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Översättning
Agneta Sellin

Dana Förlag

ORIGINALET'S TITEL *Your brain at work – strategies for overcoming distraction, regaining focus, and working smarter all day long*

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NOTES

The main ideas in this book are drawn from a handful, up to hundreds, of studies. I have listed the key studies that seem most relevant to each argument, not every paper used to write the book. Some of the papers are available online for free, though a good number also require purchasing to view. More resources are available online at www.your-brain-at-work.com, including video and audio programs.

Scene 1: The Morning Email Overwhelm

For more on Roy Baumeister's research on the prefrontal cortex's energy limits, see:

Masicampo, E. J., and R. F. Baumeister. "Toward a physiology of dual-process reasoning and judgment: Lemonade, willpower, and effortful rule-based analysis." *Psychological Science* 19 (2008): 255–60.

Vohs, K. D., R. F. Baumeister, B. J. Schmeichel, J. M. Twenge, N. M. Nelson, and D. M. Tice. "Making choices impairs subsequent self-control: A limited resource account of decision-making, self-regulation, and active initiative." *Journal of Personality and Social Psychology* 94 (2008): 883–98.

For more on different types of memory, see the Atkinson-Shiffrin model, which was proposed in 1968 by Richard Atkinson and Richard Shiffrin. See:

Atkinson, R. C., and R. M. Shiffrin. "Human memory: A proposed system and its control processes." In K. W. Spence and J. T. Spence, eds. *The psychology of learning and motivation* Vol. 2, New York: Academic Press, 1968, pp. 89–195.

Regarding different levels of effort for getting information onto the stage, this idea came from looking at cognitive bias research from psychology and linking it to the effort involved in making decisions. For example, in 1973, psychologists Amos Tversky and Daniel Kahneman explored the idea of the "available heuristic," which is how people think about things that are easy to think about most readily, which tends to be recent thoughts. See:

Tversky, A., and D. Kahneman. "Availability: A heuristic for judging frequency and probability." *Cognitive Psychology* 5 (1973): 207–32.

Our poor abilities at affective forecasting are linked to the difficulty of think-

ing about subtle factors. We incorrectly estimate what will make us happy in the future because it takes so much effort and energy to picture the future. See Daniel Gilbert's book *Stumbling on Happiness*, New York: HarperCollins, 2006.

For more on how the brain is wired to think in terms of people interacting, see:

Geary, David C. *The Origin of Mind: Evolution of Brain, Cognition, and General Intelligence*. Washington, D.C.: American Psychological Association, 2004.

Scene 2: A Project That Hurts to Think About

For more on the size of working memory, see:

Miller, G. A. "The magical number seven, plus or minus two: Some limits on our capacity for processing information." *Psychological Review* 63 (1956): 81–97.

Research showing that working memory is more like four items at best includes:

Cowan, N. "The magical number 4 in short-term memory: A reconsideration of mental storage capacity." *Behavioral and Brain Sciences* 24 (2001): 87–185.

Gobet, F., and G. Clarkson. "Chunks in expert memory: Evidence for the magical number four . . . or is it two?" *Memory* 12, no. 6 (2004): 732–47.

Shiffrin, R. M., and R. M. Nosofsky. "Seven plus or minus two: A commentary on capacity limitations." *Psychological Review* 101, no. 2 (1994): 357–61.

More on the timing involved in working memory can be found in:

Baddeley, A. D., N. Thomson, and M. Buchanan. "Word length and the structure of short-term memory." *Journal of Verbal Learning and Verbal Behavior* 14 (1975): 575–89.

Schweickert, R., and B. Boruff. "Short-term memory capacity: Magic number or magic spell?" *Journal of Experimental Psychology: Learning, Memory, and Cognition* 12 (1986): 419–25.

For more background on the soundproof room study, see:

McElree, B. "Working memory and focal attention." *Journal of Experimental Psychology: Learning, Memory, and Cognition* 27, no. 3 (2001): 817–35.

More on cognitive complexity and decision-making can be found in a field called relational complexity. See:

Halford, G., N. Cowan, and G. Andrews. "Separating cognitive capacity from knowledge: A new hypothesis." *Trends in Cognitive Sciences* 11, no. 6 (2007): 236–42.

Halford, G. S., R. Baker, J. McCredden, and J. D. Bain. "How many variables can humans process?" *Psychological Science* 16, no. 1 (2005): 70–76.

For more on Desimone's research on neural competition, see:

Desimone, R. "Visual attention mediated by biased competition in extrastriate visual cortex." *Philosophical Transactions of the Royal Society of London (Biological Sciences)* 353 (1998): 1245–55.

Desimone, R., and J. Duncan. "Neural mechanisms of selective visual attention." *Annual Review of Neuroscience* 18 (1995): 193–222.

Scene 3: Juggling Five Things at Once

For more on Robert Desimone's work on attention, see:

Desimone, R. "Visual attention mediated by biased competition in extrastriate visual cortex." *Philosophical Transactions of the Royal Society of London (Biological Sciences)* 353, (1998): 1245–55.

Desimone, R., and J. Duncan. "Neural mechanisms of selective visual attention." *Annual Review of Neuroscience* 18 (1995): 193–222.

Harold Pashler has numerous papers covering his work on multitasking, bottlenecks, and queues. Some examples of his work include:

Ferreira, V. S., and H. Pashler. "Central Bottleneck Influences on the Processing Stages of Word Production." *Journal of Experimental Psychology: Learning, Memory, and Cognition* 28, no. 6 (2002): 1187–99.

Pashler, H. "Attentional limitations in doing two tasks at the same time." *Current Directions in Psychological Science* 1 (1992): 44–50.

Pashler, H., J. C. Johnston, and E. Ruthruff. "Attention and performance." *Annual Review of Psychology* 52 (2001): 629–51.

For information regarding how health, stress, and status are intertwined, see this information about allostatic load:

Allostatic Load Working Group: Research Network on Socioeconomic Status and Health (1999). Allostatic Load and Allostasis. Retrieved from <http://www.macses.ucsf.edu/Research/Allostatic/notebook/allostatic.html> (accessed on April 10, 2009).

The University of London study about multitasking and reduced IQ was reported by Dr. Glenn Wilson, a psychologist at King's College, London. The study was sponsored by Hewlett-Packard, and not formally published as a paper. There has been some controversy about the paper, as some media outlets incorrectly shared the data.

For more on the importance of paying close attention to information in order to form long-term memories, see:

Ezzyat, Y, and L. Davachi. "The influence of event perception on long-term memory formation." Delivered at the Fifteenth Annual Meeting of the Cognitive Neuroscience Society, San Francisco, Calif., April 2008.

The basal ganglia is a major brain region. There is even an International Basal Ganglia Society. (See: <http://www.ibags.info/>.) Ann M. Graybiel is an important researcher in this area, with research in her laboratory focused on regions of the forebrain that influence movement, mood, and motivation: the basal ganglia and neural pathways interconnecting the basal ganglia with the cerebral cortex.

For more on Gerald Edelman's work on neural Darwinism, see his book *Brilliant Air, Brilliant Fire*, New York: Basic Books, 1993.

For more on how repetitive tasks cause long-term potentiation or "embedding" in the brain, see:

Bodner, M., Y. Zhou, G. L. Shaw, and J. M. Fuster. "Symmetric temporal patterns in cortical spike trains during performance of a short-term memory task." *Neurological Research* 19 (1997): 509–14.

For more on the study using the keyboard and noticing patterns unconsciously, see:

Rauch, S. L., C. R. Savage, H. D. Brown, T. Curran, N. M. Alpert, A. Kendrick, A. J. Fischman, and S. M. Kosslyn. "A PET Investigation of Implicit and Explicit Sequence Learning." *Human Brain Mapping* 3 (1995): 271–86.

