Cultivating the Whole Brain

When we think of "paying attention," the first association many of us make is to sitting behind a desk in grade school. "Listen to what I'm saying," the teacher says. "Eyes on me. Don't let your mind wander."

The focus expected of us in school—and later in the workplace—is mostly the logical, deductive, analytic attention that characterizes the upper-right quadrant of the Focus Quadrants (see page 177). We call this narrow, absorbed attention "tactical," and it's the province of the left hemisphere of the brain. But there is a second kind of absorbed focus that paradoxically has more in common with daydreaming than it does with our traditional notions about paying attention. We call it "big-picture" focus, depicted in the lower-right quadrant, and it's associated with the right hemisphere of the brain.

In most schools and organizations and in the culture at large, the capacities of the left hemisphere are accorded far more value than those of the right. The consequence is that our right hemisphere is typically underdeveloped. Is there any doubt that Western culture has privileged the capacities of the left hemisphere—in the left-hand column below—over those in the right-hand column?

LEFT	RIGHT
Verbal	Visual
Rational	Intuitive
Quantitative	Qualitative
Analytic	Synthetic
Deductive	Inductive
Simplify	Enrich

Specialize	Integrate
Separate	Connect
Critical	Nonjudgmental
Goal-oriented	Big picture–oriented
Sequential	Simultaneous
Systematic	Empathic
Objective	Subjective
Literal	Metaphorical
Rule-bound	Unbounded
Outcome-driven	Process-driven

The dominance of our left hemisphere—especially inside most companies—is a testament to the enduring power we've accorded logical thinking and scientific method ever since the Enlightenment. That shouldn't be entirely surprising. The power of rigorous critical thinking has driven remarkable advances in science, medicine, technology, and the growth of economies and democracies around the world.

Because the left hemisphere is uniquely specialized for language, it effectively serves as our spokesperson. By contrast, our right hemisphere literally lacks a voice. It wasn't until the neuroanatomist Jill Bolte Taylor's left hemisphere stopped working, after she suffered a stroke, that she was able to appreciate, for the first time, the unique capacities of her right hemisphere. "Prior to this experience," she writes, "the cells in my left hemisphere had been capable of dominating the cells in my right hemisphere. The judging and analytical character of my left hemisphere dominated my personality."

This is precisely the conclusion that neurobiologist Roger Sperry came to during the split-brain research for which he eventually won the Nobel Prize in Medicine. Sperry set out in the late 1950s to study severe epileptics who had undergone an operation called a commisurotomy. This radical surgery is aimed at bringing epileptic seizures under better control by severing the corpus callosum, which connects

the two sides of the brain. The consequence is that the two sides can no longer communicate the way they ordinarily do. Based on ingenious experiments with these patients, Sperry was able to demonstrate that each of our hemispheres is highly specialized: the left for logical, sequential tasks and the right for visual and more subjective ones, including seeing patterns and combining ideas in new ways, understanding metaphor, and recognizing emotions through body language, and tone of voice. As the psychologist Robert Ornstein has noted, the left hemisphere specializes in text and the right in context—*what* is said versus *how* it is said.

When the right hemisphere is more active, we're able to step back from the urgent demands of whatever we're doing and take a wider view, often incorporating a longer-term perspective. Rather than working step-by-step toward a conclusion, we literally become more "insightful"—open and receptive to seeing things in different ways and making new connections. Hemispheric specialization, Sperry concluded, is not an "all-or-none" phenomenon. The two hemispheres are always communicating, especially during the most complex tasks. But it is the left hemisphere that is systematically trained. As Sperry put it, "[T]here appear to be two modes of thinking, verbal and nonverbal . . . respectively, and . . . our educational system, as well as science in general, tends to neglect the nonverbal form of intellect."

QUIETING THE LEFT HEMISPHERE

There are several ways to access and evoke the experience of right-hemisphere focus, but perhaps none so reliable and powerful as an exercise devised by Betty Edwards, a former art professor who is the author of the book *Drawing on the Right Side of the Brain.* At one level, the book is a primer in how to draw. More profound, it is about how to train the right hemisphere, specifically by learning how to see in a different way than we ordinarily do. Edward's first exercise, which became the basis for her PhD thesis, is a very simple one. No words can approximate the experience you will have by actually doing it.

