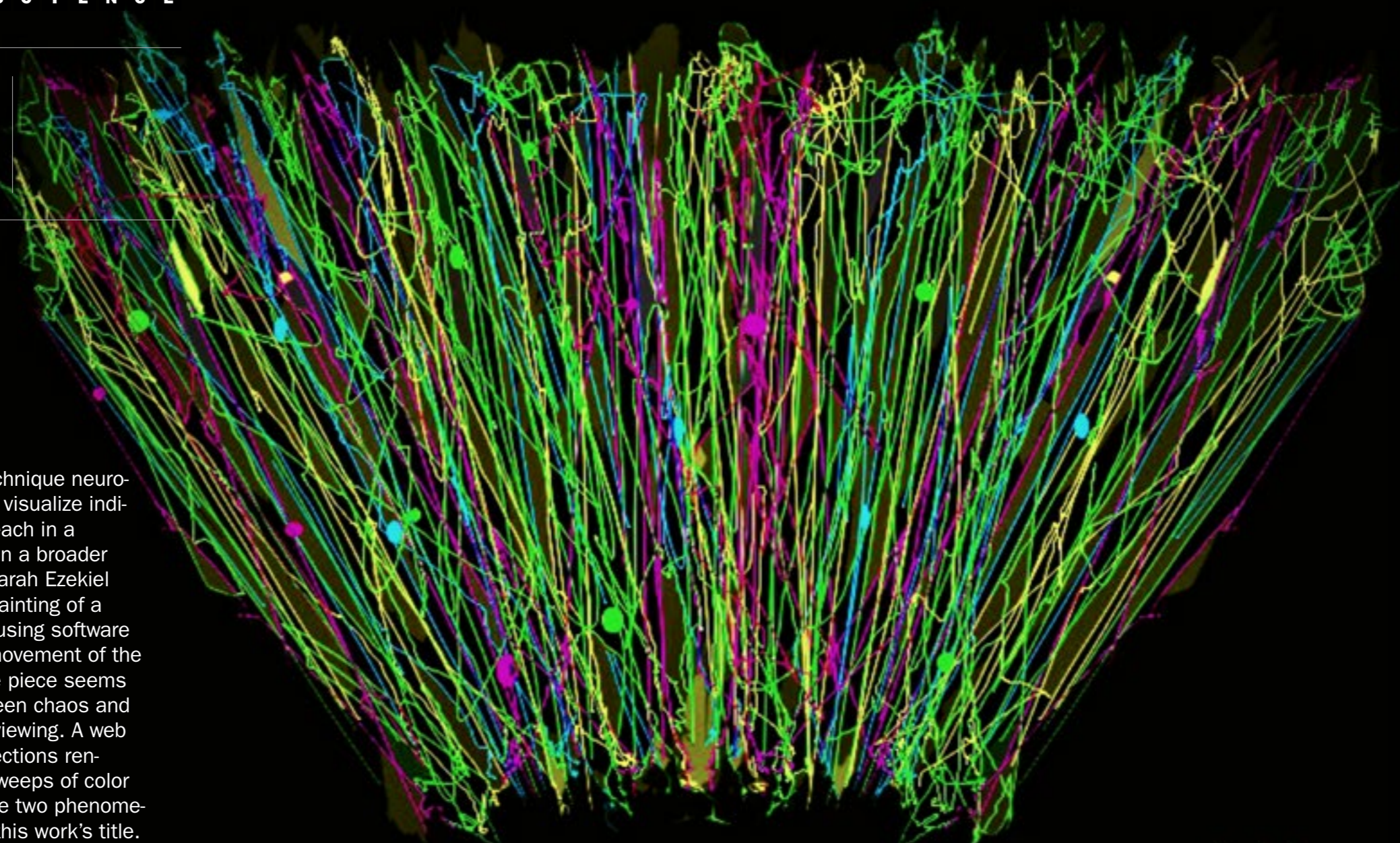
Like flowing water, information streams from the ear to the brain via the auditory nerve. University College London audiologist Dan Jagger used fluorescent microscopy to photograph the structure in a mouse. With this technique, a brilliant gold stain tinges neuron cells, the riverbeds through which information gushes. Meanwhile a second dye binds to DNA in the cells' nuclei, rendering life's most precious molecules in dazzling azure.



