Hyper and Deep Attention: The Generational Divide in Cognitive Modes

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Networked and programmable media are part of a rapidly developing mediascape transforming how citizens of developed countries do business, conduct their social lives, communicate with one another, and—perhaps most significant—think. This essay explores the hypothesis that we are in the midst of a generational shift in cognitive styles that poses challenges to education at all levels, including colleges and universities. The younger the age group, the more pronounced the shift; it is already apparent in present-day college students, but its full effects are likely to be realized only when youngsters who are now twelve years old reach our institutions of higher education. To prepare, we need to become aware of the shift, understand its causes, and think creatively and innovatively about new educational strategies appropriate to the coming changes.

The shift in cognitive styles can be seen in the contrast between deep attention and hyper attention. Deep attention, the cognitive style traditionally associated with the humanities, is characterized by concentrating on a single object for long periods (say, a novel by Dickens), ignoring outside stimuli while so engaged, preferring a single information stream, and having a high tolerance for long focus times. Hyper attention is characterized by switching focus rapidly among different tasks, preferring multiple information streams, seeking a high level of stimulation, and having a low tolerance for boredom. The contrast in the two cognitive modes may be captured in an image: picture a college sophomore, deep in *Pride and*

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Prejudice, with her legs draped over an easy chair, oblivious to her ten-year-old brother sitting in front of a console, jamming on a joystick while he plays *Grand Theft Auto*. Each cognitive mode has advantages and limitations. Deep attention is superb for solving complex problems represented in a single medium, but it comes at the price of environmental alertness and flexibility of response. Hyper attention excels at negotiating rapidly changing environments in which multiple foci compete for attention; its disadvantage is impatience with focusing for long periods on a noninteractive object such as a Victorian novel or complicated math problem.

In an evolutionary context, hyper attention no doubt developed first; deep attention is a relative luxury, requiring group cooperation to create a secure environment in which one does not have to be constantly alert to danger. Developed societies, of course, have long been able to create the kind of environments conducive to deep attention. Educational institutions have specialized in these environments, combining such resources as quiet with an assigned task that demands deep attention to complete successfully. So standard has deep attention become in educational settings that it is the de facto norm, with hyper attention regarded as defective behavior that scarcely qualifies as a cognitive mode at all. This situation would present no problem if no generational shift from deep to hyper attention were taking place. But with the shift, serious incompatibilities arise between the expectations of educators, who are trained in deep attention and saturated with assumptions about its inherent superiority, and the preferred cognitive mode of young people, who squirm in the procrustean beds outfitted for them by their elders. We would expect a crisis, which would necessitate a reevaluation of the relative merits of hyper versus deep attention, serious reflection about how a constructive synthesis of the two might be achieved, and a thoroughgoing revision of educational methods. But I am getting ahead of my story. First let us look at the evidence that a generational shift from deep to hyper attention is in progress.

The Shift to Hyper Attention: Generation M

Anecdotal evidence from educators with whom I have spoken at institutions across the country confirms that students are tending toward hyper attention. During 2005–06 I had the privilege of serving as a Phi Beta Kappa Visiting Scholar, making three-day visits during which I gave lectures, conferred with faculty members, and talked with students. I repeatedly heard comments from faculty members like, "I can't get my students to read whole novels anymore, so I have taken to assigning short stories." When I queried students, there was a more or less even split between those who identified

with deep attention and those who preferred hyper attention, but all agreed that their younger siblings were completely into hyper attention.

Of course, one would not want to rely solely on such general impressions, so after my year was completed, I researched the topic. An obvious explanation for the shift, suggested by Steven Johnson among others, is the increasing role of media in the everyday environments of young people. The most authoritative study to date of the media habits of young people was commissioned by the Kaiser Family Foundation and reported in *Generation M: Media in the Lives of 8–18-Year-Olds*. The survey focused on a statistically representative sampling of 2,032 young people, 694 of whom were selected for more detailed study through the seven-day media diaries they were asked to keep. The results indicate that the average time young people spend with media per day is a whopping 6.5 hours—every day of the week, including school days. Because some of this time is spent consuming more than one form of media, the average time with media in general (adding together the various media sources) rises to 8.5 hours. Of this time, TV and DVD movies account for 3.51 hours; MP3, music CDs, and radio 1.44 hours; interactive media such as Web surfing 1.02 hours; and video games .49 hours. Reading brings up the rear with a mere .43 hours. The activity those of us in literary studies may take as normative—reading print books—is the media form to which our young people turn least often in their leisure time.

