Cognitive Processes Psychology 309a

Readings and Notes Winter 2011



Part 2: Individual Cognition

Lecture 9 Attention

With today's lecture we begin the second part of the course. In Part 2 we move away from considering basic issues of cognitive representation and instead start looking at more active aspects of cognition, and in particular, how we pay attention to things and how we think.

The article for today, *Blind to Change, Even as It Stares Us in the Face*, introduces several ideas foundational to attention via consideration of *change blindness*. First, it raises the issue of how we never really see everything at once. Rather, we pay attention to some things and ignore others, and it's at this level that attention can be considered an "active" process, in that we're always "selecting" something to pay attention to. Second, it nicely discusses how attentional selection itself can be driven by either "bottom-up" or "top-down" factors. These are critical points to pull out of the article.

We'll emphasize the above ideas in lecture by looking at a few examples of how what you think and know influences what you see or pay attention to in the visual world.

In lecture we'll explore another idea that falls out of today's reading. To the point, one key way attention operates in a "top-down" manner is by what we *expect* to happen. In other words, our expectancies about the world play a huge role in what we end up paying attention to. In this context the idea of change blindness is perhaps not surprising, in that what we tend to be blind to are things that we don't really expect to change.

The New York Times

April 1, 2008

BASICS Blind to Change, Even as It Stares Us in the Face By NATALIE ANGIER

Leave it to a vision researcher to make you feel like Mr. Magoo.

When Jeremy Wolfe of Harvard Medical School, speaking last week at a symposium devoted to the crossover theme of Art and Neuroscience, wanted to illustrate how the brain sees the world and how often it fumbles the job, he naturally turned to a great work of art. He flashed a slide of <u>Ellsworth Kelly</u>'s "Study for Colors for a Large Wall" on the screen, and the audience couldn't help but perk to attention. The checkerboard painting of 64 black, white and colored squares was so whimsically subtle, so poised and propulsive. We drank it in greedily, we scanned every part of it, we loved it, and, whoops, time for a test.

Dr. Wolfe flashed another slide of the image, this time with one of the squares highlighted. Was the highlighted square the same color as the original, he asked the audience, or had he altered it? Um, different. No, wait, the same, definitely the same. That square could not now be nor ever have been anything but swimming-pool blue ... could it? The slides flashed by. How about this mustard square here, or that denim one there, or this pink, or that black? We in the audience were at sea and flailed for a strategy. By the end of the series only one thing was clear: We had gazed on Ellsworth Kelly's masterpiece, but we hadn't really seen it at all.

The phenomenon that Dr. Wolfe's Pop Art quiz exemplified is known as change blindness: the frequent inability of our visual system to detect alterations to something staring us straight in the face. The changes needn't be as modest as a switching of paint chips. At the same meeting, held at the Italian Academy for Advanced Studies in America at <u>Columbia University</u>, the audience failed to notice entire stories disappearing from buildings, or the fact that one poor chicken in a field of dancing cartoon hens had suddenly exploded. In an interview, Dr. Wolfe also recalled a series of experiments in which pedestrians giving directions to a <u>Cornell</u> researcher posing as a lost tourist didn't notice when, midway through the exchange, the sham tourist was replaced by another person altogether.

Beyond its entertainment value, symposium participants made clear, change blindness is a salient piece in the larger puzzle of visual attentiveness. What is the difference between seeing a scene casually and automatically, as in, you're at the window and you glance outside at the same old streetscape and nothing registers, versus the focused seeing you'd do if you glanced outside and noticed a sign in the window of your favorite restaurant, and oh no, it's going out of business because, let's face it, you always have that Typhoid Mary effect on things. In both cases the same sensory information, the same photonic stream from the external world, is falling on the retinal tissue of your eyes, but the information is processed very differently from one eyeful to the next. What is that difference? At what stage in the complex circuitry of sight do attentiveness and awareness arise, and what happens to other objects in the visual field once a particular object has been designated worthy of a further despairing stare?

Visual attentiveness is born of limited resources. "The basic problem is that far more information lands on your eyes than you can possibly analyze and still end up with a reasonable sized brain," Dr. Wolfe said. Hence, the brain has evolved mechanisms for combating data overload, allowing large rivers of data to pass along optical and cortical corridors almost entirely unassimilated, and peeling off selected data for a close, careful view. In deciding what to focus on, the brain essentially shines a spotlight from place to place, a rapid, sweeping search that takes in maybe 30 or 40 objects per second, the survey accompanied by a multitude of body movements of which we are barely aware: the darting of the eyes, the constant tiny twists of the torso and neck. We scan and sweep and perfunctorily police, until something sticks out and brings our bouncing cones to a halt.

The mechanisms that succeed in seizing our sightline fall into two basic classes: bottom up and top down. Bottom-up attentiveness originates with the stimulus, with something in our visual field that is the optical equivalent of a shout: a wildly waving hand, a bright red object against a green field. Bottom-up stimuli seem to head straight for the brainstem and are almost impossible to ignore, said Nancy Kanwisher, a vision researcher at <u>M.I.T.</u>, and thus they are popular in Internet ads.

Top-down attentiveness, by comparison, is a volitional act, the decision by the viewer that an item, even in the absence of flapping parts or strobe lights, is nonetheless a sight to behold. When you are looking for a specific object — say, your black suitcase on a moving baggage carousel occupied largely by black suitcases — you apply a top-down approach, the bouncing searchlights configured to specific parameters, like a smallish, scuffed black suitcase with one broken wheel. Volitional attentiveness is much trickier to study than is a simple response to a stimulus, yet scientists have made progress through improved brain-scanning technology and the ability to measure the firing patterns of specific neurons or the synchronized firing of clusters of brain cells.

Recent studies with both macaques and humans indicate that attentiveness crackles through the brain along vast, multifocal, transcortical loops, leaping to life in regions at the back of the brain, in the primary visual cortex that engages with the world, proceeding forward into frontal lobes where higher cognitive analysis occurs, and then doubling back to the primary visual centers. En route, the initial signal is amplified, italicized and annotated, and so persuasively that the boosted signal seems to emanate from the object itself. The enhancer effect explains why, if you've ever looked at a crowd photo and had somebody point out the face of, say, a young <u>Franklin Roosevelt</u> or <u>George</u> <u>Clooney</u> in the throng, the celebrity's image will leap out at you thereafter as though lighted from behind.

Whether lured into attentiveness by a bottom-up or top-down mechanism, scientists said, the results of change blindness studies and other experiments strongly suggest that the visual system can focus on only one or very few objects at a time, and that anything lying outside a given moment's cone of interest gets short shrift. The brain, it seems, is a master at filling gaps and making do, of compiling a cohesive portrait of reality based on a flickering view.

"Our spotlight of attention is grabbing objects at such a fast rate that introspectively it feels like you're recognizing many things at once," Dr. Wolfe said. "But the reality is that you are only accurately representing the state of one or a few objects at any given moment." As for the rest of our visual experience, he said, it has been aptly called "a grand illusion." Sit back, relax and enjoy the movie called You.

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Lecture 10 Priming

The lecture for today begins our transition into discussing aspects of cognition that occur outside conscious awareness. What we focus on today in particular is the idea of *priming*, where what you see, hear, think, or feel can automatically trigger thoughts and behaviors without you being aware that it's happening.

Consider the first article for today, *Need a Creative Boost? Find the Blue Room*. Here we learn about some work recently done at UBC wherein people working on computers with blue desktop backgrounds ended up testing as more creative, relative to people who had been working on computers with red desktop backgrounds, people who tested better on attention to detail assessments, relative to their bluebackground peers.

At the core of these effects is priming, where a colour, for example, can "prime" you to be more creative or more careful. In lecture, we'll look at cognitive models of how this all works, models referred to as "semantic association networks."

In the second article for today, *Who's Minding the Mind?*, these basic ideas are further reinforced. Of interest here are two things: What brain systems appear to be involved in unconscious priming, and how priming can explain a variety of everyday kinds of experiences we have, such as good moods changing to bad, or whether or not we may feel generous at any given moment.

The New Hork Cimes

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February 6, 2009

Need a Creative Boost? Find the Blue Room.

By PAM BELLUCK

Trying to improve your performance at work or write that novel? Maybe it's time to consider the color of your walls or your computer screen.

If a new study is any guide, the color red can make people's work more accurate, and blue can make people more creative.

In <u>the study</u>, published Thursday on the Web site of the journal Science, researchers at the University of British Columbia conducted tests with 600 people to determine whether cognitive performance varied when people saw red or blue. Participants performed tasks with words or images displayed against red, blue or neutral backgrounds on computer screens.

Red groups did better on tests of recall and attention to detail, like remembering words or checking spelling and punctuation. Blue groups did better on tests requiring imagination, like inventing creative uses for a brick or creating toys from shapes.

"If you're talking about wanting enhanced memory for something like proofreading skills, then a red color should be used," said Juliet Zhu, an assistant professor of marketing at the business school at the University of British Columbia, who conducted the study with Ravi Mehta, a doctoral student.