Editors'
Picks

BRAINBOW

Brainbow is a technique neuroscientists use to visualize individual neurons, each in a distinct tint, within a broader network. Artist Sarah Ezekiel completed this painting of a brainbow image using software that tracks the movement of the artist's eyes. The piece seems to vacillate between chaos and order with each viewing. A web of delicate connections rendered in broad sweeps of color clearly evokes the two phenomena mashed into this work's title.



Ezekiel



OPINION

Unknown Unknowns: The Problem of Hypocognition

We wander about the unknown terrains of life, complacent about what we know and oblivious to what we miss

By Kaidi Wu and
David Dunning

IN 1806, ENTREPRENEUR FREDERIC TUDOR sailed to the island of Martinique with a precious cargo. He had harvested ice from frozen Massachusetts rivers and expected to make a tidy profit selling it to tropical customers. There was only one problem: the islanders had never seen ice. They had never experienced a cold drink, never tasted a pint of ice cream. Refrigeration was not a celebrated innovation, but an unknown concept. In their eyes, there was no value in Tudor's cargo. His sizable investment melted away unappreciated and unsold in the Caribbean heat.

Tudor's ice tale contains an important point about human affairs. Often, human

Kaidi Wu is a doctoral candidate in psychology at the University of Michigan, where she studies why we do things foreigners find strange and foreigners do things we find bizarre. Her research has been featured in media outlets including *The Atlantic*, *Quartz*, and *Inside Higher Ed*. Follow her on Twitter @kaidi_wu.

David Dunning is a professor of psychology at the University of Michigan. An experimental social psychologist, he focuses on the psychology underlying human misbelief. His lab's Web site can be accessed at <https://sites.lsa.umich.edu/sasi/> and his Twitter feed is @daviddunning6.

fate rests not on what people know but what they fail to know. Often, life's outcomes are determined by *hypocognition*.

What is hypocognition? If you don't know, you've just experienced it.

Hypocognition, a term introduced to modern behavioral science by anthropologist Robert Levy, means the lack of a linguistic or cognitive representation for an object, category, or idea. The Martinique islanders were hypocognitive because they lacked a cognitive representation of refrigeration. But so are we hypocognitive of the numerous concepts that elude our awareness. We wander about the unknown terrains of life as novices more often than experts, complacent of what we know and oblivious to what we miss.

In financial dealings, almost two-thirds of Americans are hypocognitive of compound interest, unaware of how much saving money can benefit them and how quickly debt can crush them. In health, a full third of people suffering from type 2 diabetes remain hypocognitive of the illness. They fail to seek needed treatment—despite recognizing blurry vision, dry mouth, frequent urination—because they lack the underlying concept that would unify the disparate

warning signals into a single alarm.

Hypocognition is about the absence of things. It is hard to recognize precisely because it is invisible. To recognize hypocognition requires a departure from the reassuring familiarity of our own culture to gain a grasp of the unknown and the missing. After all, it is difficult to see the culture we inhabit from only within.

Consider this: how well can you discern different shades of blue? If you speak Russian, Greek, Turkish, Korean or Japanese, your chances are much better than if you speak English. The former groups have two distinctive linguistic representations of blue. In Russian, for example, dark blue (*sinii*) and light blue (*goluboi*) are as distinct as red and pink. But in English, we know blue as a single concept. The deprivation of finer-grained color concepts poses a great perceptual disadvantage. English speakers more easily confuse blue shades, not because we have poorer vision, but because we lack the more granular distinctions in the language we speak.

Hypocognition also lies in the muddle of emotional experiences that we encounter but fail to explicate. We are hypocognitive amid the rumbling moments of frustration

when we are at a loss for words to describe how we feel. If there is any consolation, we could look to other cultural worlds to acquire an emotional lexicon that acknowledges these emotions. Ever felt the unspoken but mutual desire when looking into a loved one's eyes? That's *mamihlapinatapei* in the Chilean Yagán language. Ever felt the irresistible urge to pinch a baby's cheek? That's *gigil* in Tagalog.

