Attention Deficit: The Brain Syndrome of Our Era

The plasticity of our brains, besides responding to the people and training to which we expose it, also responds, for good or for bad, to the technology all around us: television, movies, cell phones, e-mail, laptop computers, and the Internet. And by responding, I mean that our brain literally changes its organization and functioning to accommodate the abundance of stimulation forced on it by the modern world.

This technologically driven change in the brain is the biggest modification in the last 200,000 years (when the brain volume of *Homo sapiens* reached the modern level). But while biological and social factors, such as tool use, group hunting, and language, drove earlier brain changes, exposure to technology seems to be spurring the current alteration. One consequence of this change is that we face constant challenges to our ability to focus our attention.

For example, I was recently watching a televised interview with Laura Bush. While the interview progressed, the bottom of the screen was active with a "crawler" composed of a line of moving type that provided information on other news items.

Until recently, crawlers were used to provide early warning signs for hurricanes, tornados, and other impending threats. Because of their rarity and implied seriousness, crawlers grabbed our immediate attention no matter how engrossed we were in the television program playing out before our eyes. Crawlers, in short, were intended to capture our attention and forewarn us of the possible need for prompt action. But now, the crawler has become ubiquitous, forcing an ongoing split in our attention, a constant state of distraction and divided focus.

During the First Lady's interview I found my attention shifting back and forth from her remarks to the active stream of short phrases running below. From the crawler I learned that National Airport was expected to be opened in two days since its closure in the wake of the September 11 terrorist attacks; that this season's Super Bowl would be played in New Orleans one week later than usual; and that a home run record was about to be broken by Barry Bonds.

Despite my best efforts to concentrate on Laura Bush's words, I kept looking down at the crawler to find out what else might be happening that was perhaps even more interesting. As a result, at several points I lost the thread of the conversation between the First Lady and the interviewer. Usually, I missed the question and was therefore forced to remain in the dark during the first sentence or so of her response.

On other occasions I've watched split-screen interviews, with each half of the screen displaying images or text of the topic under discussion while the crawler continues with short snippets about subjects totally divorced from the interview and accompanying video or text. In these instances I am being asked to split my visual attention into three components.

One can readily imagine future developments when attention must be divided into four or more components—perhaps an interview done entirely in the form of a voice-over, with the split-screen video illustrating two subjects unrelated to the subject of the interview and accompanied all the while by a crawler at the bottom of the screen dealing with a fourth topic.

Yet we shouldn't think of such developments as unanticipated or surprising. In 1916, prophets of the Futurist Cinema lauded "cinematic simultaneity and interpenetrations of different times and places" and predicted "we shall project two or three different visual episodes at the same time, one next to the other." Yesterday's predictions have become today's reality. And in the course of that makeover we have become more frenetic, more distracted, more fragmented—in a word, more *hyperactive*.

How Many Ways Can Our Attention Be Divided?

Divisions of attention aren't new, of course. People have always been required to do more than one thing at a time or think of more than one thing at a time. But even when engaged in what we now call multitasking, most people maintained a strong sense of unity: They remained fully grounded in terms of what they were doing. Today the sense of unity has been replaced, I believe, by feelings of distraction and difficulty maintaining focus and attention. On a daily basis I encounter otherwise normal people in my neuropsychiatric practice who experience difficulty concentrating. "I no sooner begin thinking of one thing than my mind starts to wander off to another subject and before I know it I'm thinking of yet a third subject," is a typical complaint.

Certainly part of this shift from focus to distraction arises from the many and varied roles we all must now fulfill. But I think the process of personal *dis*-integration is also furthered by our constant exposure to the media, principally television. When watching TV, many of us now routinely flit from one program to another as quickly as our thumb can strike the remote control button. We watch a story for a few minutes and then switch over to a basketball game until we become bored with that, and then move on to Animal Planet. Feeling restless, we may then pick up the phone and talk to a co-worker about topics likely to come up at tomorrow's meeting while simultaneously directing our attention to a weather report on TV or flipping through our mail.

"The demands upon the human brain right now are increasing," according to Todd E. Feinberg, a neurologist at Beth Israel Medical Center in New York City. "For all we know, we're selecting for the capacity to multitask."