But for "a brainstorming session for a new product or coming up with a new solution to fight child <u>obesity</u> or teenage <u>smoking</u>," Dr. Zhu said, "then you should get people into a blue room."

The question of whether color can color performance or emotions has fascinated scientists, not to mention advertisers, sports teams and restaurateurs.

In <u>a study on Olympic uniforms</u>, anthropologists at Durham University in England found that evenly matched athletes in the 2004 Games who wore red in boxing, tae kwon do, Greco-Roman wrestling and freestyle wrestling defeated those wearing blue 60 percent of the time. The researchers suggested that red, for athletes as for animals, subconsciously symbolizes dominance.

Effects that were perhaps similarly primal were revealed in a 2008 study led by Andrew Elliot of the <u>University of Rochester</u>. Men considered <u>women shown in photographs with red backgrounds</u> or wearing red shirts more attractive than women with other colors, although not necessarily more likeable or intelligent.

Then there was <u>the cocktail party study</u>, in which a group of interior designers, architects and corporate color scientists built model rooms decorated as bars in red, blue or yellow. They found that more people chose the yellow and red rooms, but that partygoers in the blue room stayed longer. Red and yellow guests were more social and active. And while red guests reported feeling hungrier and thirstier than others, yellow guests ate twice as much. Experts say colors may affect cognitive performance because of the moods they engender.

"When you feel that the situation you are in is problematic," said Norbert Schwarz, a <u>psychology</u> professor at the <u>University of</u> <u>Michigan</u>, "you are more likely to pay attention to detail, which helps you with processing tasks but interferes with creative types of things."

By contrast, Dr. Schwarz said, "people in a happy mood are more creative and less analytic."

Many people link red to problematic things, like emergencies or X's on failing tests, experts say. Such "associations to red - stop, fire, alarm, warning - can be activated without a person's awareness, and then influence what they are thinking about or doing," said John A. Bargh, a psychology professor at <u>Yale University</u>. "Blue seems a weaker effect than red, but blue skies, blue water are calm and positive, and so that effect makes sense too."

Still, Dr. Schwarz cautioned, color effects may be unreliable or inconsequential. "In some contexts red is a dangerous thing, and in some contexts red is a nice thing," he said. "If you're walking across a frozen river, blue is a dangerous thing."

Indeed, Dr. Elliot of the University of Rochester said blue's positive emotional associations were considered less consistent than red's negative ones.

It might also matter whether the color dominates someone's view, as on a computer screen, or is only part of what is seen. Dr. Elliot said that in the Science study, brightness or intensity of color - not just the color itself - might have had an effect.

Some previous cognitive studies found no effect from color, although some used mostly pastels or less distinctive tasks. <u>One found</u> <u>that students taking tests</u> did better on blue paper than on red, but <u>Dr. Schwarz said the study used depressing blue and upbeat</u> red.

The Science study's conclusion that red makes people more cautious and detail-oriented coincides with Dr. Elliot's finding that <u>people shown red test covers before I.Q. tests</u> did worse than those shown green or neutral colors. And on a different test, people with red covers also chose easier questions. I.Q. tests require more problem-solving than Dr. Zhu's memory and proofreading questions.

When Dr. Zhu's subjects were asked what red or blue made them think of, most said that red represented caution, danger or mistakes, and that blue symbolized peace and openness. Subjects were quicker to unscramble anagrams of "avoidance related" words like "danger" when the anagrams were on red backgrounds, and quicker with anagrams of positive, "approach related" words like "adventure" when they were on blue backgrounds.

The study also tested responses to advertising, finding that advertisements listing product details or emphasizing "avoidance" actions like cavity prevention held greater appeal on red backgrounds, while ones using creative designs or emphasizing positive actions like "tooth whitening" held more appeal on blue.

When the participants were asked if they believed red or blue would improve performance, most said blue for both detail-oriented and creative tasks. Maybe, Dr. Zhu said, that is because more people prefer blue.

The study did not involve different cultures, like China, where red symbolizes prosperity and luck. And it said nothing about

mixing red and blue to make purple.

For what it's worth, many newsroom walls at The New York Times are bright tomato-soup red. The newspaper's facilities department says there are no blue rooms in the place.

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July 31, 2007

Who's Minding the Mind?

By BENEDICT CAREY

In a recent experiment, psychologists at Yale altered people's judgments of a stranger by handing them a cup of coffee.

The study participants, college students, had no idea that their social instincts were being deliberately manipulated. On the way to the laboratory, they had bumped into a laboratory assistant, who was holding textbooks, a clipboard, papers and a cup of hot or iced coffee - and asked for a hand with the cup.

That was all it took: The students who held a cup of iced coffee rated a hypothetical person they later read about as being much colder, less social and more selfish than did their fellow students, who had momentarily held a cup of hot java.

Findings like this one, as improbable as they seem, have poured forth in psychological research over the last few years. New studies have found that people tidy up more thoroughly when there's a faint tang of cleaning liquid in the air; they become more competitive if there's a briefcase in sight, or more cooperative if they glimpse words like "dependable" and "support" — all without being aware of the change, or what prompted it.

Psychologists say that "priming" people in this way is not some form of hypnotism, or even subliminal seduction; rather, it's a demonstration of how everyday sights, smells and sounds can selectively activate goals or motives that people already have.

More fundamentally, the new studies reveal a subconscious brain that is far more active, purposeful and independent than previously known. Goals, whether to eat, mate or devour an iced latte, are like neural software programs that can only be run one at a time, and the unconscious is perfectly capable of running the program it chooses.

The give and take between these unconscious choices and our rational, conscious aims can help explain some of the more mystifying realities of behavior, like how we can be generous one moment and petty the next, or act rudely at a dinner party when convinced we are emanating charm.

"When it comes to our behavior from moment to moment, the big question is, 'What to do next?' " said John A. Bargh, a professor of psychology at Yale and a co-author, with Lawrence Williams, of the coffee study, which was presented at a recent psychology conference. "Well, we're finding that we have these unconscious behavioral guidance systems that are continually furnishing suggestions through the day about what to do next, and the brain is considering and often acting on those, all before conscious awareness."

Dr. Bargh added: "Sometimes those goals are in line with our conscious intentions and purposes, and sometimes they're not."

Priming the Unconscious

The idea of subliminal influence has a mixed reputation among scientists because of a history of advertising hype and apparent fraud. In 1957, an ad man named James Vicary claimed to have increased sales of Coca-Cola and popcorn at a movie theater in Fort Lee, N.J., by

secretly flashing the words "Eat popcorn" and "Drink Coke" during the film, too quickly to be consciously noticed. But advertisers and regulators doubted his story from the beginning, and in a 1962 interview, Mr. Vicary acknowledged that he had trumped up the findings to gain attention for his business.

Later studies of products promising subliminal improvement, for things like memory and self-esteem, found no effect.

Some scientists also caution against overstating the implications of the latest research on priming unconscious goals. The new research "doesn't prove that consciousness never does anything," wrote Roy Baumeister, a professor of psychology at <u>Florida State University</u>, in an e-mail message. "It's rather like showing you can hot-wire a car to start the ignition without keys. That's important and potentially useful information, but it doesn't prove that keys don't exist or that keys are useless."

Yet he and most in the field now agree that the evidence for psychological hot-wiring has become overwhelming. In one 2004 experiment, psychologists led by Aaron Kay, then at <u>Stanford University</u> and now at the University of Waterloo, had students take part in a one-on-one investment game with another, unseen player.

Half the students played while sitting at a large table, at the other end of which was a briefcase and a black leather portfolio. These students were far stingier with their money than the others, who played in an identical room, but with a backpack on the table instead.

The mere presence of the briefcase, noticed but not consciously registered, generated business-related associations and expectations, the authors argue, leading the brain to run the most appropriate goal program: compete. The students had no sense of whether they had acted selfishly or generously.

In another experiment, published in 2005, Dutch psychologists had undergraduates sit in a cubicle and fill out a questionnaire. Hidden in the room was a bucket of water with a splash of citrus-scented cleaning fluid, giving off a faint odor. After completing the questionnaire, the young men and women had a snack, a crumbly biscuit provided by laboratory staff members.

The researchers covertly filmed the snack time and found that these students cleared away crumbs three times more often than a comparison group, who had taken the same questionnaire in a room with no cleaning scent. "That is a very big effect, and they really had no idea they were doing it," said Henk Aarts, a psychologist at Utrecht University and the senior author of the study.

The Same Brain Circuits

The real-world evidence for these unconscious effects is clear to anyone who has ever run out to the car to avoid the rain and ended up driving too fast, or rushed off to pick up dry cleaning and returned with wine and cigarettes — but no pressed slacks.

The brain appears to use the very same neural circuits to execute an unconscious act as it does a conscious one. In a study that appeared in the journal Science in May, a team of English and French neuroscientists performed brain imaging on 18 men and women who were playing a computer game for money. The players held a handgrip and were told that the tighter they squeezed when an image of money flashed on the screen, the more of the loot they could keep.