But no single emotional repertoire can encapsulate the multitudes of emotional experiences humanity has developed. Picture this scene:

A man acts clueless and clingy to get his wife to cook breakfast for him, even though he knows she is in a hurry. She cooks for him anyway. What is the man feeling?

The wife reciprocates by arranging a private social outing, making her hubby obligated to come along. The man comes along anyway. What is the wife feeling?

The emotion in play is *amae*, which you, like us, might have a difficult time parsing, unless you were brought up in Japanese culture. *Amae* is a pleasant feeling the man experiences when he basks in the indulgence of his wife, and vice versa. The man feels loved, not because his wife cooked for

But no single emotional repertoire can encapsulate the multitudes of emotional experiences humanity has developed.

him, but because she cooked for him despite his ill-mannered demand—one he masterfully orchestrated in the first place. *Amae*, an emotion with no equivalent counterpart in English, may feel befuddling and Machiavellian to a Western mind. But it makes perfect sense to the Japanese. It welcomes intimacy, fosters affection, and invites vulnerability. It is the cement of social relationships in Japan.

Perhaps herein lies the greatest peril of hypocognition. It is facing a concept that captures something we cannot fathom, an exotic emotion we cannot grasp, a certain idea that arouses in others fervor and enthusiasm but strikes us as nothing but foreign and bizarre, a certain principle that must, against our own reason, be unreasonable.

Amid pitched political battles, partisans see only the concepts associated with their own side, hypocognitive of the principles that support the judgments of their ideological opponents. Liberals, for example, construct moral arguments primarily on two principles, harm/care and fairness/reciprocity, failing to recognize additional principles, such as in-group loyalty, respect for authority, and purity concerns that drive conservative opposition.

Amid the heated discourse on bad sexual experiences, the English journalist Caitlin Moran points out, “Men’s *tabula* for women is completely *rasa*.... There are no templates for how to approach a woman in a jolly and uplifting manner, discover her sexual preferences, get feedback while you’re rolling around naked, and learn from

her without feeling oddly, horribly emasculated.” In our most intimate attempt to understand the opposite sex, how much of interpersonal misunderstanding, of social faux pas, of frustration-turned-aggression is because of hypocognition? How much are we hypocognitive of each other’s mental worlds?

If hypocognition impoverishes our knowledge and understanding, how do we become free of it? The attempt to reduce hypocognition should be a delicate pursuit, because going too far against hypocognition makes us vulnerable to its opposite—*hypercognition*. To suffer from hypercognition is to overapply a familiar concept to circumstances where it does not belong. Psychological stress, for example, has a real yet complex relationship to physical illness. But people often overextend the concept. Despite what many believe, stress does not cause ulcers or irritable bowel syndrome. It might exacerbate an episode of eczema, but in no way is it the cause of the malady.

And who are most likely to fall prey to hypercognition? Experts. Experts who are confined by their own expertise. Experts who overuse the constricted set of concepts salient in their own profession while ne-

glecting a broader array of equally valid concepts. Given a patient, a heart specialist is more likely to diagnose heart disease than an infectious disease expert, who is more likely to see the work of a virus. The bias toward what is known may lead to wrong or delayed diagnoses that bring harmful consequences.

But let’s give credit where credit is due. The human mind is an amazing organic hard drive of information. The typical English speaker will know the equivalent of 48,000 dictionary entries by age 60.