Scene 4: Saying No to Distractions

The study on office distractions is from Basex, a New York research firm. The study's twenty-six-page report, called "Information Overload: We Have Met the Enemy and He Is Us," looks at strategies companies can use to cope with information overload, including ten tips designed to ease the burden immediately. The study is available only by purchase from www.basex.com.

The data regarding changes in attention and Microsoft's efforts to reduce distractions appeared in Clive Thompson, "Meet the Life Hackers," *New York Times*, October 16, 2005.

For information regarding ambient neural activity, see:

Hedden, T., and J. D. Gabrieli. "The ebb and flow of attention in the human brain." *Nature Neuroscience* 9 (2006): 863–65.

For more on how schizophrenia may reduce people's ability to inhibit task-irrelevant signals, see Amy Arnsten's work on the prefrontal cortex, including:

Arnsten, A.F.T. "Catecholamine and second messenger influences on prefrontal cortical networks of 'representational knowledge': A rational bridge between genetics and the symptoms of mental illness." *Cerebral Cortex* 18 (2007): i6-i15.

Vijayraghavan, S., M. Wang, S. G. Birnbaum, G. V. Williams, and A.F.T. Arnsten. "Inverted-U dopamine D1 receptor actions on prefrontal neurons engaged in working memory." *Nature Neuroscience* 10 (2007): 376–84.

For more on people's ability not to think of a task, see:

Wegner, D. M., D. J. Schneider, S. Carter III, and T. L. White. "Paradoxical effects of thought suppression." *Journal of Personality and Social Psychology* 53, no. 1 (1987): 5–13.

For more on lapses in attention and on activation of the medial prefrontal cortex, see:

Mason, M. F., M. I. Norton, J. D. Van Horn, D. M. Wegner, S. T. Grafton, and C. N. Macrae. "Wandering minds: The default network and stimulus-independent thought." *Science* 315 (2007): 393–95.

The insights for the idea that "bad is stronger than good" come from two places. First from Jonathan Haidt's *The Happiness Hypothesis*, New York: Basic Books, 2005; and from the paper referenced here:

Baumeister, R. F., E. Bratslavsky, C. Finkenauer, and K. D. Vohs. "Bad is stronger than good." *Review of General Psychology* 5, no. 4 (2001): 323–70.

For more on how the orbital frontal cortex detects changes in expectations and increased novelty, see:

Leung, H., P. Skudlarski, J. C. Gatenby, B. S. Peterson, and J. C. Gore. "An event-related functional MRI study of the Stroop color word interference task." *Cerebral Cortex* 10, no. 6 (2000): 552–60.

MacLeod, C. "Half a century of research on the Stroop effect: An integrative review." *Psychological Bulletin* 109 (1991): 163–203.

Petrides, M. "The orbitofrontal cortex: Novelty, deviation from expectation, and memory." *Annals of the New York Academy of Sciences* 1121 (2007): 33–53.

For more on the right ventrolateral prefrontal cortex, see:

Lieberman, M. D., N. I. Eisenberger, M. J. Crockett, S. M. Tom, J. H. Pfeifer, & B. M. Way. "Putting feelings into words: Affect labeling disrupts amygdala activity in response to affective stimuli." *Psychological Science* 18, no. 5 (2007): 421–28.

For more about dopamine and arousal, see:

Schultz, W. "The reward signal of midbrain dopamine neurons." *News in Physiological Sciences* 14, no. 6 (1999): 249–55.

———. "Reward signaling by dopamine neurons." *Neuroscientist* 7, no. 4 (2001): 293–302.

Waelti, P., A. Dickinson, and W. Schultz. "Dopamine responses comply with basic assumptions of formal learning theory." *Nature* 412 (2001): 43–48.

To view Baumeister's self-control study, see:

Gailliot, M. T., R. F. Baumeister, C. N. DeWall, J. K. Maner, E. A. Plant, D. M. Tice, L. E. Brewer, and B. J. Schmeichel. "Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor." *Journal of Personality and Social Psychology* 92, no. 2 (2007): 325–36.

For more on the work of Jonathan Haidt, see:

Haidt, J. *The Happiness Hypothesis: Finding Modern Truth in Ancient Wisdom*. New York: Basic Books, 2005.

For more on Benjamin Libet, see:

Libet, B., E. W. Wright, B. Feinstein, and D. Pearl. "Subjective referral of the timing for a conscious sensory experience: A functional role for the somatosensory specific projection system in man." *Brain* 102, no. 1 (1979): 193–224.

The idea of having "free won't" was introduced by Jeffrey Schwartz in his book *The Mind and the Brain*, New York: Harper Perennial, 2003.

For more on explicit versus implicit awareness, see Matthew Lieberman's work on intuition:

Lieberman, M. D. "Intuition: A social cognitive neuroscience approach." *Psychological Bulletin* 126 (2000): 109–37.

Also see Rauch's study mentioned in scene 3:

Rauch, S. L., C. R. Savage, H. D. Brown, T. Curran, N. M. Alpert, A. Kendrick, A. J. Fischman, and S. M. Kosslyn. "A PET investigation of implicit and explicit sequence learning." *Human Brain Mapping* 3 (1995): 271–86.

Scene 5: Searching for the Zone of Peak Performance

The Yerkes-Dodson Law defines the relationship between arousal and performance. It was originally observed by Robert M. Yerkes and John Dillingham Dodson in a paper published in 1908.

Yerkes, R. M., and J. D. Dodson. "The relation of strength of stimulus to rapidity of habit-formation." *Journal of Comparative Neurology and Psychology* 18 (1908): 459–82

For more on how stress impacts performance, see:

Arnsten, A.F.T. "The biology of being frazzled." *Science* 280 (1998): 1711–12.

Mather, M., K. J. Mitchell, C. L. Raye, D. L. Novak, E. J. Greene, and M. K. Johnson. "Emotional arousal can impair feature binding in working memory." *Journal of Cognitive Neuroscience* 18 (2006): 614–25.

Vijayraghavan, S., M. Wang, S. G. Birnbaum, G. V. Williams, and A.F.T. Arnsten. "Inverted-U dopamine D1 receptor actions on prefrontal neurons engaged in working memory." *Nature Neuroscience* 10 (2007): 376–84.

For more on dopamine and noradrenalin levels and good prefrontal cortex functioning, see:

Birnbaum, S. G., P. X. Yuan, M. Wang, S. Vijayraghavan, A. K. Bloom, D. J. Davis, K. T. Gobeske, J. D. Sweatt, H. K. Manji, and A.F.T. Arnsten (2004). "Protein kinase C overactivity impairs prefrontal cortical regulation of working memory." *Science* 306, no. 5697 (2004): 882–84.

Vijayraghavan, S., M. Wang, S. G. Birnbaum, G. V. Williams, and A.F.T. Arnsten. "Inverted-U dopamine D1 receptor actions on prefrontal neurons engaged in working memory." *Nature Neuroscience* 10 (2007): 376–84.

For more on the link between fear and cognition, see:

Phelps, E. A. "Emotion and cognition: Insights from Studies of the Human Amygdala." *Annual Review of Psychology* 57 (2006): 27–53.

For more on the study about increasing muscle mass through visualization, see:

Yue, G., and K. J. Cole. "Strength increases from the motor program: Comparison of training with maximal voluntary and imagined muscle contracts." *Journal of Neurophysiology* 67 (1992): 1114–23

For more on the impact of visualization processes, see:

Robertson, Ian. *Opening the Mind's Eye: How Images and Language Teach Us How to See*. New York: St. Martin's Press, 2003.

For more on dopamine and love, see:

Aron A., H. Fisher, D. J. Mashek, G. Strong, H. Li, and L. L. Brown. "Reward, motivation, and emotion systems associated with early-stage intense romantic love." *Journal of Neurophysiology* 94 (2005): 327–37.

Fisher, H. *Why We Love: The Nature and Chemistry of Romantic Love*. New York: Henry Holt and Company, 2004.