The exercise has two parts. Before you begin, you'll need to get two pieces of blank paper at least the size of the pages of this book, as well as a pencil with an eraser (not a pen). You'll need a quiet place to work

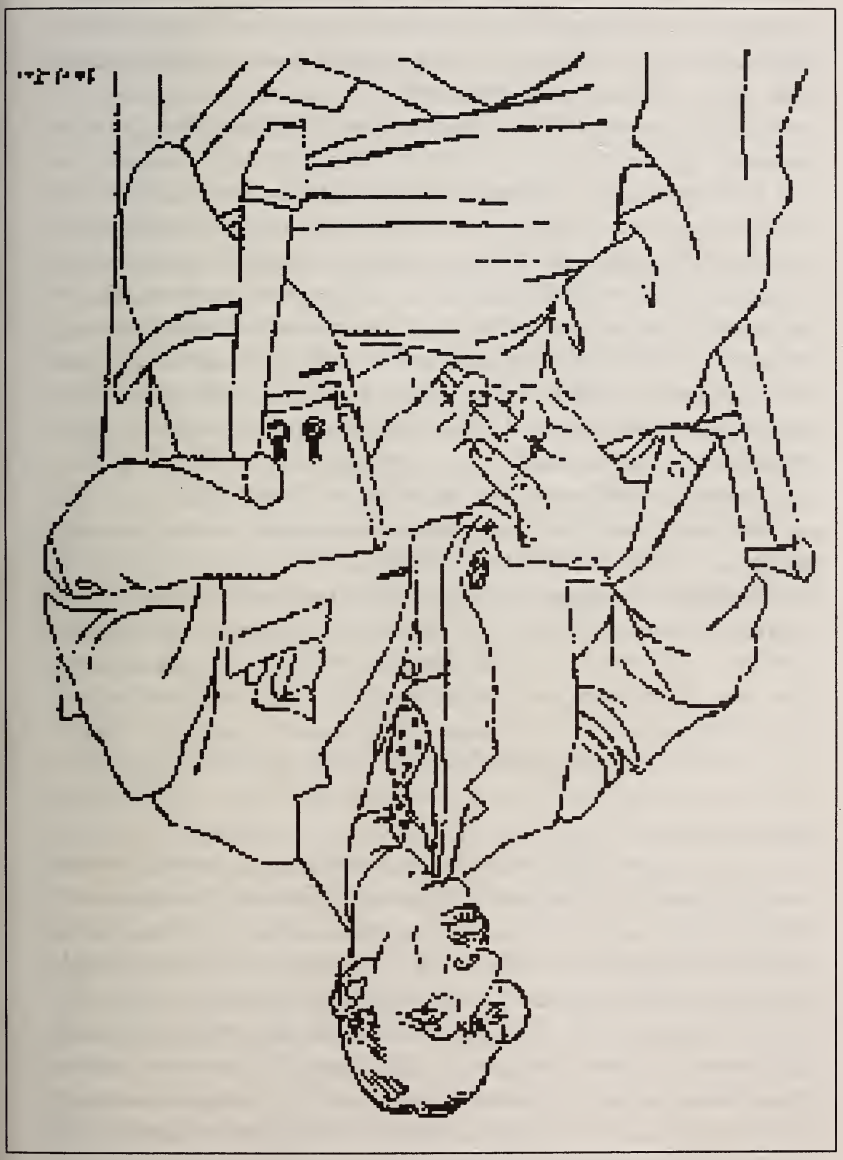
in which you're not likely to be interrupted. On the first piece of paper, the assignment is to draw a self-portrait. Unless you draw regularly—and very few of our clients do—this might seem like a daunting challenge. All we ask is that you do the best you can on the first sheet of paper. If you'd like to take a quick look in the mirror first, to remind yourself of what you look like, do so now. But then draw yourself from memory.

