The Shallows

ⓘ INTRODUCTION

BRIEF BIOGRAPHY OF NICHOLAS CARR

Nicholas Carr was born in 1959 and rose to prominence as a critic of technology's role in our culture. He is the author of *The Big Switch*, *Does IT Matter?*, *The Shallows*, and most recently *Utopia is Creepy*. Carr has been published in the *Wall Street Journal*, *The Atlantic*, and *Wired*. He lives in Colorado with his wife and runs a popular blog called RoughType.

HISTORICAL CONTEXT

Nicholas Carr wrote *The Shallows* in response to the drastic change in the way humans think and act since the invention of Internet technology. Not only does the book show how human brains have evolved since the invention of the Internet, *The Shallows* also places the Net in a historical pattern of change brought about by adaptation to technology. Carr examines the way technologies have affected humans throughout the whole of civilization.

RELATED LITERARY WORKS

Far before *The Shallows* was published, as Carr acknowledges in the "Further Reading" segment of the book, writers have been expressing concern about the effects of technology on our intelligence and our quality of life. To write his own book, Carr looked to references on a plethora of topics. Some of these include Eric R. Kandel's *In Search of Memory: The Emergence of a New Science of Mind* on the science of the brain, Paul Saenger's *Space between Words: The Origins of Silent Reading* on the history of the book, and George B. Dyson's *Darwin Among the Machines: The Evolution of Global Intelligence* on the significance of Artificial Intelligence. The influential work most notable for Carr's purposes was arguably *Understanding Media*, by Marshall McLuhan. *Understanding Media*, a cult classic, was a resounding warning shot to all consumers of media. McLuhan, who was primarily focused on television, wanted viewers and users to understand that they were being changed more by the *way* they absorbed content than the content itself, giving birth to his famous phrase "The medium is the message." With *The Shallows*—a troubling argument for the enormous effect the Internet has had on our brains—Carr followed in McLuhan's footsteps, situating himself, in the words of one *USA Today* critic, as a "Paul Revere for our Net age."

KEY FACTS

- **Full Title:** *The Shallows: What the Internet is Doing to Our Brains*
- **When Written:** 2010
- **Where Written:** United States
- **When Published:** 2010
- **Literary Period:** Contemporary Nonfiction
- **Genre:** Nonfiction
- **Point of View:** Carr narrates in the first person

EXTRA CREDIT

Pulitzer Finalist. *The Shallows* was a finalist for the 2011 Pulitzer Prize in General Nonfiction.

📖 PLOT SUMMARY

Nicholas Carr's book *The Shallows* examines the effect Internet technology is having on the human mind. In the digital age, we are overwhelmed with stimuli. Our computers, phones and digital tools allow us constant access to seemingly infinite information and give us a sense of connectivity. We are more socially focused and efficient than ever before––but these benefits come at a price. Carr worries that we are trading in valuable skills for a type of intelligence that is adapting users to their computers, instead of the other way around.

One of Carr's primary comparisons in the book is between two types of intelligence. The older definition is associated with the era of print literature. Humans used to define intelligence as the extent to which a person had a "literary mind," or a mind capable of sitting quietly and solving complex problems. However, after the Industrial Revolution, a new definition of intelligence started to take hold, one that privileged efficiency and multi-tasking over deep thinking. The system as a whole was seen as more important than the individual. With the invention of the Internet, this obsession with efficiency spiraled out of control. Our apps and tools are so easy to use that we are developing a ravenous appetite for more and more information, all consumed at breakneck speeds. The sheer volume of data we are exposed to when we surf the web may be impressive, but our brains, Carr argues, are not equipped to both navigate the distractions inherent in the design of the Internet *and* consolidate deep and meaningful new elements of knowledge. Increased reliance on and skyrocketing use of the Internet has indoctrinated users into an age of distraction and, as a result, impaired our ability to find a balance between the meditative thinking of the "literary mind" and the efficiency-centric learning style of the computer age.

Not only, Carr argues, is our definition of intelligence changing due to Internet use, but our brains are being rewired in a

disturbing way. Carr emphasizes throughout the book—using official studies, scientific concepts, and brain science—that the changes made to us by our use of the Internet are not simply changes in our thoughts, but rather anatomical alterations in the brain itself. The Internet provides such a feast of distraction that no energy is left for the parts of our brains responsible for complex thought and developing subtle human emotions. The great warning presented by *The Shallows* is not only that the Internet is changing our brains but that it may be diminishing the very skills and traits that make us human.

👥 CHARACTERS

Marshall McLuhan – Marshall McLuhan was a Canadian media critic renowned in the 60's for his book, *Understanding Media.* Now a cultural relic, the point of *Understanding Media* is often boiled down to McLuhan's famous phrase, "the medium is the message." McLuhan believed that the content we absorb is lulling us into a state of complacence, and distracting people from the numbing effects of the medium itself. Though McLuhan's unease was sparked by television, his viewpoint is highly relevant to Carr, both as a founding example of media criticism and for the ways that his theory applies to users of all sorts of media.

Eric Kandel – Eric Kandel is a scientist most famous for his *Aplysia* experiments completed in the 1960's in which he conducted research on the nervous system of the sea slug. Kandel demonstrated that "synapses change with experience," an important revelation for study of the neural pathways. Kandel's work shows how the nervous system learns from experiences and alters responses according to stimuli. The *Aplysia* experiments, as such, are used by Carr as evidence for neuroplasticity. Kandel is also the author of the 2006 memoir, *In Search of Memory*.

Plato – Plato was an ancient Greek philosopher famous for his documentation of the great orator and philosopher Socrates. One of Plato's most famous works is a dialogue known as the *Phaedrus*, in which Socrates tells the story of the god Thoth who the Egyptians credited with inventing writing. In *The Shallows*, Carr uses Plato's work as a primary source dealing with the dichotomy between oral and written culture. Though Plato was clearly on the side of writing, his life's work was documenting the orator Socrates. Plato, especially in the *Phaedrus*, reminds us that ancient cultures were orally-based and highly skeptical of new technologies like writing.

Alan Turing – Alan Turing was a British computer scientist and logician. He rose to prominence when he cracked ENIGMA, the code used by the Nazis during WWII to direct their armies. Today Turing is best known for his Turing test, which evaluated the limits of computer intelligence. For Carr, Turing is important as a forefather of the modern computer. He created

a blueprint for the modern all-capable computing device with his concept of the Turing machine, an imaginary device that could be programmed to do any sort of task. Today, the Turing machine is a real technology: the modern computer.

Fredrick Winslow Taylor – Frederick Winslow Taylor was an engineer during the late 1800s who invented a system to improve industrial efficiency. His methodology, called Taylorism, privileged the workings of the system over the individual––maximizing efficiency at any cost. Taylor's focus on the scientific management of systems involving large numbers of humans is useful for Carr as the foundational ethic of Silicon Valley giants like Google who seek to control all aspects of Internet users' affairs.

Larry Page – Larry Page is the American computer scientist famously known as a co-founder of the Internet giant Google. Page invented the search engine known as BackRub that was Google's primitive version. Larry Page is a staunch follower of the productivity-centric model of Frederick Winslow Taylor. Page is an important figure for Carr because he represents the modern obsession with efficiency.

Joseph Weizenbaum – Joseph Weizenbaum was a German-born computer scientist who made his name at MIT. He is considered a forefather of modern artificial intelligence studies due to his creation of a program called ELIZA. ELIZA was a primitive AI program that was able to recognize speech patterns and hold simple, repetitive conversations with the user. Weizenbaum is particularly important to Carr for the conclusions he comes to in his book *Computer Power and Human Reason*, namely that computer science was not only limited but that AI developments placed our humanity at risk. These surprising viewpoints made him unpopular in his field.

TERMS

Neuroplasticity – Neuroplasticity is the concept that the brain can change. Contrary to now debunked views that the brain became 'fixed' in childhood, scientists now know that the brain is changeable––or *plastic*––and that neurons rewire when exposed to repeated stimuli. This scientific concept is a vital to Carr's theory that our brains are being changed, as neuroplasticity creates the opportunity for him to prove that digital life is indeed having a deep, lasting, and anatomical effect not just on our thinking but on our actual brains.

The Enlightenment – The Enlightenment was an era of intellectual rebirth in Europe that dramatically changed ideas about science and culture in the Western world. Taking place throughout the 18th century, Enlightenment thinking––also known as the "age of reason"––removed the traditional emphasis on authority structures like religion and government and heralded the individual's capacity to solve problems through use of human reason. The Enlightenment is important

to Carr as an example of how the intellectual technology of the book, among other things, vastly altered the human mind and the course of history.

Intellectual Technology – All technologies, Carr argues, were invented to amplify certain human abilities. In *The Shallows*, Carr coins the term intellectual technology to refer to the subset of technologies that enhance mental skills. Examples of intellectual technologies include writing, the map, the clock, the book, and the Internet.

Working Memory – Working memory is the whole of what a human is conscious of at any given moment. Working memory is a kind of short-term memory, capable of holding an average of five informational elements at one time. If we don't give an element of information enough focus while it is in our working memory, it loses its place to incoming stimuli and fails to be stored in long term memory. In *The Shallows*, the concept of working memory is vital for Carr's explanation of intelligence because it serves as the middleman between short term and long term memory.

Transcendentalism – The transcendentalist movement originated in New England during the mid 18th century. Best represented by American authors Henry David Thoreau and Ralph Waldo Emerson, the American transcendentalists believed that true enlightenment and intelligence could be found through communion with nature and deep spiritual meditation. The transcendentalists placed their emphasis on thought and the inexplicable internal life rather than logical reasoning, science, and material items.

⊚ THEMES

In LitCharts literature guides, each theme gets its own color-coded icon. These icons make it easy to track where the themes occur most prominently throughout the work. If you don't have a color printer, you can still use the icons to track themes in black and white.

THE HISTORY OF TECHNOLOGY

Carr's argument in *The Shallows*––that the Internet and computer technology are changing our brains––relies heavily on historical context. In order to show how the technology of the current digital age affects thinking, Carr explores how previous technologies formerly shaped the human mind. Put another way, he argues that the Internet is just the most recent development in humanity's relationship with skill-enhancing tools.

All technology exists, in Carr's view, to extend and amplify pre-existing sets of human abilities. Just as the plow amplifies human strength and the microscope amplifies eyesight, computers amplify thinking. Carr terms this latter category of tools, the ones we use to extend mental powers, "intellectual

technologies." Examples include the map, the clock, the abacus, the alphabet, the book and––of course––the Internet.

Putting the Internet in a historical context allows Carr to extrapolate meaning from the past. When the first ancient Sumerians scratched a character in the dirt they didn't realize they were altering the course of humanity. Carr's point is that the Internet, humanity's most all-consuming tool by far, should be analyzed with the same far-reaching gravity.

DISTRACTION AND FOCUS

Carr decided to write *The Shallows* after becoming concerned about his own capacity to focus. A decade earlier, before he started to use the Internet daily, Carr had no problem staying put with a long novel or concentrating on a singular task. Recently, though, he found himself constantly distracted by a compulsion to check his email or his RSS or his Twitter feed. Carr maintains that his own case is symptomatic of a global, Internet-induced epidemic that teaches all of us to be distracted.

Carr then diagnoses the causes of this epidemic. Before the digital age, learning required the student to develop an intimate and focused relationship with the object of their study. Students trained themselves, when learning, to "block out" the normal, human, primal instinct to scan our surroundings. With enough practice, we could override the primal instinct telling us to constantly divert our attention lest we miss an opportunity or fall prey to danger. This mental evolution marked the birth of the literary brain, in which humans could meditate on a single task and developed individualized relationships with their own education.

In the digital age, Carr argues, the opposite is true. Carr shows how widespread modern problems with attention span are not arbitrary, but can be directly linked to our inundation with stimuli in the information age. The Internet, in Carr's words, is an "ecosystem of interruption technologies," rewiring our brains to seek immediate rewards and move quickly on to the next piece of stimulus. The very systems we have created to enhance our human abilities and make progress are now teaching us, again, to give in to distraction. Carr's thrust is that digital lifestyles not only provide an endless playground for procrastination and distraction when in use, but that they also have lasting effects. He argues that Internet use atrophies our ability to focus in all areas of our life––even when we are *not* online.

EFFICIENCY, SPEED, AND RELEVANCE

A pervasive element of *The Shallows* is the role of efficiency in shaping and guiding the development of technology. To some extent all technologies––"intellectual" and otherwise––came into being because we wanted to make our lives easier, and thus more

efficient. Primitive man's use of tools stemmed from an innate desire to ease the work expended by the user and relocate effort onto the tool used. However, modern striving for efficiency in computer development, Carr warns, has spiraled out of control, with unintended results.

With computational speed no longer an impediment, the Internet has become a mechanism for the rapid-fire delivery of bite-sized content. The computer can now digitize, "slice and dice," and update information at an unthinkable pace. Modern day devices are updated in near real-time with increasingly user-friendly interfaces, search engines like Google strive with religious zeal to catalogue the entirety of human information, and citizens of all ages check their social media feeds many times per minute. No longer hindered by computational speed limits, technology originally designed to make our lives easier—and thus free up our time––now preoccupies every waking moment.