For more on how arousal is individual, see:

Coghill, R. C., J. G. McHaffie, Y. Yen. "Neural correlates of inter-individual

differences in the subjective experience of pain.” *Proceedings of the National Academy of Sciences*, 100 (2003): 8538–42.

Shansky, R. M., C. Glavis-Bloom, D. Lerman, P. McRae, C. Benson, K. Miller, L. Cosand, T. L. Horvath, and A.F.T. Arnsten. “Estrogen mediates sex differences in stress-induced prefrontal cortex dysfunction.” *Molecular Psychiatry* 9 (2004): 531–38.

For more on the three types of happiness, see *Authentic Happiness*, by Martin Seligman, New York: Free Press, 2005.

Scene 6: Getting Past a Roadblock

For more on priming, see:

Jacoby, L. L. (1983). “Perceptual Enhancement: Persistent Effects of an Experience.” *Journal of Experimental Psychology: Learning, Memory, and Cognition* 9, no. 1 (1983): 21–38.

Impasse theory was developed by Stellan Ohlsson. See:

Knoblich, G., S. Ohlsson, H. Haider, and D. Rhenius. (1999). “Constraint relaxation and chunk decomposition in insight problem solving.” *Journal of Experimental Psychology: Learning, Memory, and Cognition* 25, no. 6 (1999): 1534–55

For more of Richard Florida’s work, see his book:

Florida, R., *The Rise of the Creative Class*. New York: Basic Books, 2002.

For more on novelty, see:

Petrides, M. “The orbitofrontal cortex: Novelty, deviation from expectation, and memory. *Annals of the New York Academy of Sciences* 1121 (2007): 33–53.

Dr. Mark Jung-Beeman has several great papers. For a good summary of his work see:

Bowden, E. M., M. Beeman, J. Fleck, and J. Kounios. “New approaches to demystifying insight.” *Trends in Cognitive Sciences* 9 (2005): 322–28.

For more on how anxiety and positive mood impact insight, see:

Subramaniam, K., J. Kounios, E. M. Bowden, T. B. Parrish, and M. Beeman. “Positive mood and anxiety modulate anterior cingulate activity and cognitive preparation for insight.” *Journal of Cognitive Neuroscience*, in press.

For more on the brain frequencies required for insight, see:

Kounios, J., J. I. Fleck, D. L. Green, L. Payne, J. L. Stevenson, E. M. Bowden, and M. Beeman. “The origins of insight in resting-state brain activity.” *Neuro-psychologia* 46 (2008): 281–91.

Kounios, J., J. L. Frymiare, E. M. Bowden, J. I. Fleck, K. Subramaniam, T. B. Parrish, and M. Beeman. “The prepared mind: Neural activity prior to problem presentation predicts solution by sudden insight.” *Psychological Science* 17 (2006): 882–90.

For more on the right hemisphere and insight, see:

Bowden, E. M., and M. Beeman. “Aha! Insight experience correlates with solution activation in the right hemisphere.” *Psychonomic Bulletin and Review* 10 (2003): 730–37.

Jonathon Schooler's idea of the "a-duh" experience was first published in the *Journal of Experimental Psychology*:

Dougal, S., and J. W. Schooler. "Discovery misattribution: When solving is confused with remembering." *Journal of Experimental Psychology* 136, no. 4 (2007): 577–92

The ARIA model was outlined in my book *Quiet Leadership*, New York: Collins, 2006. It was first appeared in an academic journal here:

Rock, D., "A brain based approach to coaching," *The International Journal of Coaching in Organizations* 4, no. 2 (2006): 32–43.

For more on Jonathan Schooler's work on verbalizing interfering with insight, see:

Schooler, J. W., S. Ohlsson, and K. Brooks. "Thoughts beyond words: When language overshadows insight." *Journal of Experimental Psychology* 122, no. 2 (1993): 166–83.

The information regarding 75 percent of people solving insights is a summary of data collected at dozens of workshops over three years. The highest number was 100 percent, and the lowest around 50 percent. Most of the time a group of people achieved 75 percent or higher.

For more on the effects of mindfulness on well-being and performance, see:

Hassed, C. "Mindfulness, wellbeing, and performance." *NeuroLeadership Journal* 1 (2008): 53–60.

Intermission: Meet the Director

You can explore the idea of an episodic buffer further in this paper:

Baddeley, A. "The episodic buffer in working memory." *Trends in Cognitive Sciences* 4, no. 11 (2000): 417–23.

For more on the way the prefrontal cortex manages the overall brain, see:

Miller, E. K., and J. D. Cohen. "An integrative theory of prefrontal cortex function." *Annual Review of Neuroscience* 24 (2001): 167–202.

For an introduction to social cognitive neuroscience, illustrating the early ideas of the field, see:

Ochsner, K. N., and M. D. Lieberman. "The emergence of social cognitive neuroscience." *American Psychologist* 56 (2001): 717–34.

A summary of definitions of mindfulness can be found here:

Bishop, S. R., M. Lau, S. Shapiro, L. Carlson, N. D. Anderson, J. Carmody, Z. V. Segal, S. Abbey, M. Speca, D. Velting, and G. Devins. "Mindfulness: A proposed operational definition." *Clinical Psychology: Science and Practice* 11, no. 3 (2004): 230–41.

For more on Kirk Brown's Mindful Awareness Attention Scale and how mindfulness allows people to connect to subtler internal signals, see:

Brown, K. W., and R. M. Ryan. "The benefits of being present: Mindfulness and its role in psychological well-being." *Journal of Personality and Social Psychology* 84, no. 4 (2003): 822–48.

For more on Jon Kabat-Zinn's studies of mindfulness helping with skin disease recovery, see:

Kabat-Zinn, J., E. Wheeler, T. Light, A. Skillings, M. J. Scharf, T. G. Cropley, D. Hosmer, and J. D. Bernhard. (1998). "Influence of a mindfulness meditation-based stress reduction intervention on rates of skin clearing in patients with moderate to severe psoriasis undergoing phototherapy (UVB) and photochemotherapy (PUVA)." *Psychosomatic Medicine* 60, no. 5 (1998): 625–32.

For more on mindfulness and immune function, see:

Davidson, R. J., J. Kabat-Zinn, J. Schumacher, M. Rosenkranz, D. Muller, S. F. Santorelli, F. Urbanowski, A. Harrington, K. Bonus, and J. F. Sheridan. "Alterations in brain and immune function produced by mindfulness meditation." *Psychosomatic Medicine* 65, no. 4 (2003): 564–70.

Mark Williams's research, and more on mindfulness and depression, can be found in this book:

Williams, M., J. D. Teasdale, Z. V. Segal, and J. Kabat-Zinn. *The Mindful Way Through Depression: Freeing Yourself from Chronic Unhappiness*. New York: The Guilford Press, 2007.

A good paper on mindfulness and depression is:

Teasdale, J. D., M. Pope, and Z. V. Segal. "Metacognitive Awareness and Prevention of Relapse in Depression: Empirical Evidence." *Journal of Consulting and Clinical Psychology* 70, no. 2 (2002): 275–87.

For more on Yi-Yuan Tang's study comparing mindfulness training to relaxation training, see:

Tang, Y. Y., and M. I. Posner. "The neuroscience of mindfulness." *NeuroLeadership Journal* 1 (2008): 33–37.

Tang Y. Y., Y. Ma, J. Wang, Y. Fan, S. Feng, Q. Lu, Q. Yu, D. Sui, M. K. Rothbart, M. Fan, and M. I. Posner. "Short-term meditation training improves attention and self-regulation." *Proceedings of the National Academy of Sciences* 104, no. 43 (2007): 17152–56.

Studies of mindfulness and gamma activity include:

Kaiser, Jochen, and W. Lutzenberger. "Human gamma-band activity: A window to cognitive processing." *NeuroReport* 16, no. 3 (2005): 207–11.