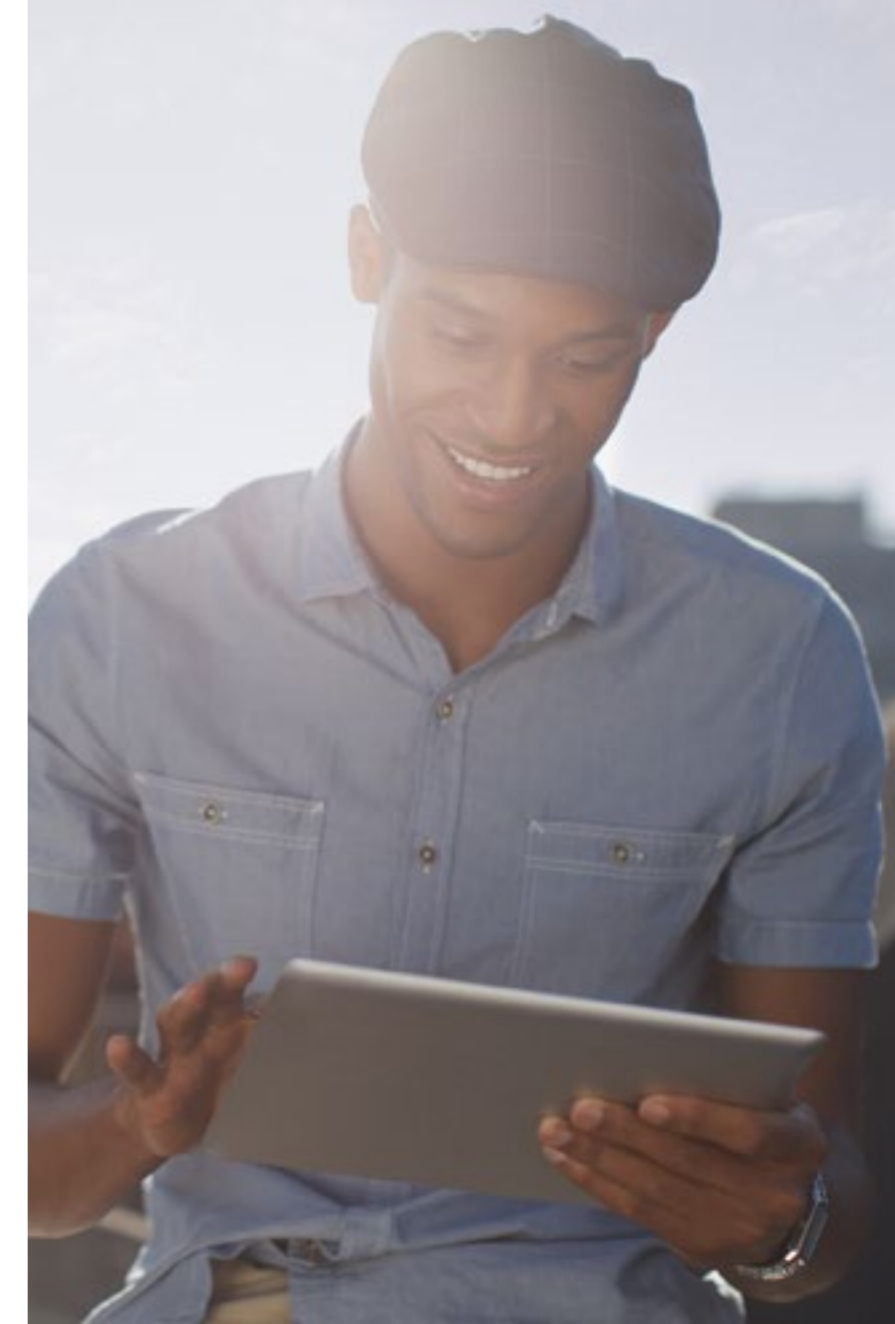
Nevertheless, even with that capacity, hypocognition is unavoidable. The vocabularies we gain in a lifetime pale against the 600,000 entries contained in the *Oxford English Dictionary*, and that is even before we turn to the myriad of concepts residing in other languages.

Over the past decades, social science has catalogued numerous knowledge gaps in the human mind. Perhaps we can start to gain insights into these blind spots by adding the notion of hypocognition to our cognitive arsenal. It will not cure our fallibility, but it might just invite us to seek out our personal unknowns and lead us to a wiser and more enriched life. **M**

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OPINION

A Buddhism Critic Goes on a Silent Buddhist Retreat

Something weird happens to a skeptical science writer during a week of meditation, chanting and skygazing

By John Horgan

GARY WATERS GETTY IMAGES

I'VE BEEN HARD ON BUDDHISM OVER THE years (see for example my [critique of the recent bestseller *Why Buddhism Is True*](#)). But I like to think I'm open-minded. So I recently put my skepticism to the test by going on a weeklong silent Buddhist retreat, which my pro-Buddhism friends Lisa and Bob argued was my moral obligation.

The retreat rocked me. I'm still trying to make sense of it, but I'm going to take a stab at describing it, if only for my own sake. As I told Julie, a teacher who advised me not to write during the retreat, I'm not sure what happens to me until I write about it.

