

This is a section of [doi:10.7551/mitpress/14922.001.0001](https://doi.org/10.7551/mitpress/14922.001.0001)

Open Minded

Searching for Truth about the Unconscious Mind

By: Ben R. Newell, David R. Shanks

Citation:

Open Minded: Searching for Truth about the Unconscious Mind

By: Ben R. Newell, David R. Shanks

DOI: 10.7551/mitpress/14922.001.0001

ISBN (electronic): 9780262375375

Publisher: The MIT Press

Published: 2023

The open access edition of this book was made possible by generous funding and support from MIT Press Direct to Open



The MIT Press

Notes

Chapter 1

1. "An Extraordinary Iceberg Is Gone, but Not Forgotten," *New York Times*, January 26, 2022, <https://www.nytimes.com/2022/01/26/climate/iceberg-a68a-antarctica.html>.
2. Interestingly, although Freud thought most mental processes take place "beneath the surface," the famous quote that opens this chapter is apparently incorrectly attributed to him. For details, see "10 Quotes Wrongly Attributed to Sigmund Freud," accessed April 27, 2022, at <https://www.freud.org.uk/2019/04/30/10-quotes-wrongly-attributed-to-sigmund-freud/>.
3. For example, see Timothy D. Wilson, *Strangers to Ourselves: Discovering the Adaptive Unconscious* (Cambridge, MA: Belknap Press, 2002).
4. Statements of this perspective can be found in George A. Miller, "Some Psychological Studies of Grammar," *American Psychologist* 17, no. 11 (1962): 748–762, <https://doi.org/10.1037/h0044708>; and Nick Chater, *The Mind Is Flat: The Remarkable Shallowness of the Improvising Brain* (New Haven: Yale University Press, 2018).
5. For example, see Jonathan St. B. T. Evans, "Dual-Processing Accounts of Reasoning, Judgment and Social Cognition," *Annual Review of Psychology* 59 (2008): 255–278, <https://doi.org/10.1146/annurev.psych.59.103006.093629>; Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011); David Halpern, *Inside the Nudge Unit: How Small Changes Can Make a Big Difference* (London: W. H. Allen, 2015).
6. This point is exemplified by the biostatistician John Ioannidis's startling claim, made not remotely in jest, that most published research is wrong: John P. A. Ioannidis, "Why Most Published Research Findings Are False," *PLOS Medicine* 2, no. 8 (2005): e124, <https://doi.org/10.1371/journal.pmed.0020124>.
7. Scott O. Lilienfeld and Irwin D. Waldman, eds., *Psychological Science under Scrutiny: Recent Challenges and Proposed Solutions* (Chichester: Wiley, 2017).
8. Richard H. Thaler and Cass R. Sunstein, *Nudge: Improving Decisions about Health, Wealth, and Happiness* (New Haven: Yale University Press, 2008).

9. See Jonathan Birch, Alexandra K. Schnell, and Nicola S. Clayton, "Dimensions of Animal Consciousness." *Trends in Cognitive Sciences* 24, no. 10 (2020): 789–801, <https://doi.org/10.1016/j.tics.2020.07.007>.

10. For an illuminating discussion of reports and how they have been treated by various schools of thought in psychology, see Eddy A. Nahmias, "Verbal Reports on the Contents of Consciousness: Reconsidering Introspectionist Methodology," *Psyche: An Interdisciplinary Journal of Research on Consciousness* 8 (2002).

11. The argument is made, for instance, in John A. Bargh and Ran R. Hassin, "Human Unconscious Processes *in Situ*: The Kind of Awareness That Really Matters," in *The Cognitive Unconscious*, ed. Arthur Reber and Rhianon Allen (New York: Oxford University Press, 2022). Bargh and Hassin say, "Much preparatory work needs to be done in order to create our conscious experiences, and by logical necessity, all this work is unconscious."

12. The representational theory of mind, which identifies mental states as ones that have representational content, is most strongly associated with Jerry Fodor. See Jerry A. Fodor, *Representations: Philosophical Essays on the Foundations of Cognitive Science* (Cambridge, MA: MIT Press, 1983).