The report also asked about the context in which young people did their homework. Thirty percent reported that "most of the time" they did homework while attending to other media such as IM, TV, and music, and another 31% reported they did so "some of the time." Some or most of the time that young people are doing the tasks assigned by educators, then, they are multitasking, alternating homework with listening to music (33%), using computers (33%), reading (28%), and watching TV (24%). Alternating, I say, because psychological studies indicate that what we call multitasking is actually rapid alternation among different tasks (Rubinstein, Meyer, and Evans). These studies also indicate that efficiency declines so significantly with multitasking that it is more time-efficient to do several tasks sequentially than attempt to do them simultaneously. One is tempted to conclude that the strong preference young people show for multitasking must have another explanation than the presumptive one that it saves time; one possibility is a preference for high levels of stimulation.

Seeking stimulation is also associated with attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD).[1] Many people do not realize that Ritalin, the drug frequently prescribed for children with ADD and ADHD, is actually a cortical stimulant; when tranquilizers

were prescribed in the early days of testing ADD and ADHD children, their symptoms became worse. This counterintuitive result is explained by Les Linet, a child psychiatrist at Beth Israel Medical Center in New York City specializing in ADD and ADHD. Linet suggests that young people with AD/HD act as if their nervous system has somehow acquired a "shield," so that normal stimulation is felt as boredom and relatively high levels of stimulation are necessary for them to feel engaged and interested. AD/HD might more appropriately be named the "search for stimulation" disorder. The behaviors listed in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) as symptoms of AD/HD, such as failure to pay close attention to details, trouble keeping attention focused during play or tasks, and avoiding tasks that require a high amount of mental effort and organization such as school projects, should be understood, Linet argues, not as misbehavior but as the search for more stimulation than the assigned task yields. More stimulation can be obtained by looking out the window, fidgeting, breaking the rules by talking with other children, and so on.

AD/HD first appeared in the third edition of the manual (1980). It is important to understand that while a percentage range is typically assigned to the number of young people with AD/HD—usually given as 3%–5% (Natl. Inst. of Mental Health)—these data are based on the statistical determination that at least six of the fourteen behaviors listed for "inattentive" AD/HD or six of the eleven behaviors listed for "hyperactivity-impulsive" AD/HD in the manual cause significant impairment. Inevitably these judgments contain subjective elements. Children might have four or five of the behaviors and not be classified as AD/HD, although clearly they have tendencies in that direction. AD/HD should be understood, then, as a category occurring at the end of a spectrum that stretches from normal. Moreover, studies indicate that some children diagnosed as having AD/HD were misdiagnosed and should not be included in this category (LeFever, Arcona, and Antonuccio; Angold, Egger, and Costell; Marshall). Add to this complication controversies over whether AD/HD should be considered as a mental disorder at all, and the picture of a definitive category with clear-cut boundaries grows fuzzy indeed (Rafalovich; Hallahan and Kauffman).

My hypothesis can now be stated in terms that link it with AD/HD. The generational shift toward hyper attention can be understood as a shift in the mean toward the AD/HD end of the spectrum. It is often claimed that the percent of population with official AD/HD is constant over time; depending on the shape of the curve, the claim is not necessarily incompatible with a shift in the mean. We do know that the number of

people diagnosed with AD/HD is rising in most industrialized countries. While this rise may be a function of increasing awareness, there is enough disagreement over the accuracy of prevailing statistics to make the claim for a constant percentage debatable, to say the least. There is evidence that AD/HD has genetic causes related to dopamine transporters and perhaps to the brain's inability to produce dopamine (Swanson et al.). But genetic predispositions often express themselves with varying degrees of intensity depending on their interaction with environmental factors, so the role played by increased environmental stimulation remains unclear. Whatever the case with AD/HD, there is little doubt that hyper attention is on the rise and that it correlates with an increasing exposure to and desire for stimulation in general and stimulation by media in particular.