Lutz, A., L. L. Greischar, N. B. Rawlings, M. Ricard, and R. J. Davidson. "Long-term meditators self-induce high-amplitude gamma synchrony during mental practice." *Proceedings of the National Academy of Sciences* 101, no. 46 (2004): 16369–73.

For more on mindfulness and cognitive control, see:

Brefczynski-Lewis, J. A., A. Lutz, H. S. Schaefer, D. B. Levinson, and R. J. Davidson. "Neural correlates of attentional expertise in long-term meditation practitioners." *Proceedings of the National Academy of Sciences* 104, no. 27 (2003): 11483–88.

Creswell, J. D., B. M. Way, N. I. Eisenberger, and M. D. Lieberman. (2007). "Neural correlates of dispositional mindfulness during affect labeling." *Psychosomatic Medicine* 69 (2007): 560–65.

Kaiser, Jochen, and W. Lutzenberger. "Human gamma-band activity: A window to cognitive processing." *NeuroReport* 16, no. 3 (2005): 207–11.

Posner, M. I., M. K. Rothbart, B. E. Sheese, and Y. Y. Tang. "The anterior

cingulate gyrus and the mechanism of self-regulation.” *Cognitive, Affective and Behavioral Neuroscience* 7, no. 4 (2007): 391–95.

The study of mindfulness in couples can be found here:

Barnes, S., K. W. Brown, E. Krusemark, K. W. Campbell, and R. D. Rogge. “The role of mindfulness in romantic relationship satisfaction and responses to relationship stress.” *Journal of Marital and Family Therapy* 33, no. 4 (2007): 482–500.

For more on the Farb paper exploring two states of experience, see:

Farb, N.A.S., Z. V. Segal, H. Mayberg, J. Bean, D. McKeon, Z. Fatima, and A. K. Anderson. “Attending to the present: Mindfulness meditation reveals distinct neural modes of self-reference.” *Social Cognitive Affective Neuroscience* 2 (2007): 313–22.

A good discussion of the Farb paper by Daniel J. Siegel is here:

Siegel, D. J. “Mindfulness training and neural integration: differentiation of distinct streams of awareness and the cultivation of well-being.” *Social Cognitive Affective Neuroscience* 2, no. 4 (2007): 259–63.

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2566758—FN1>

For more on the medial prefrontal cortex and knowing yourself, see:

Amodio, D. M., and C. D. Frith. “Meeting of minds: the medial frontal cortex and social cognition.” *Nature Reviews Neuroscience* 7 (2004): 268–77.

Gusnard, D.A., E. Akbudak, G. L. Shulman, and M. E. Raichle. “Medial prefrontal cortex and self-referential mental activity: Relation to a default mode of brain function.” *Proceeding of the National Academy of Sciences* 98 (2001): 4259–64.

Macrae, C. N., J. M. Moran, T. F. Heatherton, J. F. Banfield, and W. M. Kelley. “Medial prefrontal activity predicts memory for self.” *Cerebral Cortex* 14 (2004): 647–54.

For more on interoception, see:

Craig A. D. “How do you feel? Interoception: the sense of the physiological condition of the body.” *National Review of Neuroscience* 3 (2002): 655–66.

A good summary of all the research on mindfulness and its impact on health is:

Brown, K. W., and R. M. Ryan. “Mindfulness: Theoretical foundations and evidence for its salutary effects.” *Psychological Inquiry* 18, no. 4 (2007): 211–37.

Also see:

Davidson, R. J., J. Kabat-Zinn, J. Schumacher, M. Rosenkranz, D. Muller, S. F. Santorelli, F. Urbanowski, A. Harrington, K. Bonus, and J. F. Sheridan. “Alterations in brain and immune function produced by mindfulness meditation.” *Psychosomatic Medicine* 65, no. 4 (2003): 564–70.

For more on John Teasdale’s work, see:

Teasdale, J. D. (1999). “Metacognition, mindfulness, and the modification of mood disorders.” *Clinical Psychology and Psychotherapy* 6 (1999): 146–55.

For more on Daniel Siegel and mindfulness, see his book:

Siegel, D. J. *The Mindful Brain: Reflection and Attunement in the Cultivation of Well-being*. New York: W. W. Norton and Company, 2007.

The term *attention density* was coined by Dr. Jeffrey M. Schwartz, in this paper:

Schwartz, J. M., H. P. Stapp, and M. Beauregard. "Quantum physics in neuroscience and psychology: A neurophysical model of mind-brain interaction." *Philosophical Transactions of the Royal Society*, 2005. Published online, doi:10.1098/rstb.2004.01598, 2005; <http://rstb.royalsocietypublishing.org/content/360/1458/1309.abstract>.

Research on how mindfulness can change the brain in the long term includes:

Lazar, S. W., C. E. Kerr, R. H. Wasserman, J. R. Gray, D. N. Greve, M. T. Treadway, M. McGarvey, B. T. Quinn, J. A. Dusek, H. Benson, S. L. Rauch, C. I. Moore, B. Fischl. "Meditation experience is associated with increased cortical thickness." *Neuroreport* 16, no. 17 (2005): 1893–97.

Schwartz, J. M. "A role for volition and attention in the generation of new brain circuitry: Toward a neurobiology of mental force. *Journal of Consciousness Studies* 6, no. 8–9 (1999): 115–42.

Scene 7: Derailed by Drama

For more on the structure of the limbic system, see:

LeDoux, J. *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*. New York: Simon and Schuster, 1998.

For more on Evian Gordon's work on the brain being organized to minimize threat and maximize reward, see Gordon's integrative neuroscience theory:

Gordon, E., ed. *Integrative Neuroscience: Bringing Together Biological, Psychological and Clinical Models of the Human Brain*. Singapore: Harwood Academic Publishers, 2000.

Gordon, E. and L. Williams et al. "An 'integrative neuroscience' platform: applications to profiles of negativity and positivity bias." *Journal of Integrative Neuroscience* 7, no. 3 (2008): 345–66.

For more on the approach/avoid (toward and away) system, there is an entire edited volume of studies. See:

Elliot, A., ed. *Handbook of Approach and Avoidance Motivation*. London: Psychology Press, 2008.

The introductory paper in this volume is helpful for more context on the toward and away system. See:

Elliot, A., "Approach and Avoidance Motivation." *Handbook of Approach and Avoidance Motivation*. London: Psychology Press, 2008.

For more on how we automatically classify stimuli as reward or threat, see:

Fazio, R. H. "On the automatic activation of associated evaluations: An overview." *Cognition and Emotion* 15 (2001): 115–41.

For more on the study of nonsense words activating a threat response, see:

Naccache, L., R. L. Gaillard, C. Adam, D. Hasboun, S. Clemenceau, M. Baulac, S. Dehaene, and L. Cohen. "A direct intracranial record of emotions evoked by subliminal words." *Proceedings of the National Academy of Science* 102 (2005): 7713–17.

For more on the amygdala see:

Phelps, E. A. "Emotion and cognition: Insights from studies of the human amygdala." *Annual Review of Psychology* 57 (2006): 27–53.

For more on bad being stronger than good, see:

Baumeister, R. F., E. Bratslavsky, C. Finkenauer, and K. D. Vohs. "Bad is stronger than good." *Review of General Psychology* 5, no. 4 (2001): 323–70.

Hot spots is a term I coined in 2001 as part of a framework called the Clarity of Distance, which was published in *Quiet Leadership*, New York: Harper-Collins, 2006. I had noticed that people became unable to think clearly in a number of situations, including when an emotional issue arose.

For more on the neuroscience of emotional arousal, see:

Mather, M., K. J. Mitchell, C. L. Raye, D. L. Novak, E. J. Greene, and M. K. Johnson. "Emotional arousal can impair feature binding in working memory." *Journal of Cognitive Neuroscience* 18 (2006): 614–25.