13. See Daniel B. Rubin and Angélique C. Paulk, "Neuron, Control Thyself!" *Brain* 144, no. 12 (2021): 3550–3551, <https://doi.org/10.1093/brain/awab413>.

14. Probably the most famous critique of Freud's work is Hans J. Eysenck, *Decline and Fall of the Freudian Empire* (New York: Viking Press, 1985).

15. Mark C. Fox, Karl Anders Ericsson, and Ryan Best, "Do Procedures for Verbal Reporting of Thinking Have to Be Reactive? A Meta-Analysis and Recommendations for Best Reporting Methods," *Psychological Bulletin* 137, no. 2 (2011): 316–344, <https://doi.org/10.1037/a0021663>.

16. See Martin Fishbein and Icek Ajzen, *Predicting and Changing Behavior: The Reasoned Action Approach* (New York: Routledge, 2010).

17. See Gabriela Topa and Juan Antonio Moriano, "Theory of Planned Behavior and Smoking: Meta-Analysis and SEM Model," *Substance Abuse and Rehabilitation* 1 (2010): 23–33, <https://doi.org/10.2147/SAR.S15168>.

18. Fishbein and Ajzen, *Predicting and Changing Behavior*.

19. For one example of the possible value of adding unconscious processes, see Daniel J. Phipps, Thomas E. Hannan, Ryan E. Rhodes, and Kyra Hamilton, "A Dual-Process Model of Affective and Instrumental Attitudes in Predicting Physical Activity," *Psychology of Sport and Exercise* 54 (2021): 101899, <https://doi.org/10.1016/j.psychsport.2022.102222>.

20. Nagel's article is one of the most influential contributions to the philosophy of consciousness: Thomas Nagel, "What Is It Like to Be a Bat?" *Philosophical Review* 83, no. 4 (1974): 435–450, <https://doi.org/10.2307/2183914>.

21. The quotation is from Thomas H. Huxley, *Lessons in Elementary Physiology* (London: Macmillan, 1866), 193.

22. See Giles S. Brindley and Walpole S. Lewin, "The Sensations Produced by Electrical Stimulation of the Visual Cortex," *Journal of Physiology* 196, no. 2 (1968): 479–493, <https://doi.org/10.1113/jphysiol.1968.sp008519>. Interestingly, this demonstration of stimulation-induced phosphenes was in a blind individual.

23. See John-Dylan Haynes and Geraint Rees, "Decoding Mental States from Brain Activity in Humans," *Nature Reviews Neuroscience* 7 (2006): 523–534, <https://doi.org/10.1038/nrn1931>.

24. This demonstration, verging on science fiction but subsequently corroborated in other patients, was reported by Adrian M. Owen, Martin R. Coleman, Melanie Boly, Matthew H. Davis, Steven Laureys, and John D. Pickard, "Detecting Awareness in the Vegetative State," *Science* 313, no. 5792 (2006): 1402–1402, <https://doi.org/10.1126/science.1130197>.

25. The theory—particularly in neuroscience discussions—is often also referred to by a slightly different name: global neuronal workspace theory. Key statements of the theory can be found in Bernard J. Baars, "Global Workspace Theory of Consciousness: Toward a Cognitive Neuroscience of Human Experience," *Progress in Brain Research* 150 (2005): 45–53, [https://doi.org/10.1016/S0079-6123\(05\)50004-9](https://doi.org/10.1016/S0079-6123(05)50004-9); and Stanislas Dehaene and Jean-Pierre Changeux, "Experimental and Theoretical Approaches to Conscious Processing," *Neuron* 70, no. 2 (2011): 200–227, <https://doi.org/10.1016/j.neuron.2011.03.018>. Recent work has enriched the theory by linking it to deep learning models from artificial intelligence. See Rufin VanRullen and Ryota Kanai, "Deep Learning and the Global Workspace Theory," *Trends in Neurosciences* 44, no. 9 (2021): 692–704, <https://doi.org/10.1016/j.tins.2021.04.005>.