As the *Generation M* report observes, rising media consumption should be understood not so much as an absolute increase in the time spent with a given medium—youngsters were spending about as much time with media five years before, in 1999—as an increase in the variety and kinds of media as well as in the movement of media into kids' bedrooms, where kids consume it largely without parental participation or supervision (Kaiser Family Foundation). As Johnson convincingly argues, media content has also changed, manifesting an increased tempo of visual stimuli and an increased complexity of interwoven plots (61–106). A related point (that Johnson does not mention) is a decrease in the time required for an audience to respond to an image. In the 1960s it was common wisdom in the movie industry that an audience needed something like twenty seconds to recognize an image; today that figure is more like two or three seconds.[2] Films such as *Memento*, *Mulholland Drive*, *Time Code*, and others suggest that it is not only young people who have an increased appetite for high levels of visual stimulation. Although the tendency has been most thoroughly documented with the Generation M age group, the adult population is also affected, if to a lesser degree. Moreover, children younger than eight, which was the cutoff age for the *Generation M* study, are no doubt influenced even more deeply than their older compatriots.

Not without reason, then, have we been called the ADHD generation. Rumors abound that college and high school students take Ritalin, Dexedrine, and equivalent drugs to prepare for important examinations such as the SAT and GRE, finding that cortical stimulants help them concentrate. Surveys by two different research groups of medications taken in North Carolina and Virginia public schools find that Ritalin is being prescribed for children who do not fit the criteria for ADHD, with 5–7% misdiagnosed (Angold, Egger, and Costell; LeFever, Arcona, and Antonuccio). B. Vitiello speculates that the overuse of Ritalin may be because

parents press for it, finding that it helps their children do better in school. These results suggest that as the mean moves toward hyper attention rather than deep attention, compensatory tactics are employed to retain the benefits of deep attention through the artificial means of chemical intervention in cortical functioning.

How does media stimulation affect the brain? It is well known that the brain's plasticity is an inherent biological trait; human beings are born with their nervous systems ready to be reconfigured in response to the environment. While the number of neurons in the brain remains more or less constant throughout a lifetime, the number of synapses—the connections that neurons form to communicate with other neurons—is greatest at birth. Through a process known as synaptogenesis, a newborn infant undergoes a pruning process whereby the neural connections in the brain that are used strengthen and grow, while those that are not decay and disappear (Bear, Bear, Connors, and Paradiso 175–96). The evolutionary advantage of this pruning process is clear, for it bestows remarkable flexibility, giving human beings the power to adapt to widely differing environments. Although synaptogenesis is greatest in infancy, plasticity continues throughout childhood and adolescence, with some degree continuing even into adulthood. In contemporary developed societies, this plasticity implies that the brain's synaptic connections are coevolving with an environment in which media consumption is a dominant factor. Children growing up in media-rich environments literally have brains wired differently from those of people who did not come to maturity under that condition.

Evaluating precisely how this change should affect pedagogy requires careful analysis and attention to the ways in which different disciplines carry out their research. John Bruer, president of the James D. McDonnell Foundation, which funds cognitive neuroscientific research, has cautioned educators to distinguish between behavioral and cognitive research by psychologists on the one hand and brain research in neuroscience on the other. Whereas behavioral studies focus on observable actions, neuroscience is concerned with neural structures and processes in the brain. Bruer argues that while it is possible to bridge the gap between neuroscience and cognitive science, and also between cognitive science and education, trying to infer educational strategies from basic brain research is "a bridge too far," for it would require establishing correlations between microscopic neural patterns and such macroscopic behavior as students fidgeting in their seats ("Education"). As Bruer admits in his later writings, however, brain imaging studies are changing that situation, because they allow correlations between observable actions—what the subjects are doing at the time the image is taken—and metabolic processes in the brain ("In Search").