As expected, the players squeezed harder when the image of a British pound flashed by than when the image of a penny did — regardless of whether they consciously perceived the pictures, many of which flew by subliminally. But the circuits activated in their brains were similar as well: an area called the ventral pallidum was particularly active whenever the participants responded.

"This area is located in what used to be called the reptilian brain, well below the conscious areas of the brain," said the study's senior author, Chris Frith, a professor in neuropsychology at University College London who wrote the book "Making Up The Mind: How the Brain Creates our Mental World."

The results suggest a "bottom-up" decision-making process, in which the ventral pallidum is part of a circuit that first weighs the reward and decides, then interacts with the higher-level, conscious regions later, if at all, Dr. Frith said.

Scientists have spent years trying to pinpoint the exact neural regions that support conscious awareness, so far in vain. But there's little doubt it involves the prefrontal cortex, the thin outer layer of brain tissue behind the forehead, and experiments like this one show that it can be one of the last neural areas to know when a decision is made.

This bottom-up order makes sense from an evolutionary perspective. The subcortical areas of the brain evolved first and would have had to help individuals fight, flee and scavenge well before conscious, distinctly human layers were added later in evolutionary history. In this sense, Dr. Bargh argues, unconscious goals can be seen as open-ended, adaptive agents acting on behalf of the broad, genetically encoded aims - automatic survival systems.

In several studies, researchers have also shown that, once covertly activated, an unconscious goal persists with the same determination that is evident in our conscious pursuits. Study participants primed to be cooperative are assiduous in their teamwork, for instance, helping others and sharing resources in games that last 20 minutes or longer. Ditto for those set up to be aggressive.

This may help explain how someone can show up at a party in good spirits and then for some unknown reason — the host's loafers? the family portrait on the wall? some political comment? — turn a little sour, without realizing the change until later, when a friend remarks on it. "I was rude? Really? When?"

Mark Schaller, a psychologist at the University of British Columbia, in Vancouver, has done research showing that when self-protective instincts are primed — simply by turning down the lights in a room, for instance — white people who are normally tolerant become unconsciously more likely to detect hostility in the faces of black men with neutral expressions.

"Sometimes nonconscious effects can be bigger in sheer magnitude than conscious ones," Dr. Schaller said, "because we can't moderate stuff we don't have conscious access to, and the goal stays active."

Until it is satisfied, that is, when the program is subsequently suppressed, research suggests. In one 2006 study, for instance, researchers had <u>Northwestern University</u> undergraduates recall an unethical deed from their past, like betraying a friend, or a virtuous one, like returning lost property. Afterward, the students had their choice of a gift, an antiseptic wipe or a pencil; and those who had recalled bad behavior were twice as likely as the others to take the wipe. They had been primed to psychologically "cleanse" their consciences.

Once their hands were wiped, the students became less likely to agree to volunteer their time to help with a graduate school project. Their hands were clean: the unconscious goal had been satisfied and now was being suppressed, the findings suggest.

What You Don't Know

Using subtle cues for self-improvement is something like trying to tickle yourself, Dr. Bargh said: priming doesn't work if you're aware of it. Manipulating others, while possible, is dicey. "We know that as soon as people feel they're being manipulated, they do the opposite; it backfires," he said. And researchers do not yet know how or when, exactly, unconscious drives may suddenly become conscious; or under which circumstances people are able to override hidden urges by force of will. Millions have quit <u>smoking</u>, for instance, and uncounted numbers have resisted darker urges to misbehave that they don't even fully understand.

Yet the new research on priming makes it clear that we are not alone in our own consciousness. We have company, an invisible partner who has strong reactions about the world that don't always agree with our own, but whose instincts, these studies clearly show, are at least as likely to be helpful, and attentive to others, as they are to be disruptive.

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Lecture 11 Implicit Learning

In Lecture 11 we continue our exploration of unconscious aspects of cognition by looking at *implicit learning*, or the ability we have to gain knowledge without awareness.

We'll start lecture by considering one of the classic forms of implicit learning we all possess—the ability to learn our way around a location spatially, such as a building, town, or city. This ability is highlighted by recent neuroimaging evidence showing how we automatically tag salient landmarks for memory when walking around city sidewalks.

In the article assigned for today, *How Nonsense Sharpens the Intellect,* we'll then turn to some interesting work being done here at UBC regarding implicit learning and how it relates to our innate desire to make sense of things.

In particular, the article discusses how when we encounter things or situations that don't make sense to us, it can trigger or enhance our ability to learn things implicitly.

This is encapsulated in what is being called "the meaning maintenance model", which stipulates that our desire to make sense of the world is so strong that when something challenges our understanding, it prompts us to unconsciously search for new patterns in the world around us.

The New Hork Times

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October 6, 2009

MIND How Nonsense Sharpens the Intellect

By BENEDICT CAREY

In addition to assorted bad breaks and pleasant surprises, opportunities and insults, life serves up the occasional pink unicorn. The three-dollar bill; the nun with a beard; the sentence, to borrow from the <u>Lewis Carroll</u> poem, that gyres and gimbles in the wabe.

An experience, in short, that violates all logic and expectation. The philosopher Soren Kierkegaard wrote that such anomalies produced a profound "sensation of the absurd," and he wasn't the only one who took them seriously. Freud, in <u>an essay called</u> <u>"The Uncanny,"</u> traced the sensation to a fear of death, of castration or of "something that ought to have remained hidden but has come to light."

At best, the feeling is disorienting. At worst, it's creepy.

Now a study suggests that, paradoxically, this same sensation may prime the brain to sense patterns it would otherwise miss - in mathematical equations, in language, in the world at large.

"We're so motivated to get rid of that feeling that we look for meaning and coherence elsewhere," said Travis Proulx, a postdoctoral researcher at the <u>University of California, Santa Barbara</u>, and lead author of the paper appearing in the journal Psychological Science. "We channel the feeling into some other project, and it appears to improve some kinds of learning."

Researchers have long known that people cling to their personal biases more tightly when feeling threatened. After thinking about their own inevitable death, they become more patriotic, more religious and less tolerant of outsiders, studies find. When insulted, they profess more loyalty to friends — and when told they've done poorly on a trivia test, they even identify more strongly with their school's winning teams.

In a series of new papers, Dr. Proulx and Steven J. Heine, a professor of <u>psychology</u> at the University of British Columbia, argue that these findings are variations on the same process: maintaining meaning, or coherence. The brain evolved to predict, and it does so by identifying patterns.

When those patterns break down — as when a hiker stumbles across an easy chair sitting deep in the woods, as if dropped from the sky — the brain gropes for something, anything that makes sense. It may retreat to a familiar ritual, like checking equipment. But it may also turn its attention outward, the researchers argue, and notice, say, a pattern in animal tracks that was previously hidden. The urge to find a coherent pattern makes it more likely that the brain will find one.

"There's more research to be done on the theory," said Michael Inzlicht, an assistant professor of psychology at the University of Toronto, because it may be that nervousness, not a search for meaning, leads to heightened vigilance. But he added that the new theory was "plausible, and it certainly affirms my own meaning system; I think they're onto something."

In the most recent paper, published last month, Dr. Proulx and Dr. Heine described having 20 college students read an absurd short story based on "The Country Doctor," by <u>Franz Kafka</u>. The doctor of the title has to make a house call on a boy with a terrible toothache. He makes the journey and finds that the boy has no teeth at all. The horses who have pulled his carriage begin to act up; the boy's family becomes annoyed; then the doctor discovers the boy has teeth after all. And so on. The story is urgent, vivid and nonsensical — Kafkaesque.

After the story, the students studied a series of 45 strings of 6 to 9 letters, like "X, M, X, R, T, V." They later took a test on the letter strings, choosing those they thought they had seen before from a list of 60 such strings. In fact the letters were related, in a very subtle way, with some more likely to appear before or after others.

Mind - How Nonsense Sharpens the Intellect - NYTimes.com

The test is a standard measure of what researchers call implicit learning: knowledge gained without awareness. The students had no idea what patterns their brain was sensing or how well they were performing.

But perform they did. They chose about 30 percent more of the letter strings, and were almost twice as accurate in their choices, than a comparison group of 20 students who had read a different short story, a coherent one.

"The fact that the group who read the absurd story identified more letter strings suggests that they were more motivated to look for patterns than the others," Dr. Heine said. "And the fact that they were more accurate means, we think, that they're forming new patterns they wouldn't be able to form otherwise."

Brain-imaging studies of people evaluating anomalies, or working out unsettling dilemmas, show that activity in an area called the anterior cingulate cortex spikes significantly. The more activation is recorded, the greater the motivation or ability to seek and correct errors in the real world, <u>a recent study</u> suggests. "The idea that we may be able to increase that motivation," said Dr. Inzlicht, a co-author, "is very much worth investigating."