26. Itay Yaron, Lucia Melloni, Michael Pitts, and Liad Mudrik, "The ConTraSt Database for Analysing and Comparing Empirical Studies of Consciousness Theories," *Nature Human Behaviour* (2022), <https://doi.org/10.1038/s41562-021-01284-5>.

Chapter 2

1. This pioneering research was originally reported in Benjamin Libet, Curtis A. Gleason, Elwood W. Wright, and Dennis K. Pearl, "Time of Conscious Intention to Act in Relation to Onset of Cerebral-Activity (Readiness Potential): The Unconscious Initiation of a Freely Voluntary Act," *Brain* 106, no. 3 (1983): 623–642, <https://doi.org/10.1093/brain/106.3.623>; see also Benjamin Libet, "Unconscious Cerebral Initiative and the Role of Conscious Will in Voluntary Action," *Behavioral and Brain Sciences* 8, no. 4 (1985): 529–539, <https://doi.org/10.1017/S0140525X00044903>.

2. The meta-analysis was undertaken by Moritz N. J. Braun, Janet Wessler, and Malte Friese, "A Meta-Analysis of Libet-Style Experiments," *Neuroscience & Biobehavioral*

Reviews 128 (2021): 182–198, <https://doi.org/10.1016/j.neubiorev.2021.06.018>. It is rather salutary that, in Braun et al.'s own words (p. 194), “For this difference, we could procure data from $k=6$ studies . . . based on only $N=53$ participants (!). This meager data base stands in sharp contrast to the huge influence the Libet experiment has had on both scientific thinking in various disciplines and public discourse.” Across the entire forty-year span since Libet’s introduction of this technique for measuring the subjective and objective timing of simple movements, only data from fifty or so individuals have ever been reported. Of relevance to issues that will become of central importance in later chapters, it does, however, include data from eight participants examined in a painstaking and largely successful replication of Libet’s methods, with the full data being publicly accessible, by Tomáš Dominik, Daniel Dostál, Martin Zielina, Jan Šmahaj, Zuzana Sedláčková, and Roman Procházka, “Libet’s Experiment: A Complex Replication,” *Consciousness and Cognition* 65 (2018): 1–26, <https://doi.org/10.1016/j.concog.2018.07.004>.

3. Itzhak Fried, Roy Mukamel, and Gabriel Kreiman, “Internally Generated Preactivation of Single Neurons in Human Medial Frontal Cortex Predicts Volition,” *Neuron* 69, no. 3 (2011): 548–562, <https://doi.org/10.1016/j.neuron.2010.11.045>.

4. Chun Siong Soon, Marcell Brass, Hans-Jochen Heinze, and John-Dylan Haynes, “Unconscious Determinants of Free Decisions in the Human Brain,” *Nature Neuroscience* 11 (2008): 543–545, <https://doi.org/10.1038/nn.2112>.

5. The arguments reviewed in this section are based largely on the work of Jeff Miller and his colleagues. See Judy Trevena and Jeff Miller, “Cortical Movement Preparation before and after a Conscious Decision to Move,” *Consciousness and Cognition* 11, no. 2 (2002): 162–190, <https://doi.org/10.1006/ccog.2002.0548>; Judy Trevena and Jeff Miller, “Brain Preparation before a Voluntary Action: Evidence against Unconscious Movement Initiation,” *Consciousness and Cognition* 19, no. 1 (2010): 447–456, <https://doi.org/10.1016/j.concog.2009.08.006>; and Jeff Miller, Peter Shepherdson, and Judy Trevena, “Effects of Clock Monitoring on Electroencephalographic Activity: Is Unconscious Movement Initiation an Artifact of the Clock?” *Psychological Science* 22, no. 1 (2011): 103–109, <https://doi.org/10.1177/0956797610391100>. Recent reviews of the field were published by Marcel Brass, Ariel Furstenberg, and Alfred R. Mele, “Why Neuroscience Does Not Disprove Free Will,” *Neuroscience & Biobehavioral Reviews* 102 (2019): 251–263, <https://doi.org/10.1016/j.neubiorev.2019.04.024>, and Edward J. Neafsey, “Conscious Intention and Human Action: Review of the Rise and Fall of the Readiness Potential and Libet’s Clock,” *Consciousness and Cognition* 94 (2021), <https://doi.org/10.1016/j.concog.2021.103171>.

