

The Psychology of The Simpsons

D'oh!

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Stupid Brain!

Homer's Working Memory Odyssey

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JANUARY 6: Today the doctors pulled a crayon out of my nose, taking pressure off of my brain, and almost at once I felt a kind of awakening of my mind for the first time since I was a young child.

JANUARY 7: Homer. What did my parents have in mind when they assigned me that moniker? Was it the blind Greek bard of *The Iliad* and *The Odyssey*, or slang for the act of propelling a baseball over the wall and out of the playing field? . . . I was leafing through the dictionary today and only now, I believe, have I mastered the words *assign*, *moniker*, *propel*, *slang* and *manifestation* (see the following), as well as Homer in its ancient Greek manifestation; and until now I have not questioned the meaning of my name at all. I have plenty of time to ponder such questions, now that I've lost my job at the Springfield Nuclear Power Plant. Of course, this is not the first time I've been terminated. Mr. Burns was rather upset the time that I caused a meltdown, but he was happy to have me back when I ended my push for public safety in the nuclear power industry. This time seemed different, though. Mr. Burns seemed more than just angry. In the past he's been upset by the ridiculous problems I've caused—quite a few—but this time he just seemed

threatened and a bit frightened as if he imagined, let's say, that I would eventually take control of his company. Mr. Smithers didn't defend me in any noticeable way, either. I found it appalling, and below my dignity to fight their fabricated accusations. Oh, Marge and Bart just came in and I smell some fresh-baked dough—

JANUARY 8: Dear Diary: Two days ago I stole you from Lisa's closet floor but it's for an important cause. Now I know that *I am so smart!* I am so s-m-A-r-t! (I used to leave out that A). Diary, you were blank except for three pages written several years ago, and I really needed to tell my story. I'm tempted to throw about some of the marvelous new words I've learned (like *marvelous*), but I must remember that someday I may be unable to read these words anymore and I will want to reflect upon this period of my life. Homer of the future, if you're reading this, good for you, pal! (Why did I just write "If you're reading this?" You only need the rest of the sentence if you ARE reading it. Well, I do go on too long sometimes now. Ciao!!)

It all began with our trip to the animation convention last month. I lost my life savings in a bad investment and had to sell my body for medical testing to make money. The x-ray turned up something so unexpected that I never would have dreamed of it. There was a crayon lodged in my brain! I do vaguely recall shoving it up my nose when I was a kid to see what would happen, but I cannot be sure that the memory is authentic. At any rate, the doctors removed the crayon and, as it seems, within several minutes I was noticeably smarter. Within about fifteen minutes, I grew ashamed of many of the things I've done during my life, all while unaware of what I was really doing.

The doctors explained it all to me and so now, Dear Diary for Homer of the New Brain, I want to explain it to you. The human brain includes many different systems of nerve cells working together. We know about it from people with brain damage, from new equipment that watches the brain in action (like one they call functional magnetic resonance imaging, or fMRI), and now from the new field of "neurocrayonology" announced in a recent publication reporting the study of my own case. It seems that there is a large piece of neural real estate called the frontal lobe that is just behind the forehead, and my crayon was pressing up against that part of my brain, limiting the blood flow. It's the part of the brain that does many active things. Human things! When people have severe damage to the frontal lobes, they often seem like vegetables. They can still hear, see, feel, smell, move around, and pick up things, mind you. You can tell them stuff and they may remember, but they of-

ten don't react much. This is what happened to all those troublesome mental patients who got frontal lobotomies years ago.

This reminds me of something, Bart, if you ever read this diary: I am very sorry I told you that "if something's hard, then it's not worth doing," or that when you try your best and fail, the lesson you should take is never to try. Shame on my crayon-cracked former frontal lobes! Oh, and one more lesson. Despite all the little lines, your frontal lobe is not a coloring book.

Even a little frontal lobe damage goes a long way. You often can't get people with a few frontal lobe problems to plan their schedules, or much of anything else. If one of them is in a restaurant, they may not be able to order by themselves because they think there are so many choices that they can't decide. Or they may get completely stuck on just one choice and not be able to consider the others at all. (Mmm, food choices...). It's called "perseveration." (And all of this depends on exactly which parts of the frontal lobes are damaged, you understand. It's a complex system in itself). I remember the perseveration I had one time when I played blackjack at the casino....

DEALER: 19.

ME: Hit me!

DEALER: 20.