When you're finished, take the second sheet of paper, and turn to the next page in this book. There you'll see a sketch, which we've obviously turned upside down. Resist looking at it right-side up. Instead, begin by drawing a rectangular frame on your paper exactly the same size as the one that surrounds the drawing on the next page. Once you've done that, copy the drawing itself, as closely as you can, on your own piece of paper, and not by tracing it. Start from the bottom, and work your way up. Don't try to name anything you're drawing or to make it look like anything specific. Just draw from line to line and space to space. You can use your thumb or finger to estimate distances between lines, if that helps. Be as meticulous about re-creating what you see as possible.

Typically, this drawing takes about twenty to thirty minutes, but don't check your watch, and don't be bound by any specific time limit. Instead, allow yourself to become immersed in the process and simply draw until you've finished. It's best not to read any further before doing this exercise.

Assuming you've finished, you can now turn your drawing right-side up so you can see how you did. You were copying Pablo Picasso's sketch of Igor Stravinsky. But now let's set aside both drawings for a few moments and focus first on your self-portrait. What was your experience of drawing it, and what's your assessment of how well you did?

In all likelihood, it looks only vaguely like you and lacks much richness, detail, or three-dimensionality. There's a good chance you've represented your hair with a bunch of straight or squiggly lines, your nose with a scrawl, and your mouth with two curved lines and a straight line in between. If that's so, your explanation may well be that you're not an artist and you can't really draw. This self-critical



voice is the left hemisphere talking, and Edwards has made a career out of talking back to it. I had no previous drawing experience when I met Edwards and went through her five-day training. Based on that experience, I can attest that drawing realistically is something anyone can learn to do remarkably quickly.

In all likelihood, you overrelied on your left hemisphere, or what Edwards refers to simply as "L-mode," to draw your self-portrait. The left hemisphere is specialized to simplify, reduce, generalize, and name things. If we draw in L-mode, we're not interested in seeing a nose in all its complexity. Rather, the left hemisphere is goal-oriented and impatient to reach conclusions. It gives names to objects in order to classify them, so one nose is just like another. Asked to draw one, we tend to retrieve the symbol we have for it from memory, reproduce that, and move on. Edward's simple but profound insight was that by turning the drawing upside down, it becomes impossible for the left hemisphere to name what it sees. Confronted with a bunch of lines and shapes, the left hemisphere loses interest in the task.

The right hemisphere, by contrast, lacking the capacity to name things, is happy to immerse itself in the details of what it sees. Without language, it's also unburdened by time considerations. In "R-mode," we're in no rush to get anywhere or to arrive at a specific destination. If you took on the upside-down drawing task, it's likely that you experienced your mind quieting down, your self-critical voice giving way, the loss of a sense of time passing, and the palpable cognitive shift as you became absorbed in the task for its own sake. For many people, this is also a meditative experience, both relaxing and restorative.

Are you surprised by how well your drawing turned out? Is it better than you expected? For most of our clients, the answer is a resounding "yes." The explanation is not that you somehow unlocked latent artistic talent. Rather, it's that, by accessing R-mode, you were simply able to draw what you saw. "You already know how to draw," says Edwards, "but old habits of seeing interfere with that ability and block it." As the artist Don Dame puts it, "Drawing is the time-bound activity of seeing. It stills the brain's noise. . . . Art is a specialist's activity in this culture, and it is just a *symptom* of the process of seeing." It's not that drawing is necessarily an expression of artistic ability—it may

or may not be—but rather that *learning* to draw is a means by which to train a unique way of seeing.

As for creativity, Edwards believes it can be trained like any other skill. The practical value of drawing is that it's a way to exercise and strengthen the capacities of the right hemisphere. They're valuable in everything from problem solving to innovation to strategizing to stepping back and seeing the big picture. In a left-hemisphere dominated world, these right-hemisphere capacities are dramatically underdeveloped.

The Internet, filled with search engines, wikis, and thousands of Web sites on every imaginable topic, makes vast amounts of information instantly available to anyone. The consequence is that left-hemisphere capacities, such as breadth of knowledge, memory for details, and even gathering, sorting, and organizing information, create less of an advantage in the workplace than they once did. But there is still no computer that can match the key capacities of the right hemisphere: creative and big-picture thinking; curiosity and openness to learning; and even empathy. Think of each of these as muscles that most of us have undertrained. In a fiercely competitive and rapidly changing marketplace, they're a largely untapped source of potential competitive advantage, both for individuals and for organizations.