Further, Carr argues, the majority of Net users are trapped by the Internet's culture of relevance. The Internet now measures efficiency by content "freshness," instilling in both publishers and users a preoccupation with staying up-to-date. The winning news feed or social media platform will be the one that delivers notifications *that* much faster. Carr points to a feedback loop between web publisher and user. We are sharing more, clicking more, and getting notified more because the websites and apps are increasingly effortless to use. At the same time, the resulting flood of instantaneous information forces users to stay constantly aware – to constantly scan their digital horizons – or else they will end up less up-to-date and knowledgeable than the people around them. Put another way, websites and apps can use the social pressure to stay relevant to keep their users constantly engaged – a vicious circle of constant distraction that is to the website and app's own benefit, but leads to constant distraction and anxiety for the user. Carr therefore urges us to re-evaluate the true efficiency of tools and programs that claim to provide efficiency, but which do so not to make our lives easier but rather to survive in the brutally competitive arena of the net.

VALUE, DEPTH, AND INTELLIGENCE

One of the book's primary concerns is whether new technologies are making us more intelligent. While almost every expert and scholar agrees that the Internet has changed the way we interact with the world, there is large disagreement about whether or not this change is actually making us smarter. While the Internet has many mental and social benefits––connectivity, accessibility––Carr warns that we are at risk for a bad trade. Diehard defenders of the Internet, in Carr's view, may be mothballing intellectual skills of greater depth. As we become increasingly proficient at multi-tasking and calculating thinking, the neural pathways wired for complex emotion and thought are falling into disuse.

The question of whether or not new technologies are a boon for intelligence depends on what the user really values. The Internet and computing devices allow us to access a seemingly infinite amount of information, but the historical tradition of linear thinking and intimate, individualized study is becoming obsolete. In the same vein, the development of computer programs and Internet publications depends on what the creators see as valuable, which might not line up with what *we* see as valuable. Monetary gain, clicks, and increasing demands for efficiency are guiding forces behind the Internet's growth, and so the Internet maximizes precisely those things, but not necessarily human intelligence or intellectual value.

While we might be able to multitask, skim, and scan better than ever, Carr argues that our technology has not been developed to make us think deeper. Instead, we are adapting to an environment that values a new, "shallower" type of human intelligence. Carr believes we are trading in the skills that make us human––wisdom, creative connections, deep problem solving––for skills that make us better at using our machines.

SCIENTIFIC CONTEXT

Scientific context is the necessary foundation for the hypothesis embedded in the book's subtitle, *What The Internet Is Doing To Our Brains*. Carr cites studies involving everything from monkeys to sea slugs. He quotes scientific experts and breaks down complex neuroscience for the layman. Giving the reader a scientific understanding of brain concepts like neuroplasticity––or the brain's ability to change––is vital to convincing the reader that repeated use of the Internet can have lasting mental effects. In addition to explaining concepts like neuroplasticity, Carr also gives anecdotal accounts of scientific studies to illustrate how the brain performs under different circumstances. For example, to support his claim that the Internet's interface can detract from our ability to solve more complex problems, he cites a study in which two groups of students read a short story online, one with hypertext and one without. The students who read the story without hypertext displayed deeper comprehension of the story's content. Constantly returning to the touchstone of science with thorough citations and quotes from respected experts in a wide variety of fields gives *The Shallows* the authority and substance that a book of mere opinionating would lack.

SYMBOLS

Symbols appear in **teal text** throughout the Summary and Analysis sections of this LitChart.

THE STORY OF THOTH

The Egyptian god Thoth is credited in the ancient pantheon with inventing the intellectual technology of writing. In the story told by Socrates in Plato's dialogue *The Phaedrus*, Thoth brought the invention of writing to King Thamus, but found that his gift was unwelcome. King Thamus thought writing would weaken man's memory. He feared that writing, as a form of outsourcing, would wither natural abilities in men rather than enhancing them. In *The Shallows*, the story of Thoth is repeatedly mentioned as a reminder that new technologies always come at a price. A new tool, though it may help enhance our natural functions, may engender dependence and actually dull and weaken our inborn skills. Thoth is, at the same time, a reminder that *all* new technologies, no matter how helpful they ultimately become, initially strike fear and mistrust into the hearts of many people.

❝❝ QUOTES

Note: all page numbers for the quotes below refer to the W. W. Norton and Company edition of *The Shallows* published in 2011.

Chapter 1 Quotes

❝❝ Whether I'm online or not, my mind now expects to take in information the way the Net distributes it: in a swiftly moving stream of particles.

Related Themes:

Page Number: 6

Explanation and Analysis

Carr is disturbed by the way the Internet has affected him throughout his daily life, even when he is not online. When he writes that his mind "expects to take in information the way the Net distributes it," he means that he has become accustomed to receiving information at a certain speed and in a certain format.

What disturbs Carr here is not the particularities of how the Net distributes information, but the fact that his mind is unable to turn off the mode it goes into when using the Internet. Even when reading a book or taking part in a task that is entirely unrelated to computer use, Carr's mind automatically addresses stimuli as though it were being fed to him by a program.

❝❝ Calm, focused, undistracted, the linear mind is being pushed aside by a new kind of mind that wants and needs to take in and dole out information in short, disjointed, often overlapping bursts--the faster, the better.

Related Themes:

Page Number: 10

Explanation and Analysis

This quote gets to the point of the introductory chapter. Our minds are being updated--whether we like it or not--to a new, different sort of mind. The "linear mind" Carr refers to here is the mind created by the era of literature. Focus, serenity, and linear thinking are necessary to sit down with a complicated volume and unpack its meaning. They are the opposite, however, of what is needed to survive on the web. The Net teaches us to approach and consume information in a rapid, frantic way. The linear mind, then, is being replaced by "a new kind of mind," one molded by and for the Internet.

Chapter 2 Quotes

❝❝ When it came to the brain, the child was indeed, as Wordsworth had written, the father to the man.

Related Themes:

Page Number: 22

Explanation and Analysis

Here Carr is referring to the now denounced scientific idea that the brain's "vital paths"--or primary neural pathways--are formed and sealed in childhood. Before the discovery of neuroplasticity, or the idea that the brain is malleable and can continue learning on into adulthood, thinkers believed that the brain was like a machine that was sealed or set in childhood. The child was the "father" to the man in the sense that what happened to a man in childhood would forever seal the way his brain functioned. Carr moves on, in this chapter, to suggest that this position is highly flawed.

❝❝ The genius of our brain's construction is not that it contains a lot of hardwiring but that it doesn't.

Related Themes:

Page Number: 31

Explanation and Analysis

Contrary to the idea that the brain's circuitry is solidified in childhood, Carr concludes--after reviewing various scientific resources--that the brain is a product of both nature and nurture. General templates for brain function are coded into our DNA, but our experiences in life are constantly altering and rewiring our brain's structure. The "genius of our brain's construction," then, is that the brain is malleable--it lacks a fixed structure, allowing humans to evolve and change and adapt far beyond childhood and into old age. The lack of hardwiring--though flying in the face of earlier notions of brain structure–is what allows humans and animals to adjust to local and repeated conditions in a short amount of time, sometimes changing in as quickly as days.

Once again, this concept of changeability is better known as neuroplasticity in the realm of brain science.

●● Plastic does not mean elastic.

Related Themes:

Page Number: 34

Explanation and Analysis

Carr has established at this point in the chapter that the brain is plastic--that is, that the brain is changeable. The mind is not like a machine. Neural pathways can be rewired and we are never "stuck" with a certain type of brain.

This quote, however, highlights the important fact that though our brain may be changeable, it does not automatically snap back to old patterns and ways of thinking. The brain is not like a rubber band. It is not easy to "undo" learned behaviors. In other words, just because the brain is plastic does not mean it distinguishes between good behaviors and bad ones. We may be able to change our brains, but this change may not be for the better. Addiction, depression, and OCD are examples of unhelpful learned behaviors. The fact that brain is "not elastic" is of enormous consequence, here. If we determine that a learned behavior is detrimental after the fact, reverting to a better way of thinking is not a simple matter.

Chapter 3 Quotes

●● Although the use of any kind of tool can influence our thoughts and perspectives--the plow changed the outlook of the farmer, the microscope opened new worlds of mental exploration for the scientist--it is our intellectual technologies that have the greatest and most lasting power over what and how we think.

Related Themes:

Page Number: 45

Explanation and Analysis

Here Carr is building on his theory about human tools. In this chapter, Carr explains that each tool is used to extend a certain type of human ability. As it does so, that tool not only enhances our sphere of available action, but it also deeply influences the way we think. The plow, a tool which extends physical strength, changed the outlook of the farmer because it allowed him to conquer vast swaths of land. The microscope, which amplified our sensible range, opened up new worlds for the scientist because we now could have a look at what previously was the subject of mere conjecture.

However, the type of technologies at play in this book, and which Carr argues has most deeply affected our minds, are *intellectual technologies*, or technologies which amplify and extend our mental abilities.

●● Sometimes our tools do what we tell them to do. Other times, we adapt ourselves to our tools' requirements.

Related Themes:

Page Number: 47

Explanation and Analysis

This quote boils down Carr's take on the "determinist" and "instrumentalist" views of technology. Where determinists believe that technology is progressing nearly autonomously and is not under man's control, the instrumentalists assure technology users that these tools are neutral, nothing more than instruments we use to satisfy our subjective and personal wills.

When Carr writes, "sometimes our tools do what we tell them to do," he is making a nod to the instrumentalists by agreeing that in many cases tools are exactly that--tools, and nothing more. However, he is not convinced that we

really have the level of control over technological progress that the instrumentalists would like to believe. In many cases, he argues, our own desires become secondary to the functionality of the tool, and we find ourselves changing our own skills and traits in order to satisfy and adapt to our technology.

●● The written word liberated knowledge from the bounds of individual memory and freed language from the rhythmical and formulaic structures required to support memorization and recitation. It opened to the mind broad new frontiers of thought and expression.

Related Themes: 📱 🧠

Page Number: 57

Explanation and Analysis

In the second half of this chapter Carr has explained how the intellectual technology of writing aided the development and enriching of humanity's identity. In our purely oral culture we were prevented from making larger and deeper connections about life due to the effort required to remember knowledge.

As Carr points out, writing lifted memory from the bonds of the personal, and paved the way for a new richness of identity due to the possibility of a deeper interior life. Writing, in this way, is an intellectual technology that undoubtedly marked progress for mankind because writing made possible new levels of complexity for consciousness itself.

Chapter 4 Quotes

●● To read a book was to practice an unnatural process of thought, one that demanded sustained, unbroken attention to a single, static object. It required readers to place themselves at what T.S. Eliot, in *Four Quartets*, would call "the still point of the turning world."

Related Themes: 🚶 🧠 📈

Page Number: 64

Explanation and Analysis

Book reading, as Carr establishes in this chapter, marked a departure from our typical thought patterns. Book reading

was, in fact, "unnatural" because our primal instinct is towards scanning and distraction. As Carr explains earlier in the chapter, early humans were constantly shifting their focus in order to scan for predators or food sources. Survival was the enemy of linear thought.

Book reading, then, arose as an interesting anomaly in human nature. In order to read we had to sit quietly and focus on a single, unmoving object. We had to learn, over time--through neuroplasticity--how to hone our focus and tune out distractions in the corners of our eyes and small sounds that might break our concentration. In this way we become, when reading, "still points" in the turning world.

●● The words in books didn't just strengthen people's ability to think abstractly; they enriched people's experience of the physical world, the world outside the book.

Related Themes: 📱 🧠 📈

Page Number: 75

Explanation and Analysis

Carr has spent the majority of this chapter outlining the progression of writing, and in this quote we see the consequence of the invention of the Gutenberg press. Wide proliferation and availability of books changed societal understandings of education, as new realms of metaphor and abstract thinking were made available to persons of all classes. The result was that people not only became increasingly literate but were enabled, by their literacy--and by writers pushed by their new audience to try new things--into thinking increasingly conceptually and abstractly.

But this wasn't all. As Carr points out in this quote, books also added new shades of richness to experience in real life off the page. Here he again calls upon here our knowledge of neuroplasticity. From what we've learned so far in the book, we can infer that if we are honing a skill while reading, then those same literary skills for meaning-making and metaphorical thinking are going to follow us into everyday life and lead us into an era of unprecedented intelligence.

Chapter 5 Quotes

●● The way the Web has progressed as a medium replays, with the velocity of a time-lapse film, the entire history of modern media.

Related Characters: Alan Turing

Related Themes: 📱 🕐

Page Number: 83

Explanation and Analysis

Alan Turing, inventor and British computer scientist, anticipated the Internet-capable computer when he imagined a machine that would be universal. As technology advanced, however, the Web rapidly became a universal medium beyond even Turing's wildest dreams.

When Carr says, then, that the Web "replays...the entire history of modern media" he is referring to the Web's absorptive power. As the Net's capabilities and speed enhanced––at a velocity nobody could have anticipated––cameras, video recorders, CD players, movie theaters, and more were all subsumed into the powerful medium of the Net. The entire history of media development can be seen in microcosm when you look at the order and speed with which the Net took over the functionalities of past mediums.

💬 We don't see the forest when we search the Web. We don't even see the trees. We see twigs and leaves.

