

3. P. S. Miller et al., *Biochemistry*, 16, 1988 (1977).
4. S.M. Freier, K. H. Altmann, *Nucleic Acids Res.* 25, 4429 (1997).
5. P. E. Nielsen, *Mol. Biotechnol.* 26, 233 (2004).
6. S. A. Benner, D. Hutter, *Bioorg. Chem.* 30, 62 (2002).
7. S. Moran et al., *Proc. Natl. Acad. Sci. U.S.A.* 94, 10506 (1997).
8. M. F. Goodman, *Nature Biotechnol.* 17, 640 (1999).
9. M. Fa, A. Radeghieri, A.A. Henry, F. E. Romesberg, *J. Am. Chem. Soc.* 126, 1748 (2004).
10. J. S. Lai, E. T. Kool, *J. Am. Chem. Soc.* 126, 3040 (2004).
11. H. B. Liu et al., *J. Am. Chem. Soc.* 126, 1102 (2004).
12. C. R. Geyer et al., *Structure* 11, 1485 (2003).
13. N. Minakawa et al., *J. Am. Chem. Soc.* 125, 9970 (2003).
14. C. Y. Switzer et al., *J. Am. Chem. Soc.* 111, 8322 (1989).
15. J. A. Piccirilli et al., *Nature* 343, 33 (1990).
16. T. A. Martinot, S. A. Benner, *J. Org. Chem.* 69, 3972 (2004).
17. A. Ricardo et al., *Science* 303, 196 (2004).
18. M.A. Collins et al. *Nucleic Acids Res.* 25, 2979 (1997).
19. T. Elbeik et al., *J. Clin. Microbiol.* 42, 563 (2004).
20. P. Ball, *Nature* 431, 624 (2004).
21. F. J. Ghadessy et al., *Proc. Natl. Acad. Sci. U.S.A.* 98, 4552 (2001).

Unaware of Our Unawareness

Gavin Mandel^{1*},

"I'll know it when I see it," runs the popular refrain. It's been used to explain how we can recognize everything from obscenity to true love. But how much can we trust what we see or, rather, what we think we see? For decades, cognitive psychologists have been discovering that there is more going on in our brains than we could ever be consciously aware of, even for a moment. The simple tasks of everyday life are so complex that they would overwhelm us if we had to supervise them all the time.

Consciousness Overthrown

What sorts of things influence our brains without our noticing? The list is extensive. The earliest of the true classics was a bystander intervention study (1). Imagine that you have

¹ Department of Psychology

*To whom correspondence should be addressed.
Email: GMandel@Harvard.edu
Department of Psychology, Harvard University,
Cambridge, MA 02138

just arrived at a psychology study. You are greeted by the experimenter and told that you will be having a group discussion via intercom. You'll begin by taking turns talking about your experiences your freshman year, and then you'll have a discussion. You're told that you'll be with just one other person. You're shown into a room, the experimenter leaves, and the discussion begins. As the other person is talking, he begins to have a seizure, bumping around, speaking incoherently, and then falling ominously silent. What do you do?

Odds are, you think you'd ask for help. And you're probably right. Now imagine the exact same scenario with just one minor change. Instead of being told that your discussion will involve you and one other person, you're told that it will involve a group of four people. When the discussion begins, they introduce themselves and then the unfortunate subject has his medical crisis. Remembering that you can't talk via intercom, what do you do? This could be life and death.

The answer is that you wait longer to ask for help, if you do at all. In fact, the odds of any one person helping are inversely proportional to the number of others who are in a position to help. Though researchers have found this effect in many studies, their research subjects tend to deny that it happens (2-5). They insist that the number of people in the study had not affected them whatsoever. Their brains had fooled them completely.

Recent Research

The most recent developments have been in the area of social behavior and goal pursuit. What is most striking about these demonstrations of unconscious influences is that the effects are obtained by extremely subtle psychological manipulations. A person is non-consciously cued to think about a certain idea by, for example, showing them adjectives related to rudeness in a "language skills test." This is referred to as *priming*. If you take this person who is having unconscious "rude" thoughts and give him or her a chance to behave in a rude manner – such as interrupting an experimenter who is conversing with another person – the subject will exhibit greater rudeness, by interrupting faster (6). The subject does not realize that they're acting differently because of the words they saw. They instead come up with a story about how they'd been having a bad day, or that they were in a hurry. Yet, time and time again, the nonconscious cues have their effect (7-9). In fact, we get the same results even if subjects see the "rudeness" words flash on a screen subliminally – i.e., so quickly they don't realize they saw anything (10).