The retreat was organized by [the Dzogchen Center](#), a Buddhist organization based in Cambridge, Mass., and took place at the [Garrison Institute](#), a contemplative center on the Hudson River an hour's drive north of New York City. Coincidentally, I lived in Garrison, the hamlet after which the institute is named, from 1990 until 2009, when my marriage broke up. I taught my son and daughter how to ride bikes on the grounds of the Garrison Institute when it was just

John Horgan directs the Center for Science Writings at the Stevens Institute of Technology. His books include *The End of Science* and *The End of War*.

You become the cosmic self underlying your flawed, individual, illusory self.

an abandoned Catholic monastery, and I swam with my dog, Merlin, in a nearby spot on the Hudson.

A spiritually savvy colleague, Lindsey, recommended the retreat's leader, Lama Surya Das. A big man with a Buddha belly, Das is a self-described Jewish kid from Long Island, originally named Jeffrey Miller, who still speaks with a New Yawk accent. He is a few years older than me, and like many youths of my generation he headed East in search of answers.

He eventually became a teacher, or Lama, specializing in the Dzogchen tradition of Tibetan Buddhism. Dzogchen's meditations, chants, breathing techniques and doctrines are intended to nudge you toward enlightenment, the extraordinary way of seeing, and being, that Buddha supposedly achieved. You become the cosmic self underlying your flawed, individual, illusory self. According to Dzogchen, we are all *already* enlightened,

we're just too dumb to realize it.

Das promotes Dzogchen through his books and the Dzogchen Center, which he founded in 1991. He is a kidder, who pokes fun at Buddhism, other teachers and himself. His mother, he likes to say, calls him the Deli Lama. When he listed the four or six or whatever precepts or pillars of Dzogchen, he invariably forgot one, perhaps to let us know we shouldn't worry too much about doctrine. He liked the Zen aphorism, *If you meet the Buddha in the road, kill him*. Buddha, he explained, is within you, so any Buddha outside you isn't real.

When he chanted Tibetan mantras or prayers, his voice swerved from a bass rumble to a squeaky falsetto. It was a funny but effective way to get us to loosen up and chant along. When we meditated, opened-eyed and open-mouthed, he urged us in a hypnotic murmur to let go of our cramped, fearful, grasping self and become our true

self, which is big as the sky. That technique, like the chanting, eased me into pleasant, trance-like states.

On the first night, Das led us in meditation, talked for a while and took questions. I asked what he thought about the latest report of a prominent Buddhist leader accused of sexually abusing women. He replied that scandals involving spiritual leaders aren't unique to Buddhism, but they trouble him. He fears for the future of Tibetan Buddhism.

To my surprise, he asked what I thought. It turned out he did this often during Q&A. I said I thought we should get rid of the idea that being enlightened makes you morally infallible. Yeah, or omniscient, Das said, that's a problem too, no one is omniscient or infallible.

In addition to Das's helpers and assistant teachers, there were 30-some students on the retreat, male and female, old and young. They included (I learned when we broke silence on the last day) a rock musician, artist, human-rights lawyer, several psychotherapists, teachers and business-folk and at least four engineers (one from Google, another from Microsoft). The retreat cost \$1,800, and we were

Students could ask questions after teachings, otherwise no talking.

encouraged to give the Lama a donation at the end.

Each day's schedule, which lasted from 6 A.M. to 9:15 P.M., included 10 sessions of meditation, chanting, yoga, teaching or combinations thereof. Besides Das, three veteran female students also led teaching (dharma) sessions. Teachings focused on how to integrate Buddhist practice into ordinary life. Students could ask questions after teachings, otherwise no talking.

We were also not supposed to use phones or other digital devices or to read anything other than Das's books, which were on a table in a first-floor room. These rules weren't enforced, and I saw a few students looking at phones, laptops and non-Das books. Some, including me, also wrote in journals, although that was discouraged, too.

I went to every session the first day, but later I skipped some. I spent hours sitting

on a bench overlooking the Hudson and lying on the lawn staring at the sky. I went for a run every morning before sunrise, and several afternoons I jumped in the Hudson at the same spot where I once swam with my dog.