Feinberg's comment about "selecting" gets to the meat of the issue. At any given time evolution selects for adaptation and fitness to prevailing environmental conditions. And today the environment demands the capacity to do more than one thing at a time, divide one's attention, and juggle competing, often conflicting, interests. Adolescents have grown up in just such an environment. As a result, some of them can function reasonably efficiently under conditions

of distraction. But this ability to multitask often comes at a price—Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD).

Perhaps the best intuitive understanding of ADD/ADHD comes from the French philosopher Blaise Pascal who said, "Most of the evils in life arise from a man's being unable to sit still in a room." The fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) provides a more contemporary definition. Although ADD/ADHD affects adults as well as children, the DSM-IV describes symptoms as they affect three categories in children: motor control, impulsivity, and difficulties with organization and focus.

The motor patterns include:

(a) often fidgets with hands or feet or squirms in seat

(b) often leaves seat in classroom or in other situations in which remaining seated is expected

(c) is often "on the go" or often acts as if driven by a motor

(d) often runs about or expresses a subjective feeling of restlessness

(e) often has difficulty playing or engaging in leisure activities quietly

(f) often talks excessively

The impulsive difficulties include:

(a) often experiences difficulty awaiting turn

(b) interrupts or intrudes on others (e.g., butts into conversation or games)

(c) often blurts out answers before questions have been completed

To earn the diagnosis of the "inattentive subtype" of ADD/ADHD, the child or adolescent shows any six of the following symptoms:

(a) often does not follow through on instructions and fails to finish school work, chores, or duties in the workplace

(b) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities

(c) often has difficulty sustaining attention in tasks or play activities

(d) often does not seem to listen when spoken to directly

(e) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)

(f) often loses things necessary for tasks or activities

(g) is often easily distracted by extraneous stimuli

(h) is often forgetful in daily activities

For years doctors assured the parents of an ADD/ADHD child that the condition would disappear as their child grew older. But such reassurances have turned

out to be overly optimistic. In the majority of cases, ADD/ADHD continues into adulthood, although the symptoms change.

In their best-selling book, *Driven to Distraction*, psychiatrists Edward Hallowell and John Ratey developed a list of criteria for the diagnosis of Adult Attention Deficit Disorder. Among the most common manifestations are:

1. A sense of underachievement, of not meeting one's goals
2. Difficulty getting organized
3. Chronic procrastination or trouble getting started
4. Many projects going simultaneously; trouble with follow-through
5. A tendency to say whatever comes to mind without necessarily considering the timing or appropriateness of the remark
6. A frequent search for high stimulation
7. Intolerance of boredom
8. Easy distractibility, trouble in focusing attention, a tendency to tune out or drift away in the middle of a page or conversation
9. Impatient; low frustration tolerance
10. A sense of insecurity

Other experts on adult attention disorder would add:

11. Low self-esteem and
12. Emotional lability: sudden and sometimes dramatic mood shifts

A Distinctive Type of Brain Organization

In many instances childhood and adult ADD/ADHD is inherited. Typically, the parents of a child diagnosed with the disorder will be found upon interview to exhibit many of the criteria for adult ADD/ADHD. But many cases of ADD/ADHD in both children and adults occur without any hereditary disposition, suggesting the probability of culturally induced ADD/ADHD.

As a result of increasing demands on our attention and focus, our brains try to adapt by rapidly shifting attention from one activity to another—a strategy that is now almost a requirement for survival. As a consequence, attention deficit disorder is becoming epidemic in both children and adults. This is unlikely to turn out to be a temporary condition. Indeed, some forms of ADD/ADHD have entered the mainstream of acceptable behavior. Many personality characteristics we formerly labeled as dysfunctional, such as hyperactivity, impulsiveness, and easy distractibility, are now almost the norm.

"With so many distracted people running around, we could be becoming the first society with Attention Deficit Disorder," writes Evan Schartz, a cyberspace critic in *Wired* magazine. In Schartz's opinion, ADHD may be "the official brain syndrome of the information age."

"Civilization is revving itself into a pathologically short attention span. The trend might be coming from the acceleration of technology, the short-horizon perspective of market-driven economies, the next-election perspective of democracies, or the distractions of personal multitasking. All are on the increase," according to Stewart Brand, a noted commentator on technology and social change.