Researchers familiar with the new work say it would be premature to incorporate film shorts by David Lynch, say, or compositions by <u>John Cage</u> into school curriculums. For one thing, no one knows whether exposure to the absurd can help people with explicit learning, like memorizing French. For another, studies have found that people in the grip of the uncanny tend to see patterns where none exist — becoming more prone to conspiracy theories, for example. The urge for order satisfies itself, it seems, regardless of the quality of the evidence.

Still, the new research supports what many experimental artists, habitual travelers and other novel seekers have always insisted: at least some of the time, <u>disorientation</u> begets creative thinking.

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Lecture 12 Unconscious Thinking

In the past two lectures we've discussed aspects of cognition that are unconscious, in that things can prime us without our awareness (Lecture 10) and that we can learn things implicitly (Lecture 11). Today we consider the idea that we can actually "think" unconsciously. This is nicely illustrated in the article assigned for today, *The Unconscious Mind: A Great Decision Maker.*

The article itself introduces an emerging body of research suggesting that when making decisions such as what car or house to buy, we often end up happier with the decisions we make if we actually *don't* think too much about the decision.

How is that?!

The underlying idea is that we always have two "parallel" streams of thought running simultaneously, one "conscious" and the other "unconscious." This notion is captured in what's called *The Dual-Process Model* of cognition, with these two streams of "thought" being the "dual processes."

Importantly, however, these two streams of thought have different abilities or capacities, mainly in terms of (1) how much information they can handle or deal with at once, and (2) what information they actually pay attention to when "thinking."

In lecture we'll look more closely at the data supporting this model while giving some understanding of what each "stream" pays attention to and why.



February 21, 2006

The Unconscious Mind: A Great Decision Maker

By BENEDICT CAREY

Snap judgments about people and places can be remarkably accurate, and there is no substitute for simple logic and reflection in determining questions like which alarm clock or cellphone is the best value.

But many more important decisions — choosing the right apartment, the optimal house, the best vacation — turn on such a bewildering swarm of facts that people often throw up their hands and put the whole thing temporarily out of mind. And new research suggests that this may be a rewarding strategy.

In a series of experiments reported last week in the journal Science, a team of Dutch psychologists found that people struggling to make complex decisions did best when they were distracted and were not able to think consciously about the choice at all.

The research not only backs up the common advice to "sleep on it" when facing difficult choices, but it also suggests that the unconscious brain can actively reason as well as produce weird dreams and Freudian slips.

"This is very elegant work, and like any great work, it opens up as many questions as it answers" about the unconscious, said Timothy D. Wilson, a psychologist at the University of Virginia and the author of the book "Strangers to Ourselves: Discovering the Adaptive Unconscious." He was not involved in the research.

Psychologists have known for years that people process an enormous amount of information unconsciously — for example, when they hear their names pop up in a conversation across the room that they were not consciously listening to. But the new report suggests that people take this wealth of under-the-radar information, combine it with deliberately studied facts and impressions and then make astute judgments that they would not otherwise form.

In the study, the research team, led by Ap Dijksterhuis of the University of Amsterdam, had 80 students choose among four cars based on a list of attributes for each, like age, gasoline mileage, transmission and handling. After presenting the attributes in quick succession, the researchers instructed some students to think carefully about the decision for four minutes and distracted others by asking them to solve anagrams.

When the list of characteristics was four items, students were more likely to pick the best functioning vehicles if they reasoned through the decision, rather than if they were distracted. But with 12 attributes, the distracted anagram solvers tended to make wiser choices, the study found.

The unconscious brain has a far greater capacity for information than conscious working memory, the authors write, and it may be less susceptible to certain biases.

"One example is people who like a house for its space but don't

properly weigh in the effect of commuting distance until they're spending two hours on the train every day," said Dr. Dijksterhuis. The unconscious brain might give the commuting more weight, he said.

The researchers developed a "complexity score" for 40 products and assets based on how many of each item's attributes people took into account. Cars, computers and apartments were at the top, dresses and shirts in the middle and oven mitts and umbrellas at the bottom.

Using that scale, the psychologists surveyed students who had recently bought some of those items and found that the more the buyers thought about their purchases of simple objects, the more satisfied they were. But the opposite was the case for complex purchases, where the more time spent in conscious deliberation, the less satisfied the students were.

In a survey of shoppers outside furniture and department stores, the researchers found a similar relationship between the amount of time shoppers spent thinking about simple and more involved decisions and their later satisfaction with their purchases. The research is only a stab at characterizing a process that is mostly unknown, psychologists say.

For example, the studies did not take into account the effect of emotion or memory on the unconscious, both of which can sway decisions. Nor is it clear exactly which kinds of decisions are best handled by letting go.

"Are we saying that an executive who has just read an important report should not think about it?" said Jonathan Schooler, a psychologist at the University of British Columbia. "The research helps us work toward an answer, but I don't think we're quite there yet."

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Lecture 13 Self-Reflection

While the last three lectures have been focusing on implicit or unconscious aspects of cognition, today we take a new spin on the topic by looking at what happens when the focus of cognition is on ourselves.

The assigned article, *Don't Think Twice, It's All Right*, raises the key question for the lecture: To what extent do we actually have a good understanding of what we think? For example, if we stop and ask ourselves why we like or dislike something, is the answer we come up with accurate?

At issue is whether we have conscious access to the unconscious factors affecting thoughts and behaviors. In the article we learn that we're surprisingly bad at consciously figuring out how we feel about things.

In lecture, we'll consider the data behind this claim, and why this might actually be the case. We'll also look at some of the consequences of this difficulty we have with self-reflection, and in particular, how it can benefit us to act without thinking.

The New York Times

nytimes.com

December 29, 2005 Op-Ed Contributor

Don't Think Twice, It's All Right

By TIMOTHY D. WILSON

Charlottesville, Va.

IT'S navel gazing time again, that stretch of the year when many of us turn our attention inward and think about how we can improve the way we live our lives. But as we embark on this annual ritual of introspection, we would do well to ask ourselves a simple question: Does it really do any good?

The poet Theodore Roethke had some insight into the matter: "Self-contemplation is a curse / That makes an old confusion worse." As a psychologist who conducts research on self-knowledge and happiness, I think Roethke had a point, one that's supported by a growing body of controlled psychological studies.

Not sure how you feel about a special person in your life? Analyzing the pluses and minuses of the relationship might not be the answer.

In a study I conducted with Dolores Kraft, a clinical psychologist at the University of Texas Southwestern Medical Center, and Dana Dunn, a social psychologist at Moravian College in Pennsylvania, people in one group were asked to list the reasons their relationship with a romantic partner was going the way it was, and then rate how satisfied they were with the relationship. People in another group were asked to rate their satisfaction without any analysis; they just gave their gut reactions.

It might seem that the people who thought about the specifics would be best at figuring out how they really felt, and that their satisfaction ratings would thus do the best job of predicting the outcome of their relationships.

In fact, we found the reverse. It was the people in the "gut feeling" group whose ratings predicted whether they were still dating their partner several months later. As for the navel gazers, their satisfaction ratings did not predict the outcome of their relationships at all. Our conclusion? Too much analysis can confuse people about how they really feel. There are severe limits to what we can discover through self-reflection, and trying to explain the unexplainable does not lead to a sudden parting of the seas with our hidden thoughts and feelings revealed like flopping fish.

Self-reflection is especially problematic when we are feeling down. Research by Susan Nolen-Hoeksema, a clinical psychologist at Yale University, shows that when people are depressed, ruminating on their problems makes things worse.

In one study, mildly depressed college students were asked to spend eight minutes thinking about themselves or to spend the same amount of time thinking about mundane topics like "clouds forming in the sky."

People in the first group focused on the negative things in their lives and sunk into a worse mood. People in the other group actually felt better afterward, possibly because their negative self-focus was "turned off" by the distraction task.

What about people like police officers and firefighters who witness terrible events? Is it helpful for them to reflect on their experiences?

For years it was believed that emergency workers should undergo a debriefing process to focus on and relive their experiences; the idea was that this would make them feel better and prevent mental health problems down the road. After 9/11, for example, well-meaning counselors flocked to New York to help police officers, firefighters and rescue workers deal with the trauma of what they had seen.

But did it do any good? In an extensive review of the research, a team led by Richard McNally, a clinical psychologist at Harvard, concluded that debriefing procedures have little benefit and might even hurt by interrupting the normal healing process. People often distract themselves from thinking about painful events right after they occur, and this may be better than mentally reliving the events.

What can we do to improve ourselves and feel happier? Numerous social psychological studies have confirmed Aristotle's observation that "We become just by the practice of just actions, self-controlled by exercising self-control, and courageous by performing acts of courage." If we are dissatisfied with some aspect of our lives, one of the best approaches is to act more like the person we want to be, rather than sitting around analyzing ourselves.

Social psychologist Daniel Batson and colleagues at the University of Kansas found that participants who were given an opportunity to do a favor for another person ended up viewing themselves as kind, considerate people - unless, that is, they were asked to reflect on why they had done the favor. People in that group tended in the end to not view themselves as being especially kind.