Related Themes: 📱 🏃 🕐

Page Number: 91

Explanation and Analysis

Carr repurposes and extends the "can't see the forest for the trees" metaphor to comment on the form in which we receive information when searching the Web. Because the Web is structured to distract us, what with hyperlinks, chunks of text interspersed with streaming video, and all the various applications that make up our Net experience, we stop being able to see the whole picture. Instead, we consume things piecemeal. Carr takes it even further, implying that we only consume things in the most topical and cursory tidbits––"twigs and leaves"––because our minds, when using the Net, are so utterly distracted. Learning in a broad spectrum way, or a literary way, in which we can "see the forest" is rendered impossible by the very way the Internet is structured.

Chapter 6 Quotes

💬 [The book] loses what the late John Updike called its "edges" and dissolves into the vast, roiling waters of the Net. The linearity of the printed book is shattered, along with the calm attentiveness it encourages in the reader.

Related Themes: 📱 🏃

Page Number: 104

Explanation and Analysis

One of the mediums most poignantly transformed by digitization and absorption into the universal medium of the Web is the printed page. As Carr has described in this chapter, a digitized page––when uploaded to an E-reader or a web site––loses what makes it a clear, defined page due to the nature of the web. The text is injected with hyperlinks (or at least the option of instantly opening other "pages"), leading the mind back into the distraction state that is inherent to the Net. Because there are so many other options besides straight reading, the book loses "edges" or specificity. It no longer follows the traditional linear timeline we associate with the careful turning of a book's pages. The book's reader has a changed state of mind as well. Because the "edges" of the book are gone, so is what has confined the reader's attention, making focus far more difficult with intangible books than with those that have physical pages.

💬 In arguing that books are archaic and dispensable, Federman and Shirky provide the intellectual cover that allows thoughtful people to slip into the permanent state of distractedness that defines online life.

Related Themes: 📱 🏃 🕐 🧠

Page Number: 112

Explanation and Analysis

Federman and Shirky, the apologists for book obsolescence referenced here by Carr, argue in this chapter that long tomes like *War and Peace* were just side effects of living without the instant access to information that we now have in the age of the web. For critics like Shirky, book reading is out-of-date and inefficient. It's much easier and more efficient, in his point of view, to find what you need through skimming for key points using digitized volumes and summaries.

In this quote, Carr suggests that such viewpoints are in fact

justifications for a more sinister desire. The Net is an extraordinarily addictive medium. Intuitively, critics like Shirky may suspect that the distractedness and instant gratification provided by the Web are hindering deeper learning, but they are so deeply entrenched in a Net way of life that justification for disposing of former mediums is necessary. For this reason Carr calls out this view as "intellectual cover," or posturing that actually serves to avoid one's true motives (an actual addiction) for wanting to spend so much time on the Net.

> In the choices we have made, consciously or not, about how we use our computers, we have rejected the intellectual tradition of solitary, single-minded concentration, the ethic that the book bestowed on us. We have cast our lot with the juggler.

Related Themes:

Page Number: 114

Explanation and Analysis

This quote marks the final two sentences of Chapter 6, in which Carr's argument comes to a head. Thus far he has outlined how our replacement of other mediums with the all-consuming Internet irrevocably alters and Net-ifies their content, remaking that content in the shape of the Internet. In other words, we are opting for media that offers, at all times, the opportunity for distraction and for instant gratification. We are opting for rapid-fire tidbits of information, topical understandings, skimming and scanning.

By preferring to consume all our information on the Net, we are dismissing the form of learning and consumption that has defined previous eras of intellectual technology. The quiet, insular state required by books has been discarded in favor of the dispersed attention generated by the efficiency and quantity obsessed Web. Our increasing desire to consume information in a state of frenzy and multiplicity is what causes Carr to lament that we have "cast our lot with the juggler."

Chapter 7 Quotes

> It's possible to think deeply while surfing the Net, just as it's possible to think shallowly while reading a book, but that's not the type of thinking the technology encourages or rewards.

Related Themes:

Page Number: 116

Explanation and Analysis

Carr here refers back to the problem of how the Net is structured as a medium. He has gone to great lengths so far in the book to draw connections between shallow thinking and Net usage––but Carr wants the reader to know that the connection is not arbitrary or all-inclusive. Not all book readers are quiet and focused and meditative. In the same way, not all Net users are distractedly skimming articles. One can, of course, still have deep thoughts while using the web. Carr's point, here, is that the way the medium of the internet is designed not only discourages that depth but also takes extraordinary pains to both promote and reward distractability.

> As the psychotherapist Michael Hausauer notes, teens and other young adults have a "terrific interest in knowing what's going on in the lives of their peers, coupled with a terrific anxiety about being out of the loop." If they stop sending messages, they risk becoming invisible.

Related Themes:

Page Number: 118

Explanation and Analysis

Using the scientific context provided by psychotherapist Hausauer, Carr touches on the dramatic new levels of social anxiety created by the Net age. Because so much interaction on the web places us in a social context, users in the digital age have a heightened consciousness of and sensitivity to both their own social standing and the social standing of others. Much of the money made on the Net comes from faster, more efficient, more live-time versions of social sharing, so that one feels intimately connected with their peers.

Defenders of social media and the web might argue that this engenders unforeseen levels of connection to community. Carr, however, points to the massive levels of anxiety that accompany this development. If someone deeply entrenched in the web's social scene feels out of touch online, they become––eerily and ironically––wracked with the sense that out in the real world, they are also risking oblivion.

❝❞ When it comes to the firing of our neurons, it's a mistake to assume that more is better.

Related Themes:

Page Number: 123

Explanation and Analysis

The mind of the book reader is calm because, as Carr proves with references to scientific studies, there is less happening between neurons. This is a good thing, according to Carr, because it frees up the brain to actually process and make deep connections. When using the Internet, as he has explained, our frontal cortex is totally engaged by the problem-solving mechanisms necessary to make decisions like clicking one link over another, playing a video or not, scrolling up or down, and so forth. Book readers, on the other hand, have been shown to have much calmer patterns of brain activity.

According to Carr, it's a mistake "to assume that more is better" when it comes to this activity. The frenzied frontal cortex activity shown in Net users is actually what hinders them from getting truly engaged with the content, keeping them on the path of distraction and topical learning.

❝❞ What we are experiencing 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.

Related Themes:

Page Number: 138

Explanation and Analysis

Carr, in this quote, makes the interesting and disturbing claim that the effect of the Net on brain function reflects a reversal of history's patterns. With the dawn of the Enlightenment, people learned to train the muscle of focus in order to move away from the natural state of distractedness of early humans. This gave birth to the literary brain, a mind capable of sitting with one project and enduring a deep cultivation of knowledge.

However, in the age of the internet, we seem to be returning to a state of frenzied distraction. Steady cultivation is highly discouraged by the Net. What is preferred, encouraged, and rewarded is rapid collection of information in the endless "forest" of the Net. We find

ourselves in the strange position of an advanced technology causing us to go back in time developmentally.

❝❞ The Net is making us smarter...only if we define intelligence by the Net's own standards.

Related Themes:

Page Number: 141

Explanation and Analysis

This quote addresses a frequent question in *The Shallows*: Whether or not the Internet is actually making us smarter. To be sure, the Net encourages and hones certain skills. Today we are better multi-taskers than ever, able to rapidly shift attention between one item of information and another. We also have enhanced visual-spatial skills due to the focus that computer use places on imaginary objects. But as Carr has warned, just as neurons that "fire together wire together," neurons that *don't* fire together also *don't* wire together. Our enhanced skills in these areas mean the weakening of other abilities like deep thinking, inductive analysis, deep memory acquisition, and reflection. Most concerning of all for Carr is that we often skew the definition of intelligence to fit the Net's functionality. In other words, not only are we becoming better at the skills that make us most suitably adapted to using computers, we are altering out definition of intelligence to fit the new, Net-influenced strengths of our brains.

Chapter 8 Quotes

❝❞ Every click we make on the Web marks a break in our concentration, a bottom-up disruption of our attention––and it's in Google's economic interest to make sure we click as often as possible.

Related Themes:

Page Number: 157

Explanation and Analysis

Carr has already established so far in *The Shallows* how the Net is designed to encourage distraction and disperse our attention. One way tech companies justify this dispersal is that such a mode is more "efficient." Google is today's icon of efficiency, striving to catalogue all the information ever

created and make it available on the Web. However, as Carr points out, the company's claims may not be as benevolent or idealistic as they seem.

As Carr explains in Chapter 8, Google has economic interests riding on our clicks. Due to the way their advertising models work, the more times we click when using their search engines and other complements, the more money they make. As a result, Google actually derives revenue from the breaks in our attention and focus that happen when we go to another page or open a video. Google's business model rests entirely on the degree of our distraction.

●● The irony in Google's effort to bring greater efficiency to reading is that it undermines the very different kind of efficiency that the technology of the book brought to reading––and to our minds––in the first place.

Related Themes:

Page Number: 166

Explanation and Analysis

One of Google's most ambitious and renowned examples of its efficiency-obsession is the effort to catalogue all books in digital format. The type of efficiency at play here, however, is cause for concern.

As we remember, with the invention of writing technology that made reading a less laborious process, the mind was freed from the decoding effort and unburdened to turn focus over to interpretation of meaning. The efficiency of the book, then, was that we could do away with problem solving to get to the meat of the issue. The efficiency promoted by Google's project is not an efficiency resting within a single piece of content but efficiency based on how quickly you can move from one item to the next. We are still no longer strained by decoding, but instead of staying with one text and giving it our unburdened attention, Google's methodology quickly encourages us onto the next tidbit or snippet of information. Efficiency, for Google, is how quickly you can move between piles of data––as opposed to freeing the mind to determine what one pile of data might truly mean. The irony here, then, is that Google's model (like the internet in general) is causing us to lose the capacity to truly appreciate the very books that Google is so interested in cataloguing and making accessible.

Chapter 9 Quotes

●● The Web's connections are not *our* connections––and no matter how many hours we spend searching and surfing, they will never become our connections. When we outsource our memory to a machine, we also outsource a very important part of our intellect and even our identity.

Related Themes:

Page Number: 195

Explanation and Analysis

In this chapter on the difference between human memory and computer memory, Carr uses scientific context to establish that the process of creating a memory is a highly biological one. Not only is memory-making biological, it also serves as the basis for the way we build, enrich, and structure our conceptions of ourselves.

In present computer technology, however, a common justification for using databases and online catalogues is that we are freeing the brain from the load of creating new memories. The problem is that creating memories was never a burden to begin with––and even if it were, computers can't recreate the biological process that happens when we form a memory. Most importantly, the connections we create when making a memory inform our very identities. When we outsource memory to a machine, we are robbing ourselves of a process vital to our own development as human beings.

Chapter 10 Quotes

●● When we extend some part of ourselves artificially, we also distance ourselves from the amplified part and its natural functions.

Related Characters: Marshall McLuhan

Related Themes:

Page Number: 210

Explanation and Analysis

In *The Shallows*, Carr has put forth the argument that all technology is an extension of a natural ability. Intellectual technology––like the Net––marks the extension of our mental powers. The problem is that humans meld so easily with their tools. By assuming technology's power, we alienate ourselves from the "part" of ourselves we have enhanced. As Marshall McLuhan stated, we end up

"numbing" the part of ourselves we sought out to amplify. Carr's worry, here, is that artificial extension of the brain through the Net may in fact be setting us back. The risk

being: the more powerful our programming, the dimmer our natural minds.

SUMMARY AND ANALYSIS

The color-coded icons under each analysis entry make it easy to track where the themes occur most prominently throughout the work. Each icon corresponds to one of the themes explained in the Themes section of this LitChart.

PROLOGUE

The prologue to *The Shallows*, titled "The Watchdog and the Thief," quotes Marshall McLuhan's iconic statement: "The medium is the message." Far before the invention of the Web, McLuhan warned the public that our preoccupation with mediated content hindered our ability to analyze the effects of the medium itself. The Internet, for Carr, is the newest example of this problem. Many staunchly believe that technological devices are neutral tools with no deeper effects, but Carr uses McLuhan to compare the "masses" to sleepwalkers. The medium's content, writes McLuhan, is "the juicy piece of meat carried by the burglar to distract the watchdog of the mind." And even McLuhan, Carr writes, could never have foreseen the veritable feast of distracting content provided by our digital medias today.

Opening his book with famous media critic Marshall McLuhan is Carr's way of hinting that the The Shallows *holds a similar place in the history of tech criticism. The comparison sets the reader up to see how Carr will complicate and update McLuhan's argument. Carr's reference to McLuhan's quote also sets a foundational question for the book––how is the medium of the Internet a "juicy piece of meat" and what exactly is it distracting us from?*

CHAPTER 1

Carr opens *The Shallows* with his personal reason for writing the book. In 2007, after a decade of using the Web and believing it a great boon for his intelligence, Carr had an epiphany: the benefits of the Internet may come at a price. Carr found he could no longer focus like he used to on long pieces of writing. After doing some research, Carr found that his situation was not unique. Bloggers Scott Karp, Bruce Friedman, and Philip Davis all agreed that the Internet had made them less patient readers. Still, they preferred the rapid-fire way of absorbing information encouraged by the Internet. Carr became worried that the linear, literary mind was becoming a thing of the past.

Carr uses personal experience to connect with the reader and illustrate how deeply the Internet has affected him personally. Using his own life as an example gets readers to examine whether or not they are having difficulty concentrating themselves. By introducing the idea that there are two camps––those who are pro rapid-fire learning and those who are skeptical––Carr sets readers up to examine themselves throughout the book and choose a side.