As ADD expert Paul Wender puts it: "The attention span of the average adult is greatly exaggerated."

"It's important to note that neuroscientists and experts within the field are increasingly dissatisfied with ADHD being called a disorder," according to Sam Horn, author of *Conzentrate: Get Focused and Pay Attention—When Life Is Filled with Pressures, Distractions, and Multiple Priorities*, which lists forces in the modern world that "induce" ADD/ADHD. "They prefer to see ADHD as a distinctive type of brain organization."

Such an attitude change toward ADD/ADHD carries practical implications. When creating an optimum environment for learning, for instance, Horn suggests, "blocking out sounds can hurt. Today's younger generation has become accustomed to cacophony. Street sounds, the screeching of brakes, trucks changing gears, and the wails of ambulances are their norm. For these people silence can actually be disconcerting because it's so unusual."

To Horn's list of ADD/ADHD-inducing influences I would add time-compressed speech, which is now routinely used on radio and TV to inject the maximum amount of information per unit of time. As a result we have all become accustomed to rapid-fire motormouth commercials spoken at truly incomprehensible speeds. Think of the last car commercial you saw where all the "fine print" of the latest deal was read with lightning speed, or the pharmaceutical pitch that names a dozen possible side effects in less than five seconds.

The attention span of the average adult is greatly exaggerated.

"The attitude seems to be one of pushing the limits on the listener as far as 'the market will bear' in terms of degrading the auditory signal and increasing the presentation rate of the spoken programming," according to Brandeis University psychologists Patricia A. Tun and Arthur Wingfield in their paper, "Slow but Sure in an Age of 'Make it Quick.'"

As these psychologists point out, laptop computers, cell phones, e-mail, and fax machines keep us in constant touch with the world while simultaneously exerting tremendous pressures on us to respond quickly and accurately. But speed and accuracy often operate at cross-purposes in the human brain.

In study after study both young and older listeners recall less from materials told to them at a rapid rate. A similar situation exists in the visual sphere. A television viewer's memory for information about the weather is actually poorer after viewing weather segments featuring colored charts and moving graphics than after viewing straight-forward versions of the same information in which the weather is simply described.

As Tun and Wingfield put it: "The clutter, noise, and constant barrage of information that surround us daily contribute to the hectic pace of our modern lives, in which it is often difficult simply to remain mindful in the moment."

No Time to Listen

As the result of our "make it quick" culture, attention deficit is becoming the paradigmatic disorder of our times. Indeed, ADD/ADHD isn't so much a disorder as it is a cognitive style. In order to be successful in today's workplace you have to incorporate some elements of ADD/ADHD.

You must learn to rapidly process information, function amidst surroundings your parents would have described as "chaotic," always remain prepared to rapidly shift from one activity to another, and redirect your attention among competing tasks without becoming bogged down or losing time. Such facility in rapid information processing requires profound alterations in our brain. And such alterations come at a cost—a devaluation of the depth and quality of our relationships.

For example, a patient of mine who works as a subway driver was once unfortunate enough to witness a man commit suicide by throwing himself in front of her train. Her ensuing anguish and distress convinced her employers that she needed help, and they sent her to me. The hardest part of her ordeal, as she expressed it, was that no one would give her more than a few minutes to tell her story. They either interrupted her or, in her words, "gradually zoned out."

"I can't seem to talk fast enough about what happened to me," she told me. "Nobody has time to listen anymore."

The absence of the "time to listen" isn't simply the result of increased workloads (although this certainly plays a role) but from a reorganization of our brains. Sensory overload is the psychological term for the process, but you don't have to be a psychologist to understand it. Our brain is being forced to manage increasing amounts of information within shorter and shorter time intervals. Since not everyone is capable of making that transition, experiences like my patient's are becoming increasingly common.

"Don't tell me anything that is going to take more than 30 seconds for you to get out," as one of my adult friends with ADD/ADHD told his wife in response to what he considered her rambling. In fact, she was only taking the time required to explain a complicated matter in appropriate detail.

"The blistering pace of life today, driven by technology and the business imperative to improve efficiency, is something to behold," writes David Shenk in his influential book *Data Smog*. "We often feel life going by much, much faster than we wish, as we are carried forward from meeting to meeting, call to call, errand to errand. We have less time to ourselves, and we are expected to improve our performance and output year after year."