RICHER, DEEPER, LONGER TERM

Seeing more deeply is the metacapacity we build when we actively train right-hemisphere focus. Above all, R-mode requires slowing down—and quieting down. "If ever there was a silent process," the psychologist Jerome Bruner has written, "it is the creative one." More, bigger, faster is the province of the left hemisphere. Richer, deeper, slower is the opposing but complementary strength of the right hemisphere. We can't march relentlessly toward a near-term goal and adopt a reflective, big-picture perspective at the same time. Far too often, we choose to focus on the former at the expense of the latter. Both are crucial to the highest levels of performance.

In absorbed L-mode, we move analytically, logically, and sequen-

tially toward a goal by focusing narrowly on the task at hand. Consider an accountant doing a series of computations, a lawyer writing a brief, or a surgeon making a series of cuts. In R-mode, we can be just as deeply absorbed in a task, but we pay attention in a different way, seeing both the whole and the parts, noticing patterns, embracing paradox, ambiguity, and complexity. For example, we often dismiss intuition as magical thinking that charlatan psychics claim to have. But intuition is defined in the dictionary simply as "the power or faculty of attaining direct knowledge or cognition without rational thought and interference." In short, it's a nonverbal route to knowledge that arises not from rational deduction but from seeing and sensing more deeply.

NURTURING CREATIVITY

Where are *you* when you get your best ideas? In the shower? Working out? Driving? Walking in nature? In your dreams? Here's where you're likely not: at your desk, in front of your computer. We rarely get our best ideas when we're actively *trying* to get them, using our logic and our will. More commonly, they come to us when we're not consciously seeking them. This is the right hemisphere at work. The best ideas occur to us, paradoxically, when we let go of conscious control, something that our left hemisphere is reluctant to do. The left hemisphere not only chafes at threats to its power but also sees itself as in charge of our safety. Letting go makes it (and therefore us) feel vulnerable. The right hemisphere, by contrast, has no self-consciousness and, as a result, no sense of self to protect.

The more we understand the value of letting go, the more comfortable we become selectively setting aside L-mode to think more freely, imaginatively, and visually in R-mode. As Edwards points out, the words we use to describe creative breakthroughs are almost always associated with seeing: insight, foresight, hindsight, seeing the light, coming into focus, getting the picture, or even something as simple as "I see it."

Researchers have now begun to map more precisely what happens inside the brain in these creative moments. In a series of studies, the researchers John Kounios and Mark Jung-Beeman used brain scan-

ners and EEG sensors to study neural activity as subjects struggled to solve word puzzles. When the subjects reported that their solutions seemed to arise suddenly and spontaneously, rather than by deductive analysis, the EEG recordings revealed a flash of gamma waves in the brain's right hemisphere. The flash manifested just before the solution popped into the subject's awareness.

"Solving a problem with insight," Kounios says, "is fundamentally different from solving a problem analytically." The researchers also detected an increase in alpha brain-wave intensity in the visual cortex, which is associated with an inward focus of attention. "You want to quiet the noise in your head to solidify that fragile germ of an idea," says Jung-Beeman. The broader implication is that intentionally setting aside time to quiet the mind and activate the right hemisphere—through meditation or drawing, for example—is a powerful way to induce creative breakthroughs.

Artists understand intuitively how to move into this state, but the rest of us must learn it. Hannah Minghella, who heads production at Sony Pictures Animation, came from a highly artistic family, but in the aftermath of our work together, she became more conscious about setting the conditions that fuel her creativity. "When I first got into my job, I tried to involve myself in everything," she told us. "As time progressed, I realized that wasn't sustainable and I needed to delegate more tasks so that I could have more downtime, both to restore myself and so I could think creatively.