The study of the maze with the owl or cheese can be found in:

Friedman, R. S., and J. Förster. "The effects of promotion and prevention cues on creativity." *Journal of Personality and Social Psychology* 81, no. 6 (2001): 1001–13.

For more on accidental connections, generalizing, and other functions of the limbic system, see:

LeDoux, J. *The Emotional Brain: The Mysterious Underpinnings of Emotional Life*. New York: Simon and Schuster, 1998.

For more on James Gross's model, including the timing of emotions, see:

Ochsner K. N., and J. J. Gross. "The cognitive control of emotion." *Trends in Cognitive Sciences* 9, no. 5 (2005): 242–49.

A study comparing suppression and reappraisal in detail, including the brain regions and timing involved in both, can be found in:

Goldin, P. R., K. McRae, W. Ramel, and J. J. Gross. "The neural bases of emotion regulation: Reappraisal and suppression of negative emotion." *Biological Psychiatry* 63 (2008): 577–86.

For more on Gross's study on suppression impacting memory, see:

Richards, J. M., and J. J. Gross. "Personality and emotional memory: How regulating emotion impairs memory for emotional events." *Journal of Research in Personality* 40, no. 5 (2006): 631–51.

For more on the study comparing suppression to reappraisal outside the lab, see:

Gross, J. J., and O. P. John. "Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being." *Journal of Personality and Social Psychology* 85, no. 2 (2003): 348–62.

For more on labeling emotions and how this dampens limbic system arousal, see:

Lieberman, M. D., N. I. Eisenberger, M. J. Crockett, S. M. Tom, J. H. Pfeifer, & B. M. Way. "Putting feelings into words: Affect labeling disrupts amygdala activity in response to affective stimuli." *Psychological Science* 18, no. 5 (2007): 421–28.

For more on the study by Lieberman showing that asking people to predict their labeling of emotions can make the emotion worse, see:

Lieberman, M.D., T. Inagaki, M. Crockett, and G. Tabibnia. "Affect labeling is a form of incidental emotion regulation: Subjective experience during affect labeling, reappraisal, and distraction, forthcoming.

For information regarding how health, stress, and status are intertwined, see the following on allostatic load:

Allostatic Load Working Group: Research Network on Socioeconomic Status and Health (1999). Allostatic Load and Allostasis. Retrieved from <http://www.macses.ucsf.edu/Research/Allostatic/notebook/allostatic.html> (accessed on April 10, 2009).

For more on David Creswell's research exploring the level of activity in the brain's braking system and how this corresponds with people's level of mindfulness, see:

Creswell, J. D., B. M. Way, N. I. Eisenberger, and M. D. Lieberman. "Neural correlates of dispositional mindfulness during affect labeling." *Psychosomatic Medicine* 69 (2007): 560–65.

Scene 8: Drowning amid Uncertainty

For Jeff Hawkins's book about the cortex and prediction, see:

Hawkins, J., and S. Blakeslee. *On Intelligence*. New York: Times Books, 2004.

For more on the impact of uncertainty generating a threat response, see:

Darnon, C., J. M. Harackiewicz, F. Butera, G. Mugny, and A. Quiamzade. "Performance-approach and performance-avoidance goals: When uncertainty makes a difference." *Personality and Social Psychology Bulletin* 33, no. 6 (2007): 813–27.

Hsu, M., M. Bhatt, R. Adolphs, D. Tranel, and C. F. Camerer. "Neural systems responding to degrees of uncertainty in human decision-making." *Science* 310 (2005): 1681–83.

For more on Steve Maier's work, see:

Maier, S. F., R. C. Drugan, and J. W. Grau. "Controllability, coping behavior, and stress-induced analgesia in the rat." *Pain* 12 (1982): 47–56.

Steve Maier also worked with Martin Seligman and others to develop the idea of learned helplessness, which can happen when you feel you have no control over a stressor. For more on learned helplessness, see the following book:

Seligman, M. *Learned Optimism: How to Change Your Mind and Your Life*. Sydney: Random House Publishers, 1992.

For more on Steven Dworkin's study of rats and autonomy, see:

Dworkin, S. I., S. Mirkis, and J. E. Smith. "Response-dependent versus response-independent presentation of cocaine: Differences in the lethal effects of the drug." *Psychopharmacology* 117 (1995): 262–66.

For more on autonomy and control, see:

Mineka, S., and R. W. Hendersen. "Controllability and predictability in acquired motivation." *Annual Review of Psychology* 36 (1985): 495–529.

For more on the study of British civil servants regarding the health and mortality effects of social position in the workplace and the amount of control a person feels they have over his job, see:

Marmot, M., H. Bosma, H. Hemingway, E. Brunner, and S. Stansfeld. "Contribution of job control and other risk factors to social variations in coronary heart disease incidence." *The Lancet* 350 (1997): 235–39.

For an example of a study about people starting small business wanting more "work-life balance," see:

The 2007 MYOB Special Focus Report into the lifestyle of Small Business Owners. This can be downloaded from the MYOB website, under "About MYOB>>News>>MYOB Small Business Surveys>>Survey Special Focus Report-December 2007," at www.myob.com.au.

For more on the study regarding the health and longevity benefits to nursing homes residents of providing simple choices, see:

Rodin, J., and E. J. Langer. "Long-term effects of a control-relevant intervention with the institutionalized aged." *Journal of Personality and Social Psychology* 33, no. 12 (1977): 897–902.

For more on the teen brain, and how teenagers in the United States have half the choices of a felon in prison, see:

Epstein, Robert. *The Case Against Adolescence: Rediscovering the Adult in Every Teen*. Fresno, Calif.: Quill Driver Books, 2007.

For more on reappraisal, see:

Goldin, P. R., K. McRae, W. Ramel, and J. J. Gross. "The neural bases of emotion regulation: Reappraisal and suppression of negative emotion." *Biol Psychiatry* 63, no. 6 (2008): 577–86.

Ochsner, K. N., R. D. Ray, J. C. Cooper, E. R. Robertson, S. Chopra, J.D.E. Gabrieli, et al. "For better or for worse: Neural systems supporting the cognitive down and up-regulation of negative emotion." *Neuroimage* 23, no. 2 (2004): 483–99.

For more on how suppressing emotions impacts others, see:

Butler, E. A., B. Egloff, F. H. Wilhelm, N. C. Smith, E. A. Erickson, and J. J. Gross. "The social consequences of expressive suppression." *Emotion* 3, no. 1 (2003): 48–67.

For more on teenagers becoming more capable of cognitive change each year as they get older, see:

Steinberg, L.. "A social neuroscience perspective on adolescent risk-taking." *Developmental Review* 28, no. 1 (2008): 78–106.

Walter Freeman's statement "All the brain can know it knows from within itself" comes from his book *How Brains Make Up Their Minds*, New York: Columbia University Press, 2001.

Scene 9: When Expectations Get Out of Control

For more on expectations altering neuron functioning, see:

Lauwereyns, J., Y. Takikawa, R. Kawagoe, S. Kobayashi, M. Koizumi,

B. Coe, M. Sakagami, and O. Hikosaka, “Feature-based anticipation of cues that predict reward in monkey caudate nucleus, *Neuron* 33, no. 3 (January 31, 2002): 463–73.

For more on goals, see:

Berkman, E., and M. D. Lieberman. “The neuroscience of goal pursuit: Bridging gaps between theory and data.” In G. Moskowitz and H. Grant, eds. *The Psychology of Goals*. New York: Guilford Press, 2009, pp. 98–126.

Elliot, Andrew, ed. *Handbook of Approach and Avoidance Motivation*. London: Psychology Press, 2008.

For more on how expectations impact experience, see:

Hansen, T., M. Olkonen, S. Walter, and K. R. Gegenfurtner. “Memory Modulates Color Appearance.” *Nature Neuroscience* 9, no. 11 (2006): 1367.