To my knowledge, there have been few imaging studies of the brain processes involved in video games and other interactive pursuits. Among these are studies by Michael Posner and his colleagues at Cornell University's Weill Medical College. The researchers measured the effect of video games on what psychologists call "executive attention," the ability to tune out distractions and pay attention only to relevant information—or, in the terms used here, the ability to develop deep attention. The researchers adapted computer exercises used to train monkeys for space travel, modifying them into games for four- and six-year-olds (Rudeda, Rothbart, Saccamanno, and Posner). For five days, the children progressed from a game involving moving a cat in and out of grass to more complicated tasks, including one that asked them to select the largest number while they were simultaneously given distracting and extraneous information. The children's brain activity was measured by electroencephalographs, and they were also given tests for attention and intelligence. Some children underwent genetic testing as well. The researchers discovered that the brains of the six-year-olds showed significant changes after the children played the computer games, compared with a control group that simply watched videos. (The four-year-olds showed little change, perhaps because the age at which children typically can handle multiple information streams usually occurs between four and six years old.) The results suggest that brain structure does change as a result of playing computer games at certain ages; they also suggest that media stimulation, if structured appropriately, may contribute to a synergistic combination of hyper and deep attention—a suggestion that has implications for pedagogy.

In addition, there is an extensive body of research that throws indirect light on this subject. By far the most research on media consumption and brain imaging patterns has been done on reading. It unequivocally shows distinctively different patterns in beginning, intermediate, and adult readers. In an fMRI (functional magnetic resonance imaging) study at the Georgetown University Medical Center designed to understand better the disorder called hyperlexia (in which someone focuses obsessively on letter forms while not necessarily comprehending content), it was found that in beginning readers the most activity occurs in the superior temporal cortex, the area of the brain associated with connecting sounds to letters (Turkeltaub, Flowers, Verbalis, Miranda, Gareau, and Eden; Turkeltaub, Gareau, Flowers, Zeffiro, and Eden). In experienced readers, the most active area was the frontal left brain, associated with the accumulated knowledge of spelling. For our purposes, the details of these patterns are less important than their overall import: reading is a powerful technology for reconfiguring activity patterns in the brain. When reading is introduced

at an early age, as it customarily is in developed societies, it is likely that the process of learning to read—progressing from a beginning to an experienced reader—contributes significantly to how synaptogenesis proceeds. In media-rich environments, where reading is a minor activity compared to other forms of media consumption, one would expect that the processes of synaptogenesis would differ significantly from those in media-constrained environments in which reading is the primary activity.

Whether the synaptic reconfigurations associated with hyper attention are better or worse than those associated with deep attention cannot be answered in the abstract. The riposte is obvious: Better for what? A case can be made that hyper attention is more adaptive than deep attention for many situations in contemporary developed societies. Think, for example, of the air traffic controller who is watching many screens at once and must be able to change tasks quickly without losing track of any of them. Surely in such a job hyper attention would be an asset. One can argue that these kinds of situations are increasing more rapidly than those that call for deep attention, from the harassed cashier at McDonald's to currency traders in the elite world of international finance. The speculation that hyper attention is increasingly adaptive in contemporary society is highlighted in Bruce Sterling's novel *Distraction*, in which the problematic next step in human evolution is envisioned as a chemically induced transformation of the brain that allows the two hemispheres to operate independently of each other, turning the brain into a massively parallel organ capable of true multitasking. While such ideas remain in the realm of science fiction, it is not far-fetched to imagine that the trend toward hyper attention represents the brain's cultural coevolution in coordination with high-speed, information-intensive, and rapidly changing environments that make flexible alternation of tasks, quick processing of multiple information streams, and a low threshold for boredom more adaptive than a preference for concentrating on a single object to the exclusion of external stimuli.