"I've learned that I definitely don't do my most creative thinking at the office. I need to be completely on my own, in a quiet place, undistracted. If I need to figure something out in a script that isn't working, my ritual now is to make a cup of tea at home and sit down all by myself with a notepad, roll up my sleeves, and just write free form. That's when I usually have my best ideas. I've realized that my responsibility in this job is not to worry about the minutiae of administration or to be involved in every detail of our process, but to look for places where something has gone off creatively and to help get us back on track. I can only make that happen when I give myself the time and space I need."

Many of our clients, ranging from Sony's Matthew Lang to Mark Fields, Ford's president for the Americas, have discovered that taking a midafternoon break and going for a walk serves a dual purpose. It

provides a source of renewal, but it's also a time during which solutions to problems they've been struggling with often arise spontaneously. During the writing of this book, my midmorning break was to take a run. If I'd been unable to solve some writing problem while sitting in front of my computer, a solution would almost invariably occur to me during my runs. I found it impossible to think intentionally and sequentially about a problem while I ran, but I often had spontaneous insights or saw new connections between ideas. Much the way it is with a dream, these ideas tended to slip away very quickly. It was essential, I learned, to write down my insights the moment I finished a run. On occasion, knowing I had a specific problem to solve, I even resorted to taking a small, voice-activated tape recorder along on my runs.

LEARNING, LISTENING, AND RECEPTIVITY

If R-mode serves creativity, it also facilitates learning. Our left hemisphere is filled with thoughts, ideas, beliefs, and memories of past experiences that profoundly influence the new information it takes in. On the one hand, this instinct drives discernment and critical thinking. On the other hand, as Edwards puts it, "Preconceptions, whether they are visual or verbal, can blind one to innovative discoveries."

To a considerable extent, the ego-driven left hemisphere believes it already knows everything it needs to know. It's often more eager to confirm its existing beliefs than to explore new ideas. It's also wired to reach conclusions as quickly as possible. As Bolte Taylor put it following her stroke, "Our left mind's language center is specifically designed to make sense of the world outside of us, based upon minimal amounts of information. . . . Our left brain is brilliant in its ability to make stuff up and fill in the blanks when there are gaps in its factual data. . . . I need to remember, however, that there are enormous gaps between what I know and what I think I know." Finally, the voice of self-judgment resides in the left hemisphere and often speaks loudest when we're struggling to learn something new.

The right hemisphere, lacking language, has no way of knowing what it knows and no self-critical voice ringing in its ear. It delights in new learning. Visualize a toddler playing, laughing, and exploring,

full of curiosity and innocent wonder. With limited language skills, toddlers are largely free of a self-critical voice. They're hungry to learn and unconcerned with outcomes. It's an ideal way to grow and develop, both for children and for adults. It's also a state that can be cultivated through meditation.

When Zen Buddhists talk about "beginner's mind," they're referring to an openness to every experience, unfettered by preconceptions, agendas, or expectations. The same stance facilitates absorbed listening, a capacity notably absent in many leaders we meet. This not only limits their learning but also takes a toll on those they lead. Feeling truly heard and understood is deeply nourishing for all of us. The more skilled we get at accessing R-mode, the more receptive to others we're capable of being.

Empathy—the capacity to be sensitive, sympathetic, and responsive to what others are feeling—is the third primary strength of the right hemisphere. "Our right brain perceives the longer wavelengths of light," Bolte Taylor writes in *My Stroke of Insight.* "As a result, the visual perception of our right mind is somewhat blended or softened. This lack of edge perception enables it to focus on the bigger picture of how things relate to one another. . . . In contrast, our left brain perceives the shorter wavelengths of light, increasing its ability to clearly delineate sharp boundaries."

In short, when the right hemisphere is dominant, our sense of separateness diminishes. This may provide a neurological explanation for the sense of oneness—what both Hindus and Buddhists call "*samadhi*"—which highly practiced meditators sometimes experience when they are most deeply concentrated. In effect, boundaries disappear. In the days after her stroke, Taylor found that she was not capable of experiencing separation or individuality. "In the absence of my left hemisphere's analytical judgment, I was completely entranced by the feelings of tranquility," she writes. "Freed from all perception of boundaries, my right mind proclaims, 'I am a part of it all.' "

At the most practical level, intentionally quieting the left hemisphere is a way to relax the instinct to judge and rush to premature conclusions, which facilitates greater empathy. Numerous studies show that the most inspiring leaders are consistently those who tune in to what others are feeling and listen to them with genuine interest and respect. Along with a handful of leaders we've worked with over

the years, Amy Pascal, the co-chairman at Sony Pictures Entertainment, has an instinctive ability to make you feel as if you're the most fascinating person in the world when you're in her presence. At Sony, it's referred to, sometimes ruefully, as "being in the light." That's because as warm a place as it is to bask, many people are vying for Pascal's attention and, not surprisingly, no one feels they get enough of it.