ME: Hit me!

DEALER: 21.

ME: Hit me!

DEALER: 22.

ME: D'oh!

D'oh indeed. How humiliating.

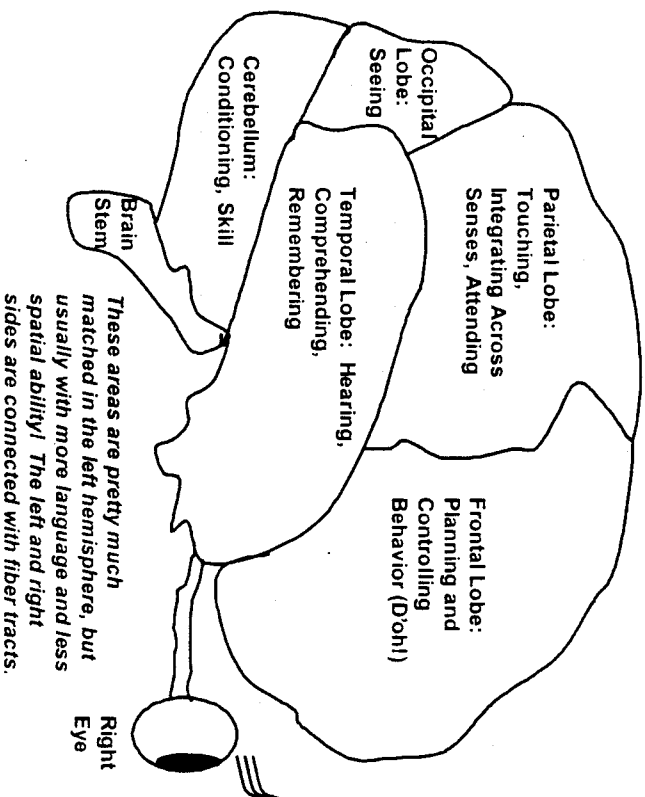
At the same time, someone with damage to the frontal lobes may do something rash, on an impulse that doesn't require much thinking; in other words, they may let their stomach think for them, or they may let their base animal instincts think for them, or they may just do what they feel, physically or emotionally. Like the time I saw a billboard for doughnuts and Duff Beer, and rubbernecked it until I slammed into the truck in front of me. Or the time I was driving through a storm with Ned Flanders, and I forgot who my passenger was. When he told me that I just hit something I said, "I hope it was Flanders." Or the time I spent Springfield's entire annual sanitation budget during my first week in charge. N'ooooh....

And come to think of it, with frontal lobe damage your memory often isn't so great, either. You can remember your past experiences pretty well, and the facts you learned (if any), but you really can't keep track of new stuff. It's like if your wife told you a short grocery list but you didn't bother to say the words to yourself. So, later, you might remember being asked to buy bread if you happen to pass it in the store or, then again, you still might not. Also, you might remember meeting someone but you might not remember exactly who they are or where you met them even though they seem familiar, which isn't too helpful. Of course, everybody has these problems to some degree, I'm told. Look at how many times old Mr. Burns has failed to recognize me! But people with frontal lobe problems tend to have them much worse. Again, all of these problems really do hit home when I reflect on the stupid things I've done throughout my life, apparently because of the fateful crayon. You'll pay for this, Magenta!

JANUARY 9: I realize that my true sins and blunders must have been even worse than I recall, because my brain would not have been able to form very smart or detailed memories of them. It's just like when you don't recall what you did when you were drunk. Wow, come to think of it, drunk + crayon in the frontal lobe = the Homer that the folks at Moe's Tavern knew and loved. (I guess loved.) That is almost unfathomable, but, Ha! I guess if everyone else at Moe's was as drunk as I was, then they may not remember much, either. Even so, I feel so humiliated. What must they have thought of me? I didn't used to worry about stuff like that, but now I do all the time. The psychologists say that I have a theory of mind now and that I didn't have one before. What this means is that I think about what other people are thinking. I hope my appointment with the doctors tomorrow goes all right.