6. This finding is reported in Uri Moaz, Gideon Yaffe, Christof Koch, and Liad Mudrik, “Neural Precursors of Decisions That Matter: An ERP Study of Deliberate and Arbitrary Choice,” *eLife* 8 (2019): 39787, <https://doi.org/10.7554/eLife.39787.001>.

7. See William P. Banks and Eve A. Isham, “We Infer Rather Than Perceive the Moment We Decided to Act,” *Psychological Science* 20, no. 1 (2009): 17–21, <https://doi.org/10.1111/j.1467-9280.2008.02254.x>.

8. Jeff Miller, Paula Vieweg, Nicolas Kruize, and Belinda McLea, "Subjective Reports of Stimulus, Response, and Decision Times in Speeded Tasks: How Accurate Are Decision Time Reports?" *Consciousness and Cognition* 19, no. 4 (2010): 1013–1036, <https://doi.org/10.1016/j.concog.2010.06.001>.
9. Libet, "Unconscious Cerebral Initiative," 529.
10. Many models of the gradual accumulation of neural activity prior to a movement have been proposed—for instance, by Aaron Schurger, Jacobo D. Sitt, and Stanislas Dehaene, "An Accumulator Model for Spontaneous Neural Activity Prior to Self-Initiated Movement," *Proceedings of the National Academy of Sciences* 109, no. 42 (2012): E2904–E13, <https://doi.org/10.1073/pnas.1210467109>; and Jeff Miller and Wolf Schwarz, "Brain Signals Do Not Demonstrate Unconscious Decision Making: An Interpretation Based on Graded Conscious Awareness," *Consciousness and Cognition* 24 (2014): 12–21, <https://doi.org/10.1016/j.concog.2013.12.004>.
11. See Sven Walter, "Willusionism, Epiphenomenalism, and the Feeling of Conscious Will," *Synthese* 191 (2014): 2215–2238, <https://doi.org/10.1007/s11229-013-0393-y>.
12. See his influential and thought-provoking book, Daniel M. Wegner, *The Illusion of Conscious Will* (Cambridge, MA: MIT Press, 2002).
13. See Albert Michotte, *The Perception of Causality* (London: Routledge, 1963); Tom L. Beauchamp and Alexander Rosenberg, *Hume and the Problem of Causation* (Oxford: Oxford University Press, 1981).
14. The experiment is described in Daniel M. Wegner and Thalia Wheatley, "Apparent Mental Causation: Sources of the Experience of Will," *American Psychologist* 54, no. 7 (1999): 480–492, <https://doi.org/10.1037/0003-066X.54.7.480>.
15. See Daniel M. Wegner, Betsy Sparrow, and Lea Winerman, "Vicarious Agency: Experiencing Control over the Movements of Others," *Journal of Personality and Social Psychology* 86, no. 6 (2004): 838–948, <https://doi.org/10.1037/0022-3514.86.6.838>.
16. See Walter, "Willusionism," for a review.
17. Eddy Nahmias, "Agency, Authorship, and Illusion," *Consciousness and Cognition* 14, no. 4 (2005): 771–785, <https://doi.org/10.1016/j.concog.2005.07.002>.
18. John McClure, "Attributions, Causes, and Actions: Is the Consciousness of Will a Perceptual Illusion?" *Theory & Psychology* 22, no. 4 (2012): 402–419, <https://doi.org/10.1177/0959354310386845>.
19. Rom Harré and Edward H. Madden, *Causal Powers* (Oxford: Blackwell, 1975).
20. This intriguing effect was reported by Petter Johansson, Lars Hall, Sverker Sikström, and Andreas Olsson, "Failure to Detect Mismatches between Intention and Outcome in a Simple Decision Task," *Science* 310, no. 5745 (2005): 116–219, <https://doi.org/10.1126/science.1111709>; Petter Johansson, Lars Hall, and Sverker Sikström,

"From Change Blindness to Choice Blindness," *Psychologia* 51, no. 2 (2008): 142–155, <https://doi.org/10.2117/psychsoc.2008.142>.