Koyama, T., J. G. McHaffie, P. J. Laurienti, and R. C. Coghill. “The subjective experience of pain: Where expectations become reality.” *Proceedings of the National Academy of Science U. S. A.*, 102, no. 36 (2005): 12950–55.

For more on Dr. Don Price, who explored the effect of the expectation of pain on people with irritable bowel syndrome, see:

http://www.stoppain.org/for_professionals/compendium/bios/price.asp.

For more on expectations and dopamine, see:

Schultz, W. “The reward signal of midbrain dopamine neurons.” *News in Physiological Sciences* 14, no. 6 (1999): 249–55.

———. “Reward signaling by dopamine neurons.” *Neuroscientist* 7, no. 4 (2001): 293–302.

Waelti, P., A. Dickinson, and W. Schultz. “Dopamine responses comply with basic assumptions of formal learning theory.” *Nature* 412 (2001): 43–48.

For more on the positive effect on mental health of having “rose-colored glasses” on oneself, see:

Taylor, S. E., J. S. Lerner, D. K. Sherman, R. M. Sage, and N. K. McDowell. “Portrait of the self-enhancer: Well adjusted and well liked or maladjusted and friendless?” *Journal of Personality and Social Psychology* 84, no. 1 (2003): 165–76.

Scene 10: Turning Enemies into Friends

For more on the social circuits in the brain, see:

Lieberman, M. D. “Social cognitive neuroscience: A review of core processes.” *Annual Review of Psychology* 58 (2007): 259–89.

For more on newborn babies orienting toward a picture of a face above any other picture, see:

Goren, C. C., M. Sarty, and P.Y.K. Wu. “Visual following and pattern discrimination of face-like stimuli by newborn infants.” *Pediatrics* 56, no. 4 (1975): 544–49.

For more on child development, see:

Wingert, P., and M. Brant. “Reading Your Baby’s Mind.” *Newsweek*, August 15, 2005, p. 35.

For more on how people classify others as friend or foe, right from infancy, see:

Porges, S. W. "Neuroception: A subconscious system for detecting threats and safety." *Zero to Three* 24, no. 5 (2004): 19–24.

For more on relatedness as a primary reward or threat, see:

Baumeister, R. F., and M. R. Leary. "The need to belong: Desire for interpersonal attachments as a fundamental human motivation." *Psychological Bulletin* 117 (1995): 497–529.

Cacioppo, J. T., and B. Patrick. *Loneliness: Human Nature and the Need for Social Connection*. New York: W. W. Norton and Company, 2008.

Carter, E. J., and K. A. Pelphrey. "Friend or foe? Brain systems involved in the perception of dynamic signals of menacing and friendly social approaches." *Journal Social Neuroscience* 3, no. 2 (2008): 151–63.

For more on Maslow's hierarchy of needs, see:

Maslow, A. H. "A theory of human motivation." *Psychological Review* 50 (1943): 370–96.

For more on mirror neurons and empathy, see:

Keyesers C., and V. Gazzola. "Towards a unifying neural theory of social cognition." *Progress in Brain Research* 156 (2006): 379–401.

Uddin, L. Q., M. Iacoboni, C. Lange, and J. P. Keenan. "The self and social cognition: The role of cortical midline structures and mirror neurons." *Trends in Cognitive Sciences* 11, no. 4 (2007): 153–57.

For more on how mirror neurons relate to grasping other people's intentions directly, see:

Iacoboni, M., I. Molnar-Szakacs, V. Gallese, G. Buccino, J. C. Mazziotta, and G. Rizzolatti. "Grasping the intentions of others with one's own mirror neuron system." *PloS Biology* 3, no. 3 (2005): 79.

More on how mirror neurons may be involved in autism, see:

Iacoboni, M., and M. Dapretto. "The mirror neuron system and the consequences of its dysfunction." *Nature Reviews Neuroscience* 7 (2006): 924–51.

For more on the ways emotions can ripple out across a group, also called emotional contagion, see:

Barsade, S. G. "The ripple effect: Emotional contagion and its influence on group behavior." *Administrative Science Quarterly* 47 (2002): 644–75.

Wild, B., M. Erb, and M. Bartels. "Are emotions contagious? Evoked emotions while viewing emotionally expressive faces: quality, quantity, time course, and gender differences." *Psychiatry Res.* 102 (2001): 109–24.

For more on how you use one set of brain circuits for thinking about people who you believe are like you and different circuits for others, see:

Mitchell, J. P., C. N. Macrae, and M. R. Banaji. "Dissociable medial prefrontal contributions to judgments of similar and dissimilar others." *Neuron* 50 (2006): 655–63.

For more on how oxytocin increases trust and decreases a natural sense of threat, see:

Kosfeld, M., M. Heinrichs, P. J. Zak, U. Fischbacher, and E. Fehr. "Oxytocin increases trust in humans." *Nature* 435 (2005): 673–76.

For more on Daniel Kahneman and social situations being the most rewarding, see:

Kahneman, D. "Objective happiness." In D. Kahneman, E. Deiner, and N. Schwarz, eds., *Well-being: Foundations of Hedonic Psychology*, New York: Russell Sage Foundation, 1999, pp. 3–14.

For more on laughter and oxytocin, see Dr. Robert Provine's book:

Laughter: A Scientific Investigation, New York: Penguin Paperback, 2001.

For more on the brain's innate need for relatedness, see:

Cacioppo, J. T., and B. Patrick. *Loneliness: Human Nature and the Need for Social Connection*. New York: W. W. Norton and Company, 2008.

More on how relatedness decreases stress, see:

Eisenberger, N. I., and M. D. Lieberman. "Why rejection hurts: A common neural alarm system for physical and social pain." *Trends in Cognitive Sciences* 8 (2004): 294–300.

Eisenberger, N. I., J. J. Jarcho, M. D. Lieberman, and B. D. Naliboff. "An experimental study of shared sensitivity to physical pain and social rejection." *Pain* 126 (2006): 132–38.

For more on how memory is affected by speaking out loud, see:

Davachi, L., A. Maril, and A. D. Wagner. "When keeping in mind supports later bringing to mind: Neural markers of phonological rehearsal predict subsequent remembering." *Journal of Cognitive Neuroscience* 13, no. 8 (2001): 1059–70.

For more on how competition reduces empathy, see:

Baumeister, R. F., J. M. Twenge, and C. K. Nuss. "Effects of social exclusion on cognitive processes: Anticipated aloneness reduces intelligent thought." *Journal of Personality and Social Psychology* 83, no. 4 (2002): 817–27.

de Quervain, D. J., U. Fischbacher, V. Treyer, M. Schellhammer, U. Schnyder, A. Buck, and E. Fehr. "The neural basis of altruistic punishment." *Science* 305 (2004): 1254–58.

For more on the release of oxytocin, see:

Kosfeld, M., M. Heinrichs, P. J. Zak, U. Fischbacher, and E. Fehr. "Oxytocin increases trust in humans." *Nature* 435 (2005): 673–76.

For more on Gallup's research, see their Web site, www.gallup.com.

Scene 11: When Everything Seems Unfair

For more on fairness as a primary reward or threat, see:

Tabibnia, G., and M. D. Lieberman. "Fairness and cooperation are rewarding: Evidence from social cognitive neuroscience." *Annals of the New York Academy of Sciences* 1118 (2007): 90–101.

For more on the ultimatum game, see:

Sanfey, A. G., J. K. Rilling, J. A. Aronson, L. E. Nystrom, and J. D. Cohen. "The neural basis of economic decision-making in the Ultimatum Game." *Science* 300 (2003): 1755–58.

Ideas about the evolutionary basis of fairness come from Stephen Pinker's book *How the Mind Works*, New York: W. W. Norton and Company, 1997.