The trick is to go out of our way to be kind to others without thinking too much about why we're doing it. As a bonus, our kindnesses will make us happier.

A study by University of California, Riverside, social psychologist Sonja Lyubomirsky and colleagues found that college students instructed to do a few acts of kindness one day a week ended up being happier than a control group of students who received no special instructions.

As the new year begins, then, reach out and help others. If that sounds suspiciously like an old Motown song or like simplistic advice from one of those do-gooder college professors, well, it is. But the fact is that being good to others will ultimately make us kinder, happier people - just so long as we don't think too much about it.

Timothy D. Wilson, a professor of psychology at the University of Virginia, is the author of "Strangers to Ourselves: Discovering the Adaptive Unconscious."

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Lecture 14 Bounded Rationality

The idea that humans are rational thinkers and decision-makers goes back to the ancient Greeks. Not surprisingly, cognitive psychologists have long taken the same view. Only recently have we begun to appreciate that our minds have their own sense of what is rational, and as we learn in Lecture 14, it involves things like pleasure, pain, and even vanity.

The first article for today, *The Voices in My Head Say 'Buy It!' Why Argue?*, introduces two key ideas on the topic. First, it informs on what passes for "traditional" rationality when it comes to making economic decisions—the domain long associated with cognitive rationality. Second, it discusses recent fMRI data showing how our purchasing decisions actually involve brain responses in regions associated with pleasure and pain/disgust.

This kind of evidence has now led researchers to believe that far from being purely rationale, much of our thinking is driven by emotions. We'll return to this idea in Part 3 of the course, when we look at moral reasoning.

In lecture, we'll buttress these ideas with another important factor influencing how "rational" our decisions are: In most cases, we don't have enough time or information to make what economists would consider to be "rational" decisions. In this sense, our rationality is considered to be "bounded", in that we do the best we can with the practical limitations of real life.

In the second article for today, *Message in What We Buy, but Nobody's Listening*, a third factor regarding why we depart from rational decisions is raised: Many of our decisions can also be viewed as reflecting a desire to socially signal. In lecture, we'll expand on this by looking at recent data demonstrating how when you take ownership of something it literally activates regions of your brain associated with reaching and grasping—as if you literally try to hold on to what is yours. The New York Times



January 16, 2007

FINDINGS The Voices in My Head Say 'Buy It!' Why Argue? By <u>JOHN TIERNEY</u>

PALO ALTO, Calif.

Now that scientists have spotted the pain and pleasure centers in the brain, they've moved on to more expensive real estate: the brain's shopping center. They have been asking the big questions:

What is the difference between a tightwad's brain and a spendthrift's brain?

What neurological circuits stop you from buying a <u>George Foreman</u> grill but not a Discovery Channel color-changing mood clock?

Why is there a \$2,178.23 balance on my January Visa bill?

This last question isn't yet fully answered, even after I stared at said Visa bill while lying inside a functional M.R.I. machine at <u>Stanford University</u>. But scientists are closer to solving the mystery. By scanning shoppers' brains, they think they've identified a little voice telling you not to spend your money. Or, in my case, a voice saying, "At this price, you can't afford not to buy the mood clock!"

For convenience' sake, economists have traditionally assumed that buyers make rational choices: I think, therefore I shop. You pass up the George Foreman grill because you sagely calculate that the money would be better spent on, say, your child's college fund. Or at least the mood clock. You choose to forgo one good in exchange for something better.

Even the most rational economists, though, realize that the shopper's mind is more complicated. The brain's "impartial spectator," as Adam Smith warned, has to duel with "the passions." Last year, after surveying shoppers' passions, behavioral economists at <u>Carnegie Mellon University</u> developed what they call the Tightwad-Spendthrift scale.

But this kind of survey reveals only what shoppers choose to confess. To find out more, the economists teamed with psychologists at Stanford to turn an M.R.I. machine into a shopping mall. They gave each experimental subject \$40 in cash and offered the chance to buy dozens of gadgets, appliances, books, DVDs and assorted tchotchkes. Lying inside the scanner, first you'd see a picture of a product. Next you'd see its price, which was about 75 percent below retail. Then you'd choose whether or not you'd like a chance to buy it. Afterward, the researchers randomly chose a couple of items from their mall, and if you had said yes to either one, you bought it; otherwise you went home with the cash.

The good news, for behavioral science, was that the researchers saw telltale patterns, which they <u>report</u> in the Jan. 4 issue of the journal Neuron. "We were frankly shocked at how clear the results were," said Brian Knutson, the Stanford psychologist who led the experiment. "It was amazing to be able to see brain activity seconds before a decision and predict whether the person would buy it or not."

The bad news, for my son's college funds, is that my responses to this experiment were not what could be called a happy medium, despite my best efforts at restraint. I passed up not just the Foreman grill but the sonic power toothbrush and the Bar Master electronic drink guide. But Dr. Knutson and his Stanford colleague, Elliott Wimmer, reported that "subject JT" chose to buy "50 percent of the items, approximately 2 standard deviations more than the average 30 percent buy rate."

I will not try to justify my need for the mood clock, the "Dodgeball" DVD, the desk-clip lamp and

the smoothie maker. I would rather pin these choices on two culprits.

The first was my nucleus accumbens, a region of the brain with dopamine receptors that are activated when you experience or anticipate something pleasant, like making money or drinking something tasty. In the experimental subjects at Stanford, this region was activated when they first saw pictures of things they wanted to buy. My nucleus accumbens just happened to respond more strongly than the typical subject's, so what else could I do? If it feels good, buy it.

The other culprit — the main villain, really — was my insula. This region of the brain is activated when you smell something bad, see a disgusting picture or anticipate a painful shock. It was typically activated in the brains of the other shoppers when they saw a price that seemed too high. I'd like to think of my insula as particularly stoic, the strong, silent type, but he's probably just an oblivious slob.

The lazy insula is a rarer affliction than you'd guess by looking at Americans' indebtedness. Tightwads slightly outnumber spendthrifts, according to surveys by George Loewenstein and his colleagues at Carnegie Mellon, Scott Rick and Cynthia Cryder. These behavioral economists think tightwads aren't any more rational than spendthrifts, because neither group is carefully weighing the long-term benefits of a Foreman grill versus college tuition. Dr. Loewenstein says the brain scans demonstrate that both kinds of shoppers are guided by instant emotions.

"We developed this propensity to experience direct pain when we spend money," Dr. Loewenstein said. "This explains why tightwads won't spend money even when they should. It also helps to explain why we overspend on credit cards, and why people prefer all-you-can-eat buffets instead of paying for each item they order. We like schemes that remove the immediate pain of paying."

These schemes are a blessing for pathological tightwads, but they leave spendthrifts worse off. Paying cash is the usual cure suggested, but that hasn't worked for me, presumably because my insula is such a slug. So I asked the Stanford psychologists to test another approach. After the shopping experiment, they scanned my brain while showing me a copy of my \$2,178.23 Visa bill and a control image of Dr. Knutson's credit card bill for a similar amount.

"When we compared your responses," Dr. Knutson told me, "we saw a little spot of insula activation when you saw your own bill."

This gives me hope for a technological cure for spendthriftness: a credit card that would remind you of your outstanding balance every time you started to buy something. It could flash the total in large numbers, or announce it in a voice (say, Simon Cowell's) designed to arouse any insula.

I realize there are certain practical obstacles to this scheme, like the unwillingness of merchants or credit -card companies to put themselves out of business. Even if a bank were willing to market the card, it would be tough to get spendthrifts to sign up for it.

But what's the alternative? You might remove the pleasure of shopping by somehow dulling the brain's dopamine receptors so that not even the new Apple iPhone would get a rise in the nucleus accumbens, but try getting anyone to stay on that medication. Better the occasional jolt of pain. Charge it to the insula.

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The New Hork Cimes

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May 19, 2009

FINDINGS Message in What We Buy, but Nobody's Listening

By JOHN TIERNEY

Why does a diploma from <u>Harvard</u> cost \$100,000 more than a similar piece of paper from City College? Why might a <u>BMW</u> cost \$25,000 more than a Subaru WRX with equally fast acceleration? Why do "sophisticated" consumers demand 16-gigabyte iPhones and "fair trade" coffee from Starbucks?

If you ask market researchers or advertising executives, you might hear about the difference between "rational" and "emotional" buying decisions, or about products falling into categories like "hedonic" or "utilitarian" or "positional." But <u>Geoffrey Miller</u>, an evolutionary psychologist at the <u>University of New Mexico</u>, says that even the slickest minds on Madison Avenue are still in the prescientific dark ages.

Instead of running focus groups and spinning theories, he says, marketers could learn more by administering scientifically calibrated tests of intelligence and personality traits. If marketers (or their customers) understood biologists' new calculations about animals' "costly signaling," Dr. Miller says, they'd see that Harvard diplomas and iPhones send the same kind of signal as the ornate tail of a peacock.