There is intense controversy about whether observed differences in male and female brains are learned or genetic. Simon Baron-Cohen, a British psychologist, is the leading proponent of the latter view. "The female brain is predominantly hard-wired for empathy," he argues in *The Essential Difference*. "The male brain is predominantly hard-wired for understanding and building systems. . . . To systematize you need detachment. . . . To empathize you need some degree of attachment in order to recognize that you are interacting with a person, not an object." By contrast, in *Pink Brain, Blue Brain* the neuroscientist Lise Eliot argues with persuasive evidence that "when it comes to differences between boys and girls . . . the fact is that the gaps are much smaller than commonly believed and far from understood at the level of the brain or neurochemistry."

Ultimately, the issue is less about gender than about the limitations of any brain that operates at the extremes. Asperger's syndrome and high-functioning autism, for example, are typically characterized by rigid, narrowly focused attention, as well as severely impaired capacity for empathy. People suffering from these disorders often live highly ordered, controlled lives. They focus narrowly on small details and stick obsessively to routines and systems. At a less pathological level, we've observed many analytically gifted, left-hemisphere-driven leaders who lack the capacity to connect emotionally with those they lead. At the opposite end, extreme empathy may lead to an inability to create boundaries with others, while high creativity may be accompanied by a spacy inability to follow through and translate ideas into actions.

THE STAGES OF CREATIVITY

Neither hemisphere of the brain provides the full range of qualities we need to operate at our best in a complex, multilayered world. Our

first imperative, then, is to stop choosing sides up between them and instead find better ways to tap the strengths of each so the whole is greater than the parts. Creativity is a good example. Because it can't be understood purely in logical terms, many of us have tended to view it as mysterious, ineffable, and even magical. In fact, thinking creatively turns out to be a classic whole-brain activity that requires both hemispheres, and more of one than the other, depending on which stage we're at in the creative process. The better we understand these stages, the more systematically we can train and enhance creativity in ourselves and others.

A surprising degree of consensus has emerged during the past hundred years about the basic stages of creative thinking. In the late nineteenth century, Hermann von Helmholtz, a physicist and physiologist, became the first scientist to suggest that creative ideas emerge in three predictable stages. The first, he said, is saturation, which is essentially the gathering of facts. The second is incubation, which is the mulling over of the information, often unconsciously. The third is illumination, when some new combination of the data leads to a breakthrough or an "Ah-ha!"

In 1908, the French mathematician Henri Poincaré suggested a fourth stage, which he named "verification," to describe the point at which a creative insight is rigorously tested for accuracy. More recently, several researchers have suggested an additional stage that precedes the other four. The psychologist George Kneller named this "first insight," which he characterized as the point at which creative challenge is defined. The five-step process therefore looks like this:

FIRST INSIGHT ▶ SATURATION ▶ INCUBATION ▶ ILLUMINATION ▶ VERIFICATION

In *Drawing on the Artist Within,* Betty Edwards makes a convincing case that each step in the creative process draws more specifically on one hemisphere of the brain or the other. In our terms, that suggests a movement between the upper- and lower-right Focus Quadrants. *First insight* is an R-mode activity. The very notion of setting a creative challenge requires stepping out of the box of what we already know. It's the inspiration a scientist has for a new experiment, the essence of a plot for a novel that suddenly occurs to a writer, or an entrepreneur's idea for a new business. "The formulation of a problem," wrote Albert

Einstein, "is often more essential than its solution, which may be merely a matter of mathematical or experimental skill."