Friends had warned that during the first few days I might struggle with self-criticism and painful memories, with sorrow and regret, but that didn't really happen, perhaps because I'm emotionally shallow. Plucked from the trappings of my normal life, I did see my vanity, insecurity and neediness in high relief, but these flaws seemed more comical than disturbing.

The first few days were hot, mid-90s, I'm guessing. There was air conditioning only in the main meditation hall, where all our group sessions were held. Monday, my second full day, was rough. I had slept poorly the previous night, and the heat was wearing me down. After the final meditation ses-

sion, I trudged up to my third-floor room. Feeling rebellious, I checked out a library at the end of my hall. Most of the books were on spirituality, the environment or history. Ugh. Then I spotted *The Collected Poems of Emily Dickinson*. Dickinson is a mystic, I rationalized, so reading her won't really be cheating, it will be like meditating.

After reading a while in bed, I realized that not every Dickinson poem is as pithily perfect as "The Brain Is Wider than the Sky." Some are a little schmaltzy and whiny. I also started feeling guilty for violating the reading ban. (Has anyone felt sinful reading Dickinson before?) So I set the book aside and lay back on the bed, a fan pushing hot air at me. I wondered, What do I do now? The answer came: Don't do anything, don't even think, just be lazy. You know how to be lazy, don't you? This was an inside joke. My girlfriend likes calling me lazy.

Then I *was* lazy, really lazy. I felt like I was sinking into the bed. Thoughts arose, but they seemed silly, not worth thinking. (Some readers are no doubt thinking, We could have told you that, Horgan.) I was resting on the bottom of a swimming pool, and my thoughts were vague, blobby

shapes moving above the surface of the water. This metaphor is overdramatic. This state felt totally natural, so much so that I didn't really pay attention to it, I was just in it. Then I fell asleep. I slept for seven hours without waking, which for me is great.

When I woke the next morning, part of me was still in that ultra-lazy state. Call it The Laziness. My thoughts still felt slightly distant, as though they belonged to someone else. I was also in a great mood. On my morning run, during breakfast and lunch, in the meditation hall, the world was grinning at me, and I was grinning back. I felt like giggling, and at the same time tears kept welling up in my eyes.

At some point I thought, Hey, what's going on here? I didn't feel as though I had discovered anything. I had simply noticed something there all along, or become something I already was. My reaction wasn't "Aha!" or "Wow!" It was more a "Duh" or Homer-esque "D'oh," like when I'm looking for my glasses and realize I'm wearing them. Except that metaphor isn't quite right, because glasses are something extra, artificial. A more precise analogy would be looking for your eyeballs and realizing they're in your head. D'oh.

I came up with these descriptions while jotting down notes on what I was feeling. I worried that writing about The Laziness would deflate it, but it persisted, along with giddiness, throughout the day. I was scheduled to meet with the Lama for 10 minutes at 4 P.M., and I obsessed over what to tell him.

I bowed, as his assistant had instructed me to do, but he stuck his hand out and shook mine. I asked, Can you become enlightened if you don't believe in enlightenment? Sure, he said, why not. I'm a science writer, I said, a skeptic, who has written critically about Buddhism, but something weird is happening to me. Das told me not to get hung up on any particular experience, just stay open-minded, see what happens, there's a lot of time left in the retreat.

As I thanked him and said goodbye, tears welled up again. Afterward, I crashed emotionally, as if all the glad molecules in my brain broke down into glum byproducts. I thought I had destroyed The Laziness by analyzing, writing and talking to Das about it. But it came back that night when I stood on the lawn, fireflies flashing around me, and looked at the violet sky,

where a half-moon hung between Jupiter and Venus.

I never felt as euphoric as on that day. Perhaps the initial giddiness resulted not from The Laziness itself but from my dawning belief that I had taken a tiny step toward enlightenment. After I had sex for the first time, I also felt euphoric, not because of the sex itself—which was awkward, and painful for my partner, who was also a virgin—but because I *finally* had sex!

But The Laziness never entirely faded. For the rest of the retreat, I felt like I could see more clearly, because my thoughts and emotions had become transparent. Things seemed charged with mythological import, especially when I was outside. The Hudson became The River. A path winding through woods became The Path. A brick wall was The Wall. A goldfinch preening in a pine tree was all the evidence anyone could want of Divine Creation.