Regarding technology's influence on us, Jacques Barzun, in his best-seller, *From Dawn to Decadence*, comments, "The machine makes us its captive servants—by its rhythm, by its convenience, by the cost of stopping it or the drawbacks of not using it. As captives *we come to resemble it in its pace, rigidity, and uniform expectations*" [emphasis added].

Whether you agree that we're beginning to resemble machines, I'm certain you can readily bring to mind examples of the effect of communication technology on identity and behavior. For instance, cinematography provides us with

many of our reference points and a vocabulary for describing and even experiencing our personal reality.

While driving to work in the morning we "fast-forward" a half-hour in our mind to the upcoming office meeting. We reenact in our imagination a series of "scenarios" that could potentially take place. A few minutes later, while entering the garage, we experience a "flashback" of the awkward "scene" that took place during last week's meeting and "dub in" a more pleasing "take."

Of course using the vocabulary of the latest technology in conversation isn't new. Soon after their introduction, railways, telegraphs, and telephone switchboards provided useful metaphors for describing everyday experiences: People spoke of someone "telegraphing" their intentions, or of a person being "plugged in" to the latest fashions.

Modern Nerves

In 1891 the Viennese critic Hermann Bahr predicted the arrival of what he called "new human beings," marked by an increased nervous energy. A person with "modern nerves" was "quick-witted, briskly efficient, rigorously scheduled, doing everything on the double," writes social critic Peter Conrad in *Modern Times, Modern Places.*

In the 1920s, indications of modern nerves were illustrated by both the silent films of the age, with their accelerated movement, and the change in drug use at the time, from sedating agents like opium to the newly synthesized cocaine—a shift that replaced languid immobility with frenetic hyperactivity and "mobility mania."

Josef Breuer, who coauthored *Studies on Hysteria* with Sigmund Freud, compared the modern nervous system to a telephone line made up of nerves in "tonic excitation." If the nerves were overburdened with too much "current," he claimed, the result would be sparks, frazzled insulation, scorched filaments, short circuits—in essence, a model for hysteria. The mind was thus a machine and could best be understood through the employment of machine metaphors. Athletes picked up on this theme and aimed at transforming their bodies into fine-tuned organisms capable, like machines, of instant responsiveness. "The neural pathways by which will is translated into physical movement are trained until they react to the slightest impulse," wrote a commentator in the 1920s on the "cult" of sports.

The Changing Rhythm of Life

In 1931 the historian James Truslow Adams commented, "As the number of sensations increase, the time which we have for reacting to and digesting them becomes less . . . the rhythm of our life becomes quicker, the wave lengths . . . of our mental life grow shorter. Such a life tends to become a mere search for more and more exciting sensations, undermining yet more our power of concentration in thought. Relief from fatigue and ennui is sought in mere excitation of our nerves, as in speeding cars or emotional movies."

In the 60 years since Adams's observation, speed has become an integral component of our lives. According to media critic Todd Gitlin, writing in *Media Unlimited,* "Speed is not incidental to the modern world—speed of production, speed of innovation, speed of investment, speed in the pace of life and the movement of images—but its essence. . . . Is speed a means or an end? If a means, it is so pervasive as to *become* an end."

In our contemporary society speed is the standard applied to almost everything that we do. Media, especially television, is the most striking example of this acceleration. "It is the limitless media torrent that sharpens the sense that all of life is jetting forward—or through—some ultimate speed barrier," according to Gitlin. "The most widespread, most consequential speed-up of our time is the onrush in images—the speed at which they zip through the world, the speed at which they give way to more of the same, the tempo at which they move."

In response to this media torrent, the brain has had to make fundamental adjustments. The demarcation between here and elsewhere has become blurred. Thanks to technology, each of us exists simultaneously in not just one *here* but in several. While talking with a friend over coffee we're scanning e-mail on our Palm Pilot. At such times where are we *really?* In such instances no less is involved than a fundamental change in our concept of time and place.

Where Is Where?

"Modernity is about the acceleration of time and the dispersal of places. The past is available for instant recall in the present," according to Peter Conrad. For example, I was recently sitting in a restaurant in Washington, D.C., while watching a soccer match take place several time zones away. During an interruption in play, the screen displayed action from another match played more than a decade ago. The commentator made a brief point about similarities and differences in the two matches and then returned to the action of the ongoing match. During all of this I was participating in a "present" comprised of two different time zones along with a "past" drawn from an event that occurred twelve years earlier. Such an experience is no longer unusual. Technology routinely places us in ambiguous time and place relationships.