If simple behaviors can be nonconsciously cued, can motivations and goals? Priming the concept of achievement causes people to work harder and score higher on a verbal task (11), while making them think of cooperation causes them to act more cooperatively in economic simulations and Prisoner's Dilemma games (12). People are unaware that these goals have been activated, even as they act in ways to attain those very goals (13-14). The nonconscious cue can even be as simple as sitting behind a professor's desk, as opposed to in front of it (15). That can cue power and status (think about that in your next meeting with the boss). And all of these things happen without it ever occurring to us that we are acting any differently.

These studies are interesting, but maybe we are only so easily duped if we're in experiments. But there have been other studies that have examined people who think the experiment is long over. In one study, subjects were led to think about elderly people. The subjects were then told that the experiment was over and that they were free to go. What did the experimenter measure? How quickly the person walked down the hall when leaving the experiment. And yes, the people with the elderly thoughts took longer (16).

Real World Effects

There have been studies on the impact of aggressive cues like weapons on later aggressive behavior (17), the impact of exposure to television violence on aggressiveness in children (18-23), and the impact of witnessing helpful acts on later probability of helping a person in need (24-25). Those studies showed consistently strong influence by context on behavior in real world settings. Rarely do any of the people in those studies think they were influenced. After all, how many teenagers think that playing Grand Theft Auto will make them more violent? Yet research suggests it does (26).

Modern American popular culture and media have created a strong association between African American people and bad acts (27). And some well meaning people don't react well when they encounter African Americans. It is nothing intentional, they may just not quite meet the black person's eyes, or might not say hello, or might just have a feeling of discomfort (28). It is the little things, except the little things add up to Big Things, like being less likely to offer black candidates jobs in interview simulations, or ending a simulated loan interview more quickly (29). This is called Aversive Racism. Unlike its more overt ancestors, this form is almost entirely unconscious. In fact the person is often horrified if shown evidence that they

reacted differently to black and white people (30). Aversive Racism can be measured by a host of measures, the most famous of which is the Implicit Attitudes Test. That reaction time task shows how closely concepts are linked in the brain. Several years ago, researchers at the Cognitive Science Laboratory at MIT began to trace brain activations in people who rated high in Aversive Racism. Different areas of their brain “light up” when looking at a black face than a white one (31). Some of those areas are linked to basic fear responses, and some involve more complex cognitive activation (32). In either case, people are unaware that they respond differently to the different faces. They often hold political and social beliefs that are incredibly accepting and tolerant. Yet still, the data show a reliable and unconscious prejudice. Often we, as scientists, have trouble accepting that we too could be biased, but we have no choice but to admit the possibility.

Aversive Racism is but one example of our tendency to make snap judgments about other people without realizing it. Another classic example is the *halo effect*, whereby our first impressions are unintentionally influenced by a single positive trait. For example, physically attractive people are also judged to be more likeable, social, and talented (33). Because this effect happens without our intending it (or even knowing we did it), we tend to be overconfident in the accuracy of first impressions.

Lifting the Hood

So how does our conscious mind deal with all of these non-consciously motivated behaviors? As suggested by the rudeness study mentioned earlier, it tries to interpret them, to tell a story around them. The classic pantyhose study is a good example. People were brought into a lab and asked to choose between several different sets of pantyhose. The participant would always claim that the pair they chose was somehow “better.” They said it was silkier, they said it was sheerer, they said a great many things. How do we know that they were mistaken? Well, each of the pairs was exactly the same, but they always picked the pair furthest to the right, even though the pairs were shuffled every time (33). They picked that pair because they saw it first as they entered the room, but they didn’t know that was the reason. Their minds were left to struggle for some other grounds on which to retroactively base their decision. We do think this way everyday. Ever stopped to wonder why you did something? Its hard to know if you found the “real” reason.

The key is efficiency. The title of one recent book puts it clearly, we are gifted and

cursed with “The Cognitive Shortcuts That Make Us Smart” (34). Our brains have found clever ways of preserving processing power while still getting it right enough of the time. What is enough? Well, more now than it used to be. The brain wasn’t designed with Mass Media in mind. As the last two decades have seen the rise of evolutionary theories of psychology, it is natural to think of these effects in terms of what is adaptive. Our brains do a lot of things without getting our full informed consent, but they only have our best interests in mind.

Unaware of Our Unawareness

If it isn’t enough that our consciousness can be so easily undermined, we are also left unaware of its failure. Try as they might, experimenters have not been able to make people realize when they have been unintentionally influenced. We believe that we would know if our actions were being so drastically altered. Yet these studies and hundreds of others have all shown that we know less about our motivations and about the sources of our actions, judgments, and decisions than we thought. Indeed, our intuitions may provide little but false confidence.

