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## This Is Your Brain on Happiness

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Circuits in your brain light up when you're happy. One groundbreaking researcher has discovered how to keep them lit.

There are no dark corners in Madison, Wisconsin, a university town that sparkles with endowment and research dollars—more than \$900 million last year—as well as just plain Midwestern niceness. The grants are well earned: It was at the University of Wisconsin—Madison that the first bone marrow transplant was performed and the first synthetic gene was created. It was here that human stem cells were isolated and cultured in a lab for the first time. And for more than a decade, one of the campus's most productive hit makers has been the Laboratory for Affective Neuroscience, run by a 56-year-old neuroscientist and professor of psychology and psychiatry named Richard J. Davidson, PhD, who has been systematically uncovering the architecture of emotion.

Davidson, whose youthful appearance and wide-open smile give him more than a passing resemblance to Jerry Seinfeld, has been studying the brain structures behind not just anxiety, depression, and addiction but also happiness, resilience, and, most recently, compassion. Using brain imaging technologies, in particular a device called a functional magnetic resonance imaging (fMRI) machine, a sort of Hubble telescope for the brain, Davidson and his researchers have observed the areas associated with various emotions and how their function changes as an individual moves through them. His "brain maps" have revealed the neural terrain of so-called normal adults and children, as well as those suffering from mood disorders and autism. Davidson has also studied a now rather famous group of subjects: Tibetan monks with years of Buddhist meditation under their gleaming pates.

Probably his most well-known study mapped the brains of employees at a biotech company, more than half of whom completed about three hours of meditation once a week led by Jon Kabat-Zinn, PhD, founding director of the Stress Reduction Clinic at the University of Massachusetts Medical School. After four months, the meditating subjects noticed a boost in mood and decrease in anxiety, while their immune systems became measurably stronger. What made headlines, though ("The Science of Happiness" sang a January 2005 *Time* magazine cover), was that Davidson vividly showed that meditation produced a significant increase in activity in the part of the brain responsible for positive emotions and traits like optimism and resilience—the left prefrontal cortex. In meditating monks, he'd separately found, this area lit up like the lights in Times Square, showing activity beyond anything he and his team had ever seen—a neurological circuit board explaining their sunny serenity.

These and other findings of Davidson's have bolstered mounting research suggesting that the adult brain is changeable, or "plastic," as opposed to becoming fixed in adolescence. What this means is that although an individual may be born with a predisposition toward gloominess or anxiety, the emotional floor plan can be altered, the brain's furniture moved to a more felicitous arrangement; with a little training, you can coax a fretful mind toward a happier outlook. It's a new understanding of the brain that represents a paradigm shift of seismic importance, and one that's sent a steady stream of reporters out to Madison like pilgrims on the road to Santiago. Perhaps just as seismic is Davidson's "coming out of the closet" (his phrase) as a highly regarded, marquee-name brain researcher with a focus on contemplation, and a commitment to putting compassion and spirituality on the scientific map. The letters on the license plate of Davidson's silvery green Subaru Outback spell out

EMOTE, but the man himself does not ooze. Gentle and precise in his speech, he is the consummate scientist, curious, quietly passionate, and utterly on topic. And despite all the buzz about his work, he'll tell you simply that he has been chipping away at the same ideas about consciousness for more than three decades.

Raised in Brooklyn—his father was in the real estate business—Richie, as friends call him, is still married to his college sweetheart, Susan, a perinatologist and director of the perinatal program at St. Mary's Hospital and Dean Medical Center in Madison. They were born nine days and a few blocks apart; both graduated high school at 16 (she from Erasmus, he from Midwood), and both have graduate degrees in psychology from nearby universities: his from Harvard, hers from the University of Massachusetts. "You couldn't have arranged a better match," he says.

When they arrived in Cambridge in the early 1970s, every swami guru and his mother was selling his wares and giving lectures, says the Davidsons' old friend Jon Kabat-Zinn, who had recently completed his own PhD, in molecular biology at MIT: "You could get an alternate education just by going to all the talks." The first spiritual leader to touch Davidson was Richard Alpert, the Harvard professor who'd been fired for his liberal deployment of LSD among his students and was reborn, phoenixlike, as Ram Dass. Through him, Davidson learned "that there was a way to work on yourself to transform your way of being, to make you happier and more compassionate." And that way was meditation.

Another big influence was fellow student Daniel Goleman, who went on to become a psychologist and the author of *Emotional Intelligence*, among other books. In 1973 he had already traveled to India, developed a contemplative practice, and published papers about it. At that time, Goleman remembers, "there was a strong sense of the new, a sense of something that had not been realized or executed before, and that it had some sort of importance for the culture."

