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Net Smart

How to Thrive Online

Howard Rheingold

drawings by Anthony Weeks

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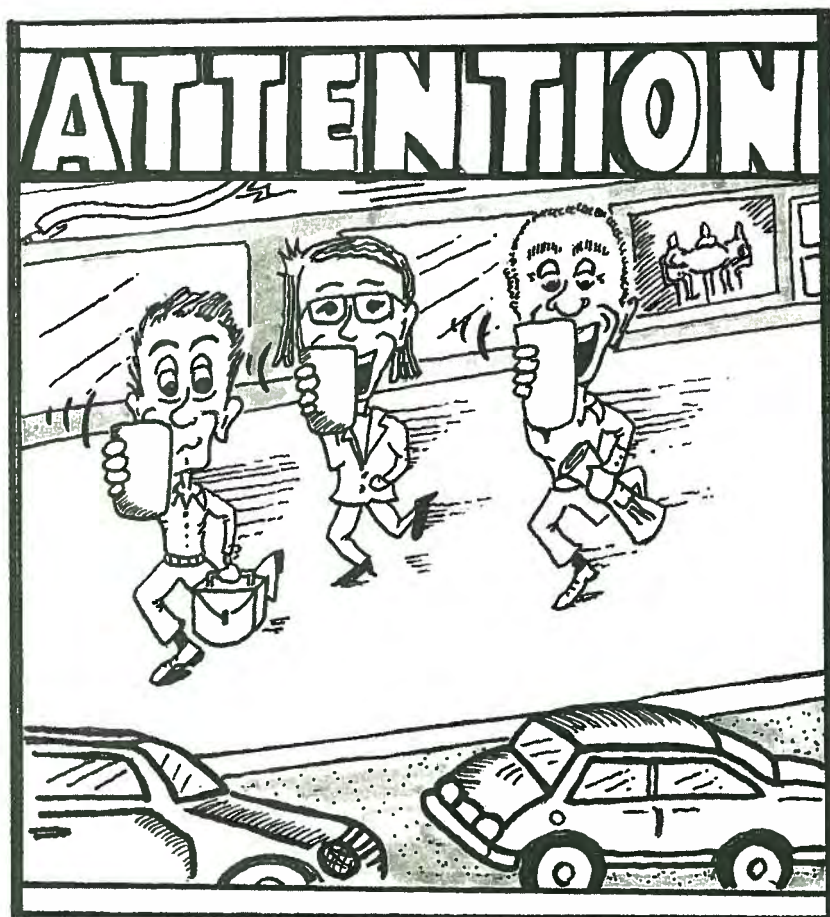
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For Judy



1 Attention! Why and How to Control Your Mind's Most Powerful Instrument

In the transmission of knowledge the children and teachers of the future should not be faced with a choice between books and screens, between newspapers and captioned versions of the news on the Internet, or between print and other media. Our transition generation has an opportunity, if we seize it, to pause and use our most reflective capacities, to use everything at our disposal to prepare for the formation of what will come next. The analytical, inferential, perspective-taking reading brain with all its capacity for human consciousness, and the nimble, multifunctional, multimodal, information-integrative capacities of a digital mind-set do not need to inhabit exclusive realms. Many of our children learn to code-switch between two or more oral languages, and we can teach them also to switch between different presentations of written language and different modes of analysis. Perhaps, like the memorable image captured in 600 BCE of a Sumerian scribe patiently transcribing cuneiform beside an Akkadian scribe, we will be able to preserve the capacities of two systems and appreciate why both are precious.

—Maryanne Wolf, *Proust and the Squid*, 2007

I've taken to opening the first class session of each semester with words that always seem to capture students' attention: "Close your laptops." My next words, "Turn off your phones," come as no surprise at that point. Then I tell them to shut their eyes, which does seem to startle them. I ask them to take one minute to observe how attention leaps effortlessly from thought to thought, directing them to "note how you don't have to work to make your mind wander. It does that all on its own."

By 2005, the year Facebook spread to most universities, the sight of students staring at their laptops rather than looking at their professor had become commonplace in classrooms. Nevertheless, the spectacle puzzled me the first time I witnessed it. Were they taking notes? Discussing my lecture? Messaging each other about what to eat for dinner? Watching YouTube? After six years of observing college students, asking them directly, and even recording their actions with video, I've concluded that the answer

is “all of the above.” The attentional shift that has been taking place among students for some time is now propagating far beyond the campus: all people and media are available all the time, and in all places, but relatively few people appear to use ubiquitous informational access and social connectivity politely and productively. Students and professors were among the first but not only humans whose social norms have been disrupted by the use of always-on/everywhere media.

“I can’t change your mental habits in a single semester,” I continue, after they open their eyes, “but I can suggest a simple, powerful idea: you can learn to be aware of how you shift your attention when your phone buzzes or your laptop screen beckons.” I’ve found that introducing a little mindfulness where previously there had been none can be insidiously irrevocable. Asking students to become conscious of their laptop use during class is like asking them to not think of a purple dinosaur.

Each week, I introduce a new attention probe to the classroom. I told a cohort of fifty students, for instance, that five of them could have their laptops open at any one time. “In order for somebody else to open their computer,” I stipulated, “one of the current five will have to close theirs.” This was not only an attention probe but also a collective action problem. It forced the current five to be aware of their own attention in the context of other students who were waiting to Google my lecture (or slay monsters in a role-playing game). Each class session, I reminded students that the objective was “to get you to start paying attention to the way you pay attention.”

I realized that my students had no idea of what it felt like to stand in front of them while they were concentrating on their computer screens. With the students’ permission, I made a video of how my classroom appeared from where I stood and then projected it at the front of the room.¹ I also aimed another camera at their laptops from the back. As I suspected, I captured a visual record of one student’s attention meandering. First, he started inspecting my personal Web site. Then he checked his email. He moved between these separate Web sites and cognitive tasks in less time than it has taken you to read these last few sentences. I wasn’t surprised to discover that students surf the Web during my class. What did intrigue me, though, was that this particular student was in fact one of my *most* attentive students. If I were to have asked him a question while he was checking his email, I’m certain that he’d know the right answer. Was this young man born with the talent to juggle multiple parallel information streams without dropping anything, the way some people are born to run swiftly? Or more interesting, Could it be that he was no more or less

attentionally endowed than other students but had *learned* something that others could learn?

I posed the last question to Clifford Nass, the often-quoted social psychologist who has an office two doors from mine at Stanford University. Nass was the principal author of a widely cited study that showed most media multitaskers to be worse than they thought at multitasking. His team also reported that their subjects’ performance on individual tasks degraded significantly when they attempted to multitask.² The most important thing I learned from Nass about mediated attention is that most media multitasking is actually task switching rapidly, *not* parallel processing, and this switching is more mentally costly than anybody thinks. People multitask because they believe they can get more done, but Nass has solid evidence that the opposite is usually the case. I meditated on this at some length, since I frequently live with multiple, simultaneous attention streams myself. Many popular publications have interpreted Nass and his colleagues’ research to mean that multitasking doesn’t work, period. I was intrigued, however, by the few exceptions to Nass’s and others’ findings about the inefficiency of task switching—the evident existence of a small number of *successful* multitaskers.

Researchers at the University of Utah reported that about 2.4 percent of the college students in their studies were able to talk on the telephone while operating an automobile driving simulator—*without* degraded performance.³ At the time of this writing, nobody knows whether those “super-taskers,” like the student I captured on video or those at the University of Utah, are innately better at processing multiple streams of information or stumbled on mental tricks that enable them to outperform others.⁴ I do know of one instance where the ability to switch rapidly and without loss of ability from task to task is essential: aviation. Indeed, one recent study claimed that experienced fighter pilots handled their executive control functions more effectively than a control group of similar intelligence: “The pilots displayed superior cognitive control, showing significantly greater accuracy on one of the cognitive tasks, despite being more sensitive to irrelevant, distracting information.”⁵ Fighter pilots have to hyperfocus on the current target in their sights (“superior cognitive control”) without losing awareness of the speck in their field of vision that might become a threat in a few seconds (“irrelevant, distracting information”). When I posted a link to this research on Twitter, someone I had not previously known replied within seconds that aviators must simultaneously “aviate, navigate, and communicate.” I reviewed the scientific literature about attention training

and found ample clues to actual techniques for improving one's ability to pay attention in the context of multiple competing media.

The first thing I learned is good news if you have been thinking that "attention training" sounds like too much work: you can experience immediate benefits by beginning in small ways to exercise mindfulness regarding your attention online. In this realm, taking *some* control, even if it is a baby step, is far better than passively letting your attention be grabbed without reflection. Growing evidence indicates consistent exercise can strengthen self-control of attention.⁶

I'll help us begin the process of learning to control attention by examining how attention works. Then I'll consider the dangers of distraction posed by social media, examine arguments that the Web is making us stupid, and weigh counterarguments that we can learn to use digital media to multiply intelligence. I'll scrutinize multitasking—how it works, why and when it doesn't along with what it's good and not good for. Learning the latest knowledge about the brain's capacity to rewire itself—known as "neuroplasticity"—can increase your power to actually direct your brain's self-rewiring function rather than just being affected by it.

It is not possible to explain the cognitive underpinnings of attention in a simple way without oversimplifying, so keep in mind that my objective is not to convey a rigorous review of brain science but instead to transmit enough basic knowledge to enable you to wrest control of your attention from media that might be trying to capture it. Oversimplification number one: *attention*, *memory*, and *executive control* are the fundamental components of thinking—and the executive control process is the particular power you can tap to control your use of social media. To experience how these three components work together, reflect on the mental actions you probably undertook the last time you misplaced your keys. First you tried to recall where you last saw your keys. You moved various snapshots of memory from the "back of your mind" into the spotlight of your attention. Part of your brain coordinated attention and memory in a mental simulation of a spatial search.

In your mental quest for lost keys, your brain shifted remembered perceptions from the background to the forefront of your attention—into what cognitive scientists call "working memory." Working memory is well known among psychologists because of an intriguingly titled research paper published in 1956, George Miller's "The Magical Number Seven, Plus or Minus Two."⁷ Miller demonstrated that most people can keep around seven chunks of information in their working memory (plus or minus two) at any one time. In order to work with more than seven chunks, some brain

mechanism has to swap out the current information under attention's spotlight and fetch another chunk from memory.

The part of your brain that you use to retrieve memories and keep information in your working memory is referred to as the "executive control" or "cognitive control" function. Scientists often liken executive control to a kind of CEO of cognitive processes that coordinates attention and memory. I caution against investing too much in the image of a little person in your brain who acts in this manner. Executive control is a function, not a person. (If you posit a little person inside your brain, you still have the problem of describing how that little person makes decisions. Do they have yet another little person nested within them?) I think of executive control as akin to a self-conducting orchestra. The executive function also helps us think about our thinking—a process technically known as "metacognition," the brain function we can use to gain control of our lives online.

Like a conductor pointing at a soloist, executive control chooses from moment to moment which memory, thought, or perception to foreground, and which ones to recede into the background, based on a previously decided goal (like the conductor's musical score). The central executive function must terminate all active selection of memories, thoughts, and perceptions related to a prior goal in order to activate the cognitive processes associated with a different aim. Suppose, for example, that your baby is crawling across the floor while you are trying to remember your keys. Keeping your baby alive is an overriding priority (strategic goal), so it is necessary to suspend your mental search for your keys (previous strategic goal) while you look for dangerous objects in the baby's path. This rerouting of attention is what your brain does when you think you are multitasking. Your brain expends time and energy whenever it suspends one attentional process to fire up another one.

When you shift your attention, there is always a short interval during which you must reorient, refocus, and filter out competing information in order to move from one stable theme to another, whether you move from remembering your keys to saving your baby, or from working on a report to reading your email. Cognitive scientists call this temporary disruption the *attentional blink*.⁸ Only you can tell whether shifting attention outside the boundaries of your focal theme is worth the time lost getting back to your original task ("switching costs")—but given experimental evidence, most people have to face the fact there *is* a cost, most of the time. Gloria Mark, professor of informatics at the University of California at Irvine, has studied the effects of workplace interruptions and found that it can take up to a half hour to regain concentration on a central task afterward.⁹

When you scan the environment for objects of interest like crawling babies, your attention is widely focused—like turning on the lights in a room to take it all in at a glance. When you notice the fork in the hand of your crawling baby and estimate that she is five seconds away from jamming it into an electric outlet, your focus narrows to a spotlight. Everybody uses each mode all the time—otherwise nobody would be able to walk through traffic, nor would anyone be able to perform brain surgery. We are at least minimally aware of the broad margins of our perceptions even while we are narrowly concentrating most of our attention. Our senses are receiving an estimated eleven million bits of information per second, while we are conscious of only forty.¹⁰ When talking about attention, mostly we are referring to the forty bits that are under the tightly focused beam of attention—although research has demonstrated that the remaining millions of bits are being attended to on a subconscious level, and still affect our thoughts and behaviors.

Humans pay a lot of attention to other humans—hence the success and seductive distractions of social media such as Facebook and Twitter. The discovery of “mirror neurons” in primates strongly implies that paying attention to others is one of the few human cognitive capabilities that may be neurally “hardwired.” Mirror neurons fire when you do something, but they also fire in the same way when you watch someone else doing the same thing. The scientists who discovered mirror neurons believe they are fundamental to social behavior: “If we want to survive, we must understand the actions of others. Furthermore, without action understanding, social organization is impossible. In the case of humans, there is another faculty that depends on the observation of others’ actions: imitation learning. Unlike most species, we are able to learn by imitation, and this faculty is at the basis of human culture.”¹¹

Neuroscientist and reading specialist Stanislas Dehaene also believes the trainability of our attention to others is essential to human sociality.

In the human species, cultural selection is further amplified by its intentional character. As stressed by the primatologist David Pratt Mac, *Homo sapiens* is the only primate with a sense of pedagogy. Only humans attend to the knowledge and mental states of others in order to teach them. Not only do we actively transmit the cultural objects we find most useful, but—as is particularly apparent with writing—we intentionally perfect them. More than 5000 years ago, the first scribes hit upon an extraordinary potential deeply embedded in our brain circuits: the possibility of conveying language through vision. This initial idea was then perfected by generations of scribes. A long chain of teaching tradition links us to these early writers who worked diligently, from one generation to the next, to make their invention easier to assimilate by our primate visual system.¹²

Mirror neurons might be basic to introspection as well as social behavior and learning. Running our own mental simulations of the future, the attentional process we will later learn to recognize as the “narrative network,” turns our ability to mentally rehearse something we’ve seen others do into a tool for controlling our own awareness.

When it comes to interacting with the world of always-on info, the fundamental skill, on which other essential skills depend, is the ability to deal with distraction without filtering out opportunity.

Conscious Distraction: Are You Captain or Captive of Your Attention Muscles?

In regard to propaganda the early advocates of universal literacy and a free press envisaged only two possibilities: the propaganda might be true, or it might be false. They did not foresee what in fact has happened, above all in our Western capitalist democracies—the development of a vast mass communications industry, concerned in the main neither with the true nor the false, but with the unreal, the more or less totally irrelevant. In a word, they failed to take into account man’s almost infinite appetite for distractions.

—Aldous Huxley, *Brave New World Revisited*, 1958

While I was writing this book, my friend Duke University professor Cathy Davidson was also working on her own book about attention.¹³ In her blog, Davidson recounts an incident that happened when she was tracking down footnote references requested by the editor. She was working at her desk, got up to put a teakettle on the stove, and went back to her writing. Hearing a garbage truck outside, she assumed it was the source of the burning rubber she was beginning to smell. When she started to see smoke, Davidson realized that the water had boiled out of the teakettle and the plastic handle had been melting. She had forgotten to pay attention to the stove while concentrating on her book. So she consciously told herself to be particularly mindful when she got into her car a few hours later, reminding herself that her thoughts were likely to drift back to those footnotes. Davidson willed herself to be more vigilant than usual while driving. A few minutes later, two dogs darted in front of her car, and she hit her brakes on time.¹⁴

Davidson told this story to emphasize the need to exercise conscious decision making in order to avoid the burning teakettle, dogs in the road, or online distraction:

The simple-minded accounts of how the Internet is ruining our attention would not connect the teakettle with the stray dog. But the new neuroscience of attention

says that itemizing attention is wrong. Interconnection is all. *Because* the trauma of the fiery red kettle caught my attention and almost got me in trouble, I was able to recalibrate, very consciously and self-consciously, my attention level and make adjustments. I'm not sure I would have done so before starting this book because we tend to think of attention passively, as if it is out of our control or only controlled outside of ourselves, by the world around us. That is not true. We can track our own attentional pathways and learn from them.¹⁵

When you are online, how often do you control your own focus—and how frequently do you allow it to be captured by peripheral stimuli? At least some of the time, your attention *is* controlled by outside forces. Jumping at a loud noise or applying the brakes at the sight of a dog in the road, for example, is not the product of reflection. Willed, sustained attention, however, requires premeditation. With a goal in mind, I actively maintain attention on a specific objective such as writing this sentence and simultaneously filter out information that is not directly applicable to my central task, such as the tiny icon that popped up in the corner of my computer screen to alert me to new email. This skill at screening out information before it reaches full awareness is not something that social media itself can do for me; automated filters help, but the most important filter is a function of my brain, not my PC. Only *you* can know your goals, and only you can determine which stimuli are relevant at any moment.

The executive control we all exercise when we maintain focus on one task becomes useful when we move from understanding attention to controlling it. Cognitive psychologists have studied how attention sharpens the field of concentration in part by filtering out unwanted stimuli.¹⁶ In a crowded setting, you employ executive control of your attention when you listen to one voice and tune out the others around you (this classic example is known, appropriately, as “the cocktail party effect”).¹⁷ If you want to experience your use of executive control directly, simply switch your attention between different conversations at a party. Observe how you change filters without consciously sorting through the competing information streams—suddenly, the voice you were following attentively becomes one of those you are *not* following. What do you move when you shift your attention? What did Davidson adjust when she jumped up from her desk and rescued her melting teakettle before it burst into flames—or when she decided to be hypervigilant when she started driving her car that morning?

Gaining control of your attention while you are online requires, first of all, intention. When you formulate a goal, you need to *intend* to achieve it. Goals and intentions enable your executive control to attune to the part of your information environment that matters most, and tune out what is

irrelevant, at least for the purpose of your goal. Even when you think you are focusing effectively, you might also be blocking out significant information—perhaps not relevant to your immediate task but instead vital to other strategic goals—along with all the distractions you are better off ignoring.

This phenomenon, known as “selective inattention,” is dramatically illustrated by the online video of the “awareness test” conducted by Daniel Simons of the University of Illinois at Urbana-Champaign and Christopher Chabris of Harvard University.¹⁸ Subjects were asked to watch a short video of two groups (distinguished by black or white T-shirts) passing basketballs and count passes by one team, or keep track of bounce versus aerial passes. While the basketballs were passed, an actor walked through the scene wearing a gorilla suit, paused, turned to look at the camera, and walked on. When asked whether anything out of the ordinary occurred, around 50 percent of the subjects did not report seeing the gorilla. The assigned task created a frame for the subjects’ attention, filtering out distractions that didn’t fit, to the point where a gorilla on a basketball court escaped notice.

When external stimuli tempt attention away from the intended focal point, the external stimuli are usually regarded as distractions—a word that has a time-wasting connotation. Distraction sounds sinful (sloth, probably). *Distraction: The Erosion of Attention and the Coming Dark Age* is the title of a contemporary critique of always-on consciousness (which I will consider shortly).¹⁹ I’ll start with the general dangers of distraction before considering several contemporary arguments that the way we use the Internet is, as Carr puts it, “making us stupid.”²⁰ Yet I want to set a boundary on our cautions: the war on distraction can go too far for your own good. Distraction is a real issue, but dwelling exclusively on its dark side can be a form of selective inattention. Alison Gopnik, professor of psychology at the University of California at Berkeley, warns that

it is certainly true that by the time we’re adults attention is a limited resource and attentional patterns are hard to change. But the exaggerated highly-focused attention we consider appropriate in a contemporary classroom is itself a recent cultural invention, and one with costs as well as benefits. Guatemalan Mayan mothers successfully teach their children to divide their attention, as Western mothers teach children to focus theirs.²¹

Without the capacity for distraction, you wouldn’t hear the taxicab horn when you step off the curb (perhaps while you are concentrating on your BlackBerry). You wouldn’t want to train yourself to ignore distractions when your life might be at stake. If you want to make mindful use of media,

however, you'll need to train yourself to recognize and withdraw attention from activities unrelated to your intended goal of the moment.