For more on how the teenage brain is less effective than a preteen brain in some activities, see:

Blakemore, S. J. "The social brain of a teenager." *The Psychologist* 20 (2007): 600–602.

McGivern, R. F., J. Andersen, D. Byrd, K. L. Mutter, and J. Reilly. "Cognitive efficiency on a match to sample task decreases at the onset of puberty in children." *Brain and Cognition* 50, no. 1 (2002): 73–89.

For links to more resources on serotonin and fairness, see:

Crockett, M. J., L. Clark, G. Tabibnia, M. D. Lieberman, and T. W. Robbins. "Serotonin modulates behavioral reactions to unfairness." *Science* 320, no. 5884 (2008): 173.

For more on how trust and cooperation increase when people experience fair offers, see:

Decety, J., P. L. Jackson, J. A. Sommerville, T. Chaminade, and A. N. Meltzoff. "The neural bases of cooperation and competition: An fMRI investigation." *Neuroimage* 23 (2004): 744–51.

Rilling, J. K., D. A. Gutman, T. R. Zeh, G. Pagnoni, G. S. Berns, and C. D. Kilts. "A neural basis of social cooperation." *Neuron* 35 (2002): 395–405.

For more on trust and oxytocin, see:

Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., and Fehr, E. "Oxytocin increases trust in humans." *Nature* 435 (2005): 673–76.

For more on expression as part of punishment behavior, see:

Xiao, E., and D. Houser. "Emotion expression in human punishment behavior." *Proceedings of the National Academy of Sciences of the United States* 102, no. 20 (2005): 7398–401.

For more on how perceived fairness reduces the difficulties of a downsizing, see:

Brockner, J. "Managing the effects of layoffs on others." *California Management Review* (Winter 1992): 9–27.

Hamel, G., and C. K. Prahalad. "Competing for the future," *Harvard Business Review* (July–August 1994): 122–28.

For more on how we accept unfairness, see:

Tabibnia, G., A. B. Satpute, and M. D. Lieberman. "The sunny side of fairness: Preference for fairness activates reward circuitry (and disregarding unfairness activates self-control circuitry)." *Psychological Science* 19, no. 4 (2008): 339–47.

For more on how we don't experience empathy with people who have been unfair, see:

Seymour, B., T. Singer, and R. Dolan. "The neurobiology of punishment." *Nature Reviews Neuroscience* 8 (2007): 300–311.

Singer, T., B. Seymour, J. P. O'Doherty, K. E. Stephan, R. J. Dolan, and C. D. Frith. "Empathic neural responses are modulated by the perceived fairness of others." *Nature* 439 (2006): 466–69.

For more on how giving to others activates a strong reward response, see:
Moll, J., F. Krueger, R. Zahn, M. Pardini, R. Oliveira-Souza, and J. Grafman. “Human fronto-mesolimbic networks guide decisions about charitable donation.” *Proceedings of the National Academy of Science* 103 (2006): 15623–28.

Moll, J., R. Oliveira-Souza, and R. Zahn. “The Neural Basis of Moral Cognition.” *Annals of the New York Academy of Sciences* 1124 (2008): 161–80.

Scene 12: The Battle for Status

For more on the study by Chen on the longevity of social pain in comparison to physical pain, see:

Chen, Z., K. D. Williams, J. Fitness, and N. C. Newton. “When hurt will not heal: Exploring the capacity to relive social and physical pain.” *Psychological Science* 19, no. 8 (2008): 789–95.

For more on how we maintain specific maps that define status relationships with people, see:

Chiao, J. Y., A. R. Bordeaux, and N. Ambady. “Mental representations of social status.” *Cognition* 93, no. 2 (2003): B49–57.

Zink, C., Y. Tong, Q. Chen, D. Bassett, J. Stein, and A. Meyer-Lindenberg. “Know your place: Neural processing of social hierarchy in humans.” *Neuron* 58 (2008): 273–83.

For more on the impact of threats to status, see:

Eisenberger, N., M. Lieberman, and K. Williams. “Does rejection hurt? An fMRI study of social exclusion.” *Science* 302, no. 5643 (2003): 290–92.

Eisenberger, N., and M. Lieberman. “Why rejection hurts: A common neural alarm system for physical and social pain.” *Trends in Cognitive Sciences* 8, no. 7 (2004): 294–300.

Lieberman M., and N. Eisenberg. “The pains and pleasures of social life.” *NeuroLeadership Journal* 1 (2008): 38–43.

For more on status in animal communities, see:

Sapolsky, R. *Why Zebra’s Don’t Get Ulcers*. 3rd ed. New York: Henry Holt and Company, 2004.

A book that illustrates the importance of status is *The Status Syndrome: How Social Standing Affects Our Health and Longevity*, by Michael Marmot, New York: Henry Holt and Company, 2005.

For more on the rewards of status, see:

Izuma, K., D. Saito, and N. Sadato. “Processing of social and monetary rewards in the human striatum.” *Neuron* 58, no. 2 (2008): 284–94.

The study about a computer giving kids positive feedback is:

Scott, Dapretto et al. “Social, Cognitive and Affective Neuroscience.” (under review, *Social Cognitive and Affective Neuroscience Journal*, 2008).

For information on the effects on the brain of chronic stress and low socioeconomic status, see:

Evans, G. W., and M. A. Schamberg. “Childhood poverty, chronic stress,

and adult working memory.” *Proceedings of the National Academy of Sciences of the United States*. Published on-line, www.pnas.org, March 30, 2009.

The idea for “status hope” being behind the phenomenon of ordinary people doing extraordinary things came from an insight I had while writing.

For more on the link between status and dopamine, see:

Grant, K. A., C. A. Shively, M. A. Nader, R. L. Ehrenkaufer, S. W. Line, T. E. Morton, H. D. Gage, and R. H. Mach. “Effect of social status on striatal dopamine D2 receptor binding characteristics in cynomolgus monkeys assessed with positron emission tomography.” *Synapse* 29, no. 1 (1998): 80–83.

For more on the link between testosterone and status, see:

Newman, M. L., J. G. Sellers, and R. A. Josephs. “Testosterone, cognition, and social status.” *Hormones and Behavior* 47 (2005): 205–11.

The idea of status being a driver for playing against yourself came from reading about how the brain uses the same circuits to know yourself as you know other people. It was an insight I had that status might explain why setting and achieving your own personal goals might be so motivating.

For more on the study of schadenfreude, see:

Takahashi, H., M. Kato, M. Matsuura, D. Mobbs, T. Suhara, and Y. Okubo. “When your gain is my pain and your pain is my gain: Neural correlates of envy and schadenfreude.” *Science* 323, no. 5916 (2009): 937–39.

For more on the SCARF model, see my article in the *NeuroLeadership Journal*:

Rock, D. “SCARF: A brain-based model for collaborating with and influencing others.” *NeuroLeadership Journal* 1 (2008): 44–52.

Scene 13: When Other People Lose the Plot

For more on complex dynamic systems and organizations, see Margaret Wheatley’s book *Leadership and the New Science: Discovering Order in a Chaotic World*, 3rd ed., San Francisco: Berrett-Koehler Publishers, 2006

The idea that we focus on the deficit and problem model more easily because of the desire to avoid uncertainty was one I had while writing the book. It’s not been tested, as far as I can tell. The idea came from linking three sets of information: the commonsense notion that we know the past, but the future is uncertain; studies showing that even small uncertainties create a threat response; and other studies showing an automatic avoidance of threatening situations.

For more on how the goals you set determine your perceptions, see:

Ferguson, M. J., and J. A. Bargh. “Liking is for doing: The effects of goal pursuit on automatic evaluation.” *Journal of Personality and Social Psychology* 87, no. 5 (2004): 557–72.

For more on priming, see:

Jacoby, L. L. “Perceptual enhancement: Persistent effects of an experience.” *Journal of Experimental Psychology: Learning, Memory, and Cognition* 9, no. 1 (1983): 21–38.