Two visuals that distill the period for Davidson are the memory of Goleman's bright red VW van, its dashboard decorated with photographs of lamas and yogis—as enticing and otherworldly as Ken Kesey's psychedelic school bus—and a 1974 snapshot of him and Goleman wearing Harvard T-shirts and sarongs in Sri Lanka, where Goleman was then living, and where Susan and Richie visited before embarking on their first meditation retreat in India.

"My professors were firmly convinced I was going off the deep end," Davidson says. "But I knew I was going to come back. I was committed to a scientific career. Still, I needed to taste more intensive meditation in that setting." And it was the hardest work he's ever done—16-hour days, two weeks of them, in utter silence. "Anyone who says meditation is relaxation doesn't know what they're talking about. It's like trying to change the course of a river."

When he returned from India, he finished his PhD and started to craft a research career around emotions, at the time the backwater of psychology. It was extraordinarily difficult. "The measuring devices were too crude," he says. "You couldn't see, as we can now, what was happening in the brain." And neuroscience barely existed. "Richie was always kind of eclectic—he wasn't bound by any discipline," says Susan, who became, as her husband likes to say, a "real doctor." His roving interests made him an odd fit, initially, for some universities. "Richie had finished his degree at Harvard, been published in all these journals, but he would go to job interviews and they would say, 'Oh, you're too clinical for our psychology department, or too this for our that,'" Susan says. "People found him interesting, but they didn't want to commit."

What changed the face of his career, according to Davidson, was a meeting in 1992 with Tenzin Gyatso, otherwise known as the 14th Dalai Lama, who urged him to home in on compassion as the object of serious and rigorous study. "If you look at the index of any scientific textbook, you won't find the word *compassion*," Davidson says. "But it is as worthy a topic of examination as all the negative emotions—fear, anxiety, sadness, anger, disgust—that have long occupied the scientific community."

When I visit Davidson in Madison, where he and Susan have lived since 1985 and raised their children, Amelie,

now 26, and Seth, 20, he tells me about his latest research: Reminding me that the Dalai Lama's mandate is to effect change in the world through the power of compassion, Davidson says, "If this is truly possible, then we should be able to discover circuits in the brain that underlie compassion and that are strengthened when it is cultivated."

His new studies on the monks—"the Olympic athletes of meditation," as he calls them—are designed to measure what happens when they engage specifically in compassion practice. So far, he's found that their brains show dramatic changes in two telling areas: increased activity not only in the prefrontal cortex—which floods them with well-being—but also in the areas involved with motor planning. It seems the monks are not just "feeling" good; their brains have primed their bodies to spring up and "do" good. "They are poised to jump into action and do whatever they can to help relieve suffering," Davidson says. (As for his own practice, Judaism is Davidson's "birth religion," but he characterizes his spiritual path as being most similar to a Buddhist one, though he hesitates to describe himself as a card-carrying devotee. Certainly all who know him say that Davidson is a glass-half-full sort of guy—his mother even called him her Joy Boy, while Susan says, "Richie is consistently upbeat." And yes, he has mapped parts of his own brain, and admits it "showed moderately strong left prefrontal activation.")

Whether generosity of spirit rubs off on others is another question Davidson has begun to probe. "We've launched a study with a highly trained, long-term Buddhist practitioner, looking at the impact of his compassionate attitude on ordinary individuals. We bring them into the MRI scanner, we expose them to pictures of suffering—gory accidents and things like that. We do this under two conditions: one where they are in the presence of an experimenter, and one where they are in the presence of the monk." Davidson is curious to see whether the results will bear out anecdotal reports that in the presence of an extremely compassionate person, you feel more relaxed, secure, loved, and safe. His team is also putting ordinary individuals, first-timers, through a two-week intervention that includes 30 minutes a day of compassion meditation. Davidson predicts changes in the brain regions associated with emotion and empathy as well as the subjects making more altruistic decisions: "They will also have the opportunity to give away some of what they earn for their participation in the study," he says. "We expect that those undergoing compassion training will donate more money."

The idea that compassion can be learned—and that the process can be measured scientifically—is what thrills Davidson. And he envisions compassion training in a variety of settings, from public schools to the corporate world. "Now we mostly have monks and other religious figures preaching about these ideas," he says. "It's quite another thing to have a hard-nosed neuroscientist like me suggest that such training may have beneficial consequences for how we act toward others as well as promoting health. Most people accept the idea that regular physical exercise is something they should do for the remainder of their lives. Imagine how different things might be if we accepted the notion that the regular practice of mental exercises to strengthen compassion is something to incorporate into everyday life."

To what extent can we really brighten our outlook? What is the best way to deflect stress? How can people become more resilient? Are there other ways aside from meditation to boost the brain? Many questions remain to be answered. It is a tantalizing prospect: that even a little more joy might be within everyone's reach. "I've been talking about happiness not as a trait but as a skill, like tennis," says Davidson. "If you want to be a good tennis player, you can't just pick up a racket—you have to practice."