JANUARY 10: Had another trip to the hospital today, and another brain scan. They said that the operation to remove the crayon was only ninety percent successful and that the other ten percent is still in there. They explained in more depth about parts of the frontal lobe. Most of the complicated thinking seems to happen in the outer part that they call the *cortex*. That part seems normal now, from what they can tell. The inner part of the frontal lobe is related to some other circuits that are more primitive. Apparently, a small particle of crayon is still affecting those more primitive circuits. What they call the limbic system affects my memory, but also my emotions and appetite. They seem to think that there may be something wrong with those things still, making me overemotional and overhungry, though I don't see it myself. I'm

FIGURE 1
The Human Brain and Its Functions



the American ideal! Sure, I understand now about the danger of trans fat in doughnuts, but we can't let our intellects govern our whole lives, can we?

JANUARY 13: I've been so busy that I didn't have time to write in the past few days. I want to document what's been happening in great detail so that others can learn from my travails and I can remember them. Well, of course the theme is: Damn that Bart! To explain what he did—D'oh!, I gotta go, the painters and the roof repair people both just arrived, and so did the principal. To think that Bart could practically demolish the school and our house in the same day with so little effort. I can't afford to reimburse the school system so I'm just going to try to act stupid about the whole Bart incident. I'm going to act like the old stupid Homer, until the principal gives up and leaves.

JANUARY 17: It's getting harder and harder to write, what with so many people asking for my advice these days. I bet they wonder why I've changed. They probably just think I stopped drinking (there I go with that "theory of mind" again!). Anyway, I've been reading a lot about intelligence. It all started in the early 1900s when the French school sys-

tem was made available for all children. Imagine, a single school system for the poor and also the rich. We should try that in Springfield (just kidding). Well, they wanted to know which kids should go to school with which other ones. Now, they could have decided that in several ways. They could have just done it by age as we do now in the good old U.S. But children of the same age can be quite different. Did you ever see the hallway in a junior high school, when the big ones just push the small ones aside? Well, I think they probably should have separated the kids according to some combination of height and weight. That way, at least, we wouldn't have the small ones getting the skit picked out of them. (You know what I'm trying to say, Mr. Censor!) But so the French decided they wanted to combine children who were at the same level of mental capability. You know: Which children can succeed at long division? Who can read Descartes? Who can spell? And so on. This was the birth of the idea of the intelligence quotient, or IQ.

JANUARY 17, 2:00 p.m.: To continue: The psychologists really didn't have a very good idea of who could do what, except by asking them. But a guy named Alfred Binet came up with a brilliant scheme, the idea of a mental age. Say you're a seven-year-old but you can answer questions just like the typical nine-year-old. Sort of like Lisa. Then they would say that you have a mental age of nine. So they could put you in with the other smart seven and eight-year-olds, and with the average nine-year-olds, and with the dumb ten-year-olds, and call it a classroom. I still think that would lead to the small ones getting the skit picked out of them. Unless they use their smarts to avoid that. I guess they'd have to tell a lot of jokes. I heard that's how Jon Stewart got by when he was a kid. Anyway, we must not use the smart-dumb method very much in the USA; Lisa is in class with Ralph Wiggum, and he makes the old me look like the new me!

JANUARY 18: The more I read about intelligence the less satisfied I am with the concept. You know, it isn't measured by questions that make a lot of sense in an organized or principled way. The questions that are used are just "whatever." Namely, whatever works. To invent the intelligence test, the psychologists made up a bunch of questions that sounded like they might be good. If a question was pretty reliably answered correctly more often by older kids than by younger kids, they would keep that question in the test. But if a question didn't distinguish between the older and younger ones, the question would be dropped.... But what if the younger kids remembered something that the older ones didn't, like, for example, the details about some nurs-

ery rhyme? I don't think the psychologists could answer that. So the test depended on their assuming certain things. The tests don't necessarily show that older children are smarter; the tests are based on that assumption! The test-makers could have focused on more well-defined abilities, but to do that I guess they would have needed more of a theory of mind!

They also made up IQ tests for adults. They did it first for the U.S. army, to see who should be in charge of aiming the rockets and who should be peeling potatoes (mnnn... potatoes). So, here, the thing they used to decide how good a question is, was called the criterion. If a soldier had really good performance on a lot of different jobs, even the complex ones, they called him smart. The criterion was job performance. Any question that those smart guys could answer more often than the screw-ups was considered a good question, and it was kept in the test. But... it's hard work to compare how the answers to lots and lots of questions relate to soldiers' work performance, so after a while they just started comparing newer tests to the older tests. I hope that after so many years, the test scores still relate to job performance, even though jobs have changed so much over time!