What about young people totally into hyper attention who nevertheless spend long periods playing a video game, intent on mastering all its complexities until they reach the highest level of proficiency? The key to this apparent paradox lies in the game's interactivity, specifically its ability to offer rewards while maintaining high levels of stimulation. As Johnson convincingly argues, video games are structured to engage the player in competing for an escalating series of rewards (176–78), thus activating the same dopamine (pleasure-giving) cycle in the brain responsible for other addictive pursuits such as gambling. But the dopamine cycle is not the whole story. A study conducted by Richard Ryan and his colleagues at the University of Rochester, in collaboration with the company Immersyve,

asked a thousand gamers what motivates them to continue playing (Ryan, Rigby, and Przybylski). The results indicate that the gamers found the opportunities offered by the games for achievement, freedom, and in some instances connections to other players even more satisfying than the fun of playing. Stimulation works best, in other words, when it is associated with feelings of autonomy, competence, and relatedness—a conclusion with significant implications for pedagogy. Moreover, James Paul Gee convincingly argues that video games encourage active critical learning and indeed are structured so that the player is required to learn in order to progress to the next level. The lesson has not been lost on the Federation of American Scientists, which commissioned a task force on educational games. The task force concluded that video games teach skills critical to productive employment in an information-rich society. In a similar vein, there is growing interest in "serious games" (Shaffer, Squire, Halverson, and Gee), in which the reward structure can be harnessed for the study of the sciences and social sciences, the report's main concerns. As the next section argues, the program can be extended to the humanities as well.

The trend toward hyper attention will almost certainly accelerate as the years pass and the age demographic begins to encompass more people of Generation M. As students move deeper into the mode of hyper attention, educators face a choice: change the students to fit the educational environment or change that environment to fit the students. At the extreme end of the spectrum represented by ADHD, it may be appropriate to change the young people, but surely the environment needs to change as well. What strategies might be useful in meeting this challenge? How can the considerable benefits of deep attention be cultivated in a generation of students who prefer a high level of stimulation and have a low threshold for boredom? How should the physical layout of an educational environment be rethought? With the trend toward hyper attention already evident in colleges and universities, these issues are becoming urgent concerns. Digital media offer important resources in facing the challenge, both in the ways they allow classroom space to be reconfigured and the opportunities they offer for building bridges between deep and hyper attention.

Hyper Attention and the Challenge to Higher Education

An interactive classroom at the University of Southern California, under the direction of Scott Fisher, functions as a laboratory to explore new pedagogical models that provide greater stimulation than the typical classroom, including more possibilities for interactions among participants. Fourteen large screens span the walls, providing display space for

input controlled by wireless laptop computers scattered around a large conference table. One mode of interaction is "*Google* jockeying": while a speaker is making a presentation, participants search the Web for appropriate content to display on the screens—for example, sites with examples, definitions, images, or opposing views. Another mode of interaction is "backchanneling," in which participants type in comments as the speaker talks, providing running commentary on the material being presented (Hall and Fisher).

The laboratory's archives, chronicled at Fisher's Web site, provide a record of the various experiments (Fisher); they show the participants struggling to find appropriate configurations that will enhance rather than undermine the educational mission. One participant comments that in backchanneling, "The speaker function becomes more about seeding ideas and opening up discussion," indicating that in such an environment, lecturing is less about a one-way transmission of information and more about providing a framework to which everyone contributes. Other comments suggest that the participants share responsibility for the insightfulness of the comments they post. As one participant comments, the interactive environment "challenges the audience to pay attention; it challenges the speaker to hold attention; perhaps it pushes everyone to . . . interact towards a shared goal." While the archives give the sense that the perfect configuration has yet to emerge, they convey a lively sense of experimentation and a willingness to reconceive the educational mission so that everyone, teachers and students, bears equal responsibility for its success.