Carr's life unfolded in a way particularly suited to studying the effects of the Internet. The first half of his life, which he calls "Analogue Youth," was without computer technology. The second half, which he calls "Digital Adulthood," was with computer technology. In 1977, when Carr started school at Dartmouth, this watershed transition could be seen on the school's campus. Dartmouth had a traditional library, but there was also a place called the Kiewit Computation Center. The Kiewit center, which housed an early computer, was not very popular––Carr spent far more time in the library reading room—but occasionally he would spend an hour or two playing a primitive game on the Center's computer.

Carr again shows how his own life can be seen as an experiment in the effects of the Internet, with himself as the guinea pig. The era he was born in caused him to live half his life before the digital age, and half of it after. Returning us to an age when libraries were used more than computers causes the reader to assess how deeply things have changed, and in a much shorter amount of time than we often remember.

Several years after he left Dartmouth, Carr became smitten with computers. He bought one of the earliest Macintoshes in 1986, starting a pattern of endless purchases to update his hardware as the technology skyrocketed. The year 1990 marked the biggest change, because until then his computers had been self-contained. With the introduction of the Web and Web 2.0, Carr soon became a Net junkie. He developed into a religious follower of his RSS feed, his MySpace, his Facebook, his Twitter, and so forth. In 2007, Carr concluded that the Internet was having a far greater impact on him than the simple, self-contained, disconnected computers ever had, and he set out to figure out why.

Carr continues his personal story to after the "jump" to the digital age, when the Internet became ubiquitous. He emphasizes his total reliance on the Internet to explain how he had rational cause to believe that this singular change––the centralization of Net-connected computers in his life––was the cause of his brain fog and lack of concentration.

CHAPTER 2

To explain how tools affect our brains, Carr opens with an anecdote about Friedrich Nietzsche. When the philosopher switched from pen and paper to a typewriter, he noted that his writing became more forceful and staccato. "Our writing equipment," commented Nietzsche, "takes part in the forming of our thoughts." Nietzsche's observation suggested that brain function actually changed in response to our tools, a view that was not accepted in his era. Carr notes that psychologist Sigmund Freud expanded this new theory of the brain in his early career as a neurophysiology researcher. Contrary to the pervasive view that the brain was a continuous fabric, Freud suggested that the brain had a cellular structure with gaps, also known as synapses. Modern scientists now know that the brain is, as Freud suggested, made of a network of neurons that transmit electric pulses through the spaces that divide them.

Nietzsche's observation about his new typewriter is important because it challenges a theory about brain science during his era––the 19th century. Carr is using historical and scientific anecdotes to set the reader up for a developmental journey that will reject an old view of the brain for a new one.

It took lots of time and research to overturn the false belief that the brain, once formed, was a fixed organ. Carr, accounting who helped change this belief, cites the work of Michael Merzenich. Merzenich studied monkeys with nerve damage in their fingers. When one part of the injured monkeys' hands were touched, the signal became confused on the way to their brains and they believed a different part of their bodies was being stimulated. However, the monkeys eventually repaired this mental confusion on their own. His study suggested that neural pathways in the monkey's brain reorganized themselves to reflect the new map of nerves in their hands. This concept of the brain's plasticity––or ability to change––is called neuroplasticity.

Carr supplements the concept of a mutable (changeable) brain with scientific evidence. He is establishing the concept of neuroplasticity early on, because the potential for the brain to be altered is key to his argument that the Internet changes us at an anatomical level.

Scientists in the early 20th century remained skeptical, however, sticking to the idea of the brain as a mechanical and fixed organ. The prevalent idea was that the "vital paths" of the brain were laid in childhood and remained fixed upon maturation. The machine-brain point of view was solidified by the past attitudes of the Enlightenment, a historical age in human development when reason and science were heralded over emotion. The result of this prevailing view was that consciousness--or the idea of a mind separate from the brain--was seen simply as a byproduct of the machine-brain.

The old view of the brain was that it was fixed once it reached adulthood, or like a machine that kept running in the same manner. Carr brings up this comparison to foreshadow a prevailing conflict throughout the book between man and machine intelligence.

As science advanced, the argument for plasticity slowly strengthened. Carr cites the work of biologist Eric Kandel, who performed a study on sea slugs in the early 1970s known as the Aplysia experiments. Kandel found that if you touch a sea slug's gill repeatedly without causing the animal harm, its original reflex to recoil lessens. The slug, through repetition, learns that it won't be hurt. This concept gave rise to the scientific saying known as Hebb's rule: "Cells that fire together wire together." In other words, repeated physical actions can reroute our brains.

Carr uses the experiments of Eric Kandel throughout the book to refer back to the concept of neuroplasticity. The reader is meant to extrapolate from the results on the sea slug—if a slug learns through repetition, than a human might as well.

The concept of neuroplasticity united two differing philosophies on the nature of mind: empiricism and rationalism. Empiricism, exemplified by philosopher John Locke, is the belief that we are born with a blank slate and that our experiences mold our minds. This can also be understood as the "nurture" argument. Rationalists like Immanuel Kant, on the other hand, hold that we are born with templates that determine how we think. The presently accepted view of the brain as plastic--or capable of change--encapsulates both. We are born with "templates," or a genetically determined basic brain structure, but our synaptic connections are shaped by our various life experiences. Neuroplasticity combines both the "nature" and the "nurture" argument.

Here Carr moves from the world of science into the world of philosophy. He invokes these two theories to imply that deeply structured views about life are challenged by new discoveries in the sciences. Reluctance to accept the concept of neuroplasticity is not purely due to lack of scientific evidence, but fear of changing the very way we think about knowledge itself.

Much of the evidence for neuroplasticity comes from studies on the brain's reaction to both physical and mental experiences. Phantom limb syndrome--in which an amputated limb is perceived as still attached--is the result of the brain being in the midst of reorganizing itself to match the body's new state. Purely mental activity can have the same effect, as seen in cab drivers in a 1990 UK study. The area of cabbies' brains responsible for storing spatial representations was far larger than average. While our DNA might determine a basic outline at birth, the process of living--as seen with the sea slug, the monkeys, the cab drivers--continually organizes and reorganizes our brain's structure. The problem, notes Carr, is that the brain doesn't discriminate when rewiring. While plasticity gives us an out from having a brain determined in childhood, the rewired habit or reaction can just as easily be unhealthy--a behavioral loss, rather than a behavioral gain.

Carr reiterates that the scientific evidence proves without a doubt that our brain is very much a learning and changing structure. The implication, however, is that our brain can be rewired to detrimental effects. He is planting the seed for his future argument, in which he suggests that the Internet might be rewiring our brains, but not for the betterment of humanity.

Digression. The ancient philosopher Aristotle believed many strange things about the brain. He believed it was a cooling mechanism, that humans have the largest brains because our hearts are the hottest of all animals, and most importantly for Carr's digression, he believed that the brain had nothing to do with sensation because "when it is touched no sensation is produced." Carr's point is that Aristotle's mistake is understandable. All of our other organs are perceptible to us because they are separate from the organ that perceives them. The question becomes, then, how do we learn about something with no level of remove? How can we think about thinking, if at all––or is the nature of consciousness forever out of consciousness' grasp?

Carr ends the section by returning to the realms of philosophy. Reaching all the way back to the ancient thinker Aristotle, he emphasizes that humans have been disturbed by the seeming impossibility of truly knowing anything about brain function for centuries. The riddle of how the brain can ever have the capacity to learn about itself is an ancient one.

The philosopher Descartes, two hundred years later, wrestled with the same idea. He compared the brain to a "machine" similar to the ones that operated royal fountains. While the heart pumps blood, the brain pumps spirit. Modern science has wiped out what now seem like silly ways to think about the brain. However, Carr points out that humans still want to believe that something about the brain remains impervious to our understanding. It's more comfortable to believe that our experiences don't imprint themselves on our brain structures. "To believe otherwise," he writes, "would, we feel, call into question the integrity of the self."

Descartes' comparison of the human brain to a machine is not just a fun anecdote, but also a callback to Carr's point that humans wants to believe their brains are somehow safe from being altered by experience. If the brain is the seat of identity, and the brain is fixed, then identity is fixed. Carr is subtly implying that humans are altered by their tools––both physically and spiritually––more than they'd care to admit.

CHAPTER 3

Carr opens this chapter with a description of how our depictions of space change as we age. In childhood we might draw a rudimentary picture to represent our house. In adulthood, we've gathered the tools to both make and comprehend complex special maps like blueprints. Vincent Virga, an expert on cartography, explains how the progression of mapmaking skills in human history parallels these stages of cognitive development. Man's first maps were scratched in the dirt. As time passed, we used tools like the compass and mathematical formulas to make our maps increasingly realistic. Eventually our maps not only could accurately represent space, but *ideas* in space––for example, a potential battle plan. Advances in cartography not only changed the way we dealt with space but the way we understood space forever. Map technology––in which we reduced reality into a microcosm, making an analogy for space––marked an increased capacity for abstract thinking in humans.

The progression from childhood to adult styles of mapmaking is a representation of human affinity for abstract thought throughout all of history. As we get older, we not only gain the ability to accurately represent space in analogous forms, but also to represent ideas of space in analogous forms. The way concrete mapmaking gave birth to abstract mapmaking reflects a general effect that tools like cartography have on human cognitive abilities.

Clocks, Carr argues, did the same thing for time that maps did for space. The demand for precise time measurement originated in the monastery, where life is regimented and revolved around ritualized prayer. As more and more people started working in factories rather than fields, synchronization became even more important. Clocks became more accurate, smaller, and cheaper––eventually becoming personalized in the form of the wristwatch, advertised as a way to stay productive.

This segment reiterates how a tool has changed our conception of something like space or time from a concrete relationship into an abstract one.

Like the map, the clock changed our thinking. These tools marked the move from Middle Ages thinking to Enlightenment thinking, in which the goal became to discern patterns beneath the surfaces of life. In other words, where knowledge in the dark ages tended to use surface evidence to jump to mystical conclusions, the new way of the Enlightenment was abstract, always pushing the depths for reasonable, provable patterns. "Independent of the practical concerns that inspired the timekeeping machine's creation," writes Carr, "...the clock's methodical ticking helped bring into being the scientific mind and the scientific man."

Both the map and the clock heralded a change in our thinking. We exchanged topical, dark-ages mysticism for the Enlightenment's focus on larger patterns. The takeaway here is that tool-enabled, abstract thinking was the foundation needed for what came next: Scientific man.

Carr places the map and the clock into a category of technology he terms intellectual technology. All technology, Carr argues, was created to expand and extend aspects of humanity. Intellectual technologies, then, are tools that extend our mental powers. One benefit of new intellectual technologies is that they frequently allow the general public to have access to ways of thinking previously only available to the elite. Carr calls this new way of thinking, specific to each technology, the technology's "intellectual ethic." To phrase this another way, Carr is saying that each technology rests on a set of assumptions about how the mind works. That set of assumptions is the "intellectual ethic." Carr finds it strange that inventors rarely pay attention to the intellectual ethics of their inventions, for, he argues, it is the ethic that has the most profound effect on users.

Carr's point is that the defining characteristic of technologies like the Internet, the map, and the clock is not just that they extend cognitive powers, but that they change the very way we think. Mentioning that the intellectual ethic is often ignored is Carr's way of implying that there is, again, something uncomfortable for humans in admitting the way our tools change us.

There are different points of view about the extent to which technology influences the course of human history. The determinists take an extreme view, believing humans to be at the whims of technology's nearly autonomous progress. An extreme determinist mindset can be found in Marshall McCluhan, who wrote that humans were merely the "sex organs of the machine world," existing only until technology develops the capacity to create itself without us. Instrumentalists like David Sarnoff, on the other hand, take solace in the idea that our tools are neutral. Instrumentalists like Sarnoff believe that intellectual technologies are instruments and that we have total control over how we use them.

Carr turns to two opposing theories about the way technology does or does not affect us to delve into the scope of the discomfort humans feel at the idea that technology can rewire our brains. This segment highlights two extremes to incite readers to evaluate both and try to place themselves on one side.

Both sides of the argument agree that breakthroughs in technology have marked pivotal moments in human history. Carr himself sees merit in both sides, but reveals a determinist leaning when he points out that humans have rarely been conscious of, or asked for, the side effects of our discoveries. The problem with investigating merit on either side of the argument is that––while we have ancient artifacts to study––we have no ancient brains. In other words, we can study the tools of past ages but we cannot study the physical minds of their users to track how these minds did or did not change.

Carr qualifies his determinist leanings by noting the difficulties of scientifically investigating the relationships between people and technology in the past. This sets up the reader for ways in which science has advanced to make such investigation possible.

The scientific discovery of neuroplasticity *has* shed some light on the issue, however. While the basic form of the brain has not changed, as H.G Wells notes in his 1938 book *World Brain,* man's "social life, his habits, have changed completely, have even undergone reversion and reversal, while his heredity seems to have changed very little if at all, since the late Stone Age." (49) We can assume, in other words, that using tools has strengthened certain neural pathways and diminished others simply because man's way of interacting with society has changed so deeply.

The thrust of this segment is that a deterministic leaning viewpoint––or at least, a standpoint that rejects technology as simply neutral––is undeniable due to the mere fact that mankind's way of interacting with the world has undergone such vast and stark changes.