As I said, though, the questions on intelligence tests often seemed kind of arbitrary and I'm not very satisfied with them. For one thing, they failed Maggie on her first intelligence test because she couldn't talk, but when we realized that she could communicate through playing blocks, they re-tested her and found out she's even smarter than Lisa (although it turned out she was cheating)! Actually, some of the psychologists aren't very happy with the tests, either. They keep arguing over whether there's just one basic kind of intelligence, which they call *g* for general intelligence, or whether there are several different types. They use really complicated math to investigate this. Some people say that what you already know—the facts and skills—make up your *crystallized intelligence*, and that that's different from how well you use what you know to figure out new ideas and new ways to do things, your *fluid intelligence*. Anyway, the tests they use to decide who gets into college were once more like fluid intelligence tests but now, these past few years, they're a bit more like crystallized intelligence tests.

JANUARY 19: To continue: Where was I? Oh yes, crystallized and fluid intelligence. They are very closely related, I'm told. People with high crystallized intelligence also tend to have high fluid intelligence. I guess that's because, after a while, people who can learn the best and figure out new things will obviously end up knowing the most. Just like,

as I was reading the other day, the stars that are traveling the fastest are also the farthest away from Earth. I'm the exception because I haven't been smart long enough to know all that much; you might say that I'm the only close star traveling fast.... Anyway, some people say there are many different kinds of intelligence, like verbal, spatial, musical, athletic, emotional and social intelligence, just to name a few. But everything they measure seems to be somewhat related to everything else, in that people who are high on one intelligence also tend to be high on others, so this *g* idea of a general intelligence doesn't seem like something to be ignored. They also say that identical twins tend to have *g*'s very similar to each other, but the way you're treated matters also, if it's extreme. So if one twin lives well, like *tis* in Springfield, and the other twin is sent to the poorhouse, like that town I won't mention by name, they don't end up thinking alike after all.

JANUARY 25: All right, I'm definitely getting interested in this "smart" thing. I've enrolled in a course at the community college in what's called cognitive psychology. It means psychology about the way people see, listen, perceive, think, imagine, remember and act out. That's a lot to consider, and I wanted to get a good value for my tuition money. Actually, I got a scholarship from the Kwik-E-Mart "Always-Open Minds" Foundation and I want to get the most value for that.

Cognitive psychology is a lot to cover in just one course. It's as if your mind is a whole committee and each guy in the committee needs a whole course of his own about him. Like that first time I met Marge. The perception guy told the impulse guy to go right up and kiss her, but then the imagination guy figured that Marge wouldn't take it too well and we might just get slapped. So he told that to the think guy, who decided that it would be better just to, say, ask her to tutor him in French to get to know her (even though we weren't taking French). Then when we knew her better, we could ask her to the prom. So that's the final decision we gave to the action guy and thankfully he listened to the think guy instead of the impulse guy. Of course, these guys didn't do as well when the impulse guy convinced the action guy to admit that we weren't taking French, but later the emotion guy acted up on his own and Marge forgave us. And it worked out happily ever after for the whole committee! Judging from what I've seen at Moe's, it's lucky that the beer-drinking guy wasn't too involved in this one.

FEBRUARY 4: My instructor is interested in something he calls "working memory." That's what I have from the power plant—working memory, meaning memory of when I used to work. Heh, heh. No,

I'm joking. Working memory refers to the small amount of ideas that you can use and keep track of at one time. We all have tons and tons of stuff in our head. Well, not literal tons, but lots of ideas and memories, built up over a lifetime. (They're quite lightweight, literally speaking, at least.) But we can't think about all of them at once. The small part that we can think about is called working memory. There are lots of ways to measure it. For example, in intelligence tests they use something called digit span, which is when they say a series of numbers to you out loud and you have to say them all back in the right order. The more you can repeat in a series without a mistake, the better your score is. This is important stuff. For example, suppose someone tells you a telephone number that you have to call and then leaves, and you don't have paper. If you forget the number, you can't make the call. You have to just remember the number in your head. It could be important, like calling for a taxi or a pizza (or maybe even a taxi with a pizza in it). You might try strategies like imagining that you are saying the number over and over until you finish pressing buttons. I think I read that they invented the digit span test not long after they invented telephone numbers!