Media-triggered distraction can be:

- *Unproductive* for the goal oriented
- *Unhealthy* for everybody
- *Fatal* for a growing number
- *Addictive* for some
- An invitation to *bad parenting*
- *Socially alienating*
- A cause for a dangerous loss of solitude

The meaning of unproductive, like distraction, requires both context and a firm idea of one's goals. If your aim is to produce a certain amount of external output (as opposed to the more internal production of learning), then the invitations to serendipity, play, and digression that digital media offer are obstacles and dangers. If your aspiration is to learn, help build community, and explore, then the issue gets more complicated. I'll revisit this when I talk about strategic goal setting.

Although she isn't a cognitive psychologist or neuroscientist, Linda Stone was an obvious choice when I started inquiring into the connection between attention, always-on media, and health. Stone has in fact been immersed in creating online media for the twenty-five years I've known her. I first met her when she was one of Apple's multimedia researchers in the 1980s. In the 1990s, when she was director of Microsoft's Virtual Worlds Group, Stone and I sat in my garden to discuss virtual communities. Since she retired from Microsoft, Stone has been concerned about the ways social media use might be affecting our minds and bodies. She was kind enough to make another garden visit this past summer to converse about our mutual interest in literacies of attention.

As we sat under my plum tree, Stone recalled that she had noticed something crucial about her own online behavior while she sat at her computer one day. "I realized that I hold my breath sometimes when I am doing my email." She has recounted this little epiphany in print:

I've just opened my email and there's nothing out of the ordinary there. It's the usual daily flood of schedule, project, travel, information, and junk mail. Then I notice . . . I'm holding my breath. As the email spills onto my screen, as my mind races with thoughts of what I'll answer first, what can wait, who I should call, what should have been done two days ago; I've stopped the steady breathing I was doing only moments earlier in a morning meditation and now, I'm holding my breath.²²

Stone grew even more intensely interested when others reported that they, too, sometimes held their breath while reading or writing email—a phenomenon that she started calling "email apnea." She told me that she came to realize that "breathing is the regulator of attention." Stone reminded me that holding one's breath is directly connected to the "fight or flight" response. When your ancestors and mine heard a noise, they held their breath until deciding whether to flee, fight, or ignore the sound, while their glands pumped energy-mobilizing hormones into their bloodstreams, just in case. Holding your breath affects the body's balance of oxygen, carbon dioxide, and nitrogen oxide. It activates the sympathetic nervous system, causing an increase in glucose and cholesterol levels in the bloodstream along with an increased heart rate as well as a sense of hunger. Stone remarked that regular breathing patterns, by contrast, activate the parasympathetic nervous system, causing relaxation, the release of digestive enzymes, and a sense of satiety—signs of a "rest and digest" mode. She pointed out that "we're putting our bodies in a state of almost constant low-level fight-or-flight. This is great when we're being chased by tigers. But how many of those 500 emails a day is a TIGER? How many are flies? Is everything an emergency? Our way of using the current set of technologies would have us believe it is."²³ Paying attention to your breath—the core technique of mindfulness meditation methods—is where Stone suggests starting to moderate our online reactions. I'll get back to that later. For now, I'm convinced that Stone is right to think that attention to breathing could be a tool to help moderate our unthinking, ultimately unhealthy reactions to many online stimuli.

In one arena of daily life, distraction has proven to be life threatening. Who hasn't witnessed the chilling sight of another driver in the next highway lane who appears to be texting while driving? A Harvard study in 2003 estimates that 2,600 traffic deaths and 330,000 accidents annually are caused by cell phone distractions.²⁴ A study in 2009 of professional long-haul truck drivers who equipped their cabs with video cameras for eighteen months claims that the collision risk became twenty-three times greater when the drivers texted.²⁵ University of Utah researchers found that drivers who talked on a cell phone—just talked, not texted—were as impaired in driving simulation tests as subjects with blood-alcohol levels close to the legal limit.²⁶ Although there are more subtle dangers to consider in this chapter, texting while driving kills; that's all that needs to be said about it. I'll only add that the fact that anyone would risk life and limb for an LOL is a clue that something about texting hooks into the human propensity to repeat pleasurable behaviors to the point of compulsion.

Is the compulsion to check up frequently on our online connections an addiction problem? I want to be careful when using the word *addiction*, which is also used for serious physiological dependencies. Nevertheless, some aspects of social media behavior that many of us experience bear an uncomfortable resemblance to graver compulsions. In the *Harvard Business Review*, Tony Schwartz proposes that information overload is a phenomenon we bring on ourselves as we become habituated to regular doses of information, social networking, and messages. Schwartz recounts a talk he gave about the value of doing one thing at a time, and how he removed the incoming streams of interruptions from email, instant messaging, and text messages. He was struck when a young man working in finance stated, "I believe everything you said, but I can't do it. If I get an email, I have to look at it." Schwartz responded by asking: "Have you considered just turning it off at certain times during the day?" "I don't think I can," the young man replied. "As soon as I turn it off, I'd start obsessing about what I'm missing."²⁷ Do you know how the young man feels? I do. My twenty-six-year-old daughter does.

That doesn't mean we have to surrender to obsession. And it doesn't necessarily mean that all task switching is detrimental to one's focus. Recent research reported in the journal *Cognition* offers evidence that brief distractions from a focal task may improve concentration over the longer run: "We propose that deactivating and reactivating your goals allows you to stay focused," the study's authors said. "From a practical standpoint, our research suggests that, when faced with long tasks (such as studying before a final exam or doing your taxes), it is best to impose brief breaks on yourself. Brief mental breaks will actually help you stay focused on your task!"²⁸

The craving for digital stimulation may be similar to food and sex addictions, which each arise when healthy behavior warps into a compulsion, eventually impairing the individual's functioning.²⁹ How do we get addicted to social media? Emily Salvaterra and her colleagues propose a psychophysiological process that reinforces Internet use, and then escalates into obsessive-compulsive "checking behavior."³⁰ They offer Youmasu J. Siewe's outline of addiction and its behavioral development: first, indulgence in the addictive behavior or substance produces pleasure, which leads to a craving for more, which if indulged too regularly leads to withdrawal symptoms, loss of control over the addictive behavior, the need for more and more frequent as well as larger doses of the addictive substance or behavior, which ultimately produces negative consequences for the addict.³¹

This book is not for people who have a serious problem controlling their online behavior. Still, some of the dynamics of addiction are probably at

play in a weaker way for most of us who spend a large part of every day online. Nobody who has ever hit the "refresh" link on their email in-box or Twitter timeline every few minutes (or more often) can deny that the possibility of compulsion lurks behind the undeniable pleasures of social media. Matt Richtel in the *New York Times*, echoing Stone, proposes that urges to check social media to the point of compulsion "play to a primitive impulse to respond to immediate opportunities and threats. The stimulation provokes excitement—a dopamine squirt—that researchers say can be addictive. In its absence, people feel bored."³² Any simple explanation of the way hormones regulate behavior is bound to be inadequate, and "dopamine squirt" seems to be a favorite phrase among those who fear that entire populations have become addicted to social media. A range of experiments has shown that the hormone dopamine does indeed appear to be associated with a reward for "seeking" behavior.

Hormones may not wholly control our behavior, but biochemical reflexes undoubtedly still influence us, even though humans have made the transition from hunting and gathering on the savanna, to hunting and gathering online. In addition to the stimulant dopamine, another chemical, oxytocin—a normally occurring human hormone that appears to facilitate bonding between friends, lovers, or parent and child—appears to come into play as well, especially when social media take up a regular part of one's life. Oxytocin was first recognized for its facilitating role in infant-parent bonding, and today it has been described more generally as "the human stimulant of empathy, generosity, trust, and more."³³

I can remember my excitement anticipating the arrival of the daily snail mail in my early years as a writer—as I put my dreams into stamped, self-addressed envelopes, and months later, would receive a rejection letter or contract. The brain-body rush I got when I heard the sound of the mail slot downstairs certainly seems akin to the descriptions of oxytocin highs. That I was rewarded infrequently by contracts rather than rejections only made my anticipation that much stronger, through the kind of "intermittent reinforcement" that makes slot machines addictive. I also recall how thrilling it felt at first to see "you've got mail" notifications pop up on my computer screen—mail more than once a day!—and how I learned to interrupt my writing work to see who awaited in my mail queue. Intuitively, a hormonal component makes sense. In a single-subject case study, Paul J. Zak of Claremont Graduate University, a pioneer in the emergent neuroeconomics field, discovered that a spike in oxytocin occurred after using Twitter for ten minutes.³⁴ The implication of Zak's finding is that the frequent checking behavior of our favorite social networks might be

reinforced by the chemically mediated feeling of connection that it gives us (oxytocin) as well as the chemical reward for hunting-seeking behavior (dopamine) described by others.

If you are a parent, beware of the media equivalent of secondhand smoke: the impact of how you use media in your children's presence. In an article about young people who "feel neglected by media-obsessed parents," Ellen Reagan told the story of a major advertising agency CEO who was, not surprisingly, a heavy BlackBerry user. One day, his daughter interrupted midtext by giving him two small, rolled-up pieces of paper. When he asked what they were, "sweetly, she slipped the construction-paper cylinders over his poised thumbs. "Blackberry handcuffs," she said."³⁵

Daniel J. Siegel, clinical professor of psychiatry at the University of California at Los Angeles (whose work on mindfulness has been among my own key influences,) told Reagan that "children need their feelings to be felt by their caregivers. That is what creates secure attachment."³⁶ According to Siegel, paying attention to your kids is not just good parenting; parental distraction interferes with the emotional sense of attachment and can affect children's developing brains. In his book *The Mindful Brain*, Siegel makes a direct connection between parent-child attention and the individual's power to control attention:

It is the social circuits of the brain that we first used to understand the mind, the feelings and intentions and attitudes of others. When we view mindful awareness as a way of cultivating the mind's awareness of itself, it seems likely that it is harnessing aspects of the original neural mechanisms for being aware of other minds. As we become aware of our own intentions and attentional focus, we may be utilizing the very circuits of the brain that first created maps of the intentions and attention of others. . . . We can propose that the interpersonal attunement of secure attachment between parent and child is paralleled by the intrapersonal form of attunement of mindful awareness.³⁷

Consider also the ways our adult media-compulsive behavior might interfere with our parental responsibility to teach adolescents how to control themselves. A *New York Times* article about a teenager in California who sent more than twenty-four thousand texts in a single month quoted the young woman talking about her mother's attempts to curb her texting habit: "She should understand a little better, because she's always on her iPhone."³⁸ Reagan also quotes MIT professor Sherry Turkle: "What is so poignant is that children try to bring their parents out of the 'BlackBerry zone' as they call it. Kids complain to me about parents having the phone with them as they watch sports with them, or TV movies, or go camping. One boy reflected on how his father kept the BlackBerry on the nightstand as he read him Harry Potter."³⁹ In a 2011 interview, Turkle told me about

stories of parents going to pick up their kids at school and the parents are not looking up from their BlackBerries. So the kid gets in the car and is absolutely crushed because that's the moment when, even if that thirteen- or fourteen- or fifteen-year-old pretends to be nonchalant, that is the moment when they want that eye contact. They need that eye contact. Parents bring their kids to the museum. I sat there at the children's museum for hours on end and watched those parents come in with their kids. They let their kids go through the whole museum, and they're standing along the walls scrolling on their BlackBerries and hitting their iPhones. They're losing the point of the exercise, which is to be with your kid at the museum—because they're happy that the kid is diverted and they're happy to be on their devices. That's why I call the book *Alone Together*.⁴⁰

When I consider social network literacies, I'll zoom in on the long debate that sociologists have had about the effects of trains, telephones, or televisions on the quality of human social connection in large social groups, or "society" in the aggregate. Sociologist Claude Fischer of the University of California at Berkeley, author of the classic 1991 book *America Calling: A Social History of the Telephone to 1940*, noted recently that "if you go back 100 years, people were writing things about the telephone not unlike what people are writing about these technologies. There was a whole literature of alarm—how it's turning everything upside down."⁴¹ Whether or not our broader social groups are growing more alienated as we grow more connected, critics I respect are voicing concern about the more atomic level of interaction: relations among families and friends.

The book that Turkle mentioned above—*Alone Together: Why We Expect More from Technology and Less from Each Other*—explores this danger to interpersonal relations.⁴² "We've come to confuse continual connectivity with making real connections. We're 'always on' to everyone. When you actually look more closely, in some ways we've lost the time for the conversations that count," Turkle told *USA Today*.⁴³ In my interview with her, Turkle asserted:

Use technology as an opportunity to think about your values. Technology has been a great gift. We have new possibilities for wonderful new things. But one of those possibilities should not be sitting in the corner of the museum while your kid goes through without you. I'm looking out over a park. It's filled with children and parents. The parents are on the bench not looking at the kids. We're sitting at dinner and texting, while everybody in the family is not talking. What are we allowing the technology to enable, and is it really where we want to be?⁴⁴

I couldn't agree more that mindfulness about technology and family discussions about it are necessary; I'm not convinced that the mediated interactions many people engage in are necessarily the devil's work. We're

thinking and socializing differently, and I'm not entirely comfortable judging these changes from the values of the past.

Consider the possible danger of alienation from ourselves as well as others. What might be called "the Thoreau objection" to the siren call of digital distraction is worth examining, since the always-on availability of information to inform or amuse along with perpetual possibilities for social interaction may be depriving us of something humans have always drawn on: solitude. As Turkle told me in 2011, "If you don't know how to be alone, you will always be lonely. If you're always connected, from the age of eight, your default position is to only be connected and you don't learn the restorative virtues of solitude."⁴⁵

I don't argue with the Thoreau objection. I embrace it. Years ago, I cut a door in my office wall; it's now three steps to my garden. The fact that I acknowledge my attraction to distraction doesn't mean that I have to succumb to the urge to be constantly connected. I simply ask myself when I reach for my iPhone while waiting in line, Why not stay disconnected for a minute and see what happens? Or I deliberately leave my podcasts at home when I take the dogs out for a walk in the neighborhood. Throw some sand into the machinery that automatizes your attention.

Distraction might be more than just deviation from focus. A good question for any mindful digital citizen to ask is, What are my media practices doing to my brain?

(Using) the Internet Makes Us Stupid (or Not)

When it came to writing, Theuth said, "This discipline, my King, will make the Egyptians wiser and will improve their memories: my invention is a recipe for both memory and wisdom." But the King said, "Theuth, my master of arts, to one man it is given to create the elements of an art, to another to judge the extent of harm and usefulness it will have for those who are going to employ it. And now, since you are father of written letters, your paternal goodwill has led you to pronounce the very opposite of what is their real power. The fact is that this invention will produce forgetfulness in the souls of those who have learned it. They will not need to exercise their memories, being able to rely on what is written, calling things to mind no longer from within themselves by their own unaided powers, but under the stimulus of external marks that are alien to themselves. So it's not a recipe for memory, but for reminding, that you have discovered. And as for wisdom, you're equipping your pupils with only a semblance of it, not with truth. Thanks to you and your invention, your pupils will be widely read without benefit of a teacher's instruction; in consequence, they'll entertain the delusion that they have wide knowledge, while they are, in fact, for the most part incapable of real judgment.

—Plato, *Phaedrus*, fifth century BCE

Recently, a heated public discussion was ignited by a few critics who asked whether our use of digital media might be damaging rather than augmenting us. Understanding these critics' contentions is an essential starting place for those of us who are trying to avoid social media damage and take advantage of digital augmentation. Foremost among these critics is Carr, whose brilliantly (if misleadingly) titled *Atlantic Monthly* article "Is Google Making Us Stupid?" and subsequent book, *The Shallows*, triggered much debate. Carr is not alone. American University linguist Naomi Baron, technology critic Maggie Jackson, former Apple and Microsoft researcher Stone, and child development specialist Maryanne Wolf have each taken different angles on the same question; each of their cautionary approaches is worthy of consideration by any social media enthusiast who claims to think critically. I agree and disagree with each of them, to different degrees and for different reasons, but I know that I've deepened my efforts to improve my social media literacies by first inquiring into the possibility that alluring new ways to know and socialize might have destructive effects. I'll take the liberty of summarizing these authors' arguments and some counterarguments, and recommend the source texts if you want to get more than the brief general descriptions I can provide here.

Digital networks, Carr believes, cause us to develop habits that ultimately harm our brains and damage culture. The literate manner of thinking that led to literature and science depended on the ability to concentrate on written works for extended periods along with the capacity for deep, contemplative, or analytic thought. Many of Carr's assertions rest on the same recent neuroscientific studies cited by those who hold that attention can be trained—the brain's ability to reconfigure itself that has become known as neural plasticity or neuroplasticity. What Carr fears is "unwelcome neuroplastic adaptations." The problem is not distractibility but instead, Carr maintains, a deep "intellectual ethic" of the Internet-using population, "a set of assumptions about how the human minds works or should work." Carr claims that an adherence to these assumptions is damaging the ability of individuals and societies to focus. It does this by inscribing the Web's innate, frenetic, and shallow sensibilities into our very neural circuitry. The Net's ethic disrupts the capacity for deep thought in a number of ways, Carr argues, starting with the elementary building block of the Web: the hyperlink. "Hyperlinks," writes Carr, "encourage us to dip in and out of a series of texts rather than devote sustained attention to any one of them. Hyperlinks are designed to grab our attention. Their value as navigational tools is inextricable from the distraction they cause." Carr fears that the hyperlink mind-set spells the death of the ways of thinking fostered by the book—and this, he feels, will be disastrous for individuals and culture.⁴⁶

Another shallowing-out force Carr cites is Web search, which was the core of his original "Is Google Making Us Stupid?" article. "A search engine," he writes, "often draws our attention to a particular snippet of text, a few words or sentences that have strong relevance to whatever we're searching for at the moment, while providing little incentive for taking in the work as a whole."⁴⁷ Multimedia and the design of the graphical user interface in which multiple windows always present multiple opportunities for distraction are another corrosive force, in Carr's view. When the plastic brain falls into habits of indulging these media, Carr argues, the cognitive effects are profound. We lose the capacity for sustained, focused attention—"the Net seizes our attention only to scatter it." We develop "screen-based reading behavior"—nonlinear, scattered, perpetual scanning at the expense of depth and concentration. As we substitute the Web for personal memory, "we risk emptying our minds"—and as the Web makes it harder to remember, we are forced to rely on it all the more. "What we're experiencing," says Carr, "is, in a metaphorical sense, a reversal of the early trajectory of civilization: we are evolving from being cultivators of personal knowledge to being hunters and gatherers in the electronic data forest."⁴⁸

I take issue with Carr's assumption of inevitability: a culture can choose to educate widely, as post-Gutenberg Europe and the rest of the world did, in response to a disruptive abundance of communications and ways of communicating. In academic circles, the attitude taken by Carr and other critics I consider here is called "technological determinism," and in my opinion it can be as dangerous as a lack of awareness of technology-enabled pitfalls. Humans have agency. The Web wouldn't have existed without that agency, even given the technical medium of the Internet.

I believe Carr is right to sound the alarm, however, about the potentially harmful effects of (the unmindful use of) digital, networked media. It's all happening so fast. Can cultural institutions emerge quickly to respond to technological disruptions? In particular, Carr's insight into a shortcoming of search forced me to think about how I've taught myself, my daughter, and my students to look beyond the snippet that a search query reveals. A search query, like a Wikipedia page, often is a bad place to end your inquiry, but an excellent place to start. An online knowledge search should be like cinema, not a snapshot, or a process of knowledge building, not a fast answer. Sometimes you want an answer (to, say, What year was René Descartes born?) and sometimes you want knowledge (concerning, for example, What does metacognition mean?) On reflection, I realized that I explore the context around a search by employing the very tool Carr abhors—the hyperlink. What Carr sees as a misleadingly incomplete

fragment, I view as a kernel of knowledge that points to other kernels that, taken together, can reveal overarching networks, connections, and systems. Where Carr wants to avoid clicking in the first place, I've taken to clicking around to get a better sense of topics.