For more on how your brain needs to settle on one behavioral approach to every situation, see:

Desimone, R., and J. Duncan. "Neural mechanisms of selective visual attention." *Annual Review of Neuroscience* 18 (1995): 193–222.

For more on how positive affect helps facilitate insight, see:

Subramaniam, K., J. Kounios, T. B. Parrish, and M. Jung-Beeman. "A brain mechanism for facilitation of insight by positive affect." *Journal of Cognitive Neuroscience* 21 (2009): 415–32.

For more on the impact of the "aha" and the "a-duh" experiences, see:

Dougal, S., and J. W. Schooler. "Discovery misattribution: When solving is confused with remembering." *Journal of Experimental Psychology* 136, no. 4 (2007): 577–92.

For more on the impact of insight, see:

Gick, M. L., and R. S. Lockhart. "Cognitive and affective components of insight." In R. J. Sternberg and J. E. Davidson, eds., *The Nature of Insight*, Cambridge, Mass.: MIT Press, 1995, pp. 197–228.

Knoblich, G., S. Ohlsson, and G. Raney. "Resolving impasses in problem solving: An eye movement study." In M. Hahn and S. C. Stoness, eds. *Proceedings of the Twenty-First Annual Conference of the Cognitive Sciences*, Vancouver: Simon Fraser University Press, 1999, pp. 276–81.

Ohlsson has explored the question of what you can do when someone is experiencing an impasse:

Schooler, J. W., and J. Melcher. "The ineffability of insight." In S. M. Smith, T. B. Ward, and R. A. Finke, eds., *The creative cognition approach*, Cambridge Mass.: MIT Press, 1997, pp. 97–133.

Matt Lieberman's process for getting students to give themselves feedback was explained to me in an interview in 2008 at his office at UCLA.

Scene 14: The Culture That Needs to Transform

For more on how changing one's own behavior is hard, Alan Deutschman's book *Change or Die* reveals a figure stated at a conference (2004) on the health care crisis: only one in nine people who underwent heart surgery could change his lifestyle. See:

Deutschman, A. *Change or Die: The Three Keys to Change at Work and in Life*. New York: Collins, 2007.

For a larger argument on the trouble with the carrot-and-stick approach in the workplace, see:

Rock, D., and J. M. Schwartz. "The neuroscience of leadership." *Strategy + Business* 43, 2006. Retrieved from http://www.strategy-business.com/media/file/sb43_06207.pdf.

For more on neural synchrony, see:

Slagter, H. A., A. Lutz, L. L. Greischar, A. D. Francis, S. Nieuwenhuis, and J. M. Davis, et al. "Mental training affects distribution of limited brain resources." *Public Library of Sciences Biology* 5, no. 6 (2007): 138.

For more on how neural synchrony plays an important role in the integration of functional modules in the brain, see:

Ward, L. M., S. M. Doesburg, K. Kitajo, S. E. MacLean, and A. B. Roggeveen. "Neural synchrony in stochastic resonance, attention, and consciousness." *Canadian Journal of Experimental Psychology* 60, no. 4 (2006): 319–26.

For an introduction to solutions-focused therapy, see:

"Solutions-focused brief counselling: An overview." In K. Hunt and M. Robson, eds. *Counselling and Metamorphosis*. Durham, UK: Centre for Studies in Counselling, University of Durham, 1998, pp. 99–106.

For information on appreciative inquiry, see:

Cooperrider, D., and D. Whitney. *Appreciative Inquiry: The Handbook*. Ohio: Lakeshore Publishers, 2002.

For more on Desimone's work on attention, see:

Desimone, R., and J. Duncan. "Neural mechanisms of selective visual attention." *Annual Review of Neuroscience* 18 (1995): 193–222.

For more on gamma band electrical waves and cognition, see:

Kaiser, J., and W. Lutzenberger. "Human gamma-band activity: A window to cognitive processing." *Neuroreport* 16 (2005b): 207–11.

Keil, A., M. M. Müller, W. J. Ray, T. Gruber, and T. Elbert. "Human gamma band activity and perception of a gestalt." *Journal of Neuroscience* 19 (1999): 7152–61.

For more on Hebb's Law, see:

Hebb, D. O. *The Organization of Behavior*. New York: Wiley, 1949.

For many case studies in neuroplasticity, see Normon Doidge's book *The Brain That Changes Itself*. New York: Viking Adult, 2007. Also Jeffrey Schwartz' book *The Mind and the Brain*, New York: Harper Perennial, 2003.

The term *self-directed neuroplasticity* appears in:

Schwartz, J. M., E. Z. Gulliford, J. Stier, and M. Thienemann. "Mindful awareness and self-directed neuroplasticity: Integrating psychospiritual and biological approaches to mental health with a focus on obsessive compulsive disorder." In S. G. Mijares and G. S. Khalsa, eds. *The Psychospiritual Clinician's Handbook: Alternative Methods for Understanding and Treating Mental Disorders*. Binghamton, N.Y.: Haworth Reference Press, 2005, p. 5.

The term *attention density* appears in:

Schwartz, J. M., H. P. Stapp, and M. Beauregard. "Quantum physics in neuroscience and psychology: A neurophysical model of mind–brain interaction." *Philosophical Transactions of the Royal Society*, 2005. Published online, doi:10.1098/rsub200401598, 2005; <http://rstb.royalsocietypublishing.org/content/360/1458/1309.abstract>.

For more on assimilation of goals, see:

Berkman, E., and M. D. Lieberman. "The neuroscience of goal pursuit: Bridging gaps between theory and data." In G. Moskowitz and H. Grant, eds. *The Psychology of Goals*. New York: Guilford Press, 2009, pp. 98–126.

For more on how the brain learns through story and metaphor, see:

Perry, B. "How the brain learns best." *Instructor* 11, no. 4 (2000): 34–35.

For more on Jim Barrell's work, and approach versus avoidance goals, see:

Price, D. D., and J. J. Barrell. "Some general laws of human emotion: Interrelationships between intensities of desire, expectation, and emotional feeling." *Journal of Personality* 52, no. 4 (2006): 389–409.

For more on the individuality of everyone's experience, see:

Coghill, R. C., J. G. McHaffie, and Y. Yen. "Neural correlates of inter-individual differences in the subjective experience of pain." *Proceedings of the National Academy of Sciences* 100 (2003): 8538–42.

The metaphor about gardening is something that emerged from my own observations. Similar ideas have emerged from research into how to best learn a musical instrument, showing that repetition is a key factor. For more information about maximizing effectiveness in arts education—including learning an instrument—see the Web site for the Dana Foundation: www.dana.org. This site also makes available links, resources, and research regarding the benefits of musical/arts training to cognitive development and psychological health.

The idea of general intelligence and self-awareness being inversely correlated emerges from a series of papers exploring the role of the medial regions versus the lateral (outer) brain regions, and what happens to people with damaged medial prefrontal regions. See:

Beer, J. S., A. P. Shimamura, and R. T. Knight. "Frontal lobe contributions to executive control of cognitive and social behavior." In M. S. Gazzaniga, ed., *The Cognitive Neurosciences III*, Cambridge, Mass.: MIT Press, 2004, pp. 1091–104.

Fox, M. D., A. Z. Snyder, J. L. Vincent, M. Corbetta, D. C. Van Essen, and M. E. Raichle. "The human brain is intrinsically organized into dynamic, anti-correlated functional networks." *PNAS* 102, no. 27 (July 5, 2005): 9673–78.

Gray J. R., C. F. Chabris, and T. S. Braver. "Neural mechanisms of general fluid intelligence." *Nature Neuroscience* (February 18, 2003).

Schnyer, D. M., L. Nicholls, and M. Verfaellie. "The role of VMPC in metamemorial judgments of content retrievability." *Journal of Cognitive Neuroscience* 17 (2005): 832–46.