Sometimes the message is as simple as "I've got resources to burn," the classic conspicuous waste demonstrated by the energy expended to lift a peacock's tail or the fuel guzzled by a Hummer. But brand-name products aren't just about flaunting transient wealth. The audience for our signals — prospective mates, friends, rivals — care more about the permanent traits measured in tests of intelligence and personality, as Dr. Miller explains in his new book, <u>"Spent: Sex, Evolution and Consumer Behavior."</u>

Suppose, during a date, you casually say, "The sugar maples in Harvard Yard were so beautiful every fall term." Here's what you're signaling, as translated by Dr. Miller:

"My S.A.T. scores were sufficiently high (roughly 720 out of 800) that I could get admitted, so my I.Q. is above 135, and I had sufficient conscientiousness, emotional stability and intellectual openness to pass my classes. Plus, I can recognize a tree."

Or suppose a young man, after listening to the specifications of the newest <u>iPhone</u> or hearing about a BMW's "Servotronic variable-ratio power steering," says to himself, "Those features sound awesome." Here's Dr. Miller's translation:

"Those features can be talked about in ways that will display my general intelligence to potential mates and friends, who will bow down before my godlike technopowers, which rival those of Iron Man himself."

Most of us will insist there are other reasons for going to Harvard or buying a BMW or an iPhone - and there are, of course. The education and the products can yield many kinds of rewards. But Dr. Miller says that much of the pleasure we derive from products stems from the unconscious instinct that they will either enhance or signal our fitness by demonstrating intelligence or

some of the Big Five personality traits: openness, conscientiousness, agreeableness, stability and extraversion.

In a series of experiments, Dr. Miller and other researchers found that people were more likely to expend money and effort on products and activities if they were first primed with photographs of the opposite sex or stories about dating.

After this priming, men were more willing to splurge on designer sunglasses, expensive watches and European vacations. Women became more willing to do volunteer work and perform other acts of conspicuous charity - a signal of high conscientiousness and agreeableness, like demonstrating your concern for third world farmers by spending extra for Starbucks's "fair trade" coffee.

These signals can be finely nuanced, as Dr. Miller parses them in his book. The "conspicuous precision" of a BMW or a Lexus helps signal the intelligence of all the owners, but the BMW's "conspicuous reputation" also marks its owner as more extraverted and less agreeable (i.e., more aggressive). Owners of Toyotas and Hondas are signaling high conscientiousness by driving reliable and economical cars.

But once you've spent the money, once you've got the personality-appropriate appliance or watch or handbag, how much good are these signals actually doing you? Not much, Dr. Miller says. The fundamental consumerist delusion, as he calls it, is that purchases affect the way we're treated.

The grand edifice of brand-name consumerism rests on the narcissistic fantasy that everyone else cares about what we buy. (It's no accident that narcissistic teenagers are the most brand-obsessed consumers.) But who else even notices? Can you remember what your partner or your best friend was wearing the day before yesterday? Or what kind of watch your boss has?

A Harvard diploma might help get you a date or a job interview, but what you say during the date or conversation will make the difference. An elegantly thin Skagen watch might send a signal to a stranger at a cocktail party or in an airport lounge, but even if it were noticed, anyone who talked to you for just a few minutes would get a much better gauge of your intelligence and personality.

To get over your consuming obsessions, Dr. Miller suggests exercises like comparing the relative costs and pleasures of the stuff you've bought. (You can try the exercise at <u>nytimes.com/tierneylab</u>.) It may seem odd that we need these exercises — why would natural selection leave us with such unproductive fetishes? — but Dr. Miller says it's not surprising.

"Evolution is good at getting us to avoid death, desperation and celibacy, but it's not that good at getting us to feel happy," he says, calling our desire to impress strangers a quirky evolutionary byproduct of a smaller social world.

"We evolved as social primates who hardly ever encountered strangers in prehistory," Dr. Miller says. "So we instinctively treat all strangers as if they're potential mates or friends or enemies. But your happiness and survival today don't depend on your relationships with strangers. It doesn't matter whether you get a nanosecond of deference from a shopkeeper or a stranger in an airport."

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Lecture 15 Perspective and Bias

In Lecture 14 we were introduced to the idea that human thinking frequently tends to deviate from traditional "rational" norms. We'll continue exploring this general theme in today's lecture, with focusing on some very basic perspectives and biases we have in our thinking that can skew our behavior in funny ways.

The first article for today, *The Advantages of Closing a Few Doors*, gives a good synopsis of perhaps the most well-known of our "irrational" biases--the idea that we have a particularly strong desire to avoid "losses."

We'll highlight this idea in lecture by considering "prospect theory", which is a theory of economic decision-making behavior which stipulates that our aversion to losses is felt more strongly than our pleasure at gains. As we'll see, this bias in human thinking is frequently exploited in advertising and marketing.

The second article for today, *Innovative Minds Don't Think Alike*, shifts focus to a common problem of perspective we have in our thinking, referred to as *the curse of knowledge*. Plainly stated, we tend to think as if everyone has the same knowledge state as ourselves. In this sense, knowledge can be a "curse", because it makes it challenging for us to appreciate that other people don't know what we know.

The interesting thing here is that this "curse" can explain all sorts of things, spanning from why we might have arguments with our significant others to the frustrating complexity of television remotes.

In our final article, *The Price of Dithering*, we see yet another common human bias in cognition: a failure to consider the consequences of *not* making a decision. Here we learn about "satisficers" and "maximizers", and how we often use "heuristics" in our decision-making.

The New Hork Times



February 26, 2008

FINDINGS

The Advantages of Closing a Few Doors

By JOHN TIERNEY

The next time you're juggling options — which friend to see, which house to buy, which career to pursue — try asking yourself this question: What would Xiang Yu do?

Xiang Yu was a Chinese general in the third century B.C. who took his troops across the Yangtze River into enemy territory and performed an experiment in decision making. He crushed his troops' cooking pots and burned their ships.

He explained this was to focus them on moving forward — a motivational speech that was not appreciated by many of the soldiers watching their retreat option go up in flames. But General Xiang Yu would be vindicated, both on the battlefield and in the annals of social science research.

He is one of the role models in Dan Ariely's new book, "Predictably Irrational," an entertaining look at human foibles like the penchant for keeping too many options open. General Xiang Yu was a rare exception to the norm, a warrior who conquered by being unpredictably rational.

Most people can't make such a painful choice, not even the students at a bastion of rationality like the <u>Massachusetts Institute of Technology</u>, where Dr. Ariely is a professor of behavioral economics. In a series of experiments, hundreds of students could not bear to let their options vanish, even though it was obviously a dumb strategy (and they weren't even asked to burn anything).

The experiments involved a game that eliminated the excuses we usually have for refusing to let go. In the real world, we can always tell ourselves that it's good to keep options open.

You don't even know how a camera's burst-mode flash works, but you persuade yourself to pay for the extra feature just in case. You no longer have anything in common with someone who keeps calling you, but you hate to just zap the relationship.

Your child is exhausted from after-school soccer, ballet and Chinese lessons, but you won't let her drop the piano lessons. They could come in handy! And who knows? Maybe they will.

In the M.I.T. experiments, the students should have known better. They played a computer game that paid real cash to look for money behind three doors on the screen. (You can play it yourself, without pay, at <u>tierneylab.blogs.nytimes.com</u>.) After they opened a door by clicking on it, each subsequent click earned a little money, with the sum varying each time.

As each player went through the 100 allotted clicks, he could switch rooms to search for higher payoffs, but each switch used up a click to open the new door. The best strategy was to quickly check out the three rooms and settle in the one with the highest rewards.

Even after students got the hang of the game by practicing it, they were flummoxed when a new visual feature was introduced. If they stayed out of any room, its door would start shrinking and eventually disappear.

They should have ignored those disappearing doors, but the students couldn't. They wasted so many clicks rushing back to reopen doors that

their earnings dropped 15 percent. Even when the penalties for switching grew stiffer - besides losing a click, the players had to pay a cash fee - the students kept losing money by frantically keeping all their doors open.

Why were they so attached to those doors? The players, like the parents of that overscheduled piano student, would probably say they were just trying to keep future options open. But that's not the real reason, according to Dr. Ariely and his collaborator in the experiments, Jiwoong Shin, an economist who is now at Yale.

They plumbed the players' motivations by introducing yet another twist. This time, even if a door vanished from the screen, players could make it reappear whenever they wanted. But even when they knew it would not cost anything to make the door reappear, they still kept frantically trying to prevent doors from vanishing.

Apparently they did not care so much about maintaining flexibility in the future. What really motivated them was the desire to avoid the immediate pain of watching a door close.

"Closing a door on an option is experienced as a loss, and people are willing to pay a price to avoid the emotion of loss," Dr. Ariely says. In the experiment, the price was easy to measure in lost cash. In life, the costs are less obvious — wasted time, missed opportunities. If you are afraid to drop any project at the office, you pay for it at home.