Engine-assisted search in itself is not a fragmenting, decontextualizing, shallowing force. Again, I reject the simple deterministic answer that the machine's affordances inevitably control the way we use the mechanism. Shallow inquiry—the uninformed way in which many people use search engines to find answers—is the deeper problem, and one that can be remedied culturally. Just as the ancient arts of rhetoric taught citizens how to construct and weigh arguments, a mindful rhetoric of digital search would concentrate attention on the process of inquiry—the kinds of questions people turn into initial search queries, and the kinds of further questions that can deepen their search. Search affords snippet thinking. Carr is right that the medium itself offers little incentive to seek depth, but it does not compel shallow, lazy thinking. I'll get into more detail about search and inquiry when I move from the literacy of attention to the art and science of crap detection—since finding what you really need to know and knowing how to sort the good from the bad info are complementary (and essential) skills in today's infosphere.

Carr's literary device of exaggeration is entertaining, but his extreme stance weakens his dismissal of the power of culture to tame media's attentional effects. To write his book, Carr did not just learn to practice judicious self-discipline. He moved "from a highly connected suburb of Boston to the mountains of Colorado," closed his Twitter account and blog, took a hiatus from Facebook, and restricted his email use. Dramatic? Undoubtedly. Necessary? I'm not so sure. He claimed his "synapses howled for their Net fix." He knows as well as I do that the world harbored abundant attractions to lure writers long before the Internet, and that the writer's primary response to the world's infinite opportunity for distraction ought to be one of internal discipline, not ascetic withdrawal. Carr found himself "sneaking clicks" or going on the occasional "daylong Web binge," until "the cravings subsided." Yes, I see what he's getting at. Who hasn't experienced the magnetic pull of social media during vacations and other times when we know it is inappropriate? But isn't the same thing true of drinking, sex, or any of a myriad of attractive pastimes? In finishing his book, he describes "backsliding" into his old habits.⁴⁹ Carr's approach keeps the reader's attention focused and brings his argument to life in a vivid way, but in so doing he ignores both potential benefits of heightened connectivity and the creative possibilities of the social media platforms he rejects.

Extremes make for good storytelling, but framing the question of how social media affects individuals as one of addiction overlooks some of its most crucial dimensions—including the all-important question, Can we learn to turn the new way of thinking into a net positive, the way humans learned to deal with the alphabetic culture that Plato warned about, through education and norms? Even Carr admits that people have power over the kinds of distraction he believes the online world offers: “Our brains are very adaptable and flexible. If you change your habits, your brain is very happy to go along. The hard thing is to change your habits.”⁵⁰ I recommend paying attention to the possibilities that Carr raises, and using them as instruments for self-examination. But I don’t believe Carr’s abstinence-only, zero-tolerance solution can resolve these issues.

I think that the power of the Internet mind-set is up to us, just as it was in relation to the Gutenberg and alphabet mind-sets. Defending this potential, New York University professor Clay Shirky writes in “Why Abundance Is Good: A Reply to Nick Carr”:

I think Carr’s premises are correct: the mechanisms of media affect the nature of thought. The web presents us with unprecedented abundance. This can lead to interrupt-driven info-snacking, which robs people of the ability to find time to think about just one thing persistently. I also think that these changes are significant enough to motivate us to do something about it. I disagree, however, about what it is we should actually be doing. . . . The change we are in the middle of isn’t minor and it isn’t optional, but nor are its contours set in stone. We are a long way from discovering and perfecting the net’s native forms, what [Roland] Barthes called the “genius” particular to a medium. To get there, we must find ways to focus amid new intellectual abundance, but this is not a new challenge. Once the printing press meant that there were more books than a person could read in a lifetime, scholars had to sharpen disciplines and publishers define genres, as a bulwark against the information overload of the 16th century. Society was better after that transition than before, even though it took two hundred years to get there. And now we’re facing a similar challenge, caused again by abundance, and taking it on will again mean altering our historic models for the summa bonum of educated life. It will be hard and complicated; abundance precipitates greater social change than scarcity. But our older habits of consumption weren’t virtuous, they were just a side-effect of living in an environment of impoverished access. Nostalgia for the accidental scarcity we’ve just emerged from is just a sideshow; the main event is trying to shape the greatest expansion of expressive capability the world has ever known.⁵¹

The expansion of expressive capability mentioned by Shirky is not, in itself, a wholly new phenomenon. As I’ll discuss in later chapters, the human propensity as well as talent for symbolic expression has been both a biological and cultural evolutionary driver. What is happening to our

language? is as important a question to ask as What is happening to our minds? and What is happening to our social relations?

In *Always On: Language in an Online and Mobile World*, Baron looks critically at the consequences of a rapidly evolving linguistic environment in which LOL (laugh out loud) and SMS (Short Message Service) seem to have created an abbreviated jargon overnight. She suggests that “email and its descendants” have triggered two fundamental changes. First, new communication technologies give us increasing control over how, when, and with whom we interact—what Baron calls “volume control.” Second, as we replace much of our spoken interaction with written exchanges, Baron fears that quantity increases and quality suffers.⁵² (A stronger version of Baron’s claim that democratized access to publishing leads to so much crap it’s killing culture is central to Andrew Keen’s book *The Cult of the Amateur*.⁵³ I reject this argument on the grounds that educating readers how to value good writing proved to be a better solution in the age of print than the remedy attempted by monarchies: licensing publishers. The huge amount of poorly developed and badly written printed matter churned out by printing presses did not prevent Charles Dickens or Honoré de Balzac from finding widespread readerships.)

I found Baron instructive regarding specific ways social media challenge traditional definitions of sociality. Baron is right, in my opinion, to urge us all to cast a critical eye on any form of socializing that can be turned on and off at will. In my own life, volume control has been a net benefit, but it’s not without its shadowy side. My craft as a writer demands that I spend my days mostly alone in a room. Given my circumstances, gaining the power to click into a virtual community increased my daily social interaction, since I was already isolated. After twenty-five years of online socializing, however, I understand (and caution others against) the danger of confining myself exclusively to communities I can click on and off. I’m healthier, and so is my society, because I’m embedded in family, neighborhood, hometown, campus, and social cyberspace. The people I’ve met online as well as mostly communicate with through virtual means have come to my rescue in times of peril, bought me lunch in Amsterdam and Istanbul, showed me caring, and shared the fun that any kind of community worthy of the name strives for—but I learned long ago that I also need to maintain my face-to-face connections.

Turkle sees the media affordance of Baron’s volume control as a root cause of the alienating aspects of social media:

People would rather text than talk, because they can control how much time it takes. They can control where it fits in their schedule. When you have the amount of veloc-

ity and volume [of communication] that we have in our lives, we have to control our communications very dramatically. So controlling relationships becomes a major theme in digital communication. And that's what sometimes makes us feel alone together—because controlled relationships are not necessarily relationships in which you feel kinship.⁵⁴

Understanding the ways volume control can be both a benefit and danger is a prerequisite to taming it. The social worlds I encounter through digital media are definitely real even if they aren't physical, but I've learned to resist thinking of them as my only reality. Baron concludes that change—good or bad—in language, thought, and society depends ultimately on individual choice. I share Baron's fears and cautions. My own stance toward media literacy—the reason I wrote this book—is based on the same conclusion Baron reached: that human agency, not just technology, is key. What you and I know, think, and do at this moment of technology-initiated yet human-centered change matters.

In *Distracted: The Erosion of Attention and the Coming Dark Age*, Jackson writes: "The way we live is eroding our capacity for deep, sustained, perceptive attention—the building block of intimacy, wisdom, and cultural progress. Moreover, this disintegration may come at a great cost to ourselves and to society." We should be worried, says Jackson, because "the erosion is reaching critical mass. We are on the verge of losing our capacity as a society for deep, sustained focus. In short, we are slipping toward a new dark age." She shows us her view of the history of what she calls "an attention-deficit culture," arguing that communications technologies, beginning with the telegraph, encouraged the development of a "culture of simultaneity and split-screen attention." Technology, she claims, feeds a need for "utopian ideals of connection," leading us deeper and deeper into virtual worlds and further from physical reality: "exploratory forays into unseen worlds are burgeoning into determined desire to increasingly inhabit new dimensions."⁵⁵ I would say that a society in which most people can read and write was once a utopian ideal, and that virtual worlds became important to our species when we first learned to manipulate symbols. Today's technology may be new, but using media to change (some would say expand) human consciousness at least goes back to forty-thousand-year-old cave paintings.

Jackson's book characterizes the threat posed by attention-deficit culture to various aspects of society. The habit of multitasking, amplified by technologies of distraction, is hurting our capacity for sustained attention. Unwittingly, we increasingly base our personal relationships on surveillance as opposed to trust. Books are disappearing (or will be soon); we're sacrificing our "hard-won" ability to wrestle with a text. The looming dark

age Jackson worries about as the ultimate consequence of attention-deficit culture will perhaps not come in the form of a dramatic collapse of civilization but more likely is happening as a slow, sinking, unavoidable decline instead. "Mesmerized by the flickering charms and lightning-fast shifts in our own time," she writes, "perhaps we can't tell at first glance whether what's creeping around us are rippling shadows or a fearful twilight."⁵⁶ I see the same possible chasm that Jackson foretells. I'm looking for ways to climb out. I don't see myself arguing with Jackson; rather, I see myself attempting to answer her challenge.

Jackson and I see eye to eye that such a catastrophe potentially might be forestalled by paying attention to attention. Despite her semiapocalyptic predictions, Jackson ends optimistically: "And yet, a *renaissance of attention* may be at hand. An antidote to our epidemic distraction lies in a set of astonishing discoveries: attention can be understood, strengthened, and taught. However we may define progress now or in the future, there is a spark of hopefulness in that."⁵⁷ When I ask myself what is to be done if Jackson is even partially right, I conclude that teaching people how to practice more mindful mediated communication seems the most feasible remedy. I like Jackson's query in an excellent Boston.com article about attention training: "If focus skills can be groomed, as research has begun to hint, the important next question is whether, and how, attention should be integrated into education. Will attention become a 21st-century 'discipline,' a skill taught by parents, educators, even employers? Already a growing number of educators are showing interest in attention training, mostly through the practice of meditation in the classroom."⁵⁸ I'm with Jackson; self-control along with the skillful use of attention, participation, crap detection, collaboration, and network awareness through social media ought to be taught to future netizens as early as possible.

Stone, in addition to identifying email apnea, came up with another useful concept for a behavior that digital media enables far more effectively than olden media did: communicating with multiple people and seeking information from multiple sources simultaneously. Who doesn't recognize the detectable hesitation in the voice of the person you are talking to on a telephone when you just know they are surfing the Web or checking their email? This antisocial form of multitasking seems to pop up everywhere, from laptops in classrooms to BlackBerries in meetings. The *New York Times* quoted Eric Schmidt, CEO of Google, in an article: "Shortly after joining the company and its young founders, Sergey Brin and Larry Page, he [Schmidt] was frustrated that people were answering e-mail on their laptops at meet-

ings while he was speaking. 'I've given up' trying to change such behavior, he says. 'They have to answer their e-mail. Velocity matters.'⁵⁹

Stone names this behavior "continuous partial attention, an always-on, anywhere, anytime, any place behavior that involves an artificial sense of constant crisis." She sees the smart-phone-and-laptop-using world seized by a new "dominant attention paradigm," characterized by what she calls "semi-sync" communication, somewhere between synchronous and asynchronous, with varying degrees of simultaneous or overlapping connectivity for different social circumstances—phone calls for close friends, text messaging for groups of friends and casual friend-to-friend conversations, and social networks for the wider orbit.⁶⁰

As with email apnea, Stone's approach is prescriptive. Continuous partial attention can hamper opportunities for reflection and authentic social connection as well as threaten personal health and well-being. Stone's solution is twofold. First, *breathe*; email apnea appears to be a symptom of being in a state of continuous partial attention, and the treatment is the same. Second, we need to learn to manage our attention and mitigate the impulse to constantly connect. Carefully managed attention is more engaged than frantic attention, Stone suggests. She gets no argument from me! When I asked her about the specifics of learning to exercise better executive control over attention, Stone reminded me that "intention is the fuel for attention." Intention and setting goals are different, she told me, because "a goal is outside and in the future, but an intention is inside you and very present. And when does behavior change? It changes in the present." Stone isn't on a crusade against multitasking or continuous partial attention. "The most wondrous mind to me," she explained, "is the resilient, flexible mind that has a capacity to adopt any kind of attention strategy and a sensibility to determine which kind of attention matches the present situation."⁶¹

When I looked for scientific means of sorting through the theorizing and philosophizing about whether the Internet is making us stupid or not, I was thrilled to discover Wolf, a professor of child development at Tufts University. An expert on the neural, cognitive, and cultural components of reading, she confronts the issue of how media such as books or computer networks affect the brain. As Wolf observes in her book *Proust and the Squid*:

We were never born to read. Human beings invented reading only a few thousand years ago. And with this invention, we rearranged the very organization of our brain, which in turn expanded the ways we were able to think, which altered the intellectual evolution of our species. Reading is one of the single most remarkable inventions in history; the ability to record history is one of its consequences. Our ancestors' invention could come about only because of the human brain's extraordinary ability to

make new connections among its existing structures, a process made possible by the brain's ability to be shaped by experience. This plasticity at the heart of the brain's design forms the basis for much of who we are, and we might become.⁶²

Human thinking processes are neither wired nor rewired, although it is convenient to think of them in that way. Even if the probability that a specific set of brain cells will fire in synchronization does resemble fixed circuitry, the brain works in a more dynamic way than the wiring metaphor implies. Wolf emphasizes that groups of neurons create new connections and strengthen pathways between them in specific networks whenever a person acquires a new skill. "Thanks to this design," Wolf notes, "we come into the world programmed with the capacity to change what is given to us by nature, so that we can go beyond it."⁶³ This is the neural plasticity feared by Carr.

Humans are born biologically equipped to recognize visual patterns, then extract meaning from them, but meshing language, vision, and attention to transmit knowledge was invented; reading is a mind technology. The visual component of reading appears to make use of deeply embedded perceptual mechanisms that probably evolved in order to track predators and prey by deciphering their footprints.⁶⁴ Each of the innate capacities recruited by the brain for use in the reading process evolved in response to some survival requirement. Wolf puts it this way:

It would seem more than likely that the reading brain exploited older neuronal pathways originally designed not only for vision but for connecting vision to conceptual and linguistic functions: for example, connecting the quick recognition of a shape with a rapid inference that this footprint can signal danger; connecting a recognized tool, predator, or enemy with the retrieval of a word. When confronted, therefore, with the task of inventing functions like literacy and numeracy, our brain had at its disposal three ingenious design principles: the capacity to make new connections among older structures; the capacity to form areas of exquisitely precise specialization for recognizing patterns of information; and the ability to learn to recruit and connect information from these areas automatically. In one way or another these three principles of brain organization [are] a foundation for all of readings evolution, developments, and failure.⁶⁵

Reading requires these separate perceptual and cognitive functions to work in a highly coordinated manner. The visual recognition of a letterform, the sequencing of letterforms, and recognition of sequences as representations of words all must synchronize in ways that our brains did not acquire through biological evolution. As Harvard psychologist Steven Pinker describes it, "Children are wired for sound, but print is an optional accessory that must be painstakingly bolted on."⁶⁶ By training humans

to read, we can harness these naturally uncoordinated processes to create a valuable new metaprocess—the ability to encode knowledge in written marks, transmit those marks across time and space, and for any other trained person a thousand miles away or a thousand years in the future to decode that knowledge. The display of letterforms on a sign and the rote recitation of the alphabet by students—tools that go back to the dawn of civilization—are brain-changing methods for creating entirely new mental mechanisms by connecting existing ones in a novel way.

Another reading expert, Dehaene, calls this adoption of previously evolved brain mechanisms to serve new tasks “neuronal recycling.”⁶⁷ Multiple levels of neural and cultural plasticity make the progressive bootstrapping power of literacy possible: training humans to read induces permanent changes in the way brain networks function; preexisting brain functions can be coordinated to perform the new tasks such as reading, writing, and arithmetic; and literacy-augmented populations can invent better alphabets, printing presses, and wireless telegraphs. Understanding the broader dynamics surrounding the encounter of your brain and the Web is essential metaknowledge that will lend power to your efforts to gain greater control over mediated attention.

Wolf addressed the concerns raised by Socrates twenty-five hundred years ago in regard to the alphabet. Wolf shares Socrates’s objections, which have the advantage over Wolf’s conjecture of being interpretable in light of the history of literacy:

Examining written language, Socrates took a stand that usually comes as a surprise: he felt passionately that the written word pose[s] serious risks to society. . . . And as we examine our own intellectual transition to new modes of acquiring information, these objections deserve our every effort to get to their essence. First, Socrates posited that oral and written words play very different roles in an individual’s intellectual life; second, he regarded the new—and much less stringent—requirements that written language placed both on memory and on the internalization of knowledge as catastrophic; and third, he passionately advocated the unique role that oral language plays in the development of morality and virtue in the society. In each instance Socrates judged written words inferior to spoken words, for reasons that remain powerfully cautionary to this day. . . . Ultimately, Socrates did not fear reading. He feared superfluity of knowledge and its corollary—superficial understanding. Reading by the untutored represented an irreversible, invisible loss of control over knowledge. As Socrates put it, “once a thing is put in writing, its composition, whatever it may be, drifts all over the place, getting into hands not only of those who understand it, but equally of those who have no business with it; it doesn’t know how to address the right people, and not address the wrong. And when it is ill treated and unfairly abused it always needs its parents to come to its help, being unable to defend or help

itself.” Underneath his ever present humor and seasoned irony lies a profound fear that literacy without the guidance of the teacher or of a society permits dangerous access to knowledge. Reading presented Socrates with a new version of Pandora’s box: once written language was released there could be no accounting for what would be written, who would read it, or how readers might interpret it.⁶⁸

Powerful technologies always entail trade-offs and while the power of a new tool is evident early, the prices we pay may take longer to become visible. Socrates was concerned about knowledge in the hands of the untutored. Many slaves supported each free Athenian of Socrates’s time, and slaves were barred from learning the “liberal arts”—the communication skills necessary for the citizens of a democracy to retain their liberty. Mass literacy and education, enabled first by the alphabet and then by the printing press, made possible the forms of knowledge and governance we know today. One price of mass literacy is that not everyone who learns to read has personal access to Socrates. If you want more than the elite to be free and autonomous, you face the problem that there aren’t enough tutors to explain the meaning of everything. If you want to radically broaden the scope of literacy, the loss of some depth might be part of the price. The question at present, not a new one, is whether loss of depth is preventable or instead is an inevitable consequence of technologies that democratize knowledge.

Democratization enables vulgarization. As cultural practices become more common, they also become more coarse and misinterpreted. In the early twentieth century, the young print journalist Walter Lippmann claimed that U.S. citizens are too gullible and ill informed to govern a modern, complex society. In response, philosopher-activist John Dewey responded that in a democracy, the answer was not, as Lippmann suggested, to confine governance to an elite but rather to make the entire population less gullible through better public education and better informed through better journalism.⁶⁹

I hear echoes of Lippmann in Carr’s arguments and see elements of Dewey’s response in Wolf’s proposals. Wolf considers the persistence in human populations of dyslexia, the perceptual anomalies that make it difficult for some people to learn to read, to be “a daily evolutionary reminder that very different organizations of the brain are possible. Some organizations may not work well for reading, yet are critical for the creation of buildings and art and the recognition of patterns—whether on ancient battlefield or in biopsy slides. Some of these variations of the brain’s organization may lend themselves to the requirements of modes of communication just on the horizon.” At the same time, Wolf is cautious about the cognitive effects

of the increasing speed with which information is created, processed, and consumed. Intellectual skills flourished, she writes, because of “the secret gift of time to think that lies at the core of the reading brain’s design.”⁷⁰

Having helped train her dyslexic son to read, plus having studied dyslexia scientifically, Wolf appears to be a strong believer in the power of teaching and learning. She contends that the demonstrable power of teaching alphabetic literacy can be applied to the challenge of information and media literacies:

We must teach our children to be “bitextual” or “multitextual,” able to read and analyze texts flexibly in different ways, with more deliberate instruction at every stage of development on the inferential, demanding aspects of any text. . . . My major conclusion from an examination of the developing reader is a cautionary one. I fear that many of our children are in danger of becoming just what Socrates warned us against—a society of decoders of information, whose false sense of knowing distracts them from a deeper development of their intellectual potential. It does not need to be so, if we teach them well, a charge that is equally applicable to our children with dyslexia.⁷¹

Developing a pedagogy of attention is, I believe, the basis for Wolf’s kind of education.