Carr argues that one way technology has changed our brains is by changing our language. Technology gave us new metaphors for understanding the world. With the advent of the clock, we received new words and concepts. We could describe previously inexplicable organs, like the brain, in a mechanistic fashion. In this way, external technologies had deep effects on our use of metaphors and, as a result, on our internal worlds.

Working within the history of these changes, Carr identifies metaphorical language as proof of technology's deep effects. Identifying language as a changed aspect of human life serves his argument by pointing to altered internal life and even physical anatomy.

While language itself is not a technology because we learn to speak without instruction, reading and writing are acquired skills and count as intellectual technologies. Instruction in different types of reading and writing shapes and molds the brain in a variety of ways. Carr provides evidence for this by referencing brain scans done on populations like the Chinese who use logographic symbols. Such populations have widely different brain circuitry than those who use phonetic alphabets.

The gist of this section is that speakers of different languages have different brains. Because language is a technology, the implication here is that each variant on a technology has a highly individual effect.

As Carr points out, we didn't always have writing. Human culture was originally based in oral––or spoken––traditions. In ancient times, the difficult systems of Egyptian and Sumerian scholars required memorization of thousands of characters, meaning interpretation was limited to the elite. Writing was dictated to and read back by a select group of literate scribes. When the Greek alphabet was invented in 750 BC, the new system of letters was more economical, requiring less memory resources and thus setting the groundwork to expand literacy. However, even in the fourth century BC, writing remained a novelty, and many had doubts about this new technology.

Carr moves to an even more "macro" scope, identifying the social consequences of language technology. Writing, for a long time, was laborious, making literacy an elite privilege. The implication is that advancements in writing technology would change social structures by expanding literacy to the masses, further proving Carr's point that technology has greatly affected the development of mankind.

Carr recalls the *Phaedrus*, a famous work by the philosopher Plato. In the *Phaedrus* orator Socrates tells the **story of Thoth**, Egyptian god and inventor of writing. In the story, Thoth's invention is rejected by King Thamus on the grounds that men will become forgetful. Thamus' worry is that writing, acting like an external bank for memory, will cause his subjects' internal memories to wither. Plato, a writer, obviously had a different standpoint. He fought the oral tradition because it relied on recall and limited knowledge to the stores of human memory. While Carr notes that our ancestors may have had emotional depths we know nothing about due to their reliance on memory, there is no doubt that the transition into a literary, writing-based culture was the foundation for the achievements of the Western world.

For Carr's book, the story of Thoth's rejection by the king perfectly describes a general worry experienced by many (dating even back to ancient times) on the eve of a new technological era––that something, inevitably, will be lost.

CHAPTER 4

Carr turns his attention here to the history of writing, or the original intellectual technology. The Sumerians were the first to use a writing medium, etching cuneiform into clay tablets. In 2500 BC, the Egyptians began making paper, but it was expensive. The wax tablet came about because it was a cheaper, reusable option. Even as writing technology advanced, Carr points out, it was shaped by the oral legacy. Silent reading was unknown in the ancient world and there were no word order conventions. The scribes used something called *scriptura continua*, or sentences without breaks between the words, imitating the uninterrupted flow of speech. Carr notes that, scientifically, the absence of these mores placed a far greater cognitive burden on readers. When you don't know where one word ends and another begins, text becomes a puzzle. Ancient eyes had to move slowly and, Carr assumes, their entire frontal cortex would be plugging away, making reading laborious.

Carr describes how in the early days of writing—our original intellectual technology—great mental strain was placed on the frontal cortex of the reader. This specific fact––that reading was like decoding, and required problem-solving parts of the brain to be activated––provides historical evidence for Carr's later scientific proposition that deeper thinking is inhibited by neural overactivity.

After the collapse of the Roman Empire, the people of the Middle Ages started needing books for increasingly practical reasons. Written language finally changed to accommodate the eye rather than the ear. Rules about word order and placing spaces between words made silent and rapid reading much easier. As reading became less of a problem-solving exercise, what we know today as "deep reading" became possible. Readers became both more efficient––able to read and understand an increasing number of texts––and more attentive, as well.

This segment shows how language evolved to relieve cognitive strain. Word order, spaces between words, and silent reading all came about to make reading less laborious and open literacy up to a larger population.

Carr pivots to focus on this new attentiveness created by reading. He writes that the human brain––like most other animal's brains––is naturally in a state of distraction. We shift our gaze in a reflexive way to scan for danger. Reading, then, was unnatural at first in that it required sustained attention to a static or unmoving thing. Humans had to learn how to block out external stimuli. Different from other tasks that required focus––like hunting or craftsmanship––reading required concentration to decipher the written text as well as meditative interpretation of the text's meaning. Reading created more than simply a literate brain; it created the *literary* brain.

Carr compares the sort of mind that reading requires to the constantly distracted state of primal man. This prepares the reader for the advent of what Carr calls the "literary brain." The focus and meditation required to read were learned skills that altered people's natural, distracted state and marked a watershed moment in the history of the human mind.

Writers were liberated as well by the changes in language technology. Professional scribes were no longer as vital. The new possibility for anyone to write gave birth to infinitely more personal and adventurous works of literature. The increased ease of writing also made revision and editing possible. Paul Saenger, author of *Space between Words*, explains that self-conscious authorship arose because the writer could finally "see his manuscript as a whole and by means of cross-references develop internal relationships and eliminate the redundancies common to the dictated literature."

As reviewing and reading over their work became easier, writers became increasingly self-conscious and started to edit and re-read their work. Carr shows once more that changes in technology lead to new phenomena in the internal life of the technology's user.

Works of writing soon contained more complex arguments, were being divided into paragraphs, and had increasingly individual styles. Library architecture also reflected the new direction. Private cloisters to accommodate vocal reading were replaced with reading tables complete with reference books like dictionaries. Reading, being an increasingly private act, enriched human senses of individuality. However, despite the fact that a small publishing industry was born, handwritten codices remained costly and books––and the literary mind they created––were not yet mainstream.

Carr continues to show how new developments in writing technology changed human life, inside and out. The change from an oral and "groupy" tradition to a silent and private practice placed increased emphasis on the development of individual identity.

Carr goes on to focus on the publishing technologies that pushed the literary mind to the forefront. The primary invention was the Gutenberg publishing press, famously attributed to German goldsmith Johannes Gutenberg. Gutenberg created adjustable molds for cast letters that could be moved, disassembled and reorganized. His masterpiece was the renowned Gutenberg Bible. After the press caught on, the cost of manufacturing books was steeply reduced. With an influx of cheaper paper from China, books flooded the market. Both demand and supply skyrocketed, creating a cycle that set the world on track to becoming populated by literary minds, no matter what social class you were born into.

Carr continues to show how new developments in writing technology changed society. The development of the Gutenberg press, a landmark event in world history, caused deep social change, as it allowed humans of any class or status to have easy access to books.

Carr closes the chapter with an explanation of the chapter's title, "The Deepening Page." The kind of reading that accompanied the literary mind is very different than the kind we practice every day when we read signs, ads, and labels. As literacy expanded, writers felt the confidence to push the complexity of the form. This cycle encouraged the development of increasingly abstract ideas. The result of book reading and book writing was that human consciousness "deepened," or became richer as authors strengthened the individual's capacity to focus on complex ideas.

A feedback loop was put into place by increased literacy. The more writing we saw, the better we could read; and the better we could read, the more we wrote. The "deepening" of consciousness Carr refers to directly connects the advancement of writing technology to increased complexity of identity.

Digression. Carr turns a spotlight on Lee de Forest, an engineer with a doctorate from Yale who invented a device in 1906 called the audion. The modest invention was a current amplifier consisting of three wires, and it would change the world. De Forest had "inaugurated the age of electronics" by inventing a device that could amplify radio transmissions, providing the foundation for transistor radios and numerous other electrical devices.

This segment, on Lee de Forest's audion, serves as a transition into the following chapter on the Internet. The audion's crucial relationship to electronics shows how a single invention can change the course of human history.

CHAPTER 5

Carr opens this chapter with Alan Turing and his Turing machine, an imaginary device that anticipated the modern computer. Turing's machine would be a "universal machine" able to be programmed for any conceivable purpose. However, even Turing admitted his idea was limited by speed, or computing time, which was very slow in the early 20th century. In Turing's time, it was far faster and cheaper to have a man in a darkroom render a photograph than it was for the earliest digital computer to complete the same task. Today the Internet, no longer limited by speed, has absorbed and digitized every sort of information imaginable, taking Turing's idea to new heights. The cost of a computing task, Carr reports, has dropped by 99.9% since the 1960s.

The foundational concept for this chapter is Turing's idea of a machine that could serve any purpose and would have unlimited potential. By opening with the Turing machine, Carr preps the reader to be astonished by how quickly the make-believe became reality, all through eliminating the obstacle of speed.

The web's evolution offers a compressed history of media, having absorbed the functionality of everything from Gutenberg's press to the movie theater. Text was first, as typographical symbols were the easiest to represent. Next, with the lowered cost of bandwidth, web pages began to incorporate photographs and drawings. Soon the job of radios and phonographs was absorbed by the Net too, and when MP3s were invented, sound files could be compressed for easy sharing. Finally, the Net consumed movie theaters, able to quickly transmit not only video but also elaborate 3D games.

This segment explains how the functionality of each type of media was absorbed in turn by the Internet, foreshadowing the Internet as a force for making old technologies obsolete. In short, the Internet is Turing's machine come to fruition––but it has consequences.

Carr points out that the difference between the Net and other mass media is that the channel of communication goes both ways. Not only does the Net connect you with businesses, it provides a platform for personal interaction. Sites like Wikipedia, Flickr, and YouTube successfully rely on users to provide the enormous amount of content offered.

The Net provides things that media in their original form could not: namely, "bi-directionality" (or content that is both consumed and created by users).

As the speed and capacities of the Internet increased, the amount of time we spend logged on has skyrocketed. A 2009 study reported that adults were spending an average of twelve hours online a week, not counting time on handheld phones. Carr warns us, too, against the assumption that much of this Net use is being taken from leisure time otherwise devoted to TV. Nielsen studies show that as Net use has increased, the time Americans devote to television has increased as well. The point being: Net use has only increased the time Americans spend in front of screens. Users for example, often watch TV as they operate both a laptop and a mobile phone.

What Turing did not predict was that as the speed of his machine was enhanced, we would spend more and more time using it. The takeaway here is that Americans spend a massive amount of time on the Internet, and that amount is only increasing. In practice, speed of technology doesn't equal more free time for people to spend on things other than technology—it just means more free time to spend on the Internet.

What is definitely decreasing is the time spent reading print medium like newspapers, magazines and books. A 2008 study reported that young adults, the most avid Net users, spent a mere 49 minutes a week reading printed matter. Though we are definitely reading more words in total due to the amount of text on the Net, less and less of this text is in paper form. Carr brings it back to Turing, stating: "Once information is digitized, the boundaries between media dissolve." Things like cassettes, spools, phonographs––tools specific to their medium––have been replaced by the faster, cheaper, all-purpose-tool of the Internet.

Carr continues to outline the consequences of the Turing machine being actualized in the form of the Internet. Not only do we use the Internet more, but we read drastically less. What's more, the consequence of the Internet's media-absorbant power has pushed a wide array of technological objects into disuse and obsolescence.

Though people still collect records and use film cameras, there is no question that such items have lost their economic power and, as a result, have been shelved as what Carr calls "progress's dead ends." While the benefits of the Internet––connectivity, accessibility––are many, there are consequences to pushing aside the various physical mediums we used to use and replacing them with a universal medium. The DVD industry, the United States post office, and the newspaper business have all fallen on hard financial times, with newspapers and journals putting all resources into digital outlets, and many publications ceasing to exist all together.

In the same way that machines take workers' jobs, the Net has taken the jobs of old media. A further consequence, then, of the Internet is the obliteration of entire media industries.

Carr points out that the process of digitizing other mediums––particularly text––recreates content in the internet's image. In other words, the reading experience online is intensely different than on paper. The content is broken down, strewn with hyperlinks, and set against the distracting background of all the other information the Net has absorbed. While hyperlinks increase the ease with which we can jump between documents, the nature of Net searches encourages the fragmentation of texts. The result is that we skip from fragment to fragment at lightning pace. Quoting the blogger Cory Doctorow, Carr concludes that computers plunge us into an "ecosystem of interruption technologies."

Not only does the Internet take over the job of distributing the content of other mediums, it changes that content irrevocably. The hyperlink, for example, chops up our reading experience and encourages the user to skip back and forth. Here Carr is introducing one of his main points: The Internet is designed to engender distraction.

As people's minds grow used to the Internet's way of unbundling and fragmenting content into easily consumed bits, other media are evolving to mimic the Internet's style. Magazines like *Rolling Stone* no longer publish sprawling, 7,000 word features, but instead a jumble of shorter pieces. Newspapers focus on headlines, summaries, and tables to make skimming their contents easier. Television networks use text crawls on the screen to run pop-up ads and shows like *Late Night with Jimmy Fallon* are written to encourage breaking up the content. The writers know that video hubs like Hulu will later choose select clips to show for free. Even experiences in the real world are becoming mediated. Certain symphonies and theaters encourage audience usage of platforms like Twitter during performances so the audience can engage in group commentary whilst the performance is taking place. The experience of the classic library is changing too, becoming less and less a place to go for free reading time and increasingly synonymous with free Wi-Fi.