FEBRUARY 6: So, I was thinking. I never really had much trouble remembering telephone numbers, except for that time I had to ask the operator the number for 911. Oh, and the time they made us dial an area code every time we made a call. Hmm. Well, anyway, some other kinds of working memory made me look really, REALLY stupid. Think about what I did after I met that great guy who was a roofer. (I think his name was Ray, and people thought he was my imaginary buddy.) I was told to watch CBS Monday night at 9 p.m. I recall that I kept asking stuff and the guy kept answering: "... and what day would that be?" "Monday." "On what channel?" "Channel 9." "If I were to watch this show, what time would I watch it?" "9 p.m." "Really? What channel is showing it?" And so on, like that, over and over. Yikes, how many times have I said something like, "Uh-huh, uh-huh. Okay. Um, can you repeat the part of the stuff where you said all about uh-hh, the things?" I never would have realized how stupid I sounded if Bart hadn't secretly tape-recorded me, and if Lisa hadn't stolen the tape from his tree house, and if Maggie hadn't put it in her mouth and crawled into my bedroom with it. So why was this so much harder than telephone numbers? I suppose it was because I wasn't saying the information to myself, like I sometimes do with telephone numbers. And some of the other working memory tests, the ones that really seem to predict how intelligent you are, make you do two things at once, like counting some dots and re-

membering the sum; counting some more and remembering that sum; and after several sets of dots, you have to repeat all of the sums. You really have to be smart to succeed at a list of four or five of those at a time. People who do are usually really good at lots of other complicated stuff like solving problems, understanding what they read, and reasoning. That's why some people think that working memory is what makes you intelligent!

FEBRUARY 8: I asked my cognitive psychology professor about working memory today. He said that using your working memory often requires that you pay attention. If you say the words over and over, you don't have to pay attention much. But if you don't say them like that, you do have to pay attention or you'll lose them. And it depends on the brain. It depends on the frontal lobes, as we've been saying, and the parietal lobes doing a different job. The professor said the parietal lobes are farther back in the brain, on the left and the right. (The frontal lobes have a left and the right too, but they come together in the center.) More intelligent people seem to have better frontal lobes and maybe better parietal lobes, too. But behaviors can be deceiving. If intelligent people are upset or bored and unmotivated and thinking about something else, they won't do well on your test because they aren't using their frontal lobes in the right way. They won't do well if they're tired or drunk, either.

The frontal and parietal lobes work together as a team, in a network. So, with a crayon stuck in my frontal lobe, I wasn't able to control my attention very well. The Duff Beer and doughnut billboard just captured my attention away from driving like nothing, and I couldn't stop it. But if I had the crayon in my parietal lobe somehow (though it couldn't get there through my nose), I would have different problems. Then I wouldn't be able to see or imagine things the right way. If it was stuck in the left side, I wouldn't be able to notice things on the right side of the world, like the billboard. If it was stuck in the right side, I wouldn't be able to notice things on the left. That's called unilateral neglect and a lot of folks Dad's age get it from a stroke. Maybe that's what was wrong with his golf game, when he kept hitting the ball to the right of the hole. (His stroke made him add strokes! Hee hee, I'm hilarious sometimes!) Also, some parietal lobe patients don't know that there is anything wrong with them, and they deny it. Then they just seem so unaware. But also, without your parietal lobes you wouldn't be able to keep very many things in mind. You wouldn't remember the time, the place, and the channel all at once. (I don't think that the crayon could affect my pa-

rietal lobe but, since the frontal lobe helps to control what the parietal lobe emphasizes, maybe they work together enough that they gave me the problem in paying attention. That seems to be why I didn't do too well on intelligence tests. Actually, my golf score was much higher than my IQ until recently).

I have been doing really well in my cognitive psychology class. Part of the reason is that I have been using information that I learn in class to improve my study habits. I learned that we remember information better if we study it a little bit every day, rather than trying to cram it in all the night before the exam. Also, that allows better sleep before the exam, which is important for working memory and retrieving information for the exam. Woo hoo!

MARCH 20: It is too bad that I haven't written in a long time. I haven't felt like it at all. I've been depressed. It's just been a little disconcerting to have an IQ of maybe 140 and a whole life history of a guy with an IQ of maybe 85. I just don't feel like I know who I am. The people around me don't seem to know who I am either. I'm not sure that being smart is everything I hoped it would be. Also, it makes me practically ineligible for some jobs with the government. I'm seriously toying with the idea of doing away with Smart Homer. All it would take is another crayon back up the nose....