As another example, while recently sitting on the beach at South Beach in Miami I was amazed at the number of people talking on cell phones while ostensibly spending the afternoon with the person who accompanied them to the beach. In this situation the *here* is at least partly influenced by the technology of the cell phone that both links (the caller and the unseen person on the other end of the cell phone) and isolates (the caller and the temporarily neglected person lying beside him or her on the beach blanket). Such technologies are forcing our brains to restructure themselves and accommodate to a world of multiple identity and presence.

Intellectually we have always known that the "reality" of the here and now before our eyes is only one among many. But we never directly experienced this multilevel reality until technology made it possible to reach from one end of the world to another and wipe out differences in time, space, and place. Starting with telephones we became able to experience the "reality" of people in widely dispersed areas of the world. With the cell phone, that process has become even more intimate. Time, distance, night, and day—the rules of the natural and physical world—cease to be limiting factors.

And while some of us may celebrate such experiences and thrive on constantly being connected, others feel the sensation of a giant electronic tentacle that will ensnare us at any moment.

My point here isn't to criticize technology but to emphasize the revolution that technology is causing in our brain's functioning. If, for example, through technology, anyone at any given moment is immediately available, "here" and "there" lose their distinctive meanings. We achieve that "acceleration of time and dispersal of places" referred to by Peter Conrad.

And yet there is an ironic paradox in all this: As a result of technological advances we participate in many different and disparate "realities," yet as a result of our attention and focus problems we can't fully participate in them. We can shift back and forth from a phone conversation with someone in Hong Kong and someone directly in front of our eyes. Yet thanks to our sense of distraction we're not fully focused on either of them. What to do?

The Plastic on the Cheese

"If I can only learn to efficiently carry out several things simultaneously then my time pressures will disappear," we tell ourselves. And at first sight multitasking seems a sensible response to our compressed, overly committed schedules. Instead of limiting ourselves to only one activity, why not do several simultaneously? If you owe your mother a phone call, why not make that call while in the kitchen waiting for the spaghetti to come to a boil? And if Mom should call you first, why not talk to her while glancing down at today's crossword puzzle?

Actually, multitasking is not nearly as efficient as most of us have been led to believe. In fact, doing more than one thing at once or switching back and forth from one task to another involves time-consuming alterations in brain processing that reduce our effectiveness at accomplishing either one.

Whenever you attempt to do "two things at once," your attention at any given moment is directed to one or the other activity rather than to both at once. And, most important, these shifts decrease rather than increase your efficiency; they are time and energy depleting.

With each switch in attention, your frontal lobes—the executive control centers toward the front of your brain—must shift goals and activate new rules of operation. Talking on the phone and doing a crossword puzzle activate different parts of the brain, engage different muscles, and induce different sensory experiences.

In addition, the shift from one activity to another can take up to seven-tenths of a second. We know this because of the research of Joshua Rubinstein, a psychologist at the Federal Aviation Administration's William J. Hughes Technical Center in Atlantic City.

Rubinstein and his colleagues studied patterns of time loss that resulted when volunteers switched from activities of varying complexity and familiarity. Measurements showed that the volunteers lost time during these switches, especially when going from something familiar to something unfamiliar. Further, the time losses increased in direct proportion to the complexity of the tasks. To explain this finding the researchers postulate a "rule-activation" stage, when the prefrontal cortex "disables" or deactivates the rules used for the first activity and then "enables" the rules for the new activity. It's this process of rule deactivation followed by reactivation that takes more than half a second. Under certain circumstances this loss of time due to multitasking can prove not only inefficient but also dangerous.

For example, remember the speculation that cell phone–associated automobile accidents could be eliminated if drivers used hands-free devices? Well, that speculation isn't supported by brain research. The use of cell phones—hands-free or otherwise—divides a driver's attention and increases his or her sense of distraction.