One of the most interesting consequences of the Internet becoming our primary means of consuming information is that older mediums are also changing to reflect the Internet experience. The way we move through the world is increasingly resembling the way we navigate a series of websites. Television and even live experience are embracing the social media concepts of sharing and the Internet standard of small, easily digestible pieces. The concern is that we are changing our surroundings to match the functionality of a new technology, rather than changing the technology to fit our surroundings. Whether this change is good or bad is Carr's primary question, and remains to be seen.

CHAPTER 6

In this chapter, Carr turns his attention to the fate of the printed book. To some extent, Carr argues, the book has remained fairly safe from the Net's influence. You don't have to worry about a book breaking, there is far less eye fatigue, and engaging physically with a book offers a pleasure that reading Internet text cannot. However, though it has taken a bit for e-books to get off the ground, digital readers are making improvements in an attempt to compete with the old-fashioned intellectual technology of books. New high-resolution screens have reduced eye strain and features like the ability to enlarge type or sound out words are boons for the elderly. The ability to download as many books to your reader as you can mp3s to an iPod has a definite appeal. The e-book has started to take hold.

The pastime of reading has been safe in some ways from the influence of the Internet, but only in so far as the printed book still exists––and even that is changing. Though the book has an enduring appeal due to its non-electronic nature, new digital readers are gaining increased popularity. Alluding to the fate of the printed book prepares the reader for a chapter devoted to this "old-fashioned" technology and how it may be in danger.

Carr emphasizes that the experience of reading on an e-reader is much different than the experience of reading a paper book. The Kindle, Amazon's e-reader, has a built-in wireless component allowing you to purchase new books, read newspapers, search the web, etc. One of the most notable Kindle features is the incorporation of links. You can be redirected to an article on related topics, a word's definition, or Google search results. The author Steven Johnson worries that the new dynamic offered by the e-book, where a world of pertaining information is so easily searchable, will cause us to lose the total immersion that is the classic joy of book reading. Of the digitized book, Carr writes: "It loses what the late John Updike called its 'edges' and dissolves into the vast, roiling waters of the Net." Reading printed books in e-book form has, in other words, become as distracting as reading websites.

E-readers like the Kindle present the same issues as other media absorbed by the Internet. Through the process of digitization, the media, and thus the experience of the content itself, is changed. Being able to check the definition of a word or search a related article at any time is not recognizable as a traditional reading experience. Once more Carr urges us to look at the consequences of digitization of content––namely, that we are distracted from truly engaging with the content by the very nature of the medium.

The digitization of the book is influencing how new books are produced as well. The more readers find books using online search engines, the higher the pressure for writers to craft their books with the question of how their book could get clicks in mind. Essayist Caleb Crain describes the coming phenomenon as a trend towards "groupiness" in writing and reading, where people read "for the sake of a feeling of belonging" rather than enlightenment. Writers, Carr worries, are in the same vein moving away from risky experimentation and towards palatable and accessible styles. The odd result is that we are reversing a historical pattern. The era of mass book reading is coming to a close, and literary readers are again becoming a minority group.

This segment introduces the concept of historical inversion. Literary readers are again becoming a minority. The culprit, for Carr, is once again the amazing influence of the Internet. Writers are changing their styles to accommodate the "groupy" atmosphere of the Internet. As a result, book writers are shying away from experimentation in order to gain more readers, a mindset inherited from the Internet-born desire to get the most hits. The pull away from the individual and towards the most palatable is, for Carr, a worrisome trend because it shuts the door on literary reading.

Throughout history, Carr explains, people who believed that new technologies would replace books have always been wrong. Phonograph lovers thought soon all books would be recorded as audio, but listening didn't replace reading. Neither have technologies like the Internet or TV, but our preoccupation with these new technologies means we devote less time than ever to actually reading solid books. They may still be around, but we are no longer, Carr argues, in the age of print.

The time we devote to the Internet has consumed our leisure to the point that Carr can confidently announce the end of the era of print. The takeaway from this segment is that while books may still be around, they may as well not be because we just aren't reading them.

Scholars like Clay Shirky from NYU are fine with this change. Shirky argues that people don't need or want to read Tolstoy or Proust anymore for good reason. Those big tomes and the literary reading they invite were, to Shirky, "just a side-effect of living in an environment of impoverished access." His point is that we only read such long works because a more efficient way of learning wasn't yet available. People like Shirky represent the new anti-literary mind, but Carr is skeptical of his argument. He worries that Shirky's attitude is less an argument than a convenient way to avoid guilt about wanting to constantly slip into the distracting, addictive juggling act of online life. Carr's conclusion in this chapter is that we have rejected the individual, focused intellectual tradition for a working life preoccupied with juggling a multiplicity of tasks.

Here Carr addresses a very important counter-objection: What if people are fine with the end of print? Attitudes like Shirky's suggest that the end of literary reading is actually a sign of progress and ushers in a new age of informational accessibility. Carr suggests that this attitude is concealing the justifications of an addict, however. The juggling act of the Internet, to put it bluntly, is fun––and people will go to great lengths to convince themselves that the fun way is the best one. But choosing fun, for Carr, means rejecting the literary tradition that gave us enriched individuality. That has to have some very serious consequences.

CHAPTER 7

Carr opens the chapter by claiming that the Internet is a mind-altering technology not because we tend to use it so frequently but because of the way it is designed. The sensory (sensation based) and cognitive (brain based) stimuli offered by the Internet follow the same repetitive and addictive patterns proven to cause fast alteration in brain circuitry.

In this introductory segment Carr tells us without mincing words that the Internet's design is addictive, and he has the brain science to back it up.

Sensation wise, we are engaging nearly all of our senses when we use the Internet. As we touch our devices––tapping, scrolling, rotating the screen––we hear videos, images, and sounds. Engaging with the Net delivers constant input to our somatic, visual, and auditory cortices.

The Internet is a physically intense and encompassing experience to a degree we don't often realize.

Cognitively we are being stimulated as well. The interactivity of the Net is constantly engaging our reward system, making us hyper-aware of our social standing. Whether we are clicking links, posting on Twitter, or blogging, the Net teaches us to look forward to the next page, the new followers, and the likes. Therapist Michael Hausauer notes that teens and young adults have a terrific fear that if they stop sharing or checking social media they will become invisible.

The cognitive effects of the Internet are also more profound than we might realize. The way the Internet is structured to promote social engagement has caused a phenomenon of social anxiety. Despite the fact that we use the Internet alone, we feel more invisible when we aren't online, proving that the social framework created by the Internet is enormously powerful––often feeling more "real" than the interactions we are having in the room.

The Net's great paradox, Carr argues, is that it captures our focus only to split that focus in a thousand directions. We are returned again to a previous state—this time, the bottom-up distractedness of primal man. Carr points out that not all distraction is bad. Breaks in attention are necessary for the subconscious to solve problems but only, as Dutch psychologist Ap Dijksterhuis points out, if we have first defined the problem. The Net is a blaring pool of stimuli with no singular problem, stopping deep and creative thinking in its tracks. The longer we spend time doing Net thinking—skimming, hopping links, and so forth—the weaker the neural pathways that support intellectual thinking become. These effects follow us offline and into real life.

For Carr, the most significant consequence of prolonged Internet use is a reversion back to the distracted state of primal humanity. The constant stimuli of the Internet literally rewire our brains to continually seek the next thing, creating a feedback loop that turns our brains into skimming machines. We see, once again, a historical reversion. Any muscle for focus honed by the literary style of learning is being systematically weakened by the Internet's structure.

Going deeper into the science behind exactly *why* the Net makes it so difficult to concentrate, Carr references a study examining brain function in novel web surfers being taught how to use the Internet. In the study, which compared the novices to veteran Net users, the novice web surfers were seen to develop the same amount of prefrontal cortex brain activity as veteran surfers after only five days of practice. Contrarily, the brains of book readers showed significantly less action in the prefrontal cortex.

The key to understanding why the Internet makes it hard to focus is activity in the prefrontal cortex. Here, Carr sets up for a scientific argument to prove that the Internet is designed to distract us, and is succeeding to do so on an anatomical level.

While Carr notes that extensive activity in this section of the brain can help keep the brains of elderly Net users sharp, there are downsides to the way the Net forces us to use the problem solving part of our brain. The intense prefrontal cortex activity required to decide whether or not to click on a link or play a video redirects mental resources from more interpretive functions. We return, again, to a previous puzzle-solving state. In this way, present Net usage closely reflects the early, laborious *scriptura continua* sort of reading. In both cases deep arguments and deep thinking are sacrificed as the majority of effort goes into decoding the information. In short, it's a mistake to think that more neurons firing is always better. The calm brain activity viewed in readers is the brain of a deep thinking human, rather than a decoding machine.

The fact that book readers have less activity in the prefrontal cortex when reading does not mean they aren't thinking. On the contrary, it means that the brain is freed up to do the deep meditation that only a human can do. Carr wants us to understand that using the Internet—with an interface requiring constant choices—creates a neural situation that limits our ability to think deeply.

Another scientific concept that helps to understand how the Internet affects our learning is working memory. A particular type of short-term memory, working memory is what we are conscious of at any given moment. "The depth of our intelligence," Carr explains, "hinges on our ability to transfer information from working memory to long-term memory." The problem is, unlike the vast holding tank of our long-term memory, working memory can hold only a few elements at once. As a result, trying to transfer information from working memory to long-term memory in the chaotic environment of the Internet is, to use Carr's metaphor, like trying to transfer water blasting from a room full of faucets into a bathtub using just a thimble as your tool. The overload of incoming information, also known as the cognitive load, impedes our ability to distinguish important information from what is irrelevant, a problem many studies link to ADHD.

Going into further depth about the difficulties presented by the interface of the Net, Carr explains that what is hindered when we are distracted is our ability to create new memories. If being distracted overloads our working memory and makes it hard to learn new information, and if our ability to learn new information is the measure of our intelligence, then we are led to the concerning question of what kind of intelligence, exactly, the Internet creates.

To further explain how Internet use impairs cognitive load, Carr cites a study in which two groups of students were both given Elizabeth Bowen's short story "The Demon Lover." One group had hypertexts in their version and one group did not. The hypertext group, because their prefrontal cortex was busy navigating decisions about whether to click, proved to have significantly more trouble comprehending the story and reported being confused. The research suggested a correlation between disorientation––or cognitive overload––and the number of links on a page. Carr concludes that supplying information in multiple forms takes a serious toll on the human ability to retain information, comprehend ideas, and solve problems.

Carr provides a scientific study as proof for his hypothesis. By telling us that Net users were more confused about Bowen's story when they read it with hyperlinks, we conclude that eliminating distractions leads to deeper comprehension. Carr is suggesting, between the lines, that all Net reading is a risky way to learn. If just being on the Net increases confusion, then a book is probably the more productive choice––but productivity is not the Net's aim; its aim is to be used.

Next, Carr turns his attention to the new style of reading that takes place on the web. In short, he casts doubt that what we do on the Net is truly reading at all. It might be better described as scanning, or power-browsing. Carr shows that screen-based reading behaviors have been proven in studies to be non-linear, characterized by an F shape in which the eyes skip around the screen, spotting keywords and pausing on graphics. Carr again points to an interesting reversal. We are evolving backwards from being literary cultivators of knowledge and have entered the age of informational hunter-gatherers.

Once more Carr is using scientific studies to prove that we are distracted by the Net's interface. We don't deep read but instead scan, which is another concerning reversion back to the state of primal humanity. Carr implies that technology is not always a force that brings straightforward progress. The Net enhances some skills and sends others back to prehistoric times.

Carr makes a point to tell readers that the Internet does have mental benefits. Video games increase visual focus and the mental calisthenics demanded by Internet use could help a small expansion in working memory capacity, an adaptation that would help us better juggle data. As jobs and social lives increasingly depend on the use of electronic media, it appears that the better we are at multitasking the more valuable we become as employees and friends. The question, however, is whether optimizing our brains for multi-tasking is the type of intelligence we want. While Net use has led to increased visual-spatial skills and the ability to multi-task, our abilities to think deeply and read for extended periods are eroding. We are adapting our brains to be best at functioning the way the Internet functions––as machines for decoding and sorting through the forum where all the knowledge is kept, rather than singular intelligences that contain knowledge within themselves.

The Internet, being a machine for multi-tasking, has made us excellent multi-taskers. Carr writes this to show that he does not take issue with the argument that the Internet is enhancing certain mental abilities. What he does take issue with is Net users failing to ask whether we should *be adapting our mental abilities to the functionality of a machine. Here we return to the question of what kind of intelligence the Net is fostering. Considering how the Net reshapes things in its own image, it makes sense that the intelligence of the Net user is an intelligence that serves the Net.*

Digression. In, "On the buoyancy of IQ scores," Carr references a study done by James Flynn showing that IQ scores have been rising steadily since WWII. This so-called "Flynn effect" has been used to defend everything from television to the Internet. However, Carr points out that IQ scores have been going up for a long time, suggesting the change is dependent on societal factors rather than recent technologies. Verbal SAT scores, for example, have been steadily dropping. Flynn himself eventually concluded that the rise in IQ scores had to do with a change in the definition of intelligence. With the dawn of the technical age, Carr argues, scientific aptitudes for classification rather than drawing new conclusions became the defining factors of smartness. We aren't actually any smarter than our parents, he points out, we're just measuring intelligence by increasingly tech-influenced standards.