Mindfulness in an Always-On World

Mindfulness in its most general sense is about waking up from a life on automatic, and being sensitive to novelty in our everyday experiences. With mindful awareness the flow of energy and information that is our mind enters our conscious attention and we can both appreciate its contents and also come to regulate its flow in a new way. Mindful awareness, as we will see, actually involves more than just simply being aware: it involves being aware of aspects of the mind itself. Instead of being on automatic and mindless, mindfulness helps us awaken, and by reflecting upon the mind we are enabled to make choices and change becomes possible.

How we focus attention helps directly shape the mind when we develop a certain form of attention to our here-and-now experience and to the nature of our mind itself, we create a special form of awareness, mindfulness.

—Daniel J. Siegel, *The Mindful Brain*, 2007

Scientists and meditators both claim that simple exercises can increase attentional agility. That’s why the Chicago Bulls and Los Angeles Lakers use a meditation teacher. Attention processes, like muscles, can be strengthened through exercise, resulting in measurable changes in brain functions.⁷² Here’s how it works, and how to do it.

I’ve been interested in the neuroscience of attention training since 1968, when I based my undergraduate thesis at Reed College on the work of Joe Kamiya, PhD, University of California at San Francisco.⁷³ Kamiya had studied the electroencephalographic (more popularly known as brain wave) patterns of Buddhist monks and claimed that these experienced meditators exhibited a higher than normal incidence of the eight to ten cycles per second alpha wave. The electric rhythms detectable by scalp electrodes can’t resolve a fine-grained image of brain activities; electroencephalogram (EEG) study is like analyzing the seabed by standing on a cliff and looking at the waves break on shore. Yet brain waves do offer a window on the neural correlates of states of mind. In 1968, an exciting idea began to energize research activity: making people conscious of their brain waves can enable them to influence their brain wave output. Kamiya demonstrated that ordinary subjects who were not meditation practitioners could learn to increase their proportion of alpha wave activity by playing an audible tone to subjects whenever alpha waves were detected and instructing subjects to maintain the sound as much as possible—a procedure that came to be known as “brain biofeedback” or “neurofeedback.”⁷⁴

After graduating from Reed, I studied at the State University of New York at Stonybrook with Professor Lester Fehmi, whose laboratory was exploring the possibilities of Kamiya’s findings. Fehmi continues his research to this day, but I left neuroscience in 1970. Fehmi’s most recent book, *Open Focus: Harnessing the Power of Attention to Heal Mind and Body*, published in 2007 with coauthor Jim Robbins, lends a descriptive name to the mental state associated with brain wave control.⁷⁵ The state of mind associated with alpha, as I recall it, was indeed focused in that it felt the opposite of dreamy, wandering, or distracted. But it was, well, open because it wasn’t focused on any one thing—including trying to make the sound of the tone by emitting more alpha waves. I spent many hours in an electromagnetically shielded room at the university, where I affixed electrodes to the scalp of our subjects (and myself) and converted our EEG signals into wavy lines inked onto long, fanfolded strips of paper. It was very analogue; there was nothing digital about it. I learned to recognize the alpha pattern by looking at the paper as it scrolled out of the machine.

I recall that I was best able sustain the audible feedback tone and inscribe the right kind of squiggles onto the paper by *not* making an effort. The feeling is more of a “letting go.” I would stop making a mental effort, and then the tone and squiggles would flow. Fehmi’s open focus is a good descriptor of a kind of attention that is not directing itself at a single task, or maintaining a narrative linking multiple perceptions, thoughts, plans, goals, and

memories, but that is continuously awake and alert to itself in the present. After I left the State University of New York, I tried to raise money for an electronics wizard friend of mine to create a brain biofeedback unit in a briefcase. I remember thinking that my friend was joking when he told me that he was going to abandon months of circuit design. "Here is the amplifier circuitry I was trying to get into a briefcase," he said, holding up a little metal gizmo about the size of a pencil eraser. It was an "operational amplifier," one of the first successful uses of the newly invented integrated circuitry that miniaturized complex circuits on silicon chips.

As Fehmi and other neurofeedback practitioners continue to prove, learning to control brain waves and other bodily signals can indeed be useful in learning meditation, managing pain, and even controlling computers (you can be certain whenever you read a headline about scientists "controlling computers with thoughts" that it concerns neurofeedback). Despite the persistent interest of a few cognitive scientists and clinicians along with a somewhat New Agey cult of enthusiasts, neurofeedback has not made the multimillionfold progress over the past four decades that miniaturized digital circuitry has.⁷⁶ Miniaturized digital circuitry, however, also made possible the more sophisticated brain-imaging devices such as functional magnetic resonance imaging (fMRI) that are being used to observe finer-grain brain correlates of mental processes. Although the brain mechanisms underlying attentional processes are complex, subsequent research has strongly reinforced Kamiya's finding that becoming aware of attention processes through their neural correlates can help people learn to control those processes. What excited me in 1968 still excites attention researchers today—evidence that changing the mind can lead to changing the brain.

Both neuroscientific and contemplative schools of thought about attention training use the same word to describe the mental self-leverage that makes it possible for the mind to change the brain: mindfulness. In the words of mindfulness teacher Jon Kabat-Zinn, mindfulness is "the awareness that emerges through paying attention on purpose."⁷⁷ That awareness, which even tentative direct experimentation can grant to some noticeable degree, is the power tool that all the other literacies depend on. Mindfulness is what connects your attention to skills of digital participation, collaboration, crap detection, and network smarts. Deliberately exercised, continually strengthened, and judiciously applied, mindfulness is the most important practice for anyone who is trying to swim through the infostream instead of being swept away by it.

Soren Gordhamer, author of *Wisdom 2.0: Ancient Secrets for the Creative and Constantly Connected*, wrote of mindfulness:

A teacher of mine used to say, "Do what you normally do; just do it with awareness." He meant that if you bring consciousness to any activity, your experience of it changes. If you make conscious a conversation, you better know what to say and can more fully listen to the other person; if you make conscious your work on a project, you can more easily see what it needs to progress; if you make conscious an unskillful habit, you can better understand why you follow it and how to release it. If you add consciousness to any activity, the nature of it changes, and the creative is illuminated.⁷⁸

Gordhamer interviewed George Mumford, the sports psychologist who taught mindfulness meditation to the Bulls and Lakers. I found Mumford's reply instructive:

In sports, what gets people's attention is this idea of being in the zone, or playing in the zone. When they are playing their best, they can do no wrong, and no matter what happens they are always a step quicker, a step ahead. That happens when we are in the moment, when we are mindful of what is going on. There's a lack of self-consciousness, there's a relaxed concentration, and there's this sense of effortlessness, of being in the flow. We have that experience in other parts of our life, but we equate it with sports because there are rules and guidelines, and it is a situation where you get immediate feedback. When we are in the moment and absorbed with the activity, we play our best. That happens once and awhile, but it happens more often if we learn how to be more mindful. By mindful, I mean being aware, being engaged with the present moment. Mindfulness is useful because it is through this that we can see what is going on. It means knowing what needs to happen and doing it.⁷⁹

When using the mind to influence the brain, it helps to start by knowing why you should believe these practices work. A number of studies—more than I can cite here succinctly—have demonstrated that mindfulness exercises can have lasting effects on attention. After a brief look at the experimental evidence, I'll get down to practical basics: that is, what other researchers and I have found to be successful in our efforts to become more mindful digital citizens. Fortunately, you don't have to take the advice that follows on faith alone—even faith in experimental data. Your best proof ultimately is to try it yourself. You've already started influencing your attention by thinking about it, or as noted above, by what some learning theorists call metacognition.

The word metacognition means the act of thinking about thinking and more; "metacognitive strategies" enable people to apply what they have learned about attention control to new learning tasks—a "higher order thinking which involves active control over the cognitive processes engaged in learning."⁸⁰ Wikipedia has an excellent page on metacognition, which notes that "metacognition is classified into three components":

1. *Metacognitive knowledge* (also called metacognitive awareness) is what individuals know about themselves and others as cognitive processors.
2. *Metacognitive regulation* is the regulation of cognition and learning experiences through a set of activities that help people control their learning.
3. *Metacognitive experiences* are those experiences that have something to do with the current, ongoing cognitive endeavor.⁸¹

I'm introducing metacognition at this point because education theorists claim that learning about metacognition can lead to doing it more effectively—and emphasize that learning about and doing it yourself are both necessary. Jennifer A. Livingston, professor of educational psychology at the State University of New York at Buffalo, writes:

While there are several approaches to metacognitive instruction, the most effective involve providing the learner with both knowledge of cognitive processes and strategies (to be used as metacognitive knowledge), and experience or practice in using both cognitive and metacognitive strategies and evaluating the outcomes of their efforts (develops metacognitive regulation). Simply providing knowledge without experience or vice versa does not seem to be sufficient for the development of metacognitive control.⁸²

"Knowledge" is an abstraction; whatever it is, it's rooted in the activities of the brain. Neuroscientists are using new tools to look at the neural substrates of attention, thought, and knowledge. Meditation practice turns out to be a highly desirable experimental variable for those trying to study whether attention training can improve attentional agility.

Norman Farb and six other scientists at the University of Toronto used fMRI visualization to study novices and subjects who had practiced mindfulness meditation techniques. (I'll get into the specifics of mindfulness meditation shortly, but I can describe it here simply enough: with a nonjudging attitude, pay attention to your breath and return your attention to it when you find your mind wandering; repeat this process over and over again.) The Toronto neuroscientists claim to have discovered that people use two different kinds of attention that correspond to different brain networks. One network, which the researchers called "the default network" and more evocatively "the narrative network," is what is active when you think about yourself and your fantasies, evoke memories, and formulate plans.⁸³

David Rock, in a *Psychology Today* article titled "The Neuroscience of Mindfulness," explains:

When the default network is active, you are thinking about your history and future and all the people you know, including yourself, and how this giant tapestry of information weaves together. . . . [W]hen you experience the world using this narrative network, you take in information from the outside world, process it through a filter

of what everything means, and add your interpretations. Sitting on the dock with your narrative circuit active, a cool breeze isn't a cool breeze, it's a sign that summer will be over soon, which starts you thinking about where to go skiing, and whether your ski suit needs a dry clean. The default network is active for most of your waking moments and doesn't take much effort to operate. There's nothing wrong with this network, the point here is you don't want to limit yourself to only experiencing the world through this network.⁸⁴

The other brain network and accompanying attentional state identified by Farb and his colleagues is a "direct experience network," during which an entirely different set of brain regions are active. The narrative network is essential for planning, and plans can create perceptual frames that allow you to focus and also filter out irrelevant information. But direct experience enables more sensory information to be perceived in the present and thus a more flexible response (that is, the opposite of a habitual or compulsive response). The narrative network is what is most active when your mind drifts into plans and memories during meditation. The direct experience network is what is most active when you keep your attention on your breath; it is probably the one that is active when an athlete is in the zone.

A multitude of research teams have tested the effect of mindfulness meditation on the kind of attention networks demonstrated by Farb and his colleagues. Amisha Jha, Jason Krompinger, and Michael Baime in the Department of Psychology at the University of Pennsylvania examined neural and cognitive attentional subsystems, both before and after mindfulness training, concluding that "mindfulness training may improve attention-related behavioral responses by enhancing functioning of specific subcomponents of attention."⁸⁵ The *New York Times* reported that Jha, Krompinger, and Baime have been engaged in training U.S. Marines. With streams of real-time, life-and-death information from drone aircraft and other sources flooding display screens, attention training is a serious military issue: "At an Army base on Oahu, Hawaii, researchers are training soldiers' brains with a program called 'mindfulness-based mind fitness training.' It asks soldiers to concentrate on a part of their body, the feeling of a foot on the floor or of sitting on a chair, and then move to another focus, like listening to the hum of the air-conditioner or passing cars."⁸⁶

Psychologist Michael I. Posner and science writer Brenda Patoine observed, "Given the importance of the executive attention network, my colleagues and I wondered what might improve its efficiency. To find out, we adapted a series of exercises, originally designed to train monkeys for space travel, to investigate the effects of attention-training exercises in 4-6 year old children," and discovered that "tasks specifically designed to

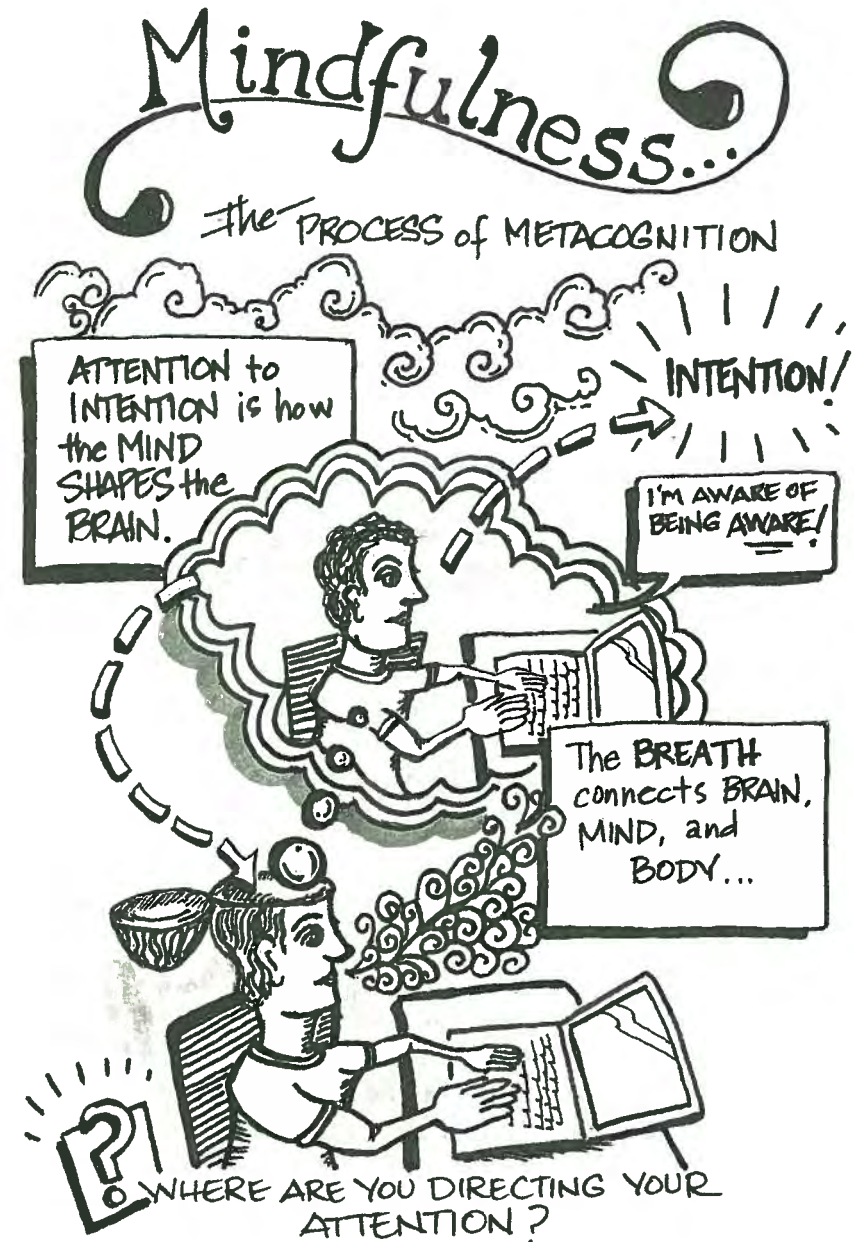
exercise the underlying networks can indeed improve attention, and that this kind of training can translate to better general cognition."⁸⁷ Pamela D. Hall, assistant professor of psychology at Barry University, claims that college students who learned meditation had significantly higher grade point averages compared to the control group.⁸⁸

There is more research into the neuroscience of meditation, mindfulness, and attention training than I have room to summarize here. Branch out from the bibliographies of the work I've cited and you can explore the scope of this burgeoning young field for yourself. One more study is worth noting. In the late 1960s, Stanford University psychology professor Walter Mischel conducted a simple experiment with children as young as four. He introduced the subjects to a marshmallow, which he put on a table in front of them, informing the young subjects that they could eat the marshmallow, but if they could wait while the experimenter stepped out of the room for a few minutes, they could have two marshmallows. Mischel filmed the subjects when they were alone with the temptation. Some of them ate the marshmallow, forfeiting the second. Some of them waited for the extra reward. The research became more interesting years later, when Mischel tracked down his former subjects. He discovered that those children who couldn't wait to eat the marshmallow were more likely to have behavioral problems and ended up with Scholastic Assessment Test scores that were on average 210 points lower than those who had experienced patience decades before. Mischel concluded that "intelligence is largely at the mercy of self-control," and more specifically, the self-control of *attention*.⁸⁹

Jonah Lehrer, in his *New Yorker* article about Mischel's research, writes:

Mischel's conclusion, based on hundreds of hours of observation, was that the crucial skill was the "strategic allocation of attention." Instead of getting obsessed with the marshmallow—the "hot stimulus"—the patient children distracted themselves by covering their eyes, pretending to play hide-and-seek underneath the desk, or singing songs from "Sesame Street." Their desire wasn't defeated—it was merely forgotten. "If you're thinking about the marshmallow and how delicious it is, then you're going to eat it," Mischel says. "The key is to avoid thinking about it in the first place." In adults, this skill is often referred to as metacognition, or thinking about thinking, and it's what allows people to outsmart their shortcomings. (When Odysseus had himself tied to the ship's mast, he was using some of the skills of metacognition: knowing he wouldn't be able to resist the Sirens' song, he made it impossible to give in.)⁹⁰

Mischel believes that self-control is more than an innate ability, but also incorporates environmental and individual variables such as motivation, perspectives, and heuristics (mental tricks) employed to maximize rewards



and minimize complications (which are states, not traits). “We can’t control the world,” remarks Mischel, “but we can control how we think about it.”⁹¹ If a four-year-old can achieve the miraculous feat of delayed gratification with a few simple tips, there may be enormous payoffs to becoming students of our own minds. Undoubtedly, there are many tricks just as easy as “look away” that may allow us to maximize our attentional potential.

Now let’s look at how you can test attention training for yourself. I’ll start by demystifying meditation—an exercise that many who haven’t tried might imagine to be far more difficult than it really is (at least at the beginning). In addition to practical exercises like mindfulness meditation, I’ll introduce some strategic goal-achieving tips that I’ve gathered over the years from others who are more adept.

Training the Puppy Mind

Breath is the bridge which connects life to consciousness, which unites your body to your thoughts. Whenever your mind becomes scattered, use your breath as the means to take hold of your mind again.

—Thich Nhat Hanh, *The Miracle of Mindfulness*, 1975

Breathe in. Breathe out. (My ankle is going to start bothering me in this position [body thought].) Breathe in. (How will I describe this? [planning]) Breathe out. Breathe in. (I wasn’t so fast to jump from thought to thought when I did this yesterday [remembering].) Breathe in. Breathe out. Breathe in.

Continue in this manner for a few pages and you get the picture of what goes on in the inner theater of my awareness when I meditate. I itch, fret, free-associate, and think about thinking about thinking. I sit with my back straight, legs crossed, eyes half closed, hands held in front of my navel, one hand resting in the other palm, and focus my attention on my breath, observing my body pull air in, then expel it, and watching my mind as it attends to my breathing and drifts involuntarily to one thought or another. Whenever I become aware that my intention to concentrate on my breath has been distracted by the emergence of a thought or feeling, I label the thought (“body thought,” “planning,” “remembering,” etc.) and then let it drift away on its own, just the way it emerged. I bring my attention back to my breath. I don’t try to “think about nothing.” I don’t strive to do better than I did yesterday or last year. I simply observe the way thoughts emerge and pass away with or without my conscious intent.