In an important study carried out by psychologist Peter A. Hancock at the University of Central Florida in Orlando and two researchers from the Liberty Mutual Insurance Company, volunteers simulated using a hands-free cell phone while driving. The volunteers were instructed to respond to the ringing of a phone installed on the dashboard of their car. At the instant they heard the ring they had to compare whether the first digit of a number displayed on a computer screen on the dashboard corresponded to the first digit of a number they had previously memorized. If that first digit was the same, the driver was supposed to push a button. In the meantime, they were to obey all traffic rules and, in the test situation, bring the car to a full stop.

While the distracting ring had only a slight effect on the stopping distance of younger drivers (0.61 seconds rather than 0.5 seconds), it had a profound effect on the stopping distance of drivers between 55 and 65 years of age: 0.82 seconds rather than 0.61 seconds, according to the researchers. Distraction, in other words, reduces efficiency.

In another test of the cost of multitasking, volunteers at the Center for Cognitive Brain Imaging at Carnegie Mellon University in Pittsburgh underwent PET scans while simultaneously listening to sentences and mentally rotating pairs of three-dimensional figures. The researchers found a 29 percent reduction in brain activity generated by mental rotation if the subjects were also listening to the test sentences. This decrease in brain activity was linked to an overall decrease in efficiency: It took them longer to do each task.

A reduction in efficiency was also found when the researchers looked at the effect of mental rotation on reading. They discovered that brain activity generated when reading the sentences decreased by 53 percent if the subjects were also trying to mentally rotate the objects.

A similar loss of efficiency occurs when activities are alternated. For instance, David E. Meyer, a professor of mathematical psychology at the University of Michigan in Ann Arbor, recruited young adults to engage in an experiment where they would rapidly switch between working out math problems and identifying shapes. The volunteers took longer for both tasks, and their accuracy took a nosedive compared to their performance when they focused on each task separately.

"Not only the speed of performance, the accuracy of performance, but what I call the fluency of performance, the gracefulness of their performance, was negatively influenced by the overload of multitasking," according to Meyer.

All of which leads to this simple rule: Despite our subjective feelings to the contrary, actually our brain can work on only one thing at a time. Rather than allowing us to efficiently do two things at the same time, multitasking actually results in inefficient shifts in our attention. In short, the brain is designed to work most efficiently when it works on a single task and for sustained rather than intermittent and alternating periods of time. This doesn't mean that we can't perform a certain amount of multitasking. But we do so at decreased efficiency and accuracy.

Thanks to technology, each of us exists simultaneously in not just one *here* but in several.

But despite neuroscientific evidence to the contrary, we are being made to feel that we *must* multitask in order to keep our head above the rising flood of daily demands. Instead of "Be Here Now," we're encouraged to split our attention into several fragments and convinced that multitasking improves mental efficiency.

Instead, multitasking comes at a cost. And it's true that sometimes the cost is trivial, or even amusing, as with the following experience of a young mother: "I had to get dressed for my daughter's middle school choral program, get another child started on homework, and feed another who had to be ready to be driven to soccer practice. Of course, the phone kept ringing, too. I thought I had everything under control when the complaints about the grilled cheese started. Without getting too angry, I growled for her to just eat it so that I could finish getting dressed. What else could I do in such a rush? My daughter then said, 'I can't eat it, Mom. You left the plastic on the cheese.'"

Other times, the cost of multitasking can be much less amusing. Imagine yourself driving in light traffic on a clear day while chatting on a cell phone with a friend. You're having no problem handling your vehicle and also keeping up your end of the conversation. But over the next five minutes you encounter heavier traffic and the onset of a torrential rainstorm. Your impulse is to end the conversation and pay more attention to the road, but your friend on the other end of the line keeps talking. After all, he isn't encountering the same hazardous conditions from the comfort of his office or home. You continue to talk a bit longer, shifting your attention between your friend's patter and the rapidly deteriorating road conditions. As a result, you fail to notice that the tractor-trailer to your right is starting to slide in your direction. . . . Your survivors will never know that your divided attention, with its accompanying decrease in brain efficiency, set you up for that fatal accident.

In essence, the brain has certain limits that we must accept. While it's true that we can train our brain to multitask, our overall performance on each of the tasks is going to be less efficient than if we performed one thing at a time.