IQ scores may technically be rising, but if they are based on tech-influenced categories, than we are only testing for a very narrow definition of intelligence. What's more, we should be wary of the fact that technology is so deeply influencing every aspect of our lives––even our IQ tests. The takeaway from this digression is that the definition of intelligence changes with our intellectual technology.

CHAPTER 8

This chapter opens with Frederick Winslow Taylor's efficiency-based philosophy of productivity. Taylor observed factories and wanted to make a change. His new method, called Taylorism, achieved maximum speed and efficiency by favoring the system as a whole over the individual.

Taylorism is a perfect example of the social pull away from individuality that Carr has been hinting at in the book so far.

Taylorism finds its modern day incarnation in Google, a company founded, in the words of CEO Eric Schmidt, "around the science of measurement." Studying everything from user eye-movements to their affinity for clicking on one shade of blue over another, Google's righteous aim is to eliminate the obstacle of subjectivity and guide Internet users with all-knowing databases and algorithms.

Google has taken Taylorism to a new level. Even the colors Google users click have been selected for their agreeableness, which is a way of eliminating personal choice. Carr implies that the degree to which Google controls user experience is disturbing.

Larry Page, Google's founder, was obsessed with efficiency. His search engine was born from a simple analogy. Just as a scholastic paper's prominence relies on how many other works cite it as a reference, a web page's importance could be measured in how many pages directed a user there via links. From this seedling idea, Page created a database called BackRub that ranked and categorized sites. BackRub eventually became Google, and their mission statement was to organize the "seemingly infinite amount of information on the web."

The takeaway from this segment is that Google and other tech companies place priority on efficiency and ease-of-use. By putting all known information into a single database, Google makes the user experience easier. The consequence, however, is that the value of any one piece of information is judged not by the user but rather by the algorithm.

Google also needed to monetize their project. In order to make a profit and keep search results relevant, Google's ad placement was determined by the frequency with which links were actually clicked. The company's success is a direct result of this user-reliant formula. Knowing what links were popular helped their algorithms separate the wheat from the chaff. Web pages soon became rated for importance on the basis of both their connectivity and publication date so that the search engine always generated the most relevant results in order to beat competitors. Carr identifies Google's "intellectual ethic"––or the privileging of efficiency––as the prevailing ethic of the Internet.

In this segment, Carr explains that Google's focus on efficiency and categorization may not be a purely righteous mission. The more we surf the web, the more links we click; and the more links we click, the more ads we see. Google's intellectual ethic may be efficiency, but that is because efficiency pays off. We use the web more and more because it is increasingly user friendly, and Google rakes in the profits.

Carr argues that competition between Google and other web publishers has encouraged user appetite for rapid and easily consumed bits of information. Because each company aims to be fastest and most efficient in order to get revenue, a cycle is created in which users come to expect an ever-increasing amount of information at lightning speeds. In 1999 blog users realized they had to post multiple times a day to keep traffic on the uptick. Soon after, RSS readers came onto the web as a way of sorting and "pushing," or highlighting, news headlines. Most notable was the rise of social media sites like MySpace, Facebook, and Twitter––all dedicated to providing endless updates for the user about what is happening, in the news and in their social groups, and providing these updates in as close to real time as possible.

Competition, Carr points out, has only amped up the focus on efficiency as the be-all end-all of Internet companies. Users have a role to play in this process as well, of course. The more efficient a social media service is the more we use it, creating an environment of constant one-upmanship. Users come to expect updates in real time, placing an unforeseen emphasis on speed as the marker of quality in a web publisher.

Google has also been playing the game as ferociously as ever. For Google, page importance is no longer judged solely on links coming into a site anymore but monitors at least two hundred different "signals," or indicators of importance, at all times. The signal with greatest priority of late is page "freshness." Google checks popular sites every few seconds to place priority on how recently updated and thus relevant the page is, the goal being to eventually fulfill the dream of a real-time and total Internet index.

Carr again emphasizes the importance of speed for a web publisher. Google is at the forefront because they check for updates in as close to real-time as possible. Their criteria for judging what sites they prioritize in results is worrisome because, again, agency is given to the search engine rather than the user.

Carr pauses to reinforce that Google's seemingly ever-changing business model is in fact very simple: The more time we spend on the internet, the more money Google makes. This is because, Carr explains, Google's model for revenue is based around complements, or in business terms, two things that are consumed together. Everything you do on the Internet is, for Google, a complement. This is also why Google provides services like email. The more time users spend using Google's free information services and staring at computer screens, the more money Google rakes in from ad revenue. YouTube, for example, is not profitable in itself, but Google bought the company because it enabled them to gather more user information. As Carr writes: "Google wants information to be free because, as the cost of information falls, we all spend more time looking at computer screens and the company's profits go up." It makes sense, then, that Google's overarching goal is to digitize every conceivable sort of information, transfer it to the web, catalogue it in their search engine, and dispense it to users in small, easily-digested bits with ads in tow.

Carr returns to the important insight that Google is monetizing our logged Net time. Services provided for free are only free because they further enmesh us in the web, which gives Google profits in the long run. Carr emphasizes the monetization of efficiency to show how the proclaimed desires of Silicon Valley types to "make all information accessible" in fact may contain ulterior motives and unforeseen consequences.

The hunger to categorize all information can be seen in Google's "moon shot," or their aim to digitize all the books ever printed. Google's book project caused controversy, however, because they failed to pay authors for rights. The real notable significance of the project, Carr argues, is how Google measured the value of a book not as a work of art but as "another pile of data to be mined." The Google library represents, for Carr, the irony of the digital age's definition of efficiency. The technology of the book was more efficient than *scriptura continua*, freeing reader's minds for deeper thinking. Google's efficiency, however, frees the reader's mind to consume an increasing amount of shallower, bite-sized content.

Google's book project serves as an excellent microcosm for Carr to lay out what he believes to be the general intellectual ethic of the Internet. For Google and others, what one era used to see as a work of art is simply a pile of mineable (and thus, monetizable) data. While there are benefits to the book digitization project, Carr wants us to pick up on the trend towards categorization and compiling rather than thoughtful and meditative consumption.

To better explain Google's role, Carr turns his attention to the difference between two different philosophies about knowledge and enlightenment. Transcendentalism, as represented by Nathaniel Hawthorne and Ralph Waldo Emerson, proclaims that enlightenment is the result of introspection, solitude, and meditation. Transcendentalism was in conflict with the ethic of the Industrial Revolution, which placed a prevailing emphasis on efficiency. To put it another way, Transcendentalism opposed the idea that access to information, rather than contemplation, was the key to human development. A modern incarnation of the Industrial ethic opposed by the Transcendentalists can be found in Google.

Carr uses the Transcendental attitude to go deeper into what is at risk when we privilege efficiency over everything else. Transcendentalism, for Carr, is another way to access the meditative and subjective type of learning that is the hallmark of the literary mind. Saying that Google is an embodiment of the Industrial ethic is, similarly, another angle to look at the company's devotion to efficiency.

Carr makes clear that his issue is not with the accessibility to information provided by the Internet but with the lack of balance between meditative and efficiency-based modes of learning. Forced to adapt to Internet speeds and live in perpetual motion, we no longer know how to strike a balance that incorporates quiet, calm learning. Though more information is available to us than ever before, we don't have the Transcendentalist's skills––the knack for reflective depth––to make use of it.

Carr is careful to emphasize that he is not arguing for the elimination of all models of efficiency. What he calls for is a balance. The problem, however, is that the Net has already rid us of the skills necessary to strike that balance.

What this boils down to, for Carr, is a new definition of intelligence. It is telling that the prevalent metaphor today for brain function is a machine. If the brain is like a machine, then it makes sense to measure intelligence in terms of productivity––but this leads to a warped conception of the mind. A perfect example of this conception lies in the foundation of Google's desire to create AI: "What's disturbing about the company's founders is not their boyish desire to create an amazingly cool machine that will be able to outthink its creators, but the pinched conception of the human mind that gives rise to such a desire." Google and its executives hold fast to the Taylorist belief that intelligence is the result of a process that can be pinpointed and optimized just like the workings of a factory.

The type of intelligence promoted by Google is warped, Carr argues, because it measures itself by the signposts that make a good machine: Efficiency, productivity, and speed. Carr wants the reader to think about what it is, exactly, about computers that cause us to conflate human intelligence and machine intelligence––and whether we really asked for, or want, this new definition of a keen mind.

CHAPTER 9

To begin a conversation about memory, Carr returns to Plato's *Phaedrus*. In the *Phaedrus*, ancient orator Socrates warns that writing might cause people to be dependent on books and weaken their memories. Socrates' fear, as Italian novelist Umberto Eco points out, was a natural and ancient one, "an eternal fear: the fear that new technological achievement could abolish or destroy something that we consider precious, fruitful, something that represents for us a value in itself, and a deeply spiritual one." Socrates may have been right in part. However, Carr argues that books have historically freed people to chart an individual path of learning, and that books are responsible for man's heightened focus on individuality.

New technology frightens us because we are not sure what skills it might be replacing. In the case of books, the skill in question was the capacity of memory, but what we may have lost in memory, Carr argues, was worth it for the deepened individuality that books afforded us. Carr thus primes the reader to evaluate whether or not the "exchange" is also worth it when it comes to the Net.

What's more, reading has proven to actually improve rather than deaden memory. To display this point, Carr writes that the Dutch humanist Erasmus advised students to memorize notable passages from their books. For Erasmus, memorization was not a mechanical process but a way to synthesize or internalize knowledge that speaks to you. Memorization fell out of fashion with increasing technologies for knowledge storage, and in the age of the Internet, we have a seemingly endless external database. As *NYT* columnist David Brooks puts it, we have "outsourced" our memory, putting us in the strange position of having access to everything and knowing less than ever before.

Our fear of tampering with memory was a passing fad, as the Internet age embraced the idea of "outsourcing" mental space to computers. The implied question here is whether or not we should have retained those fears, and if our memory skills have, in fact, been hindered.

Carr turns his attention to the process of how memories are made. He begins by recalling scientist Eric Kandel, who demonstrated in the 1970s with his *Aplysia* experiments that synapses are altered by experience. Kandel, looking past the simple withdrawal of the slug's gill, wanted to investigate the underlying issue: How the brain was transforming experience into memories. In 1890, philosopher William James concluded there were two kinds of memories: primary memories, which we forget almost instantly, and secondary memories, which we can remember forever.

To investigate whether our memories have been affected by the Internet, Carr ventures to explain how the process of making memories works on a scientific level. He introduces the concept of primary and secondary memories to set the stage for explaining why we forget some things but remember others forever.

Studies on boxers who develop amnesia after blows to the head imply that even strong memories remain unstable after they are formed. Further research suggests that the brain requires a certain period of hours to "fix" a memory and transfer it from short-term to long-term. The process is delicate and any disruption can erase the memories forever. In fact, the storage of long-term memories, as proved by U Penn neurologist Louis Flexner, is *biological*, requiring the synthesis of new proteins, whereas the creation of short-term memories is not. Kandel's continued research on the sea slug, in which he traced the neuronal signals, not only proved that repetition of an action encourages the consolidation of a short-term memory into a long-term memory, but also cast light on Flexner's discovery. Kandel found that the creation of long-term memories stimulated growth of new synaptic terminals. In other words, the anatomy of the brain had to change in order to store the long-term memories, proving––as Kandel wrote in his 2006 memoir––that the anatomy of the brain is changed with learning.

Karr returns to Eric Kandel and his sea slugs to emphasize with a real world example how we retain knowledge. The takeaway here is that the process of memory making is both delicate and biological. The process is delicate because the brain requires time to transform a primary memory into a secondary memory. If the brain is interrupted, the memory is gone forever. Most importantly, the process requires the creation of new synaptic terminals––meaning that memories are anatomically located. Memories require protein creation, evidence which directly supports Carr's claim that the brain physically changes in response to stimuli.

Carr illuminates two other types of memories: implicit and explicit. Implicit memories are recalled automatically from the unconscious when doing a performative action like riding a bike. Explicit memories are recollections of facts and happenings in our past experienced in conscious working memory. Carr points out that the memories we are usually referring to when we talk about our memories—in this book and in general—are the explicit ones.

This segment serves as an introduction to the concept of working memory. The takeaway here is that working memory contains all the explicit facts and recollections in our conscious mind.

Carr notes that when storing explicit memories, or consolidating them into long-term memory, an ancient part of the brain called the hippocampus plays a pivotal role. In 1953 a man named Henry Molaison had part of his hippocampus removed to cure his epileptic seizure. Unfortunately, though his seizures stopped, Molaison was unable to remember many of his recent explicit memories and was no longer able to store new ones at all. His experience suggests that the hippocampus is the holding place for new memories. Once the memory is fully consolidated, it is sent to the cortex for secure storage––but the process can take years, explaining why so many of Molaison's memories vanished.

Molaison's seizures serve to emphasize how delicate the process of memory consolidation really is. Quite simply, the process of memory consolidation requires a "stay" for x amount of time in a part of the brain called the hippocampus before the memory is transferred to the cortex for long-term storage. By showing how disruption of this process hindered Molaison's ability to make new memories, Carr implies that other types of disruption could hinder our own processes of memory consolidation as well.