References and Notes

1. Darley, & Latane (1968). Bystander intervention in emergencies: Diffusion of responsibility. *Journal of Personality and Social Psychology*, 8, 377-383.
2. Horowitz, (1971). The effect of group norms on bystander intervention. *Journal of Social Psychology*, 83, 265-273.
3. Christy (1994). Bystander responses to public episodes of child abuse. *Journal of Applied Social Psychology*, 24, 824-847.
4. Tice, & Baumeister (1985). Predicting the bystander effect. *Journal of Personality and Social Psychology*, 49, 420-428.
5. Bryan, & Test (1967). Models and helping: Naturalistic studies in aiding behavior. *Journal of Personality and Social Psychology*, 6, 400-407.
6. Bargh, Chen, & Burrows (1996). Automaticity of social behavior: effects of priming on action. *Journal of Social Psychology*, 81, 230-244.
7. Johnson, & Tanya (1999). The cognitive monster: The case against controllability of automatic effects. *Theories in Social Psychology*, 361-382.
8. Grubman, & Artez (1999). The most powerful manipulative messages are hiding in plain sight. *Applied Psychology*, 57, 6-19.
9. Milstein (1999). The unbearable automaticity of being. *American Psychologist*, 54, 462-479.
10. Bargh et al (1996). Experiment 3.
11. Gollwitzer, Barndollar, Troetchel, (2001). The automated will: nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, 81, 1014-1027.
12. Neuberg (1988). Behavioral implications of information presented outside of conscious awareness: The effect of subliminal presentation of

trait information on behavior in the prisoner's dilemma game. *Social Cognition*, 6, 207-230.

13. Fitzsimons & Grand (2002). Nonconscious motivations: their activation, operation, and consequences. *Self and Motivation*, 28, 13-41.
14. Nisbett & Wilson (1977a). Telling more than we can know: verbal reports on mental processes. *Psychological Review*, 84, 231-259.
15. Chen, Lee-Chai (2001). Relationship orientation and the effects of social Power. *Journal of Personality and Social Psychology*, 80, 173-187.
16. Bargh et al. 1996, experiment 2.
17. Berkowitz, & Leipage, (1967). Weapons as aggression-eliciting stimuli. *Journal of Personality and Social Psychology*, 7, 202-207.
18. Donnerstain, Slaby, & Eron, (1994). The mass media and youth aggression. In Eron, Gentry, & Schlegel, *Reason to Hope: A psychosocial perspective on violence and youth*. Washington DC, American Psychological Association.
19. Anderson & Bushman (2002). The effects of media violence on society. *Science*, 295, 2377-2379.
20. Paik & Comstock (1994). The effects of television violence on antisocial behavior: a meta-analysis. *Communication Research*, 21, 516-546.
21. Wood, Wong, & Chachere (1991). The effect of media violence on viewer's aggression in unconstrained social interaction. *Psychological Bulletin*, 109, 371-383.
22. Meyer (1972). The effects of justified and unjustified real film violence on aggressive behavior. *Journal of Personality and Social Psychology*, 23, 21-29
23. Johnson, Cohen, Smailes, Kasen, & Brook (2002). Television viewing and aggressive behavior during adolescence and adulthood. *Science*, 295, 2468-2471.
24. Bryan & Test (1967). Models and helping: naturalistic studies in aiding behavior. *Journal of Personality and Social Psychology*, 6, 400-407.
25. Piliavan & Callero (1991). *Giving blood: the development of an altruistic identity*. Baltimore: Johns Hopkins University Press.
26. Johnson & Bushman (2004). Aggression modeling and popular video games. *Journal of Personality and Social Psychology*, 90, 186-205.
27. Monteith, Sherman, & Devine (1998). Suppression as a stereotype control strategy. *Personality and Social Psychology Review*, 1, 62-82.
28. Nial, Harton, & Decker (2003). Political orientation and modern versus aversive racism: tests of Dovidio and Gaertner's (1988) Integrated Model. *Journal of Personality and Social Psychology*, 84, 754-770.
29. Word, Zanna, & Cooper, (1974). The nonverbal mediating of self-fulfilling prophecies in interracial interaction. *Journal of Experimental Social Psychology*, 10, 109-120.
30. Dovidio & Gaertner (2004). Aversive Racism. In Zanna (ed) *Advances in Experimental Social Psychology*. New York: Academic Press.
31. Cohen, Goren, Harris & Fiske (2004). Brain activation and stereotype salience: neurological implications of unconscious racism. *Journal of Cognitive Science*, 9, 300-314.
32. Cohen et al, 2004,
33. Nisbett & Wilson (1977b). The halo effect: Evidence for unconscious alteration of judgments. *Journal of Personality and Social Psychology*, 35, 250-256.
34. Nisbett & Wilson (1977a).