If you haven’t done it, watching your breath with your eyes closed and labeling your thoughts as they pass through your mind sounds like a colossal waste of time. I admit that I get antsy, and look forward to getting back to work, play, or whatever I had been doing. I don’t assign the “fun” tag to meditation. But this simple exercise provided an invaluable foundation when I started striving to surf the Web without becoming distracted (or more precisely, without becoming *too* distracted—for me, distraction online often leads to discovery, and only becomes a problem when it grows compulsive and saps time from a more important task). I’ve learned to use exercises in focusing awareness of my own breathing—as simply as I’ve described it—as a tool for learning to control my attention. Every day before lunch, I meditate for ten or fifteen minutes. I’ve been doing this for more than ten years now. Even though I don’t meditate for long stretches, the practice of watching my mind for a small part of each day has had an observable effect. The exercise, an introspective equivalent to other rote learning exercises like reciting the alphabet or memorizing multiplication tables, creates a kind of internal observing faculty that I did not have before—a faculty that sometimes wakes up and warns me when I get caught in obsessive thought loops.

I remember distinctly in gut emotion, if not sensory detail, the first time I noticed my self-created internal observer. I was taking a kayaking class that involved two days in still water for basic training before going downstream as an expedition. I was just too top heavy and lacked sufficient upper-body strength to do the “Eskimo roll” that every kayaker has to learn in order to right the canoe when it capsizes—a tricky combination of moves that one is obliged to execute upside down in a flowing river. When the instructor told me sorrowfully that “big guys” like me often have a problem and that I’d have to paddle one of the inflatable kayaks, I took it hard. Two minutes later, I noticed that I was replaying the big-guy line over and over again to myself. I was getting into a thought loop, my internal observer noted—one that triggered unpleasant emotions and interfered with enjoying my stupendously beautiful surroundings. I was going to have to go down the river in any case, and nobody but me really cared that I was paddling a kiddie kayak, unless I wanted to devote myself to caring. I might as well savor the rest of the river trip. When I got home, I went on a campaign to lose thirty pounds.

I haven’t tried to learn kayaking again, but that experience of catching myself in an obsessive and emotionally unpleasant thought was a powerful lesson to me in the value of cultivating an internal observer—a lesson that comes in handy moment to moment when I’m online.

Learning (and cultivating an internal observer is definitely a kind of learning) changes neuronal structure by strengthening connections between networks of neurons, a concept originally postulated by Freud and later reformulated by Canadian behavioral psychologist Donald O. Hebb. In 1949 Hebb proposed that learning linked neurons in new ways. He proposed that when two neurons fire at the same time repeatedly (or when one fires, causing another to fire), chemical changes occur in both, so that the two tend to connect more strongly. Hebb's concept—actually proposed by Freud sixty years before—was neatly summarized by neuroscientist Carla Shatz: "*Neurons that fire together wire together.*"⁹² Hebb also demonstrated that certain kinds of associative learning led to the strengthening of coordinated firing among specific networks of neurons. This kind of neuroplastic learning by which the repeated practice of a mental skill leads to specific changes in brain functions is offered by advocates as recent scientific evidence for what meditative disciplines have asserted for millennia.⁹³

When I intentionally aim the beam of my self-awareness on my breath, I strengthen networks of brain cells that eventually begin to function together even when I'm not consciously meditating. Being aware of my own thoughts, I realized, is a skill that can be learned through patient repetition. Some meditation teachers refer to the process as resembling that of training a puppy to not poop on the rug. Patiently, whenever the puppy deposits something on the rug, you pick it up and place it on the piece of newspaper near the door. Then you do it again and again. The puppy eventually starts pooping on the paper. Then you can put the paper outside. I swear that this is true, at least through the beginning levels of meditation training: much of meditation training is exactly like training a puppy, just as the teacher told me. Once I repeated the exercise for a sufficient number of days in a row, the mental pattern grooved in enough to awaken my internal observer even when I wasn't sitting in meditation.

Siegel believes that awareness of the breath performs a kind of mental-neural synchronization:

Breath is a fundamental part of life. Breathing is initiated by deep brainstem structures and is impacted directly by our emotional states. Yet breath can also be intentional. And for all of these reasons, breath awareness brings us to the heart of our lives. We come to the borderline between automatic and effortful, between mind and body. Perhaps for each of these reasons, pathways toward health included the mindful focus on the breath as a starting point on the journey.⁹⁴

Twenty years ago, I coauthored a book with a scientist who studied sleep and dreaming—specifically the kind known as "lucid dreaming" in which you realize that you are in a dream state and begin to direct it.⁹⁵ While

writing the book, I needed to train myself to recognize that I was dreaming and then seize control of the plot. The method my coauthor, Stephen LaBerge, suggested worked well: I wrote the words "Am I dreaming?" on a small card and put the card in my pocket. Throughout the day, at least once during every waking hour, I pulled the card out, looked at it, and thought about the question. About three weeks into the exercise, I pulled out the card on an otherwise perfectly ordinary day and noticed that the letters seemed to scramble to get back into place when I looked at the card, as if the letters had been loafing. I had trained myself to question whether I was awake or not at least once an hour, and without consciously intending to do it, I started reality testing while I was dreaming. Although everything and everyone around me looked real, I decided to test my perceived reality by pushing off the ground with my toes. When I began to float above the ground, I realized I was dreaming. Lucid dreaming training, like training a puppy, is not that different from the kind of intention-attention awareness I encourage you to try when you are online. Instead of "Am I dreaming?" try "Have I drifted?"

University of Washington professor David Levy has been studying the interface of attention and information for a long time. Previously, at the fabled PARC, Levy believes he may have witnessed the first email interruption, when a researcher who was demonstrating the first graphical user interface answered an email in the middle of it.⁹⁶ Levy created a college course called "Information and Contemplation."⁹⁷ In addition to teaching breath awareness to his students, Levy asked them to keep a log of their email behavior for a week, noting how their body and emotions felt, and how they were breathing while they were online. After a week of logging their interior observations during online activities, he asked the students to "look for regularities" in their logs. "Every single student discovered," Levy said in a talk to Google employees, "by doing this form of mindfulness practice, that there were certain things happening for them around email that were actually not what they wanted at all."⁹⁸

Mindfulness in all its forms and applications certainly is an end in itself, but practicing mindfulness in regard to online attention serves a specific strategic goal. Your goal and mine in this context is not just the control but also the management of attention. Stone captures it well in writing about continuous partial attention:

We have focused on managing our time. Our opportunity is to focus on how we manage our attention. We are evolving beyond an always-on lifestyle. As we make choices to turn the technology OFF, to give full attention to others in interactions, to block out interruption-free time, and to use the full range of communication tools

more appropriately, we will re-orient our trek toward a path of more engaged attention, more fulfilling relationships, and opportunities for the type of reflection that fuels innovation.⁹⁹

In the *Huffington Post*, Stone offers valuable advice on “how to switch from managing time to managing attention”:

1. Each evening or morning before you start your day, make a short list of your intentions (the result and feeling of something you want) for the day and by each, write the related to do's for that day. Try to keep your list to 5 intentions. Consciously choose what you will do and what you will not do. Keep a different list of what you will review for inclusion on other days.
2. List only what you really expect to do that day. As other things come to mind, write them on a separate list. By putting these items on a separate list, you are creating the space to be in the moment with each of your day's priorities. Review that list as you plan for the next day and determine how they fit in to your plans. Give yourself some down time, enjoy your successes at the end of the day.
3. Give yourself meaningful blocks of uninterrupted time to focus on each intention. Turn OFF technology each day during those blocks and focus on your intentions.
4. At home, be clear about what technology you'll use and where. Computer in the kitchen? Maybe not.¹⁰⁰

I have information windows on my thirty-inch computer screen, but two paper index cards lie on my desk, at the periphery of my attention as I write this. On one card is my hand-sketched calendar that shows how long I need to take on finishing each chapter of this book in order to reach the deadline. Next to it is the goal I scribble out with an analog pen on the other index card. Today, for example, my index card said: “Finish ‘Training the Puppy Mind.’” I don't do anything except take twenty seconds to write out the day's goal. But my purposes are served by both the object in the periphery of my attention and the metacognitive knowledge that I placed a piece of paper at that edge to help me deploy my attention more mindfully online.

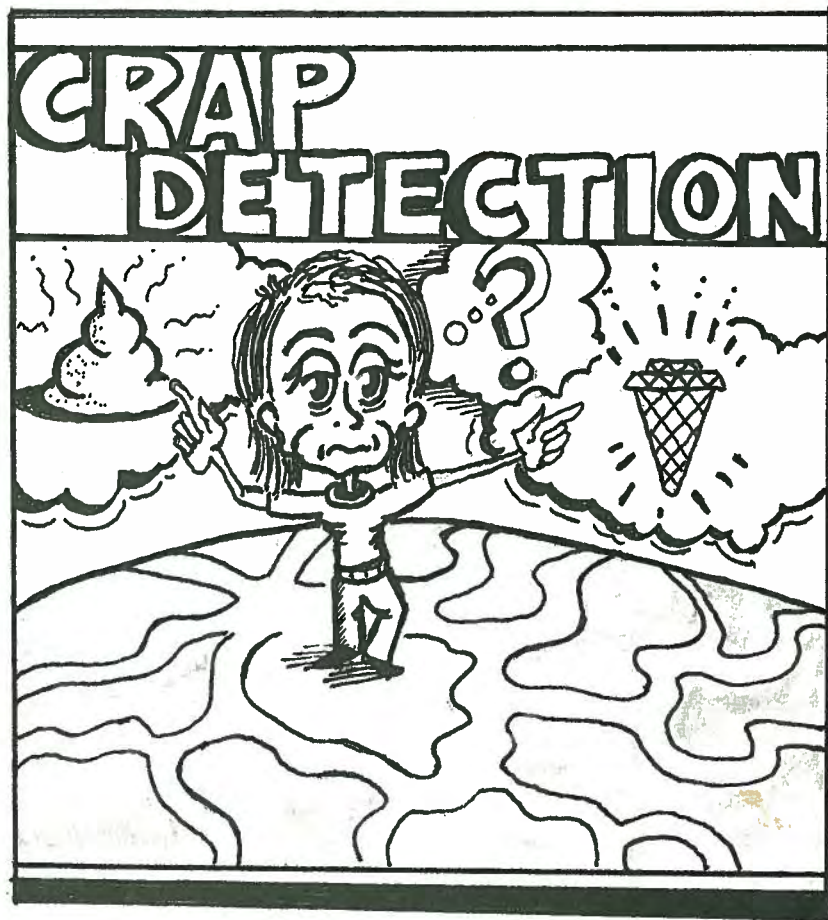
Writing a goal can, and in this exercise should, become the first step in setting your intention. Strategic adviser Peter Bregman recommends an “18-Minute Plan for Managing Your Day” that takes goal-managed attention to the next level of commitment. After setting your plan for the day, Bregman suggests setting an alarm to remind you to refocus, take a deep breath, and evaluate your activity in light of your goal. Review your day at the end of it. “The power of rituals is their predictability,” Bregman reminds us.¹⁰¹

The two complementary components of the goal-setting rituals recommended by Stone, Bregman, and others consists of two parts: the goal

setting itself, and the deliberate creation of a ritual of setting goals. Professor B. J. Fogg, director of Stanford's Persuasive Technology Lab, puts it this way: “Forget about ‘decisions’—habits are about strategy (having a smart plan) and rehearsal (until behavior is simple and automatic). Three steps to new habits: Make it tiny, find a spot, train the cycle.”¹⁰² What could be tinier than writing a one-sentence goal for the day before you get online, and reviewing it once or twice? Doing it before plunging into social media is what Fogg means by “find a spot,” and “train the cycle” simply refers to doing it over and over again. In addition to practicing basic attention-to-breath meditation off-line, my recommendation for learning mindful use of social media is to establish a new habit that connects—however thinly at first—your goals to your moment-by-moment stream of attention. And remind yourself to breathe consciously from time to time.

When I interviewed Nass, he proposed that a better way for getting things done than multitasking all day is to deliberately work on a single task for fifteen to thirty minutes before going with the multitasking flow for five to ten minutes. This insight is the basis for a simple attention-training methodology known as the “Pomodoro Technique.”¹⁰³ The method is easy enough. Write down your major tasks to accomplish each day on a piece of paper. Set the timer (which resembles a tomato; hence pomodoro) for twenty-five minutes and work on one task in whatever medium the task requires until you hear the alarm sound. Then take five minutes to do what you want. Repeat. Every four pomodoros, take a longer break. Train yourself to be present and aware of whether what you are doing online is going to help you achieve your own goal. Eventually you don't need the alarm clock.

Once you've evoked your attention's attention and you've started regrooving your attentional habits, you need to turn your attention to the content of your attention: How do you know that the information you've found is true, false, plausible, or preposterous? The next task for your attention in training is to develop the most important skill mindful digital citizens require to make it through life successfully these days: crap detection.



2 Crap Detection 101: How to Find What You Need to Know, and How to Decide If It's True

Every man should have a built-in automatic crap detector operating inside him.

—Ernest Hemingway, 1965

Like attention, you learn crap detection by trying out a few techniques such as those I suggest in this chapter—and then putting them into practice. Then make them habitual. The danger of distraction or credulity is made possible by digital media, but the danger you and I can do something about is the bad habit of not controlling attention or failing to crap-detect rumors. If the rule of thumb for attention literacy is to pay attention to your intention, then the heuristic for crap detection is to make skepticism your default. Don't refuse to believe; refuse to start out believing. Continue to pursue your investigation *after* you find an answer. Chase the story rather than just accepting the first evidence you encounter.

The first time I saw my daughter use a search engine to research homework, I explained that “in the olden days, you gathered information by going to the library for a book or magazine article. You might disagree with a library book, but you could be somewhat confident that someone checked the author's claims about facts before the book was published. When you get results from a Web search engine and click on a link, you can't be sure that what you get is accurate or inaccurate information, misinformation, or totally bogus.”

“Who can tell me which is which?” she asked, getting to the heart of the Internet's challenge to the age-old authority of texts.

“I'm afraid that's now up to the person who uses information they find on the Web, not the people who put information onto it,” I answered, much to my daughter's dismay. “You can get fooled into believing all kinds of wrong things if you don't know how to tell the difference between the good and bad stuff.”

To show her what I meant, I typed in the name of the civil rights leader Martin Luther King Jr. I knew that near the top of the first page of results from most search engines is a link to a site titled "Martin Luther King Jr.: A True Historical Examination."¹ It doesn't take long to see that this "true historical examination" presents King as a disreputable character. I asked: "How do you know if this is true or not?"

"It looks like most everything on the Web," my daughter replied.

"Look for an author," I prompted.

She did a search on several of the authors' names whose work was republished on the site and noticed that search result snippets frequently used the word "racist." I showed her how a free Internet service called Whois reveals the name of the registered owner of most Web sites. The true historical examination site turned out to be owned by an organization called Stormfront. A few additional keystrokes revealed that Stormfront is a white supremacist organization. (Years after that discussion with my daughter, Stormfront started publishing "Hosted by Stormfront" on its home page.)

Ever since I started demonstrating to my daughter and, more recently, my university students that all is not what it seems to be online, I've collected URLs for Web sites that appear to be real, but are either willfully misleading like the "cloaked" Web site I showed my daughter or reveal themselves to be hoaxes if you look closely enough. The harmlessness of Web tricks varies. A site that urges readers to support the campaign to "help save the endangered tree octopus" is mildly amusing (and contains clues to its fake nature if you dig deeper), but the site that claims to be an online pregnancy detector is more frightening ("fill in your name and press the 'start test' button").^{2,3} (The pregnancy test site disappeared, months after I first found it, although I located it by using Google's "cached copy" service—and in the future I'll be able to use the Internet Archive's Wayback Machine to get a snapshot of what the site looked like before it was removed. Publishing is permanent now; in chapter 6, I'll get into what that means for all of us.)⁴ Genochoice.com comes across as highly professional and offers totally fictional capabilities such as cloning yourself.⁵ Hetracil.com looks like a slick ad by a pharmaceutical company, except there is no such thing as an "anti-effeminacy drug."⁶ I collect links to hoax sites under the tag "Crap Detection."⁷

When my daughter asked, "How can I tell if *anything* I find on the Web is real?" I told her to "think skeptically, look for an author, and then see what others say about the author." In recent years, journalist John McManus has written an excellent guide to crap-detecting journalism, "Detecting Bull: How to Identify Bias and Junk Journalism in Print, Broadcast, and on the

Wild Web." "Think like a detective," advises McManus.⁸ Like smart Web searching, good credibility testing is a process, not a one-shot answer. Simply deciding to perform more than one search query, use more than one search engine, or look beyond the first page of search results is the first step in tuning your critical information consumption skills, just as observing your own attention is the first step in learning mindful media use.

My daughter and search engine technology both came of age in the late 1990s. Today, as it was then, the root question for assessing the credibility of a Web page remains, Who is the author? Immediately after that, ask, What are the author's sources? The first source we tested for martinlutherking.org began to raise warning flags regarding possible bias. A lack of sources is as suspicious as sources with known bias. Learn to use Easywhois or another Whois service to find out who owns a site if there is no author listed; use alexa.com to find out approximately how much traffic a Web site receives.^{9,10} Once you know a URL, try pasting it into one of the tools on Network-tools.com.¹¹ If the author provides a way to communicate or add comments, turn up the credibility meter. If the author responds to comments, read those responses. Is the site a .gov or .edu? If so, increase your estimation of a site's credibility.

Take the Web site's design into account, but don't count on it. Professional design should not be seen as a certain indicator of accurate content (Genochoice and Hetracil are beautifully designed), yet visibly amateurish design is sometimes a signal that the "Institute of Such-and-Such" might be a lone crackpot. Treat a site's design not as validation of credibility but instead as one possible clue (along with grammatical errors, suspicious sources or lack thereof, and other people's negative opinions of the site) that could convince you to lower your evaluation of the site's credibility. If the author provides sources, search the authors' names. Have other Web sites linked to this page, and if so, who are the linkers? Use the search term "link: http:// . . ." (with your URL in place of the ellipses) to see every link to a specified page. A veteran ink-stained-turned-digital journalist I've known since he left the *San Francisco Examiner* to become a founding editor of *Salon*, Scott Rosenberg, has published an excellent guide for consumers of both news and any kind of information online: "In the Context of Web Context: How to Check Out Any Web Page."¹²

All the mechanics of doing this kind of checking take only a few seconds of clicking, copying and pasting, searching, and judging for oneself. The part that requires the most work is learning how to judge.

Journalists talk about "triangulating" by checking three different, credible sources. In January 2011, I saw a report on Twitter that Egypt had cut

its country off from the Internet. I didn't know the person who had tweeted this alarming report—the kind that journalist Dan Gillmor calls “interesting, if true.” So I looked on the CNN, Al Jazeera, ABC, and BBC Web sites. Nothing. At this point, I not only felt that I should be skeptical but also warned others via Twitter. Several people replied to me immediately with links to independent sources. But three of those sources linked back to the same blog post that had been made a few minutes prior by the author I don't know. Then someone else told me via Twitter that a person I know to be a reliable source was on the phone with a journalist in Cairo when the Internet blackout started happening. So I looked at the reliable source's own tweet stream and verified the report about their call to the Cairo reporter. I had one point of my triangle. Someone else on Twitter reminded me to use “traceroute,” an Internet service that reports on the availability of Web sites. Sure enough, there seemed to be an outage in Egypt; the whole country indeed seemed to be unavailable from my part of the Internet. I'm not technical enough to know whether this can be faked or is a frequent temporary occurrence, but it was strong enough to be my second point. When the Associated Press published a report of curtailed Internet access in Egypt, about an hour after I saw the first tweet, I had my triangle and started retweeting my sources.