Other experiments might try enhancing the capacity for deep attention by starting with hyper attention and moving toward more traditional objects of study. One of the difficult and complex texts I like to teach, for example, is *The Education of Henry Adams*. Suffused with dry wit and stuffed with historical details, this text is an object, if ever there was one, that demands deep attention. Imagine a course that begins by studying strategies of self-presentation at the wildly popular *Facebook*, including naiveté, deception, ironic juxtaposition, competition, cooperation, betrayal, and compelling narrative. This introduction provides a rich context in which the sly and subversive self-presentations in *The Education of Henry Adams* can be analyzed, including an assignment that asks students to compose *Facebook* entries for the book's ironic persona.

A similar experiment might be tried with the popular computer game *Riven* and William Faulkner's formidably complex novel *Absalom, Absalom!* Like the novel, *Riven* unfolds through geographically marked territory, five islands in which brothers compete for dominance. Whereas in *Riven* access to the narrative can be gained only by solving the game's myriad

puzzles, in *Absalom Absalom!* the narrative is accessible through the trivial device of turning pages. Nevertheless, understanding Faulkner's narrative requires solving multiple puzzles of identity, motivation, and desire. The juxtaposition invites comparison with the hyper attentive mode of interactive game play, where the emphasis falls on exploring and remembering crucial clues embedded in a reward structure keyed to gaining access to the next level of play. With Faulkner's novel, the deep attentive mode of rhetorical complexity, temporal discontinuity, and diverse focalization is coupled with the subtle cognitive reward of constructing large-scale patterns in which these can fit.

A somewhat different configuration emerges from juxtaposing Emily Short's interactive fiction *Galatea* with Richard Powers's novel *Galatea 2.2*. Both works feature a gendered artificial intelligence with which the player's character (in the interactive fiction) and the protagonist (in the print novel) interact, respectively. Whereas the challenge in Short's *Galatea* is to engage the artificial intelligence in realistic conversation to understand her backstory, motivations, and psychology, the challenge in Powers's fiction is to use the interactions of the protagonist, named Rick Powers, with the artificial intelligence Helen to understand his backstory, motivations, and psychology.

In Short's interactive fiction, Galatea is visualized as an animated statue with whom the player's character can interact by conversing. If transitions in the conversation are too abrupt or unrelated to previous comments, the statue turns her back to the player's character and refuses to engage in further intercourse. Access to Galatea depends, then, on creating realistic ways to advance the conversation without alienating her. In Powers's novel, the climax turns on the protagonist's giving Helen information that alienates her from the world into which she, as an entity with a profoundly different embodiment than humans, has been dropped halfway. Whereas the interest in *Galatea* lies in discovering the complexity of Galatea's responses, which typically vary with each game play and spring from the sophisticated coding of the game engine algorithm, in *Galatea 2.2* the words remain the same but their meaning varies depending on how the characters' actions are interpreted. These differences notwithstanding, the challenge implicit in both works is for the reader or player to understand the personae through narration, a perspective that brings into view common ground between hyper and deep attention.

As these examples show, critical interpretation is not above or outside the generational shift of cognitive modes but necessarily located within it, increasingly drawn into the matrix by engaging with works that instantiate the cognitive shift in their aesthetic strategies. Whether inclined

toward deep or hyper attention, toward one side or another of the generational divide separating print from digital culture, we cannot afford to ignore the frustrating, zesty, and intriguing ways in which the two cognitive modes interact. Our responsibilities as educators, not to mention our position as practitioners of the literary arts, require nothing less.

NOTES

1. *Attention deficit disorder* (ADD), the older terminology, has been replaced by the newer diagnostic terminology of *attention deficit hyperactivity disorder* (ADHD), which is divided into three categories: predominantly inattentive, predominantly hyperactive-impulsive, and combined inattentive and hyperactive-impulsive. *ADD* is no longer regarded as a properly diagnostic term. Because it still circulates in the culture, however, *AD/HD* has been adopted to refer to both older and newer terms.

2. This information is according to Alexander Singer, a noted Hollywood film and television director. Rita Raley remarks on the same phenomenon when in her classes she uses the indoctrination scenes from the 1974 film *The Parallax View* to demonstrate how slow the images are by contemporary standards.

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