Saturation, the gathering of information, involves immersing one's self in the known, which is foremost a left-hemisphere activity. This second stage in the creative process involves not just gathering the information but also reading through it: sorting, evaluating, organizing, outlining, and prioritizing. This tends to be laborious, methodical work, and it is sometimes shortchanged, but always at a cost. As George Kneller puts it: "One of the paradoxes of creativity [is] that in order to think originally, we must familiarize ourselves with the ideas of others." Information, in short, represents the raw material from which original thinking emerges—and the more knowledge one has, the better the base. In Anders Ericsson's terms, saturation represents a critical component of deliberate practice, building the base of knowledge that lies at the heart of true expertise.

In any extended creative endeavor, we're likely to hit roadblocks at certain points along the way. Imagine the feeling of being stuck on a problem. Your mind seems to be going in circles or you find yourself spacing out. The harder we try at those times, the more confused and frustrated we often become. That's when the R-mode *incubation* phase begins. In many cases, this occurs unintentionally after we throw up our hands and walk away from the problem, at least temporarily. When we understand incubation as a critical stage in the creative process, it can be something we move to intentionally after recognizing we've exhausted our logical, left-hemisphere capacity to solve a given problem. That's one of the reasons we urge our clients to break up their days—and especially their periods of intense focus—with a walk, or by meditating or exercising.

It's also in R-mode, after we've stopped trying to solve a problem logically and sequentially, that the fourth stage of creativity, *illumination,* occurs. This is the moment of breakthrough, when the solution comes to us unbidden, a gift that seems to arise spontaneously. For the chemist Friedrich August Kekulé, the breakthrough he'd been wrestling with occurred one afternoon in 1857, when he fell into a reverie while working on a textbook. He had a half-waking dream about a snake seizing its own tail. That image, he later explained, led directly to his hypothesis that the carbon atoms in benzene formed a closed ring. Solving the structure of benzene became the key to un-

derstanding the basis of many organic compounds. While working on *The Last Supper,* Leonardo da Vinci regularly took off from painting for several hours at a time and seemed to be daydreaming aimlessly. Urged by his patron, the prior of Santa Maria delle Grazie, to work more continuously, da Vinci is reported to have replied, immodestly but accurately, "The greatest geniuses sometimes accomplish more when they work less."

The final stage of the creative process is *verification.* Often this requires the application of rigorous scientific method, which represents the best of left-hemisphere thinking. Even the most creative insights aren't worth much if they can't be translated into a form in which they can be understood and used by others. This L-mode stage may require long hours in a laboratory, meticulously testing a finding, or hunched over a computer, translating an understanding into words. Verification is the difference between a clever hypothesis or intuition and a solution that reliably and enduringly changes lives. It's through the capacities of the left hemisphere that we translate insights and ideas into laws, generalizable principles, and practical applications.

Understanding the difference between the capacities of the two hemispheres of our brain allows us to intentionally foster the conditions that best serve each one. Absorption is the core capacity we need to use either hemisphere optimally. The capacity to move flexibly between L-mode and R-mode—drawing on either one or both, according to the task—is the essence of the whole brain operating at its best. "Using the two modes together," Edwards writes, "you can learn to think more productively, whatever your creative goals may be." To thrive—individually and organizationally—we need nothing less.

CHAPTER SIXTEEN ACTION STEPS

- Seeing more deeply and creatively is the capacity we build by training the right hemisphere of the brain. The first step is learning to slow down and quiet our minds of internal chatter. Schedule at least one half-hour period this week in which to brainstorm around some issue at work. You can help to access your right hemisphere by doodling, daydreaming, going for a long walk, or undertaking any activity that frees you from having to think consciously.
- The most inspiring leaders are those who consistently tune in to what others are feeling and listen to them with interest and respect. The next time you have a meeting or conversation with someone, practice listening closely without interrupting. Give that person your undivided attention, and see what it feels like. What did you learn or discover that you wouldn't have otherwise?
- Begin any creative project by immersing yourself in what's already known. This is the step known as "saturation," and, contrary to the assumption many of us make, the best ideas tend to emerge by extending, deepening, rethinking, and reframing what's already known.