This told me that Twitter can be an hour or more faster than existing news networks—if you know how to triangulate. Those who failed to triangulate in 2009 about previous reports that “American Airlines will fly medical help to Haiti if you text this number,” however, ended up repeating a hoax. The “Gay Girl in Damascus” whose blog was widely followed during the Syrian revolt of 2011 was exposed as a U.S. man (a classic case history of journalistic crap detection).¹³

You aren't paranoid if you suspect that some sites might even deliberately try to deceive you. Political pranksters created Gatt.org, and once duped the Center for International Legal Studies into believing this was the World Trade Organization's Web site. A few years ago, the aforementioned center arranged for someone from the parody site to speak at its annual conference. The speaker—an imposter from an activist group known as the Yes Men—made outrageously racist remarks, claiming to be an authentic World Trade Organization spokesperson. In a staged incident, the speaker was pied and then faked his own death. Disinformation can be well crafted. Look around mercuryfacts.org and see if you can figure out on your own that the site has a pro-fishing-industry agenda.¹⁴ I searched “who is behind mercuryfacts.org,” and the top result was a Wikipedia page about a public relations professional who was reportedly hired by the tobacco industry and

others to create misleading Web sites.¹⁵ A search for the name of the alleged public relations pro's organization, “Center for Consumer Freedom,” led me to Sourcewatch.org, a kind of Wikipedia for people who want to track down front groups online.¹⁶ A good question to ask yourself, particularly when a Web site asks you to download something to your own computer, is, Might somebody be trying to put one over on me?

In recent years, as so many more people have started to rely on the Web for such vitally important forms of information as news, scholarly research, and medical as well as investment advice, the lack of general education in critical consumption of resources found online has become a public danger. No, Gates won't send you five dollars for forwarding this chain email, the medical advice you get in a chat room isn't necessarily better than what your doctor tells you, and the widow of the deceased African dictator is definitely not going to transfer millions into your bank account. That scurrilous rumor about the political candidate that never makes the mainstream media, but circulates as email and blog posts probably isn't true. The data you are pasting into your memo or term paper may well be totally fabricated—and detectable by specialized plagiarism-finding search tools. If nothing else, check Snopes.com, the site that has been debunking online rumors since 1995, before you pass along the latest social media meme infection.

In the previous chapter, I mentioned Stanford professor Fogg in regard to attention training because he's an expert in the use of social media persuasion, self-persuasion, and habit changing. (I often cite the names of people who make scientific claims so my readers can search on my sources, and then judge their credibility for themselves.) Fogg also coauthored one of the earliest studies of how people test the credibility of Web pages. In “The Elements of Computer Credibility,” Fogg and coauthor Hsiang Tseng stress that credibility is always a perceived quality, and not a property that can be found in any human or computer product.¹⁷ Think of credibility as a measure of the degree to which you believe the information you are evaluating is accurate. In 2001, Fogg and several other colleagues studied fourteen hundred participants in the United States and Europe, noting that online credibility judgments are affected by references and links to real-world means of verification (brand name, contact information, credentials, and feedback by site users, like Amazon reviews), usability and quality of site design, errors and technicalities such as broken links and frequent site unavailability, and currency and reliability (recency of updates, consistency, and verifiability).¹⁸

Credentials and highly regarded brands reduce the burden of investigating the credibility of information online, but do not remove it; hoaxes at

such distinguished institutions as Harvard and the *New York Times* signal that although they have proven reliable, even the most well-credentialed sources are not 100 percent authoritative.^{19, 20} Anybody who has spent sufficient hours or years surfing the Web can sense when a Web site is broken or obviously badly designed, and most people know how to discount sites that have not been updated in ages. Fogg and his colleagues seem to be confirming common sense. A different study, however, uncovered yet another commonly used method that could be dangerously misleading: too many people seem to regard search engines as authoritative in themselves. A study in 2010 by Eszter Hargittai, Lindsay Fullerton, Ericka Menchen-Trevino, and Kristin Yates Thomas, found that students use search engines as a parameter of trustworthiness. As long as a site is toward the top of a search engine's listings, many of this study's subjects considered it credible.²¹

People who are more experienced at Web surfing, some research suggests, do triangulate by applying several methods for assessing credibility. A study by R. David Lankes showed that experienced Web users combine clues (thinking like a detective) from search engines, automated recommendations, aggregation services, and "network recommendations" via social media. Lankes explains that "whereas credibility has historically been tied to concepts of authority and hierarchy, in the reliability approach users determine credibility by synthesizing multiple sources of credibility judgments. Both the need for synthesis and the richer set of resources to be synthesized are products of the pressure for participation enabled and imposed by networked digital media."²² Lindsay Pettingill's Harvard study found that

in order to determine the presence of these "credibility" criteria, students used various cues: popularity of site, professional reputation/offline reputation (including professional staff with resources to gather definitive and credible information), previous personal experience with site, proof of "neutral" (not for-profit) affiliation (.gov for government site, .edu for education, .org for non-profits), tone of the writing (neutral vs. opinionated), and elements of style (use of quotes, pictures, by-lines, newspaper layout).²³

Most people ask themselves whether a detective-like inquiry to verify the answer to a Web search is worth the time. According to researchers Soo Young Rieh and Brian Hilligoss, interviews with twenty-four college students revealed that they would be willing to compromise certainty about credibility for speed and convenience.²⁴ That trade-off is familiar to older Web users as well. I know that I apply the same calculus, weighing what is at stake before allocating more time. As Shirky puts it, "There's a spectrum of authority from 'Good enough to settle a bar bet' to 'Evidence to include in a dissertation defense.'"²⁵ Most of the time, trading certainty for

convenience is a reasonable decision—but not always. That's where asking yourself whether you have time for another query and considering what's at stake is a useful strategy.

Miriam Metzger, Andrew Flanagin, and Ryan Medders conducted one of the most thorough studies of exactly how people test the credibility of Web pages. They analyzed focus group data from 109 participants with diverse demographic characteristics and different levels of Internet expertise. Noting (as I did to my daughter) that "digital media and information abundance may complicate people's confidence in and knowledge of who is in authority," Metzger and her colleagues added, "Electronic networks and social computing applications make it easier for individuals to harness collective intelligence to help them assess and evaluate information and sources online."²⁶ I'll soon drill down on that "collective intelligence" aspect of credibility testing. The social aspects of critical evaluation can be powerfully useful, but they also can be misleading. Skill at evaluating the quality of collective intelligence is essential to knowing how to take advantage of it.

Before taking on a more detailed examination of social factors in credibility testing (what Metzger and her colleagues mean when they talk about harnessing "collective intelligence to help them assess and evaluate"), consider that a kind of popularity measurement is critical to the way all search engines work today. Google's famous "PageRank" algorithm (named after Google cofounder Page, who created it as a graduate student) arranges the results of a Web search by measuring how many other Web pages link to every Web page identified in a search. Of all the Web pages that have the words specified in the search query, those with the highest number of inbound links coming to them from other pages are ranked higher in the search results, and links from sites that are themselves linked to by a large number of sites count more than those from less popular ones.

The secret sauce for Google's search is more complicated than that, but counting links as proxy votes for the usefulness of a Web site is fundamental. PageRank takes into consideration the ranking of each page that casts a vote for another page's credibility and usefulness by linking to it — links from some pages are given higher value in the PageRank evaluation." The various flavors of voting on which Google's "+1," Facebook's "like," and Digg's "digg" and "bury" are based can be powerful collective judgment aggregators, but the presence of spam blogs and "content farms" that publish random words or text pasted from other blogs plus the names of brands the spammers want to push are evidence that it can be lucrative to game "Google juice." The entire profession of search engine optimization

involves the craft of manipulating the opinion of search engines, just as public relations involves the craft of manipulating public opinion.

Some recent ethnographic research by others indicates that seventh graders who happen to be hard-core gamers, bloggers, or YouTubers are more likely less trusting, and more inclined to look beyond the surface of a Web search—probably because enthusiastic young creators of online content use search and social media to learn their subculture's craft.²⁷ In my interview with Ito, who directed the most extensive ethnographic study of youth and digital media yet conducted, she noted that "one of the side effects or what we call collateral learning for kids who do engage in geeked-out, interest-driven activities is that when you start engaging in knowledge or media production, you tend to develop a much more sophisticated understanding of how knowledge and media is produced more generally"²⁸ Metzger, Flanagin, and Medders report that

those who use the Internet to immerse themselves in virtual worlds more often (including playing games such as World of Warcraft) and those who contribute information online, show higher levels of concern about credibility. These results indicate that as kids engage more, and more deeply, with various aspects of the Internet, they may develop a healthy sense of skepticism and concern about the believability of information online. . . . [U]sing more methods to evaluate credibility and being more meticulous in evaluating information leads kids to be more cautious about trusting strangers.²⁹

So while age can be a factor in crap-detection fluency, experience and engagement may be more important. A ten-year-old online game enthusiast or videoblogger may do more sophisticated credibility testing than an eighteen-year-old college student who doesn't use the Web much.

Before you can test information, you need to know how to find it. I'll start with search skills, and then look at mental, digital, and social tools you can use to lead a more crap-free life online.

How to Search and How to Know

Looking around online and searching is an important first step to gathering information about a new and unfamiliar area. Although many of these forays do not necessarily result in long-term engagement, youth do use this initial base of knowledge as a stepping-stone to deeper social and practical engagement with a new area of interest. Online sites, forums, and search engines augment existing information resources by lowering the barriers to looking around in ways that do not require specialized knowledge to begin. Looking around online and fortuitous searching can be a self-directed activity that provides young people with a sense of agency, often

exhibited in a discourse that they are "self-taught" as a result of engaging in these strategies. The autonomy to pursue topics of personal interest through random searching and messing around generally assists and encourages young people to take greater ownership of their learning processes.

—Mizuko Ito, *Hanging Out, Messing Around, and Geeking Out*, 2009

Search engines are such powerful magic that we've forgotten how magical they really are. While people stand in line for hours to pay for the privilege of walking around a fake village full of actors posing as magicians in the Wizarding World of Harry Potter theme park, millions of people use computer and telephone keyboards to utter magical spells—with various degrees of proficiency and success—every day. If you can cast your search query, the exact words you submit to a search engine, in precisely the right terms, screens full of up-to-date knowledge in multiple media appear before your eyes, literally out of thin air. Your Internet provider charges you for transmitting the data back and forth, but the knowledge comes to you free of charge. What could be more magical than that?

Google, Bing, Yahoo! and other search engines offer search as a free service on the Web, because searches provide the marketing information that advertisers have sought like the conquistadores sought El Dorado—a way to show large numbers of individuals advertisements that each person might actually be interested in. Search is both a public good—something useful to everybody, but that individuals lack sufficient incentive to create for themselves—and a way to amass significant private wealth by selling a valuable commodity. In Web search, the valuable commodity is the searchers' attention. Search engines sell sponsored links that appear on the top or side of the page of links displayed in response to a search query. Whenever someone clicks on a sponsored link, a small amount of money goes to the search engine provider. Those clicks add up to billions of dollars each year.

Access to attention is not just lucrative. It can be political. When petroleum company BP's Deepwater Horizon offshore platform started spewing crude oil into the Gulf of Mexico in 2010, BP bought sponsored link space from major search engines for terms such as "oil spill," "BP's oil spill," and "Deepwater Horizon" in order to provide its side of the story. I bring in Harry Potter and BP to underscore the way that the knowledge magic of search terms depends on how well the searcher phrases the spell. Observations of how people search online reveal that few individuals apply even the most elementary of advanced search operators such as using quotation marks around exact phrases, or using addition or subtraction symbols to include or omit certain words. Google, Bing, and other search engines have a link

to “advanced search” on their home page that enables diligent searchers to look for pages on which all the words in the search query appear in any order, exact wording or phrases appear, and one or more of a list of words appears, eliminating pages on which specific unwanted words appear. Knowing how to use advanced search can empower any searcher, but these technical competencies don’t necessarily inform the searcher about how to find the information they want in an adequate context. What steps must be taken to turn searching and finding into learning and knowing?

Chris Heuer teaches people to search through his social media club, and offers the good advice to “write the answer you want to get” when formulating your search query.³⁰ For instance, I wanted to know how and why Thomas Edison (who championed delivering electricity through direct current), rather than his equally brilliant rival Nicola Tesla (who championed alternating current), ended up winning the battle for commercial control over electricity. The answer I wanted to get would complete the sentence “Tesla lost to Edison because . . .” so I entered that phrase (minus the three dots) into Google and Bing. Google’s Search Basics puts it this way:

A search engine is not a human, it is a program that matches the words you give to pages on the web. Use the words that are most likely to appear on the page. For example, instead of saying [my head hurts], say [headache], because that’s the term a medical page will use. The query [in what country are bats considered an omen of good luck?] is very clear to a person, but the document that gives the answer may not have those words. Instead, use the query [bats are considered good luck in] or even just [bats good luck], because that is probably what the right page will say.³¹

Although I had to know how to follow the trail and assess the quality of the sources, the top page of links for each of the two major search engines provided everything I needed to know and much more. At that point, my infotention training kicked in to remind me that I was writing a blog post today, and needed to stop following the trails of links about electric inventions, genius, and the turn of the twentieth century, fascinating as they might be. On another day, without a deadline, I’d call such unplanned trail following a form of exploratory learning. When investigating a topic, I often add the words “critique” or “criticism” to my search query in order to find contrary or skeptical opinions.

I visited the Googleplex, as googlers call their futuristic headquarters in Mountain View, California, on several occasions to talk with Dan Russell, Google’s “search anthropologist.”³² Russell also traveled to my corner of the San Francisco Bay Area to walk in an oak forest and talk about how people search online. One of the first things Russell noted was that sometimes using more words in a search query can help you zero in on the answer,

but sometimes making your query too precise “takes you down the wrong rabbit hole.” Adding words can return more precise answers, yet that means restricting the scope of the results. Frequently, at the beginning of a series of searches, you want to start more broadly. “Choose keywords that you think will appear on the page you seek, put yourself in the mind-set of the author,” Russell suggested.³³

Russell also advised familiarizing yourself with the anatomy of search page results: the sponsored links are clearly indicated by all reputable search engines, and are most often presented both at the top and in the right-hand margin of search results pages. When you are seeking information about something to buy or somewhere to go on vacation, sponsored links might turn out to be useful. But if you are not interested in information provided by someone trying to sell you something, the other links on a page along with pages deeper in the search engine results are important. The top line of each result, usually presented in bold type, is the Web page’s title as a clickable link that will bring you to that page. The short (usually two-line) description below the title is known as the “snippet,” and below that is the Web address of the site listed (aka the URL). Sometimes, scanning the snippets reveals a phrase or set of words that would make for a better query—or tell you all you need to know about the topic.

Search, Russell reminded me, can be a gateway to self-learning—which in turn reminded me of Ito’s discovery that for young digital culture enthusiasts, searching about a subject is part of a cultural learning process. Ito concluded that youth who “mess around” online by searching for clues to a subcultural topic such as role-playing games, animated cartoon videos, the Pokémon card game, or fan fiction that might seem trivial to others are partaking of a complex social system that uses knowledge exchange for competitive bonding as well as builds learning communities around the tools of their subculture’s digital craft. The youths interviewed for Ito’s studies had discovered something crucial to all who use Web search: search is most productively used for learning rather than just for finding.

If you don’t know much about a topic and seek guidance in learning about it, Russell suggested using search terms such as “tutorial,” “introduction,” “lesson,” “background” in your query. Although educators warn students not to use Wikipedia as a final source or citation, Russell explained that Wikipedia is often a good place to begin an inquiry about a topic. If you can narrow your search down to a word like “metacognition” or phrase like “evolution of cooperation,” Wikipedia is likely to include a set of external links that can be excellent starting points. Russell called these starting points “gateway sites,” and also recommended cia.gov for international

facts and data, reference.com, and about.com (now owned by the *New York Times*). When you are in beginner learning mode, Russell said to include “how-to” or “DIY” in your search to find gateway sites about a topic. I’ve discovered that going to YouTube and searching on how to do whatever it is you want to learn is more likely than not going to lead you to a detailed video that someone made about doing exactly what you want to learn to do.

I also spent time with a search expert for Google’s most recent competitor, Microsoft’s Bing search engine. When I blogged about crap detection, I was contacted by Betsy Aoki, senior program manager for Bing. She wanted to know if Microsoft could use my blog post in a compendium of critical thinking resources that the Bing team was compiling for teachers and librarians. I replied that I would grant permission as long as Microsoft didn’t try to own it. That wouldn’t be a problem, she assured me. Then I asked why she was particularly interested in critical thinking. It turned out that Aoki, a former journalist, was at the forefront of Microsoft’s effort to position Bing as a “decision engine.” Teaching people to use search and other tools to critically examine the information they find on the Internet was part of Microsoft’s strategy. For that reason, Aoki enlisted me along with others in compiling critical thinking as well as online credibility-testing resources for educators and librarians. When I was unable to physically attend a scheduled workshop with teachers and librarians, Aoki helped me create my first videos for educators about crap detection.

Aoki reminded me to look at the snippet for contextual clues (the snippet for Hetracil on both Bing and Google contains the words “[contains fictitious information]”), examine the second, third, and later pages of search results, and use more than one search engine. Although I had not told her that Google’s Russell had said the same thing, Aoki also approved of Wikipedia as a site that is, more often than not, a useful jumping-off point, a gateway to a series of searches organized as a learning journey rather than a treasure hunt.

When Aoki first contacted me, she asked, “How can I help you get the message out about crap detection and critical thinking?” I suggested that we enlist teachers and librarians in compiling good resources for teaching critical thinking. Microsoft sponsored me as a speaker at the International Society for Technology and Education (ISTE), a conference of exactly the people I wanted to learn from and reach.³⁴ During my talk, I launched a wiki, hosted on ISTE’s Web site, and invited educators to add to it—an ongoing online resource repository for tools, lesson plans, and hoax sites.³⁵

The free e-book that Microsoft has made available as a result of Aoki’s work, including my contributions and many others, together with detailed online lesson plans, is a valuable guide for educators who seek specific ways to teach critical thinking.^{36,37} I’m happy that Microsoft sees a competitive advantage in encouraging critical thinking and will be happy if Google starts making similar resources available.

My conversations with Google’s Russell and Bing’s Aoki convinced me that if the two biggest search engines were interested in search literacy, I was on the right track with my nascent ideas about helping people learn to be more critical information consumers. And I confirmed my experience from my own PLN that we already have a well-understood social role for a critical thinking tutor: librarians.

Once you’ve searched, you need to determine how much you should trust the information your search has yielded. That’s where your well-tuned internal crap detector comes in handy.

Tuning Your Crap Detector

So you see, when it comes right down to it, crap-detection is something one does when he starts to become a certain type of person. Sensitivity to the phony uses of language requires, to some extent, knowledge of how to ask questions, how to validate answers, and certainly, how to assess meanings.

I said at the beginning that I thought there is nothing more important than for kids to learn how to identify fake communication. You, therefore, probably assume that I know something about how to achieve this. Well, I don’t. At least not very much. I know that our present curricula do not even touch on the matter. Neither do our present methods of training teachers. I am not even sure that classrooms and schools can be reformed enough so that critical and lively people can be nurtured there.

Nonetheless, I persist in believing that it is not beyond your profession to invent ways to educate youth along these lines. [Because] there is no more precious environment than our language environment. And even if you know you will be dead soon, that’s worth protecting.

—Neil Postman, *Bullshit and the Art of Crap Detection*, 1969

Use the following methods and tools to protect yourself from toxic bad info. Use them and then pass them along to others. Promote the notion that more info literacy is a practical answer to the growing info pollution. Be the change you want to see.

Although the Web undermines authority (by enabling anybody to publish), authority is still useful as one clue to credibility in a detective hunt

that accounts for many other clues. Claims to authority, however, need to be questioned. I might add credibility to my assessment if a source is a verified professor at a known institution of higher learning, an authentic MD or PhD, but I would not subtract it from people without credentials whose expertise seems authentic. If you are going to grant credibility to people whose expertise is based on being a professor of something, make sure that assertion is accurate. Don't stop at simply verifying that the claim to be a professor is valid if you are looking for scientific credibility. The next step is to use the Faculty Scholarly Productivity Index that derives a score from the scholar's publications, citations by other scholars, grants, honors, and awards.³⁸ If you want to get even more serious, download a free copy of Publish or Perish software, which analyzes scientific citations from Google Scholar according to multiple criteria.³⁹ Or use the h-index to calculate how many times other scientists have cited a particular source.⁴⁰ Again, don't trust just one source; triangulate.