"We may work more hours at our jobs," Dr. Ariely writes in his book, "without realizing that the childhood of our sons and daughters is slipping away. Sometimes these doors close too slowly for us to see them vanishing."

Dr. Ariely, one of the most prolific authors in his field, does not pretend that he is above this problem himself. When he was trying to decide between job offers from M.I.T. and Stanford, he recalls, within a week or two it was clear that he and his family would be more or less equally happy in either place. But he dragged out the process for months because he became so obsessed with weighing the options.

"I'm just as workaholic and prone to errors as anyone else," he says.. "I have way too many projects, and it would probably be better for me and the academic community if I focused my efforts. But every time I have an idea or someone offers me a chance to collaborate, I hate to give it up."

So what can be done? One answer, Dr. Ariely said, is to develop more social checks on overbooking. He points to marriage as an example: "In marriage, we create a situation where we promise ourselves not to keep options open. We close doors and announce to others we've closed doors."

Or we can just try to do it on our own. Since conducting the door experiments, Dr. Ariely says, he has made a conscious effort to cancel projects and give away his ideas to colleagues. He urges the rest of us to resign from committees, prune holiday card lists, rethink hobbies and remember the lessons of door closers like Xiang Yu.

If the general's tactics seem too crude, Dr. Ariely recommends another role model, Rhett Butler, for his supreme moment of unpredictable rationality at the end of his marriage. Scarlett, like the rest of us, can't bear the pain of giving up an option, but Rhett recognizes the marriage's futility and closes the door with astonishing elan. Frankly, he doesn't give a damn.

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The New York Times

December 30, 2007

BRIGHT IDEAS Innovative Minds Don't Think Alike

By JANET RAE-DUPREE

IT'S a pickle of a paradox: As our knowledge and expertise increase, our creativity and ability to innovate tend to taper off. Why? Because the walls of the proverbial box in which we think are thickening along with our experience.

<u>Andrew S. Grove</u>, the co-founder of Intel, put it well in 2005 when he told an interviewer from Fortune, "When everybody knows that something is so, it means that nobody knows nothin'." In other words, it becomes nearly impossible to look beyond what you know and think outside the box you've built around yourself.

This so-called curse of knowledge, a phrase used in a 1989 paper in The Journal of Political Economy, means that once you've become an expert in a particular subject, it's hard to imagine not knowing what you do. Your conversations with others in the field are peppered with catch phrases and jargon that are foreign to the uninitiated. When it's time to accomplish a task — open a store, build a house, buy new cash registers, sell insurance — those in the know get it done the way it has always been done, stifling innovation as they barrel along the well-worn path.

Elizabeth Newton, a psychologist, conducted an experiment on the curse of knowledge while working on her doctorate at Stanford in 1990. She gave one set of people, called "tappers," a list of commonly known songs from which to choose. Their task was to rap their knuckles on a tabletop to the rhythm of the chosen tune as they thought about it in their heads. A second set of people, called "listeners," were asked to name the songs.

Before the experiment began, the tappers were asked how often they believed that the listeners would name the songs correctly. On average, tappers expected listeners to get it right about half the time. In the end, however, listeners guessed only 3 of 120 songs tapped out, or 2.5 percent.

The tappers were astounded. The song was so clear in their minds; how could the listeners not "hear" it in their taps?

That's a common reaction when experts set out to share their ideas in the business world, too, says Chip Heath, who with his brother, Dan, was a co-author of the 2007 book "Made to Stick: Why Some Ideas Survive and Others Die." It's why engineers design products ultimately useful only to other engineers. It's why managers have trouble convincing the rank and file to adopt new processes. And it's why the advertising world struggles to convey commercial messages to consumers.

"I HAVE a DVD remote control with 52 buttons on it, and every one of them is there because some engineer along the line knew how to use that button and believed I would want to use it, too," Mr. Heath says. "People who design products are experts cursed by their knowledge, and they can't imagine what it's like to be as ignorant as the rest of us."

But there are proven ways to exorcise the curse.

In their book, the Heath brothers outline six "hooks" that they say are guaranteed to communicate a new idea clearly by transforming it into what they call a Simple Unexpected Concrete Credentialed Emotional Story. Each of the letters in the resulting acronym, Succes, refers to a different hook. ("S," for example, suggests simplifying the message.) Although the hooks of "Made to Stick" focus on the art of communication, there are ways to fashion them around fostering innovation.

To innovate, Mr. Heath says, you have to bring together people with a variety of skills. If those people can't communicate clearly with one another, innovation gets bogged down in the abstract language of specialization and expertise. "It's kind of like the ugly American tourist trying to get across an idea in another country by speaking English slowly and more loudly," he says. "You've got to find the common connections."

In her 2006 book, "Innovation Killer: How What We Know Limits What We Can Imagine — and What Smart Companies Are Doing About It," Cynthia Barton Rabe proposes bringing in outsiders whom she calls zero-gravity thinkers to keep creativity and innovation on track.

When experts have to slow down and go back to basics to bring an outsider up to speed, she says, "it forces them to look at their world differently and, as a result, they come up with new solutions to old problems."

She cites as an example the work of a colleague at Ralston Purina who moved to Eveready in the mid-1980s when Ralston bought that company. At the time, Eveready had become a household name because of its sales since the 1950s of inexpensive red plastic and metal flashlights. But by the mid-1980s, the flashlight business, which had been aimed solely at men shopping at hardware stores, was foundering.

While Ms. Rabe's colleague had no experience with flashlights, she did have plenty of experience in consumer packaging and marketing from her years at Ralston Purina. She proceeded to revamp the flashlight product line to include colors like pink, baby blue and light green - colors that would appeal to women - and began distributing them through grocery store chains.

"It was not incredibly popular as a decision amongst the old guard at Eveready," Ms. Rabe says. But after the changes, she says, "the flashlight business took off and was wildly successful for many years after that."

MS. RABE herself experienced similar problems while working as a transient "zero-gravity thinker" at Intel.

"I would ask my very, very basic questions," she said, noting that it frustrated some of the people who didn't know her. Once they got past that point, however, "it always turned out that we could come up with some terrific ideas," she said.

While Ms. Rabe usually worked inside the companies she discussed in her book, she said outside consultants could also serve the zero-gravity role, but only if their expertise was not identical to that of the group already working on the project.

"Look for people with renaissance-thinker tendencies, who've done work in a related area but not in your specific field," she says. "Make it possible for someone who doesn't report directly to that area to come in and say the emperor has no clothes."

Janet Rae-Dupree writes about science and emerging technology in Silicon Valley.

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Lecture 16 Multi-Tasking

Up until this point, we've been assuming that people are thinking and behaving with respect to doing a single thing at once. However, in real life we're often doing to or more things simultaneously, as anyone who has ever used a cell phone while driving knows. How does this so-called "multi-tasking" affect cognition?

The first article for today, *Multitasking Can Make You Lose..Um...Focus*, provides a great introduction to the main issues at hand. For one, it identifies the two key ways in which we multitask: either doing two or more things simultaneously or rapidly switching back-and-forth between multiple tasks. At issue in the article is how these habits of modern life tend to negatively impact our ability to do things. Key for us is understanding how our multitasking limitations relate to the ideas covered in Lecture 9.

The second article for today, A Problem of the Brain, Not the Hands: Group Urges Phone Ban for Drivers, emphasizes what has become a major public policy issue over the past few years, an issue directly related to limitations we have with multitasking. The central point made by the article: the problems with cell phones and driving is in the brain, not whether both hands are on the wheel.

In lecture we'll examine the data discussed in the phone/driving article more closely. Collectively, what the evidence shows is that when talking on the phone while driving, our driving behaviors are greatly degraded, precisely what is to be expected when trying to do multiple things at once.

The New Hork Times



October 25, 2008

SHORTCUTS Multitasking Can Make You Lose ... Um ... Focus **By ALINA TUGEND**

AS you are reading this article, are you listening to music or the radio? Yelling at your children? If you are looking at it online, are you e-mailing or instant-messaging at the same time? Checking stocks?

Since the 1990s, we've accepted multitasking without question. Virtually all of us spend part or most of our day either rapidly switching from one task to another or juggling two or more things at the same time.

While multitasking may seem to be saving time, psychologists, neuroscientists and others are finding that it can put us under a great deal of stress and actually make us less efficient.

Although doing many things at the same time – reading an article while listening to music, switching to check e-mail messages and talking on the phone - can be a way of making tasks more fun and energizing, "you have to keep in mind that you sacrifice focus when you do this," said Edward M. Hallowell, a psychiatrist and author of "CrazyBusy: Overstretched, Overbooked, and About to Snap!" (Ballantine, 2006). "Multitasking is shifting focus from one task to another in rapid succession. It gives the illusion that we're simultaneously tasking, but we're really not. It's like playing tennis with three balls."

Of course, it depends what you're doing. For some people, listening to music while working actually makes them more creative because they are using different cognitive functions.