The retreat convinced me that contemplation can reproduce the effects of psychedelics, a claim I have long doubted. On the retreat, as during a trip, I saw life's inexplicability and improbability, which I like to call "the weirdness." On psychedelics, the weirdness screams at you. On the

The Lama, during our private chat, said Buddhism isn't true, but it works. Something worked during the retreat, but what was it?

retreat, the weirdness murmured. Imagine the perceptual state that inspired Dickinson to write "A Bird Came Down the Walk."

In my old tripping days, when I encountered strangers, I shunned eye contact, because I feared people would see into my soul and know I was high. I felt that same reflexive fear during the retreat. I had to remind myself, You're not doing anything illegal, fool! And everyone else here is probably tripping, too!

Some other students seemed to be in trances much deeper than mine. On the last day, when we could talk, a young man to whom I mentioned my looking-for-your-eyeballs analogy said he felt like he'd been looking for his head and realized he had no head. Whoa.

It's considered bad form to talk too di-

rectly about enlightenment, and I understand why. As Dickinson said, some things are best seen veiled. But enlightenment, I decided by the end of the retreat, is banal. It means simply appreciating each moment, no matter how mundane and annoying, as an end in itself, not as a means to another end, like making money or impressing others. Like, be here now, Dude.

Easy to say, hard to do. Most of us see our lives as a series of chores to be completed, not moments to be cherished. I certainly do. An insidious effect of being a blogger is that my life becomes fodder for my writing. I'm not complaining, I love this gig, but there is a price.

Is it worth devoting weeks, months, years, decades to cultivating hyperattentiveness? Is that the best thing to do with

life? No. There is no best thing to do with life, and Buddhism errs in implying otherwise. The exaltation of enlightenment makes us vulnerable to abuse by sleazy gurus. And seeking enlightenment is pretty self-indulgent. The world isn't all fireflies and goldfinches. It has problems that need fixing, as I was reminded whenever I looked across the Hudson at the West Point Military Academy.

But I'm glad I went on the retreat. The Lama, during our private chat, said Buddhism isn't true, but it *works*. Something worked during the retreat, but what was it? My wishful thinking? Suggestibility? A charismatic guru assuring me over and over that I am Buddha? Hours and hours of meditation? Chanting? Staring at clouds? Isolation from my laptop, phone and Kindle? From email, Netflix, Twitter, Facebook, *The New York Times*, idle chitchat, all the usual distractions? The heat? Withdrawal from caffeine (I cut back when I took ayahuasca earlier this summer and quit entirely for the retreat)? Who knows.

Now that I'm back in the real world (which, given the digital distractions, is more virtual than real), The Laziness is fading, becoming a memory, an idea. I

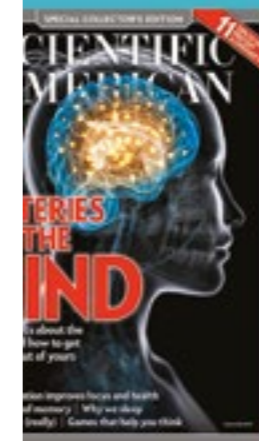
don't know what The Laziness is, and I'm suspicious of any explanation of it, Buddhist or otherwise. But I want to get it back, and sustain it, no matter what I'm doing. Grading freshman papers, waiting for the subway, watching *Humans* with my girlfriend. When I seek The Laziness, I am not living in the moment, I am looking for my eyeballs, but I can live with that paradox. I'm thinking of starting each day by chanting, *D'oh*.

Postscript: I'd like to thank Lisa and Bob for urging me to try a retreat and Lindsey for recommending Lama Surya Das. *Post-postscript:* See my followup post, [Buddhism, the Good and the Bad](#). **M**

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OPINION

Why the Most Important Idea in Behavioral Decision Making Is a Fallacy

The popular idea that avoiding losses is a bigger motivator than achieving gains is not supported by the evidence

By David Gal

LOSS AVERSION, THE IDEA THAT LOSSES are more psychologically impactful than gains, is widely considered the most important idea of behavioral decision making and its sister field of behavioral economics. To illustrate the importance loss aversion is accorded, Daniel Kahneman, winner of the 2002 Nobel Prize in economics, wrote in his 2011 best-selling book, *Thinking Fast and Slow*, that “the concept of loss aversion is certainly the most significant contribution of psychology to behavioral economics.” As another illustration, when Richard Thaler was awarded the 2017 Nobel Prize in economics, the phrase “loss aversion” appeared 24 times in the Nobel Committee’s description of his contributions to science.