Cerebral Geography

Despite the inefficiency of multitasking, the brain is able to deal with more than one thing at a time. If that weren't true, we wouldn't be able to "walk and chew gum at the same time," as a critic once uncharitably described a former U.S. president. The trick is to avoid activities that interrupt the flow of the main activity.

For example, listening to music can actually enhance the efficiency among those who work with their hands. I first learned of this a year or so ago when a draftsman casually mentioned to me that he felt more relaxed and did better work while listening to background music. Many surgeons make similar claims. In a study aimed at testing such claims, researchers hooked up 50 male surgeons between the ages of 31 and 61 to machines that measured blood pressure and pulse. The surgeons then performed mental arithmetic exercises designed to mimic the stress a surgeon would be expected to experience in the operating room. They then repeated the exercise while the surgeons listened to musical selections of their own choosing. The performances improved when the surgeons were listening to the music.

In another study, listening to music enhanced the surgeons' alertness and concentration. What kind of music worked best? Of 50 instrumental tracks selected, 46 were concertos, with Vivaldi's *Four Seasons* as the top pick, followed by Beethoven's Violin Concerto op. 61, Bach's Brandenburg Concertos, and Wagner's "Ride of the Valkyries"—not exactly your standard "easy listening" repertoire.

But easy listening isn't the purpose, according to one of the surgeons interviewed. "In the O.R. it's very busy with lots of things going on, but if you have the music on you can operate. The music isn't a distraction but a way of blocking out all of the other distractions."

Music undoubtedly exerts its positive effects on surgical performance at least partially through its kinesthetic effects, an observation made by Socrates in Plato's *Republic*: "More than anything else rhythm and harmony find their way to the inmost soul and take strongest hold upon it." Thanks to music, the surgeon is more concentrated, alert, technically efficient, and—most important—in the frame of mind most conducive to healing. "Take Puccini's *La Bohème*," says Blake Papsin, an ear, nose, and throat surgeon in Toronto. "It's an absolutely beautiful piece of music that compels the human spirit to perform, to care, to love—and that's what surgery is."

Music and skilled manual activities activate different parts of the brain, so interference and competition are avoided. If the surgeon listened to an audiobook instead of a musical composition, however, there would likely be interference. Imagining a scene described by the narrator would interfere with the surgeon's spatial imaging. Listening to the audiobook would activate similar areas of the

brain and cause competition between the attention needed to efficiently and accurately operate and to comprehend the images and story in the audiobook. We encounter here an example of the principle of *cerebral geography*: The brain works at its best with the activation of different, rather than identical, brain areas. That's why doodling while talking on the telephone isn't a problem for most people, since speaking and drawing use different brain areas. But writing a thank you note while on the phone results in mental strain because speaking and writing share some of the same brain circuitry.

Thanks to new technology, especially procedures like functional MRI scans, neuroscientists will soon be able to compile lists of activities that can be done simultaneously with a minimal lapse in efficiency or accuracy. But, in general, it's wise to keep this in mind: A penalty is almost always paid when two activities are carried out simultaneously rather than separately.

Questions for Critical Reading

1. According to Restak, what are the problems with multitasking? Locate passages where he discusses the impact of this practice. Do you think multitasking is possible? How does it function in your own life?
2. How does culture affect biology? Perform a critical reading of Restak's text in order to describe the ways in which what we do can change what we are.
3. What are "modern nerves"? Define the term through Restak's essay and then provide examples from both his text and your own life.

Exploring Context

1. Take the ADD/ADHD test at psychcentral.com/addquiz.htm. How does your score reflect Restak's argument? Connect your response to your work on multitasking from Question 1 of Questions for Critical Reading.
2. Explore the Web site for Twitter at twitter.com. Is this abbreviated style of blogging a reflection of the problems that Restak explores? Or is staying hyperconnected to your friends a way of combating the demands on attention? Consider the relation between Twitter and your definition of "modern nerves" from Question 3 of Questions for Critical Reading.
3. Play the Multitasking game at itch.com/games/multitasking. How does your performance in the game confirm or complicate Restak's argument? Connect your response to your work on multitasking from Question 1 of Questions for Critical Reading.

Questions for Connecting

1. Kwame Anthony Appiah, in "Making Conversation" (p. 57) and "The Primacy of Practice" (p. 63), explores the persistence of social practices and the possibilities of change. Can we use his ideas to address the problem that Restak