But despite what many of us think, you cannot simultaneously e-mail and talk on the phone. I think we're all familiar with what Dr. Hallowell calls "e-mail voice," when someone you're talking to on the phone suddenly sounds, well, disengaged.

"You cannot divide your attention like that," he said. "It's a big illusion. You can shift back and forth."

We all know that computers and their spawn, the smartphone and cellphone, have created a very different world from several decades ago, when a desk worker had a typewriter, a phone and an occasional colleague who dropped into the office.

Think even of the days before the cordless phone. Those old enough can remember when talking on the telephone, which was stationary, meant sitting down, putting your feet up and chatting - not doing laundry, cooking dinner, sweeping the floor and answering the door.

That is so far in the past. As we are required, or feel required, to do more and more things in a shorter period of time, researchers are trying to figure out how the brain changes attention from one subject to another.

Earl Miller, the Picower professor of neuroscience at the Massachusetts Institute of Technology, explained it this way: human brains have a very large prefrontal cortex, which is the part of the brain that contains the "executive control" process. This helps us switch and prioritize tasks.

In humans, he said, the prefrontal cortex is about one-third of the entire cortex, while in dogs and cats, it is 4 or 5 percent and in monkeys about 15 percent.

"With the growth of the prefrontal cortex, animals become more and more flexible in their behavior," Professor Miller said.

We can do a couple of things at the same time if they are routine, but once they demand more cognitive process, the brain has "a severe bottleneck," he said.

Professor Miller conducted studies where electrodes were attached to the head to monitor participants performing different tasks.

He found that "when there's a bunch of visual stimulants out there in front of you, only one or two things tend to activate your neurons, indicating that we're really only focusing on one or two items at a time."

David E. Meyer, a professor of psychology at the <u>University of Michigan</u>, and his colleagues looked at young adults as they performed tasks that involved solving math problems or classifying geometric objects.

Their 2001 study, published in The Journal of Experimental Psychology, found that for all types of tasks, the participants lost time when they had to move back and forth from one undertaking to another, and that it took significantly longer to switch between the more complicated tasks.

Although the time it takes for our brains to switch tasks may be only a few seconds or less, it adds up. If we're talking about doing two jobs that can require real concentration, like text-messaging and driving, it can be fatal.

The RAC Foundation, a British nonprofit organization that focuses on driving issues, asked 17 drivers, age 17 to 24, to use a driving simulator to see how texting affected driving.

The reaction time was around 35 percent slower when writing a text message - slower than driving drunk or stoned.

All right, there are definitely times we should not try to multitask. But, we may think, it's nice to say that we should focus on one thing at a time, but the real world doesn't work that way. We are constantly interrupted.

A 2005 study, "No Task Left Behind? Examining the Nature of Fragmented Work," found that people were interrupted and moved from one project to another about every 11 minutes. And each time, it took about 25 minutes to circle back to that same project.

Interestingly, a study published last April, "The Cost of Interrupted Work: More Speed and Stress," found that "people actually worked faster in conditions where they were interrupted, but they produced less," said Gloria Mark, a professor of informatics at the University of California at Irvine and a co-author of both studies. And she also found that people were as likely to selfinterrupt as to be interrupted by someone else.

"As observers, we'll watch, and then after every 12 minutes or so, for no apparent reasons, someone working on a document will turn and call someone or e-mail," she said. As I read that, I realized how often I was switching between writing this article and checking my e-mail.

Professor Mark said further research needed to be done to know why people work in these patterns, but our increasingly shorter attention spans probably have something to do with it.

Her study found that after only 20 minutes of interrupted performance, people reported significantly higher stress, frustration, workload, effort and pressure.

"I also argue that it's bad for innovation," she said. "Ten and a half minutes on one project is not enough time to think in-depth about anything."

Dr. Hallowell has termed this effort to multitask "attention deficit trait." Unlike attention deficit disorder, which he has studied for years and has a neurological basis, attention deficit trait "springs entirely from the environment," he wrote in a 2005 Harvard Business Review article, "Overloaded Circuits: Why Smart People Underperform."

"As our minds fill with noise — feckless synaptic events signifying nothing — the brain gradually loses its capacity to attend fully and gradually to anything," he wrote. Desperately trying to keep up with a multitude of jobs, we "feel a constant low level of panic and guilt."

But Dr. Hallowell says that despite our belief that we cannot control how much we're overloaded, we can.

"We need to recreate boundaries," he said. That means training yourself not to look at your BlackBerry every 20 seconds, or turning off your cellphone. It means trying to change your work culture so such devices are banned at meetings. Sleeping less to do more is a bad strategy, he says. We are efficient only when we sleep enough, eat right and exercise.

So the next time the phone rings and a good friend is on the line, try this trick: Sit on the couch. Focus on the conversation. Don't jump up, no matter how much you feel the need to clean the kitchen. It seems weird, but stick with it. You, too, can learn the art of single-tasking.

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January 13, 2009

WELL

A Problem of the Brain, Not the Hands: Group Urges Phone Ban for Drivers

By TARA PARKER-POPE

In half a dozen states and many cities and counties, it is illegal to use a hand-held cellphone while driving - but perfectly all right to talk on a hands-free device.

The theory is that it's distracting to hold a phone and drive with just one hand. But a large body of research now shows that a hands-free phone poses no less danger than a hand-held one - that the problem is not your hands but your brain.

"It's not that your hands aren't on the wheel," said David Strayer, director of the Applied Cognition Laboratory at the <u>University</u> of <u>Utah</u> and a leading researcher on cellphone safety. "It's that your mind is not on the road."

Now Dr. Strayer's research has gained a potent ally. On Monday, the National Safety Council, the nonprofit advocacy group that has pushed for seat belt laws and drunken driving awareness, <u>called for an all-out ban on using cellphones while driving</u>.

"There is a huge misperception with the public that it's O.K. if they are using a hands-free phone," said Janet Froetscher, the council's president and chief executive. "It's the same challenge we had with seat belts and drunk driving — we've got to get people thinking the same way about cellphones."

Laboratory experiments using simulators, real-world road studies and accident statistics all tell the same story: drivers talking on a cellphone are four times as likely to have an accident as drivers who are not. That's the same level of risk posed by a driver who is legally drunk.

Why cellphone use behind the wheel is so risky isn't entirely clear, but studies suggest several factors. No matter what the device, phone conversations appear to take a significant toll on attention and visual processing skills.

It may be that talking on the phone generates mental images that conflict with the spatial processing needed for safe driving. Eyetracking studies show that while drivers continually look side to side, cellphone users tend to stare straight ahead.

They may also be distracted to the point that their engaged brains no longer process much of the information that falls on their retinas, which leads to slower reaction times and other driving problems.

At the University of Utah, Dr. Strayer and his colleagues use driving simulators to study the effects of cellphone conversations. A simulator's interior looks like that of a <u>Ford Crown Victoria</u>, and a computer allows researchers to control driving conditions. Study participants are asked to drive under a variety of conditions: while talking on a hand-held phone or a hands-free one, while chatting with a friend in the next seat, and even after consuming enough alcohol to make them legally drunk.

While in the simulator, drivers are asked to complete simple tasks, like driving for several miles along a highway and finding a particular exit, or navigating local streets where they must brake for traffic lights, change lanes and watch for pedestrians. How fast they drive, how well they stay in their lane, driving speed and eye movement are closely monitored.

The Utah researchers have also placed electrodes on participants' scalps to gauge how they process information. Similar studies, using brain imaging, have been done at Carnegie Mellon.

The studies show that cellphone conversations are highly distracting compared with other speaking and listening activities in the car.

One might think that listening to talk radio or an audio book would degrade driving skill; it does not. (A quiz after the driving test confirmed that the drivers were really paying attention to the programs.)

Well - National Safety Council Urges Cellphone Ban for Drivers - NYTimes.com

Likewise, it is easy to equate talking to a friend on a cellphone with talking to a friend in the passenger seat. But a December <u>report in The Journal of Experimental Psychology: Applied</u> debunked that notion. Utah researchers put 96 drivers in a simulator, instructing them to drive several miles down the road and pull off at a rest stop. Sometimes the drivers were talking on a hands-free cell phone, and sometimes they were chatting with a friend in the next seat.

Nearly every driver with a passenger found the rest stop, in part because the passenger often acted as an extra set of eyes, alerting the driver to the approaching exit. But among those talking on the cellphone, half missed the exit.

"The paradox is that if the friend is sitting next to you, you drive safer," Dr. Strayer said. "When you talk to that person on a cellphone, you're much more likely to be involved in an accident."

Despite the overwhelming body of evidence that cellphone use while driving is risky, the idea of a total ban is sure to be controversial.

"People understand the dangers, but they just don't want to give it up themselves," said Ms. Froetscher, of the National Safety Council. "But years ago we didn't put on seat belts, or people who might have had a drink before driving wouldn't think of it now.

"We have to educate people that it's a risky behavior."

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