Why has such profound importance been attributed to loss aversion? Largely, it is because it is thought to reflect a fundamental truth about human beings—that we

David Gal is professor of marketing at the University of Illinois at Chicago. He previously served on the faculty of Northwestern University. His research areas include the psychology of decision making, identity and behavior, and innovation and creativity. He is working on a book, *The Power of the Status Quo*. Follow him on Twitter @realdavidgal.

are more motivated by our fears than by our aspirations. This conclusion, it is thought, has implications for almost every aspect of how we live our lives.

However, as documented in a recent critical review of loss aversion by Derek Rucker of Northwestern University and myself, published in the *Journal of Consumer Psychology*, loss aversion is essentially a fallacy. That is, there is no general cognitive bias that leads people to avoid losses more vigorously than to pursue gains. Contrary to claims based on loss aversion, price increases (that is, losses for consumers) do not impact consumer behavior more than price decreases (that is, gains for consumers). Messages that frame an appeal in terms of a loss (for example, “you will lose out by not buying our product”) are no more persuasive than messages that frame an appeal in terms of a gain (for example, “you will gain by buying our product”).

People do not rate the pain of losing \$10 to be more intense than the pleasure of gaining \$10. People do not report their favorite sports team losing a game will be more impactful than their favorite sports team winning a game. And people are not particularly likely to sell a stock they be-

People do not rate the pain of losing \$10 to be more intense than the pleasure of gaining \$10.

lieve has even odds of going up or down in price (in fact, in one study I performed, over 80 percent of participants said they would hold on to it).

To be sure it is true that big financial losses can be more impactful than big financial gains, but this is not a cognitive bias that requires a loss aversion explanation, but perfectly rational behavior. If losing \$10,000 means giving up the roof over your head, whereas gaining \$10,000 means going on an extra vacation, it is perfectly rational to be more concerned with the loss than the gain. Likewise, there are other situations where losses are more conse-

quential than gains, but these require specific explanations not blanket statements about a loss aversion bias.

If what I am claiming is true, why has belief in loss aversion persisted so strongly? An idealized view of science is that theories are accepted or rejected based solely on empirical evidence. In fact, science is not simply an objective search for truth, but also a social process, in which proponents of a theory must convince other scientists, through logic and argumentation, of how evidence should be interpreted.

However, this process advantages incumbent theories over challengers for a number of reasons, including confirmation bias, social proof, ideological complacency, and the vested interests of scientists whose reputations and even sense of self are tied to existing theories. A consequence is scientific inertia, where weak or ill-founded theories take on a life of their own, sometimes even gaining momentum despite evidence that puts their veracity in doubt.

In the case of loss aversion, contradictory evidence has tended to be dismissed, ignored or explained away, while ambiguous evidence has tended to be interpreted in line with loss aversion. For example, a paper

purporting to illustrate that price increases are more impactful than price decreases received 65 citations in Google Scholar in 2016, whereas a follow-up paper challenging this view received only 17 citations.

Moreover, belief in loss aversion has meant that phenomena that have nothing to do with loss aversion have nonetheless been interpreted to reflect loss aversion. For example, the sunk cost effect, the finding that people are more likely to continue an endeavor once an investment in it has been made, has been attributed to loss aversion. While the sunk cost effect might reflect a reluctance to recognize losses, this is not relevant to loss aversion, which requires a comparison be made between losses and gains.

In sum, our critical review of loss aversion highlights that, even in contemporary times, wrong ideas can persist for a long time despite contrary evidence, and therefore, that there is a need to critically assess accepted beliefs and to be wary of institutional consensus in science and otherwise. While loss aversion has frequently been cited to explain why people are biased toward the status quo, perhaps fittingly, the case of loss aversion illustrates the importance of challenging science's status quo. **M**

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