Think of tools such as search engines, the productivity index, and hoax debunking sites as forensic instruments like Sherlock Holmes's magnifying glass or the crime scene investigator's fingerprint kit. For people who bet their health on online medical information, their economic well-being on online financial gossip, or their political liberty on the rumored news they get from Twitter, blogs, or YouTube, the stakes in this detective game are high. For example, you could triangulate by googling the author's name, entering the author's name in the Faculty Scholarly Productivity Index, and using the literacy resources at FactCheckED.org to triangulate a source.⁴¹ FactCheckED.org's sister site, FactCheck.org, researches claims by all political factions.⁴² How much stronger would democracies be if citizens checked the political section of the *New York Times*' "About Urban Legends" site or the U.S. Department of State's "Conspiracy Theories and Misinformation" site before passing along a link or an email about, respectively, a political figure or conspiracy theory?^{43, 44}

Crap-detection skills and the lack of them are a life-and-death matter for more people every day. The good news about the pace of medical research is also the bad news: few medical specialists can keep up with the rate of new discoveries. That means that it's possible for the collective intelligence of a committed community—and there is nothing as committed as people who are suffering from a disease—to stay ahead of all but the most dedicated individual specialists. Nevertheless, along with the latest word on cutting-edge drug trials are unsubstantiated claims, rumors, and outright quackery. Well-intentioned yet dangerously misinformed people, quacks

who sincerely believe that their ineffective cures will save the world, and straight-out charlatans who unblushingly fleece the ailing abound online. It's not just that uninformed consumers of bad medical information can harm themselves; people who link and forward without checking closely are part of the problem. When it comes to medical information, just as when it comes to information that affects political liberty, believing or forwarding bad info can be unhealthy or fatal.

How much work is it to check three links before believing or passing along online health information? Simply googling the name of the person who tried to sell do-it-yourself eye surgery kits, for example, immediately raises questions for those who are considering aiming lasers at their own retinas.^{45, 46} Patients who want to learn more about their disease and treatment are not totally at the mercy of the oceans of rubbish. Tools for navigating research reports and treatment options exist. For scientific articles, ScienceDirect has guest access.⁴⁷ The Health on the Net Foundation has been a steady source of finding reliable, credible health information online.⁴⁸ It even has a browser plug-in that enables you to check health information on any Web site against Health on the Net's database.⁴⁹ An astute medical student wrote a quality-check guide to medical information online.⁵⁰ The Medical Library Association published "A User's Guide to Finding and Evaluating Health Information on the Web."⁵¹ Start with these gateways if you are new to seeking online medical information.

What person *doesn't* search online about their disease after they are diagnosed? According to the Pew Internet and American Life Project, "[Sixty-six percent] of Internet users look online for information about a specific disease or medical problem."⁵² In a *Time* magazine article, Zachary F. Meisel, an emergency physician and clinical scholar, describes the situation:

To debate whether patients should or should not Google their symptoms (which a surprising number of doctors seem to enjoy engaging in) is an absurd exercise. Patients already are doing it, it is now a fact of normal patient behavior, and it will only increase as Internet technology becomes ever more ubiquitous. The average Joe has more health information at his fingertips—both credible and charlatan—than all the medical libraries ever built put together. So the real question is, What can professionals do to translate this phenomenon into better health for their patients and the public?⁵³

Meisel suggests that health care professionals encourage their patients to educate themselves about their diseases, and "guide their patients to Internet sites that exclusively present current, peer-reviewed and evidence-based health information."⁵⁴ I'm cheered that in an international newsmagazine,

a medical professional has publicly advised doctors to teach their patients the kind of crap detection that licensed practitioners learn to do early in their medical careers. Meisel, for instance, points to the Agency for Healthcare Research and Quality Web site that provides specific guidebooks for different diseases, directing patients with particular diseases to officially vetted research reports that compare different health care interventions.⁵⁵

The Web site Search Engine Watch, an industry source I consider knowledgeable, published a good article by Dean Stephens titled “Turning to Social Media and Search Engines for Smart Health Answers.”⁵⁶ In regard to getting answers, Stephens recommends MedHelp.org and JustAnswer.com for “detailed information specific to your question from health professionals,” and favorably mentions Sharecare.com and Healthline.com.^{57, 58, 59, 60} The Pew Internet and American Life Project claims that while medical professionals and Web searches are sources of some types of information for cancer patients, “when it comes to practical advice for coping with day-to-day health situations, people are as likely to turn to peers as they are to professionals.”⁶¹

Today, large professional operations such as PatientsLikeMe.com and CureTogether.com host peer communities for patients as well as their families and caregivers.^{62, 63} PatientsLikeMe makes its money by selling anonymized data about patients to pharmaceutical companies—and it is abundantly open about it. In 2011, PatientsLikeMe used its data to crowd-source (more on that later) and publish its own clinical trial questioning the effectiveness of using lithium carbonate to slow the progress of the disease amyotrophic lateral sclerosis. By comparing patients who took lithium with similar patients who did not, the online social network presented evidence strong enough to stimulate more rigorous studies. Although not a gold standard double-blind trial, this patient-initiated research is an early indicator.⁶⁴ CureTogether encourages “patient-driven research,” and relies on funding by its founders and angel investors. OrganizedWisdom.com curates and organizes information from thousands of health and wellness experts.⁶⁵ TalkAboutHealth.com matches patients with peers and experts—a kind of matchmaker for support groups.⁶⁶

With the resources provided in this chapter and a willingness to regard medical Web searching as a learning journey rather than a race to find an answer, informed patients and caregivers have more than enough tools to find good information, but also detect the bad information related to any medical condition or treatment.

If there is anything more important than health, it's liberty. As James Madison put it, “A popular Government, without popular information, or

the means of acquiring it, is but a Prologue to a Farce or a Tragedy; or, perhaps both. Knowledge will forever govern ignorance: And a people who mean to be their own Governors, must arm themselves with the power which knowledge gives.”⁶⁷ Madison was pointing at the significance of relatively accurate, unbiased, uncorrupted journalism to the functioning of a democracy. Digital media and networks have challenged the institutions and practices of journalism just as they have undermined the authority of medical professionals as the sole source of valid information about diseases. In the medical field, however, doctors and nurses are still the best caregivers for the ailing. In journalism, two billion Internet users, more than five billion cell phones, hundreds of millions of bloggers, Twitter and Facebook users, and hundreds of millions of camera phones have broadened as well as democratized the field, and at the same time multiplied the need for critical news consumers.

The power of nonprofessionals first came to light in the 1990s, when bloggers on the Left independently researched a story that mainstream media appeared to have let fade: the history of racist remarks by U.S. Senate majority leader Trent Lott, who was forced to resign his leadership post.⁶⁸ As the power and spread of social media grew, acts of citizen journalism began to grow more common. The first pictures of the London terrorist bombings of July 7, 2005, for example, came from camera phones at the site of the attack.⁶⁹ Along the same lines, the first pictures from the site of the 747 that landed in the Hudson River in 2009 came via smart phone and Twitter.⁷⁰ And smart phones sent video directly from the streets of Tehran in June 2009 and Cairo in 2011.⁷¹

Before Twitter came on the scene, online services like Flickr and YouTube enabled users to tag photographs and video with keywords, making it possible to search for images tagged with those keywords, revealing all the still images and videos coming in from amateur chroniclers during an event. Because Twitter didn't have a native tagging capability, a Twitter user invented the “hashtag” by suggesting that people signal common interests by putting the # symbol in front of words—like #jan25, the hashtag of the Egyptian popular uprising of 2011.⁷² The *San Diego Union-Tribune* called publicly for citizen reporters to use the same tags and hashtags for their images of that area's wildfires in 2007.⁷³ Using the search facility on Flickr or YouTube enables you to see a stream of images or videos, and automatically subscribing to that search through Really Simple Syndication (RSS; explanation to come) means you can continue to see visual reports stream in as others upload them—in real time.

Although traditional gatekeepers have been disintermediated through the widespread adoption of digital tools and networks, the need for trained (if not professional) verification of raw news reports is greater than ever. Anybody can send a video or tweet from the scene of breaking news. When those reports are vetted, situated in a context, coherent stories of real people involved are told, and spokespeople for different points of view about the reports are quoted—all that is when journalism is being committed, whether or not the individuals engaged in the verification, contextualization, and storytelling work for brand-name institutions. Like it or not, journalism is becoming something more akin to a network than a guild.

Many journalists believe that the news cycle accelerated past the breaking point with *Newsweek's* decision in 1998 to wait for confirmation while Internet reporter Matt Drudge broke the Monica Lewinsky story.⁷⁴ The events in Iran in June 2009 made it clear to the world that the increasing velocity of information was overwhelming the traditional public filter of brand-name journalists who staked their careers and their networks' reputation on getting the story right before broadcasting it. Citizen reporters, credible and otherwise, using Twitter and YouTube swamped even the capabilities of previously fast-moving electronic journalists in vans with camera crews. When the political demonstrations happened in 2009, people in Iran and around the world used the now-famous hashtag #iranelection, and for a few days flooded the world with riveting images, shocking and politically inflammatory videos, torrents of contradictory reports, rumors, and apparent disinformation, along with both informed and ignorant political arguments. At one point, 221,000 tweets about Iran passed through Twitter each hour.⁷⁵

As the Iran events unfolded, Marc Ambinder wrote an astute article in the online *Atlantic*, in which he advised, "Follow the developments in Iran like a CIA analyst." Just as thinking like a detective is a strategy for trying to determine the credibility of Web info, thinking like an intelligence analyst is a strategy for trying to gauge the credibility of online reports about breaking news events. Ambinder recommends watching for disinformation, looking for patterns in the geographic location of sources (but warns against assuming that everything that resembles a pattern really is one), examining your assumptions, and seeking out sources that contradict them.⁷⁶

When I started paying attention to citizen journalism, Gillmor, the traditional print journalist mentioned above, was one of my trusted sources. A veteran reporter for the *San Jose Mercury News*, then regarded as the

newspaper of record for Silicon Valley, he was one of the first newspaper reporters to take up blogging in the late 1990s. Gillmor didn't stop at blogging. Not only did he permit readers (who he started calling "the former audience") to comment but he replied to their comments too. And he enlisted his online network's help in providing tips and contextualizing the stories he was pursuing. I used Gillmor's book *We the Media* as a text when I taught digital journalism at Stanford University.⁷⁷ Gillmor and I have talked often about the need for more effective crap detection, and I'm happy to say that he published a book, *Mediactive*, out of his work at the Berkman Center for Internet and Society at Harvard University and the Walter Cronkite School of Journalism and Mass Communication at Arizona State University. *Mediactive* seeks to improve the public sphere by helping people not only become more savvy news consumers but also encouraging them to be active, mindful participants in news making.⁷⁸

Gillmor's five "Principles of Media Consumption" add up to "core principles for turning mere consumption into active learning." The first principle, "Be Skeptical," is in line with what I've written here so far. The second one, "Exercise Judgment," cautions against reverting to cynicism in response to the unreliability of online information: "Clearly, we need to ask ourselves what kind of society our kids will inherit if they don't trust or believe anyone but their friends, regardless of whether those friends are well informed." Principle number three, "Open Your Mind," is an encouragement to seek out legitimate sources that disagree with your own beliefs.⁷⁹

One of the fears cited by scholars such as Cass Sunstein, head of President Obama's Office of Information and Regulatory Affairs, is the tendency of individuals to pay attention to only those online sources that reinforce their own beliefs.⁸⁰ This has been called the "echo chamber" effect, in which bloggers read and quote other bloggers they agree with. In 2011, Eli Pariser, former online organizer for Moveon.org, published his book *The Filter Bubble*, in which he detailed how search engines use precise information about your interests and search history to customize your searches; people who mostly search for and click through to liberal political sources are less likely to see conservative sources, and vice versa—a factor that helps enclose people into bubbles without their conscious knowledge.⁸¹ Getting outside the echo chamber and bubble requires the conscious cultivation of sources beyond your usual ones. For example, if all the news you pay attention to is from the United States, Gillmor recommends GlobalVoices, an online project that aggregates reliable blogs from around the world.⁸²

Gillmor's fourth principle, "Keep Asking Questions," is also in line with the "think like a detective" investigative mind-set. Principle five, "Learn Media Techniques," reinforces the learning value of engaging actively in social media as a way of participating in the production of culture and familiarizing yourself with the attitude of the cultural producers whose product you consume.⁸³

Some people are exploring the use of social media for crap detection about journalism. FairSpin.org's community votes on stories in order for its aggregate judgments to identify opinion disguised as fact, and reflect the degree of political bias detected in stories from both the Left and Right.⁸⁴ NewsTrust.net is an online community of reviewers (around twenty-two thousand as of this writing) who use a set of review tools devised by veteran journalists.⁸⁵ I was one of its first members (and served on its board of directors). NewsTrust may or may not represent the way people curate the news for each other in the future, but it's definitely one of the experiments to watch in crowdsourcing critical thinking about journalism.

I can submit any story for review, and NewsTrust's home page then offers a selection of stories already reviewed by other community members. When I opt to review a story for NewsTrust, a menu pops up. I'm asked to rate on a scale of one to five whether the story is factual, fair, and well sourced, and whether (again on a one-to-five scale) I trust the publication or would recommend the story. NewsTrust has one-click-away details on how to assess a news story for factual claims, possible bias, and source credibility. While NewsTrust aims for depth of critical analysis, other applications of social media to journalistic crap detection are trying to do something about the difficulty of detecting credible sources at times of high-velocity reporting—from "social curation" to "crowdsourcing the filter," which I'll discuss later in this chapter.

Bad info isn't the only daily hazard for the mindful digital citizen. There's also the issue of too much information, too quickly. Infotention combines a mind-set with a tool set.

Infotention: Attention to Information

In an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it

—Herbert Simon, "Designing Organizations for an Information-Rich World," 1971

In one window on the screen to my right, I'm composing a PowerPoint presentation about social media and collective action. In one window on the screen to my left, I see that there is new email in my queue. I also note that in another window, one of the people I follow on Twitter has linked to something about a business that runs itself as a wiki. The tweet catches my eye. I ignore my email, switch my attentional focus away from my PowerPoint in progress, and click on the link in my Twitter stream. The link leads me to a five-minute video that's perfect for the presentation I'm composing. I download the video and attach it to my PowerPoint. I also bookmark the video's location with the tags "wiki," "video," and "collaboration." Although I use information technology skills in this brief slice of my life online, including tuning Twitter networks, downloading videos, and social bookmarking, I've also been exercising attentional skills that took me years to learn.

Because I'm a writer, my attention is an evolutionary battleground where potentially enriching or distracting new information feeds as well as competes with the articles and books I need to produce in order to make a living. When do I "get back to work" exactly, and when is my meandering attention precisely what I'm supposed to be doing in order to keep up with my field? For my first ten years as an aspiring writer, my mind wandered often to the wall, the window, the dishes that needed to be done, and the magazine to browse, but eventually, every day, I had to wrench my attention back to the blank page in front of me and try to activate my fingers on the keyboard. Since the early 1980s, however, the digital world along with the network of fascinating but potentially distracting links, videos, tweets, emails, wall posts, and wittily captioned photographs of cute cats has been both the seductive distraction and relevant knowledge flow that have competed for my mind.

The moment you see a link, and then decide whether or not to click it, is the moment you exert executive control of your attention or, by not exerting control, allow it to be captured. When you open your laptop in class, back channel with your BlackBerry in a business meeting, or text while walking down the street or attending a museum with your child, you engage in cognitive and social acts that affect your mind as well as your society. Infotention, as noted earlier, is a word I came up with to describe a mind-machine combination of brainpowered attention skills and computer-powered information filters. It consists of three elements:

- Honing the mental ability to employ the form of attention appropriate for each moment is an essential internal skill for people who want to find,

direct, and manage streams of relevant information by using online media knowledgeably. Knowing when not to text, when to bring your attention back on task, and when to take a break from all media is necessary, but not sufficient for successfully navigating the info flow. Not drowning is not the same as swimming.

- Knowing how to put together intelligence dashboards, news radars, and information filters from online tools, like persistent search and RSS, is the external technical component of information literacy.
- Together with and in addition to your own attentional discipline along with use of online power tools, infotention involves sociality—other people. Increasingly, most of the recommendations that make it possible to find fresh, useful signals amid the overwhelming noise of the Internet are transmitted through social media—online networks that mediate social exchange and relationship. Tuning and feeding our PLNs is where the internal and technological meet the social.

Mentally trained, technologically augmented, socially mediated infotention is about continuously detecting information that could be valuable specifically to you, whenever and wherever it is useful to you. Tuning your input doesn't guarantee that what comes in will all be accurate, or that paying obsessive attention to it will be healthy. That's where crap-detection skills and mindfulness come in.

Billions of humans can't deny that they're trying to cope with always-on, available-everywhere, raw data. Yet few people know that the history of information overload goes back centuries, and that we've found ways to deal with it before.

Two contradictory statements seem to be necessary to portray the state of today's info-overloaded cyber-BlackBerrians:

- The flow of information available is accelerating at an unprecedented rate for digitally connected people, from eight-year-olds with smart phones to every adult who lives in fear of an overflowing email in-box.
- At the same time, cries of alarm over cognitive damage caused by the latest communication medium echo ancient fears that seem to cycle over the centuries the way certain email canards recirculate endlessly in the infosphere (please do not send greeting cards to Craig Shergold, the little boy in England with the brain tumor; he's been well for decades, and the postmaster in his village is not happy with the situation).⁸⁶

In August 2010, Google CEO Eric Schmidt dropped a mind-boggling statistic at a high-tech conference: every two days, humans produce as much

information as we did from the era of cave paintings up to 2003.⁸⁷ I looked up a few more stats. SMS messages were up to seven trillion annually by 2011.⁸⁸ Facebook displayed a trillion ads in 2010.⁸⁹ According to a study done at the University of California at San Diego, the average American consumes thirty-four gigabytes of information on an average day.⁹⁰ Clearly, the raw volume and velocity of information as well as opportunity for distraction now is unprecedented. But I find the info-overload fears of the past to be instructive in the way they eerily reflect today's moral panics about the putative stupefying effects of the Web, and in the hopeful clue that history conveys—people responded to overload in the past by developing mind tools to elevate the information-handling capacities of literate people.

In 1755, French writer and philosopher Denis Diderot warned:

As long as the centuries continue to unfold, the number of books will grow continually, and one can predict that a time will come when it will be almost as difficult to learn anything from books as from the direct study of the whole universe. It will be almost as convenient to search for some bit of truth concealed in nature as it will be to find it hidden away in an immense multitude of bound volumes. When that time comes, a project, until then neglected because the need for it was not felt, will have to be undertaken.⁹¹

That project, for Diderot and his Enlightenment confreres, was the first encyclopedia. Too much knowledge? Let's try to organize it! Wikipedians are Diderot's intellectual heirs. Writing of strategies for coping with information in the sixteenth century, Ann Blair notes that Conrad Gesner complained of the "confusing and harmful abundance of books" in 1545, barely a century after the advent of printing, and that Adrien Baillet warned, a century after Gesner, that "we have reason to fear that the multitude of books which grows every day in a prodigious fashion will make the following centuries fall into a state as barbarous as that of the centuries that followed the fall of the Roman Empire."⁹² Alphabetic indexes, reference books, bibliographies, note taking, authors, and critics were just some of the tools invented in response to the problems Gesner and Baillet worried about. And before print, responses to the problems of scribal overload led to silent reading, punctuation, and the codex form that books still take at present.