APRIL 3: Dear Diary: This is Lisa. I am carrying on for Dad. He hasn't felt like writing in a while but I was fascinated and touched by his personal Odyssey documented in these pages. The trouble was, being smart made him depressed for some reason. Apparently, there was some friction with Mom because she felt like he wasn't the man she married. She couldn't explain it and was crying a lot. Also, he wasn't getting along with any of his old friends. So, against my counsel, Dad decided to put the crayon back in his nose. Actually, I think Moe helped. I have to admit that I am relieved, having the old Dad back again. But I hereby swear to transcribe something he says every day, because I pledged to him that I would do that. I love him very much and it's the least I can do. Every day I'm going to ask him to tell me about his day and, in the interests of science, I'll write down exactly what he says, verbatim.

APRIL 4: H.S., transcribed by L.S. Well, Lisa, today I went to my class in cognitive psychology. That's where the guy talks about stuff and it helps me to figure out why we are the way we are. He asked if anyone ever lost brain cells and he told us about a study on somebody who did.... So, Lisa, you really think I messed up my brain once? Uh-oh, me lose brain cells? I don't remember that. Oh well, what's important is to

treat the brain cells you've got to beer and TV! (Note from L.S.—Today, to impress us with his continuing education, Dad is wearing a leather jacket onto which he sewed tweed elbow patches. When I told him that professors actually wear leather patches on a tweed jacket, not the reverse, and that he ruined a perfectly good jacket, he said, "Incorrect, Lisa. TWO perfectly good jackets!").

APRIL 5, 5:30 p.m.: H.S., transcribed by L.S. I heard about this crazy experiment in class today where the not-so-smart people with bad working memories noticed things better than the smart people with good working memories. Woo hoo! They gave some people a message in one ear in headphones, and they were supposed to repeat that message out loud. At the same time, in the other ear there was a message they were supposed to ignore. What was very sneaky was that they said each guy's own name in the car that was supposed to be ignored. Guess what? Most of the not-so-smart people noticed their names, and most of the smart people didn't notice. The teacher said something about smart people with good working memory focusing their attention better, blah, blah, blah. But I say that the not-so-smart people are smarter than the smart people! I am so smart! S-M-R-T! Why are you looking at me like that? Oh, look at that bird at the window. What do you think is for dinner? Wait, I think Marge is talking about me on the phone and I want to go spy on her.

APRIL 5, 6:30 p.m.: H.S., transcribed by L.S. Hey, Lisa, in class today I heard about this funny experiment where the low working memory people noticed things better than the smart people. Woo hoo! They gave some people a message in one ear in headphones, and... Huh? What do you mean I told you this already? Lisa, don't you think I know whether I've told you something or not? Hey, was that your stomach I just heard or mine? Okay, good. Anyway, Lisa, don't you think your daddy knows when he's told you something or not?

APRIL 6: H.S., transcribed by L.S. Well, Lisa, I heard about another crazy experiment today. They said you could only remember about three to five different things. Like I can remember all three of the people in our family: me, Marge, and Maggie.... Didn't I say you? You, Marti, and Barge. I mean, Bart and Marge. And you. And, oh yeah, Maggie. And me. Anyway, you can remember more if you make chunks out of them (mmm...chunks...). Okay, so if you and Bart tied your legs together and Mom and I tied our legs together, then I'd be able to remember all four of us: you and Bart, me and Marge, so the whole family would be remembered.... What do you mean? I said Maggie. Didn't I? D'oh! Any-

way, the smart people think they're so GREAT because they can remember MORE things, and make larger CHUNKS. Well, I showed them. I made a huge chunk out of six doughnuts by squooshing them together into a paper cup, and when I got to Moe's I remembered to take all six of them in with me for a snack. I'm like that guy who built a rocket from scratch and blasted into orbit! What was his name? Apollo Creed?

APRIL 7: H.S., transcribed by L.S. I'm so glad that I got my job back! The interview was a cinch. I knew just how to answer every question without even thinking! I knew that vampires are make-believe, just like elves, gremlins and Eskimos! And I owe it all to a little crayon. Let's go out tonight to celebrate... you all can wait in the car while I stop at Moe's for a few minutes, and then we'll go to dinner.