Carr's in-depth explanation of human memory consolidation serves to highlight the problems with an analogy that compares human memory to computer memory. Human memory, unlike computer memory, is alive––it is a biological process. Carr quotes Kobi Rosenblum, an extensive researcher on memory consolidation: "While an artificial brain absorbs information and immediately saves it in its memory, the human brain continues to process information long after it is received, and the quality of memories depends on how the information is processed."

This segment summarizes the above argument to prove how wildly inaccurate the comparison of computer memory is to human memory. Carr has proved with scientific evidence that memory is a biological process, meaning that our memories are alive and change over time. The contrast with static computer memory is clear, and casts doubt on whether "outsourcing" memory to computers is really the wisest choice.

The idea of outsourcing memory, then, Carr suggests, is invalid because memories have a unique history that changes each time we recall them. If a memory is brought back into working memory, it turns back into a short-term memory and so gains a new context. Biological memory is in a perpetual state of renewal, where memories change each time they are moved from one place in the brain to another. In contrast, computer memory is comprised of fixed items that always stay exactly the same, no matter how many times you move them back and forth. Also unlike a computer, the human brain has no storage cap. Our cognitive powers aren't constrained when we store new long-term memories and we can, conceivably, keep storing new ones forever. The idea, then, that online databases free our brains for intelligent thought by outsourcing memory is flawed because the two types of memory function so differently.

Once again, Carr emphasizes the differences between machine memory and human memory––but in this segment, he takes his argument further. The biological nature of memory undermines the claim that outsourcing memory to computers "frees up" the brain for more complex thought. As a result, we are forced to consider what benefits outsourcing memory to online databases and other Net locations really has, if it has benefits at all.

The Internet, in fact, places so much pressure on working memory that consolidation of long-term memories is obstructed. Consolidation of long-term memory depends on our level of attentiveness. As Kandel writes: "For a memory to persist, the incoming information must be thoroughly and deeply processed." If the working memory is overloaded and we are unable to attend to it, that information is released in a matter of seconds––meaning the Internet, by overloading working memory, is not helpful to the consolidation of long-term memory.

Carr returns to the concept of working memory to explain that not only does the Net lack the capacity to do the work of human memory, it actually hinders the very delicate consolidation process we do have. The influx of stimuli means we don't have enough time to bring the information from working memory into long term storage. This is, quite plainly, because we are too distracted to give any singular item the attention it needs to make the jump.

Worse yet, due to neuroplasticity, the more we use the Internet the more we train the brain to process information quickly but without attentive focus. We become, in other words, very good at forgetting and worse and worse at locking information into our biological memories. This creates a feedback loop in which our trained-to-forget memories rely increasingly on the Net's databases. Carr's point is that the connections of the Internet are not remotely as rich and complex as our own synaptic connections. As Carr puts it: "When we outsource our memory to a machine, we also outsource a very important part of our intellect and even our identity." What is at stake is the very nature of our identities. We risk becoming spread as thin as the Internet––becoming "pancake people"––without the complex internal architecture of personality taken as a given in the decades before we had such overwhelming access to knowledge.

In this segment Carr uses the micro problem of memory consolidation disruption when using the Internet and then shows us the big picture. The brain is plastic and learns from experience. As such, the more our memory consolidation is disrupted by lack-of-focus, the less our brains rely on our increasingly forgetful memories. Carr uses science to show how the fallacy of machine brains being like human brains affects our very identities. Increased reliance on Net databases not only accustoms our brains to being distracted, but the knowledge-incorporation-process that is the foundation of identity development is disturbingly limited.

Digression. Carr addresses the issue of how he was able to write this book at all in the age of distraction. Carr writes that at the beginning he struggled immensely, only able to write in spurts and constantly distracted by the Net. He made a drastic change in order to really get the work done and moved to an isolated house in the mountains of Colorado. There, Carr only had a slow DSL connection and no cell service. He canceled his social media connections and kept his email program turned off for the majority of the day. Dismantling his life on the Net caused definite withdrawal pains, but eventually Carr felt like his brain readjusted to literary thinking. He began to calm down and regained the ability to focus on his work.

In this digression, Carr outlines the lengths he had to go in the age of distraction––moving to Colorado, dismantling his accounts––to focus sufficiently to write this very book. Though it is possible to go off the grid, Carr is careful to admit that most people do not have this luxury. Work and social life often demand constant attention to digital devices. Carr's success in breaking away proves that however deep we've gone, the brain does *have the ability to bounce back.*

CHAPTER 10

Carr opens the chapter with Joseph Weizenbaum, an MIT computer scientist who invented a computer program in the sixties that could parse and respond to language. The program, called ELIZA, recognized speech templates and rephrased sentences in question form. ELIZA was modeled to have the personality of a psychotherapist. Strangely, despite the program's simplicity and obvious artifice, the program caught on. Weizenbaum was shocked by how ready people were to suspend disbelief and become "emotionally involved with the computer." Engaging with ELIZA was like a variation on Alan Turing's "Turing test," in which a person is engaged through the monitor with one computer and one person. In the Turing test, if the subject was not able to distinguish which user was human, then the computer program could be considered intelligent. Those who used ELIZA, on the other hand, knew their interlocutor was a program, and yet they wanted to believe it was real.

ELIZA, a computer program that masquerades as a therapist, calls into question what kind of relationship a user really wants with his or her machine. The fact that humans choose to become emotionally involved with programs they know logically are made by computers is, for Carr, a disturbing revelation. Carr opens the book's final chapter with ELIZA to set the stage for a discussion on our spiritual relationship to computer technology.

The public's reaction to ELIZA brought Weizenbaum to contemplate the fascinating question of why the intellectual technology of computers has made the idea of man as a machine so much more plausible. In his book, *Computer Power and Human Reason*, Weizenbaum suggests that intellectual technologies like the computer have become so important to our society that "they can no longer be factored out without fatally impairing the whole structure." Following the same pattern as past intellectual technologies, the enmeshment of the computer in our daily lives is a permanent commitment. Wiezenbaum's book was unpopular with fellow programmers, however, as it warned not only that AI science had major limits, but that we risked losing our humanity if we started trying to assign computers the tasks that make us most human––for example, tasks requiring wisdom.

Here Carr directly relays what has already been a common refrain throughout the book: Computer technology is thoroughly enmeshed in our lives. The extent to which we rely on computers has reached, quite seriously, a point of no return. Carr has illustrated this pattern with many intellectual technologies, and the Net is no different in the breadth and scope of its influence. His worry, once again, is that our fascination with creating artificial intelligence in machines like the computer is detrimental to our very humanity.

Carr explains that the human ability to meld with his tools is our distinguishing trait as a species. When the farmer raises his hammer, the brain reads the hammer as part of his hand. These bonds, Carr points out, go both ways. Tools both extend possibilities and constrict them. A hand holding a hammer can only be a tool for pounding nails. The same analogy can be applied to computers. Carr found that after a period of word processing he lost the knack for writing by hand. Indeed, cursive is disappearing from curriculums altogether. About this phenomenon of tools' two-way effects, Marshall McLuhan wrote that our tools numb whatever part of the body they "amplify." The numbing concept is not a new one. Carr suggests that the price we have always paid for technology's power is alienation. Even mapmaking diminished our internal navigational skills. Carr is not being dramatic but rather advising that, for each new intellectual technology, users make an honest investigation of what skills are being sensitized *and* what skills are being dimmed.

In this segment Carr builds on the idea that computer technology is affecting our identities. As we amplify our faculties with tools, we actually numb the ability in question. Here Carr harkens back once more to a historical pattern in which new technologies always come at a price. Something is dimmed for each thing that is sensitized. In the case of intellectual technologies, what is it we are really losing?

Carr brings up another fascinating reason for the ease with which our nervous systems merge with computers: social instinct. As humans have evolved, we have become increasingly social beings. A recent neuroimaging study revealed that we have brain regions dedicated to the act of "mind-reading," or trying to figure out what is going on in other people's heads. Harvard neuroscientist Jason Mitchell suggests that our high facility for detecting minds has, in the computer age, led to the perception of minds in inanimate objects. Our brains mimic the states of other brains we interact with, so not only are we quick to attribute human qualities to manmade machines, but we are prone to taking on machine qualities ourselves.

In this segment Carr gives us a possible explanation for why we seem so intent on merging with our intellectual technology. His argument, as it culminates here, is that we compare our brains to computers not because they are innately similar but because we are intensely social beings. Using scientific context, Carr urges us to see that identification with computers is a social phenomenon that could have unexpected consequences.

Reliance on highly efficient computer programs, Carr warns, actually can inhibit performance and intellectual choices. In a study done by Christoph van Nimwegan in 2003, two groups of volunteers were asked to solve a puzzle. One was given helpful software and the other unhelpful software. It was, in fact, the group with the unhelpful software that was able to solve the puzzle with fewest mistakes. Van Nimwegan suggests that outsourcing cognitive work reduces our personal ability to build knowledge structures.

Some of these consequences are pragmatically undesirable. As Carr points out in this segment, the studies of Nimwegan suggest that we actually are better problem solvers without the aid of technology because we are forced to build our own internal skills.

The focus on creating ever-more "user friendly" programs for computer users, in this light, does not bode well long-term for human depth of intelligence—especially because search programs place emphasis on the most prevalent, mainstream opinion. The fact that we no longer have to skim the lesser known articles to get to the one most relevant to our topic means we are being nudged constantly towards the most common point of view. Humans know that the easy way is not the best way but, as Carr warns, the easy road is the road search engines encourage us to take. Taylorism is a good analogy. After Taylor, workers in factories began to follow a script written by someone else rather than coming to their own unique conclusions. Computer programs can be useful and ingenious, but the process of creativity is a messy one that cannot be reduced into steps. Computer programs cause us to rely less on our intuition and more on pre-established routes and ideas.

Some of these consequences are existentially disturbing. Carr's ultimate point is that reliance on computer technology makes for a shallower type of intelligence. Creativity is a messy process, and computer technology and efficiency-centric Net software rob us of the journey to unique conclusions. What Carr is getting at here is that it is the personal journey which makes for the depth and complex architecture in our identities. All we are getting from databases are final answers, and they are likely to be more mainstream and uninventive than what we would have discovered unaided.

Carr brings the final chapter of *The Shallows* to a close with a callback to the Transcendentalist movement, this time using a scientific study that supports Transcendentalist ideas. In 2008, a team at U Michigan subjected two groups of people to tests designed to tax working memory and the ability to stay focused. They then had one group walk through the park and the other group walk through a busy city street. When re-tested, the group that walked through the park improved significantly, while the other group showed no improvement. The conclusion of the researchers was that "simple and brief interactions with nature can produce marked increases in cognitive control." On the Internet, there is no comparative oasis of restoration, but only the busy street.

Carr approaches the subject from both a scientific and a philosophical angle. Showing transcendentalist theory prevailing in a scientific study, Carr concludes that one simple reason why using the Net and computer technology diminishes creative ability is that we don't get that "break" from the artificial. Though we might feel like surfing a different website is a "break" from our work, studies suggest that interactions with physical nature actually refresh and improve our ability to stay focused. Once again, Carr suggests that the transcendentalists may have been right about more things than we give them credit for.

Carr points out that a quiet mind is not only necessary for deep thinking but also for complex human emotions like compassion. Antonio Damasio, director of USC's brain and Creativity Institute, completed studies showing how complex human emotions are inherently slow. Using neuroimaging, Damasio found that when a subject saw a fellow human experience physical pain, the brain activity was quick. In contrast, empathizing with psychological pain showed less activity, indicating that the process of empathy requires time to unfold. We need to "transcend immediate involvement of the body" to grasp the true moral dimensions of a situation. The experiment indicates that distraction impedes us from experiencing the most subtle (and human) forms of emotion. Carr suggests that not just our power to concentrate is diminished by the way the Net is rerouting the brain—our ability to form complex emotions is being hampered as well.

It's true that many are heartened by the change, excited that we are evolving to gain new multitasking skills and shedding abilities "perfected in an era of limited information flow." The writers in favor of these changes see these new cognitive habits as the only solution to navigating the digital age, but Carr does not find their arguments reassuring. He quotes philosopher Martin Heidegger, who observed in the 1950s that technology might "so captivate, bewitch, dazzle, and beguile man that calculative thinking may someday come to be accepted and practiced *as the only* way of thinking." The literary mind and its companion of meditative thinking––attributes historically considered the essence of humanity––may, Carr warns, fall victims to what bedazzled Net users call progress.

Carr's argument in this final chapter appeals to every aspect of humanity. In this segment he goes so far as to warn that the distracted state promoted by the internet could have moral consequences in the real world. Subtle emotions like empathy don't have the time to develop when we are in a state of Net-induced distraction. If the pragmatic consequences of poorer memory don't worry the reader, losing the ability to experience a full range of human emotions should do the trick. Carr, as we see at this point, is approaching again and again the same frightening idea that Net usage is diminishing many aspects of our humanity.

Here Carr makes his final appeal to the reader. His entire book has worked towards a singular warning: under the guise of progress, essential parts of our humanity are being lost. Having established that humanity's essence is located in our ability to complete tasks with quiet minds and meditative, creative thinking––in other words, to complete tasks with wisdom––the reader can see that a new definition of intelligence as calculative has usurped the older, "literary" view of identity. Carr's scientific context, historical patterning, and spiritual analysis culminate in the chilling conclusion that the Internet is not only changing our brains; it is also changing our identities, and there may be little we can do to stop it.

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