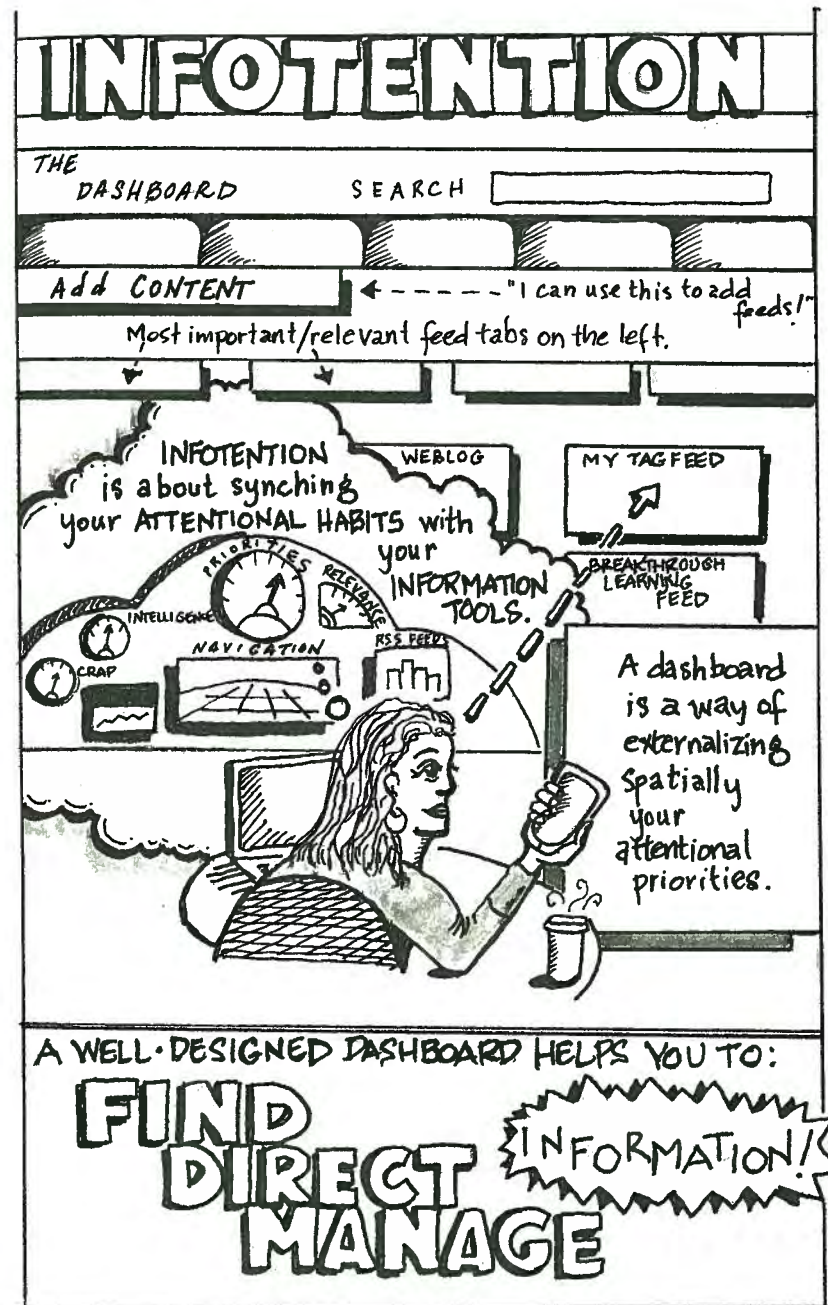
The print overload revolution created problems and stimulated solutions in the sciences as well. According to Brian W. Ogilvie, the overabundance of printed descriptions by naturalists overwhelmed "the limited bounds of factual knowledge that had characterized ancient and medieval natural history, creating an information explosion with which naturalists have

struggled ever since."⁹³ Biological classification systems were invented to make sense of this overabundance of unorganized data. The history of previous information overload panics and the tools that were devised to cope with them suggests that a period of info overwhelm after the invention of every radically more efficient means of communication tends to be greeted by alarm, followed by new info tools and the growth of newly literate populations. The problem has never been definitively solved. The recurring cycle of inventing cultural methods to filter and organize the plenitude unleashed by new tools of mass publication, thus making possible even newer publishing tools to create even more abundance, constitute the kind of coevolutionary arms race (like predator and prey) that accelerates innovation in biology.

The tools that are evolving in response to the most recent and biggest info crisis begin at the cognitive level. Trained human attention and judgment is required, or the technical leverage is useless. Before learning how to build radars, filters, and dashboards, it helps to begin by reviewing the basics of mindfulness. Formulate goals and turn them into intentions by paying attention every once in a while to what you are doing at the moment, and then reflecting briefly on how what you are doing relates to your larger goal. That's all you need to get started; when you sit down in front of a screen, write out by hand your goals for each day on a piece of paper, and put it on your desk at the periphery of your vision. A few times each day you will notice the paper. At those moments, ask yourself how your current activity online fits your own goals for the day (and take a deep breath). Practice mindfulness in your use of media in small ways, find places to fit practice into your day, repeat until you've established a new habit of paying some attention to what you are doing with media—texting, gaming, reading, writing, Web surfing, or any one of the 1,001 ways to use your mind online.

If Stanford's Fogg is to be believed, small steps at regular intervals, repeated over time, form a highly effective way to establish new habits. When you are familiar with simply paying attention to your mind on media on a regular basis—daily, hourly, every ten minutes, or whatever you can manage—turn your ever-stronger attentional skill to improving the quality of the microdecisions you make online.

So far, I've been talking about strategies. Microdecisions are tactical; they are what you use to take on information overload minute by minute. Trauma teams perform triage in emergency rooms, on battlefields, and at the scene of natural disasters. They look at each casualty, and decide



whether this person will probably live without immediate attention, are probably going to die no matter what assistance they are given, or are likely to live only if they receive immediate care. Then they focus their efforts on the people in the third category. Attentional triage is not about life and death but instead ultimately about the quality of life for the practitioner.

I've established the habit of asking myself: Is this information or opportunity to communicate worth my attention at all, given my goal for today? Is it something I want to look at later, but not right now while I am focusing on a task toward a larger goal (in which case, maybe I'll open a tab on my browser)? Is it information that I don't want to distract myself with at the moment and don't want to burden my near-term reading agenda, but might want to refer to later, because it is about a subject that interests me (in which case I'll tag and bookmark)? Like basic mindfulness, paying attention to microdecisions—and learning to make them more and more quickly—is easy enough to start, and yields increasing power to diligent, regular practitioners. It's an exercise in strategic goals (What am I setting out to do?), attention (What am I about to click on?), and intention (I'm going to ignore this, or open a tab or bookmark, because I intend to return to focus) that deepens the more you do it.

People and machines publish information so rapidly, and search engines index it so quickly, that we've been living with the "real-time Web" for some time now. I've taught my digital journalism students to use free tools such as RSS aggregators, persistent searches, and engagement filtering services to create dashboards that enable them to swiftly tune into the latest, most credible streams of information on any topic, from a devastating cyclone in Bangladesh to a street demonstration in Cairo, a medical or technological breakthrough, or industry-specific events. The keywords are "tune" and "stream." The real-time Web is not a queue (like your email in-box) but rather a stream. Don't even try to keep up. Learn to sample. You aren't digesting volumes of input. You are tuning your antennae for the right signals and bringing the right information to you while you turn attention away from information that isn't right for you. This partly involves knowing where to put your sensors, and partly how to set up persistent searches.

Start by using the fundamental tool of infotention dashboards: the RSS feed. RSS permits any subscriber to a Web site to be instantly informed whenever that Web site is updated. Web services called RSS aggregators or RSS readers such as Google Reader, Bloglines, Netvibes, or Apple's Mail application allow people to subscribe to blogs or other streams of information enabled by RSS (increasingly, nonhuman sensors like buoys or robot

cameras on Mars can send out RSS streams). If you find a site you want to subscribe to, there is an icon or link somewhere on the site to help you copy the short Web address—a kind of URL—that you enter into your aggregator in order to get future updates.

Robin Good, a source I've come to trust in recent years on matters of information literacy, introduced me to the notion of bundling RSS feeds together strategically into what he calls "news radars." A growing number of services make it easy to set up radars if you don't want to roll your own; Good published an excellent guide to these "content curation" tools.⁹⁴ I also use paper.li, a service that turns all the URLs tweeted by all the people I follow (or lists of people I designate as knowledgeable about specific topics) into a daily newspaper with headlines, snippets, video, and slides.⁹⁵ The layout of newspaper pages is an infotention methodology that has jumped from print to screen-based info flows precisely because it takes advantage of our attentional habits (and trains them). If I know how to find who the experts are, I can compile a daily Twitter-fed news stream about any topic, neatly organized and formatted for my attention. Similarly, aggregage.com puts together custom "newspapers" about specified content.⁹⁶ Roll your own feed reader or use templated services, but by all means organize and continuously curate your feeds.

Search and RSS can be combined. Click on "advanced search" on the home page of Google News or Yahoo! News, perform a search, and then subscribe to that search, so that any time one of the tens of thousands of news publications around the world indexed by those services publishes the set of words specified in your search in the future, it will show up in your aggregator. Set up a Google alert, and have it delivered as a "feed."⁹⁷ When this book is published, I will know within minutes if the title (or my name) is mentioned in a major newspaper somewhere in the world in any of five languages. Whenever fast-breaking events occur, people often agree on a common hashtag like #jan25 for the 2011 demonstrations in Cairo. I can subscribe to RSS feeds from that hashtag on Twitter, Flickr, and YouTube. You can see how this could be useful to journalists.

I currently use the Netvibes RSS reader because it provides three levels of organization that I can sync with my mental priorities.⁹⁸ I have public dashboards, private ones, another one I use for academic matters, and still another for changing interests. Each dashboard makes it possible for me to easily create a series of tabs for different topics. I have a Netvibes "page" for digital journalism, for example, and tabs on that dashboard for new tools, new methods, citizen journalism, crap detection, and the news business. I can drag and drop the tabs to different horizontal positions. Positioning

tabs is one way I use visual organization to sync my attention with my dashboard. The cognitive act of categorizing is an important link between digital information-management tools and attention, the way breath connects brain, body, and intention. I use my dashboard as an aid to organizing my attention. The most goal-relevant tabs are on the left, and the least goal-relevant ones are on the right. Some days, I only click on the leftmost one or two tabs to quickly scan the latest feed headlines, and from there, make a microdecision about whether to investigate further at that instant.

At the tab level, I keep the most goal-relevant feeds in the leftmost columns and put the most frequently updated feeds in the top row. Within the feeds themselves—displayed as boxes of adjustable sizes, arrayed in panes on the page—I can scan lists of headlines and snippets from posts. Clicking on a headline opens a pane in the dashboard that shows the blog post or search result. I can browse and scan only the headlines quickly, or click through to the sources and read in greater depth (and at greater switching costs). I have RSS feeds for specific experts' tags in social bookmarking services. I delete feeds when I find them less than useful, and add them when I want to explore a new topic or learn more broadly about it. Within a few minutes of breaking news, it is possible to set up a dashboard with Google News and Yahoo! News searches, Google alerts, hashtag searches on Twitter, blog posts from experts, and feeds on tags from Flickr, YouTube, and Delicious. Without knowing any programming, I can use Yahoo! Pipes to merge all those inputs into a single RSS output that others can subscribe to if I give them the URL. Taking search as a learning instrument to the next level of engagement, dashboards can be used educationally as well as journalistically. I know a sixth-grade teacher who had her students create dashboards instead of writing papers.⁹⁹

Knowing how to ignore the irrelevant is the first step, but knowing how to get the relevant to come to you is the next one. Learning how to find and evaluate good sources of accurate information is a cognitive issue, but we're beginning to see the automation of cream detection—semiautomated, semisocial, infotention amplifiers. Can crap and cream detection both be automated? My former student, Johan Jessen, wrote a masters thesis about how to create an automatic crap detector, and is now seeking funding to start implementing it.

Jessen cites the innovation of WikiTrust, a reputation system for Wikipedia authors and content hosted at the University of California at Santa Cruz.¹⁰⁰ After installing the WikiTrust add-on, users see words highlighted on Wikipedia pages in different colors, depending on whether the text has a

high or low reputation. Text that has not been edited recently and/or repeatedly and editors whose revisions have not been edited for a greater length of time have a higher reputation than text that has never been edited. Jessen also pointed me to Wiki-Watch, a project of the Study- and Research-Centre on Media Law of the European University Viarina Frankfurt, Germany, which assesses Wikipedia articles by checking the number of sources, the number and reputation of editors, and the number of links directed to an article.¹⁰¹ By compiling and combining different social and algorithmic methods, Jessen hopes to expand such assessment instruments beyond Wikipedia to build "a fully-automated credibility evaluation tool."¹⁰²

Shirky has described the pre-Web era of publishing as working on a "filter, then publish" paradigm, subjecting text to editors and publishers before making it available; now, Shirky observes, the paradigm has flipped to "publish then filter."¹⁰³ In that sense, Shirky adds, "there is no such thing as information overload, there is only filter failure."¹⁰⁴ As I've explained, Google's PageRank algorithm is based on the aggregation of popular opinions to create a pretty good, if not trustworthy, ranking of Web pages, and other online communities like eBay, Digg, and Facebook aggregate opinions for different reasons. Digg is a metanews site where participants don't create original stories but instead vote on whether to "digg" or "bury" news stories and videos listed on their home page.¹⁰⁵ The Digg community is so large that a highly ranked story can crash a small publication's server (this is true of a number of other sites such as Slashdot and 4chan). Such popularity-based aggregated rankings can be gamed. One blogger discovered that a clique of ultraconservative participants (the "Digg Patriots") had conspired to bury stories with a more liberal viewpoint.¹⁰⁶

Shirky labels this emerging system that combines digital aggregation with human opinions "algorithmic authority." He defines algorithmic authority as "the decision to regard as authoritative an unmanaged process of extracting value from diverse, untrustworthy sources, without any human standing beside the result saying 'Trust this because you trust me.'"¹⁰⁷

As an example, Shirky cites a statement that could be right or wrong: "Khotyn is a town in Moldova."

This is a compressed telling, and swerves around many epistemological potholes, such as information that can't be evaluated independently ("I love you"), information that is correct by definition ("The American Psychiatric Association says there is a mental disorder called psychosis"), or authorities making untestable propositions ("God hates it when you eat shrimp.") Even accepting those limits, though, the assertion that Khotyn is in Moldova provides enough of an illustration here, because it's false. Khotyn is in Ukraine.

And this is where authority begins to work its magic. If you told someone who knew better about the Moldovan town of Khotyn, and they asked where you got that incorrect bit of information, you'd have to say "Some guy on the internet said so." See how silly you'd feel?

Now imagine answering that question "Well, Encyclopedia Britannica said so!" You wouldn't be any less wrong, but you'd feel less silly. (Britannica did indeed wrongly assert, for years, that Khotyn was in Moldova, one of a collection of mistakes discovered in 2005 by a boy in London.) Why would you feel less silly getting the same wrong information from Britannica than from me? Because Britannica is an authoritative source.

Authority thus performs a dual function; looking to authorities is a way of increasing the likelihood of being right, and of reducing the penalty for being wrong. An authoritative source isn't just a source you trust; it's a source you and other members of your reference group trust together.¹⁰⁸

With Google, that reference group is everyone who puts a link on their Web page. With Digg, it's the Digg community. Crap detection must be applied recursively to communities that claim authority, but these communities provide yet another vector to combine with others as inputs to judgment. Both crap detection and knowledge finding have become social. When I interviewed him, Lee Rainie, director of the Pew Internet and American Life Project, noted:

The data have shown us that as the information environment gets more complicated, and as people struggle to keep up with the volume, velocity, and variety of information, they turn to their social networks for a lot of cues about attention and meaning and even audience for their reaction to things. Networks more and more matter to people as they are making decisions or solving problems or trying to get their needs met. I mean literally our data show that people increasingly scan their networks as avidly as they scan the headlines to figure out what the news of the day is.¹⁰⁹

We're beginning to see raw beams of algorithmic authority filtering through prisms of socially curated judgment. What if, after a process of testing, you decide to trust a particular person or group of people to know something about Moldova or nanotechnology? Twitter makes it easy to create a list and subscribe to ("follow" in Twitter speak) those people's tweets as a group. You can use a Twitter client to switch your stream to only those tweets that come from that group, or more interestingly, you can feed that list to paper.li and get an edited newspaper. What if you take that expert opinion and aggregate it? Sulia.com combines this kind of aggregation (I'll get down to more detail about crowdsourcing in chapter 4) with editorial expertise by treating Twitter lists as a kind of indication of trust.¹¹⁰ People

who put other people in lists named "Egypt" or "search engines" are casting votes for the expertise of the individuals on those lists. Lists can be automatically polled (Sulia claims to crawl millions of them), combined, and then output as what Sulia calls "channels." Sulia claims to add another dimension of human editorial insight by creating editorial networks whose expertise is in recognizing expertise.

Research into combining algorithmic methods and human curation to find the best information as well as eliminating the worst is just getting started. Michael Noll, Ching-man Au Yeung, Nicholas Gibbins, Christoph Meinel, and Nigel Shadbolt presented a paper in 2009 titled "Telling Experts from Spammers: Expertise Ranking in Folksonomies."¹¹¹ Noll and his colleagues applied their algorithm to a data set of a half-million users of the social bookmarking service Delicious.com and claim to be able to automatically detect experts, in part by looking for the first people to bookmark a resource that ends up being bookmarked by many other users. A folksonomy is the classification scheme that emerges when large numbers of people apply their own categories (for example, tags) instead of fitting them into a predesigned categorization system (an ontology). Remember how the dictionary, the index, and classification systems developed in response to the print revolution's info overload? It's happening again.

Research turns into product development rapidly in the Web world. Anything that works in a controlled study today might end up on your Web browser within a year or two. One experiment is already beginning to show promise: automated tools for detecting subtle manipulation, recognizing bad rumors, and finding credible news in fast-moving streams. Indiana University researchers have developed a system they call "Truthy" for tracking the emergence and spread of misinformation on Twitter.¹¹² Fans of the television program the *Colbert Report* will recognize an homage to the July 31, 2006, edition, when Stephen Colbert satirically proposed that a new kind of socially engineered truth had been created by reliance on social knowledge aggregation communities like Wikipedia. Colbert introduced the words "Wikiality" and "truthiness." He suggested that his viewers introduce a spurious statement of fact into Wikipedia, thereby creating a kind of Wikipedia-mediated reality—Wikiality.¹¹³

Truthy detects rumors, uses epidemiological models to track them to their origin, and enables Web surfers to report suspicious sites by clicking on a "Truthy button." Truthy's research objectives proclaim:

We also plan to use Truthy to detect political smears, astroturfing, misinformation, and other social pollution. While the vast majority of memes arise in a perfectly organic manner, driven by the complex mechanisms of life on the Web, some are

engineered by the shady machinery of high-profile congressional campaigns. Truthy uses a sophisticated combination of text and data mining, social network analysis, and complex networks models. To train our algorithms, we leverage crowdsourcing: we rely on users like you to flag injections of forged grass-roots activity. Therefore, click on the Truthy button when you see a suspicious meme!¹¹⁴

Only time will tell whether Truthy will defeat or make a dent in the spread of scurrilous rumors in future election cycles.

Infotention tools that enable people to tune their own filters are emerging. DataSift.net filters Twitter's seventy million tweets per day, or eight hundred tweets per second, by applying a rules-based engine (for example, "show me tweets containing 'google' from users who don't have 'social media' in their bio, and who have more than five hundred followers," or "show me tweets from my curated Twitter list of tech brands that have more than a hundred retweets").¹¹⁵ PARC has offered its experimental recommender system "zerozero88" to "address information overload by helping users avoid missing important or relevant content buried within their information streams."¹¹⁶

The urgent need by journalists and crisis responders to identify reliable sources of news amid the torrent of tweets that were transmitted during the terrorist attacks of 2010 in Mumbai led to a more directly pragmatic experiment. SwiftRiver is an ongoing attempt to develop sociotechnical systems to crowdsource the filter: by combining the judgment of known experts, social trust measures, and the digital aggregation of mass communications. SwiftRiver aggregates data from many sources, such as Twitter, Flickr, YouTube, and other real-time streams. Text streams can be submitted to natural language processing, and automatically tagged with "who," "what," "where," and other tags; the autotagging can be checked in near real time by communities of volunteers with computers or smart phones (hence, crowdsourcing the filter). The machine-and-human-filtered information stream is then further refined by eliminating duplicates, clustering event reports, and assigning a weighted "reality score." As each new event stream tests the system, algorithms are refined to match those reality scores that ended up being accurate predictors. Filtered data are transformed into real-time, dynamic, animated visualizations that enable networks of experts (journalists and others) to "read" the torrent of event reports more effectively, with more clues to add to their own triangulation methods.¹¹⁷

Once you pay attention to attention itself, and practice crap detection and infotention, you're ready to reap maximum benefit from the next literacy: participation. The first two literacies are internal, cognitive, and individual. The last two literacies of collaboration and network smarts are external, social, and collective. Linking them is the act of participation that connects the individual mind to the web of digital culture.