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Brain Candy

By DANIEL J. LEVITIN
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My dog, Shadow, does not have an intact disgust module. Neither did the succession of best friends who preceded him. Dogs will eat or roll in practically anything, without any trace of an emotion that seems to be uniquely human. Human infants don't show disgust until they're 5 to 7 years old.

Disgust, Michael S. Gazzaniga argues in his new book, "Human," is one of the five emotional modules that distinguish us from other species. Other modules are common across species. Neither adults, nor human infants nor wallabies, for example, have to be explicitly taught to avoid certain dangers. Encountering a large, fast-approaching creature with sharp teeth — even if you have never encountered it

before — causes an automatic fear and avoidance reaction. Evolution has hard-wired a general fear response into our brains, rather than a fear of specific things — you never know what you might encounter, and you don't want to sit there ruminating about it while you become lunch. Speaking of rumination, part of what makes human brains special is that we are the only animals who even bother to ask the question of why we're special.

Gazzaniga, a cognitive neuroscientist at the University of California, Santa Barbara (and one of the inventors of the field), takes us on a lively tour through the latest research on brain evolution. (Full disclosure: the book discusses three of my papers, among hundreds by others.) Human brains turn out to be less different from other animal brains than you might think. Language and social cognition fall along a continuum across species.

Deception, for instance, long thought to be unique to humans, is present in monkeys and crows, which can even hide their attempts to deceive. Counterintuitively, much of what makes us human is not an ability to do more things, Gazzaniga writes, but an ability to inhibit automatic responses in favor of reasoned ones; consequently, we may be the only species that engages in delayed gratification and impulse control (thank you, prefrontal cortex).

Gazzaniga doesn't shy away from hard problems, like why humans, alone among species, have art. The attraction to stories, plays, paintings and music — experiences with no obvious evolutionary payoff — is puzzling. "Why does the brain contain reward systems

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that make fictional experiences enjoyable?" he asks. Part of the answer, he argues, is that fictional thinking engages innate "play" modules that enhance evolutionary fitness (that is, the ability to propagate one's genes) by allowing us to consider possible alternatives — hypothetical situations — so that we can form plans in advance of dangers or even just unpleasant social situations. "From having read the fictional story about the boy who cried wolf when we were children," he writes, "we can remember what happened to him in the story and not have to learn that lesson the hard way in real life." Art may be more than a leisure activity. Artistic, representational thinking could have been fundamental in making us the way we are. As Gazzaniga concludes, "The arts are not frosting but baking soda."

In a hair-raising final chapter, Gazzaniga turns to the question of whether technology may eventually make us something other than human, exploring such potential enhancements as brain implants and germ-line gene therapy, which alters the DNA in sperm, egg or embryo (thus passing the changes on to future generations). It's one thing to eliminate genes that cause cystic fibrosis or muscular dystrophy, which tests already allow us to detect in developing embryos. But what happens, Gazzaniga asks, when we identify genes that indicate a high probability of developing diabetes or heart disease in middle age? Will we toss the embryo, "start all over again and try for a better one?" Or change the offending genes based on probabilistic outcomes?

You may reject out of hand the idea of a neural implant, a computer chip grafted to your brain. But the lines become blurred. We already alter our neurochemistry through caffeine and alcohol (not to mention [Prozac](#)). People with thyroid or pituitary problems use pills or injections to restore their hormonal balance. Others have cochlear implants or electrodes to stimulate injured parts of the brain. If a chip could mediate thyroid function, that doesn't seem so different. A neural implant might also stimulate the prefrontal cortex and brain stem the way caffeine or [Ritalin](#) or Prozac do. But will we accept an implanted memory restorer for people with Alzheimer's? What about intelligence-enhancement chips for schoolchildren? Gazzaniga imagines the conversation: "Honey, I know that we were saving this money for a vacation, but maybe we should get the twins neural chips instead. It is hard for them in school when so many of the other kids have them and are so much smarter." If this is fundamentally different from discussions about glasses, hearing aids or Ritalin, that difference is not obvious.

And if neural implants could keep Shadow from rolling in dead squirrel, maybe they wouldn't seem so disgusting after all.

Daniel J. Levitin is a professor of psychology and behavioral neuroscience at McGill University and the author, most recently, of "The World in Six Songs: How the Musical Brain Created Human Nature."

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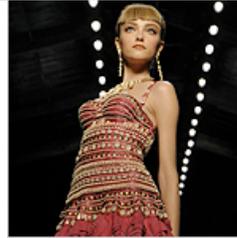
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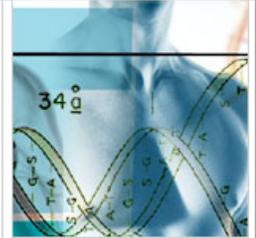
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