APRIL 8: H.S., transcribed by L.S. I played a really good trick on Mr. Smithers. It was all from an experiment that I learned from my Cognitive Psychology class. They showed us that people who can't remember many things in their working memory also look the wrong way. Or, actually, they look the right way when they're told to look the wrong way. Anyway, you tell them that when a light flashes on the left, they are supposed to look right, and if it flashes on the right, they are supposed to look left. The professor did this on a computer screen, but later when I got to the power plant I managed to get the lights on the console to blink that way, too. Anyway, the not-so-smart people look at the blinking light even though they were told that they were supposed to look the other way. Heh, heh, heh. Silly not-so-smart people! So, I told Mr. Smithers he had to look away from the light when it blinked or he'd get a surprise. And when he looked at the light, I shot him in the eye with a squirt gun. Then he was sort of mad but I told him he could do it to me. But before we could get that far, more lights started blinking. I'm not sure what all of the blinking lights meant. Maybe I shouldn't have messed with the first one. But we've never had any safety troubles at the power plant because they hire watchmen. I'm a watchman, actually. Anyway, so I'm glad I have my job back.

APRIL 9: H.S., transcribed by L.S. Well, I took my final exam today in Cognitive Scatology. Yep, we graded it right in class. I flunked the exam but I got a C in the class. Woo hoo! My first two exam grades were great but somehow I blew the final. It had a lot of good questions on it but they made me think of other things. I don't understand why I blew it after I pulled an all-nighter to read the textbook and the notes. I thought I could take short naps between questions in the exam, but the professor didn't like me setting an alarm clock in the classroom. But it's still

the best class grade I ever got. So maybe that crayon stabbed me right in the "stupid gene" that all the male Simpsons are supposed to have. You never can tell.

References

- Baddeley, A. (2000). "The episodic buffer: a new component of working memory?" *Trends in cognitive sciences*, 4, 417-423.
- Baddeley, A., & Hitch, G. J. (1974). "Working memory." In G. Bower (ed.), *Recent advances in learning and motivation*, Vol. VIII. New York: Academic Press.
- Conway, A. R. A., Cowan, N., & Bunting, M. F. (2001). "The cocktail party phenomenon revisited: The importance of working memory capacity." *Psychonomic Bulletin & Review*, 8, 331-335.
- Conway, A. R. A., Kane, M. J., & Engle, R. W. (2003). "Working memory capacity and its relation to general intelligence." *Trends in Cognitive Sciences*, 7, 547-552.
- Cowan, N. (2005). "Working-memory capacity limits in a theoretical context." In C. Izawa & N. Ohta (eds.), *Human learning and memory: Advances in theory and applications*. The 4th Tsukuba international conference on memory Erlbaum, 155-175.
- Cowan, N. (2005). *Working memory capacity*. New York, NY: Psychology Press.
- Kane, M. J., & Engle, R. W. (2002). "The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective." *Psychonomic Bulletin & Review*, 9, 637-671.
- Kane, M. J., & Engle, R. W. (2003). "Working-memory capacity and the control of attention: The contributions of goal neglect, response competition, and task set to Stroop interference." *Journal of Experimental Psychology: General*, 132, 47-70.
- Miyake, A., & Shah, P. (eds.) (1999). *Models of Working Memory: Mechanisms of active maintenance and executive control*. Cambridge, U.K.: Cambridge University Press.
- Neisser, U., Boodoo, G., Bouchard, T., Brody, N., Ceci, S. J., Halpern, D., Loehlin, J., Perloff, R., Sternberg, R. J., & Urbina, S. (1996). "Intelligence: Knowns and unknowns." *American Psychologist*, 51, 1-25.

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Homer's Soul



Paul Bloom and David Pizarro

THE DEEPEST QUESTION in psychology—perhaps the deepest question that humans have ever faced—concerns the very existence of mental life. We know that our minds are the products of our brains. We can even use methods such as fMRI to localize certain sorts of mental events, such as the concentration involved in reading a difficult passage of text, the nervousness that many whites feel while looking at a black male face, or the anger at being cheated while playing a simple game. But we remain mystified by what the philosopher David Chalmers has called “The hard problem”: How is it that a physical object (and not a fancy one at that, a bloody lump of grey meat) gives rise to pain, love, morality and consciousness?

Fortunately, scientists can make considerable progress without solving this problem. Viewing the mind as a computer, for instance, has given rise to detailed and intricate models of language learning, visual perception and logical reasoning—all without a theory of how computation can give rise to conscious experience. Similarly, clinical psychologists don't need to solve the mind-body problem to ascertain the causes of specific mental disorders, or to assess potential treatments. Scientists