21. Its more technical name is *optic acceleration cancellation theory*. For discussion of this theory, see Seville Chapman, "Catching a Baseball," *American Journal of Physics* 36, no. 10 (1968): 868–870, <https://doi.org/10.1119/1.1974297>; Zoltan Dienes and Peter McLeod, "How to Catch a Cricket Ball," *Perception* 22, no. 12 (1993): 1427–1439, <https://doi.org/10.1068/p221427>; Claire F. Michaels and Raoul R. D. Oudejans, "The Optics and Actions of Catching Fly Balls: Zeroing Out Optical Acceleration," *Ecological Psychology* 4, no. 4 (1992): 199–222, https://doi.org/10.1207/s15326969eco0404_1; Dees B. W. Postma, Joanne Smith, Gert-Jan Pepping, Steven van Anandel, and Frank T. J. M. Zaai, "When a Fly Ball Is Out of Reach: Catchability Judgments Are Not Based on Optical Acceleration Cancellation," *Frontiers in Psychology* 8 (2017): 535, <https://doi.org/10.3389/fpsyg.2017.00535>.

22. Though see Postma et al., "When a Fly Ball."

23. This careful research is reported in Nick Reed, Peter McLeod, and Zoltan Dienes, "Implicit Knowledge and Motor Skill: What People Who Know How to Catch Don't Know," *Consciousness and Cognition* 19, no. 1 (2010): 63–76, <https://doi.org/10.1016/j.concog.2009.07.006>.

24. The concept of attribute substitution is elaborated by Daniel Kahneman and Shane Frederick, "Representativeness Revisited: Attribute Substitution in Intuitive Judgment," in *Heuristics and Biases: The Psychology of Intuitive Judgment*, ed. Thomas Gilovich, Dale Griffin, and Daniel Kahneman (Cambridge: Cambridge University Press, 2002), 49–81, <https://doi.org/10.1017/CBO9780511808098.004>.

25. Moreover, it seems highly likely that even the forced-choice recognition finding underestimated participants' "awareness." As already noted, the true trajectory of gaze when the ball is coming to the eye is increasing at a decreasing rate. Yet when Reed and colleagues actually measured gaze with a video camera, for many cases the difference between (a) α going up at a decreasing rate and (b) α going up at a steady rate was negligible, and probably led to differences in the final position of the ball that were well within the tolerance of the hand in adjusting to actually catching a ball. Despite this, a and b were two distinct alternative choice options given to participants, whose responses were scored as incorrect if they chose b rather than a. Quite apart from the possibility that participants did not attend to the subtle semantic difference between the two options, the case for classifying them as unaware on the basis that they reported that α followed a steadily increasing profile seems debatable.

26. For a critical review of several decades of research on implicit learning, see David R. Shanks, "Implicit Learning," in *Handbook of Cognition*, ed. Koen Lamberts and Robert L. Goldstone (London: Sage, 2005), 202–220.

27. For an experiment adopting essentially this method, see Darrin O. Wijeyaratnam, Zacharie Cheng-Boivin, Richard D. Bishouty, and Erin K. Cressman, "The Influence of

Awareness on Implicit Visuomotor Adaptation," *Consciousness and Cognition* 99 (2022): 103297, <https://doi.org/10.1016/j.concog.2022.103297>.

28. Several examples of this cycle of evidence and counterevidence are described in Shanks, "Implicit learning."

29. See Melvyn A. Goodale and A. David Milner, "Separate Visual Pathways for Perception and Action," *Trends in Neurosciences* 15, no. 1 (1992): 20–25, [https://doi.org/10.1016/0166-2236\(92\)90344-8](https://doi.org/10.1016/0166-2236(92)90344-8); M. A. Goodale, A. D. Milner, L. S. Jakobson, and D. P. Carey, "A Neurological Dissociation between Perceiving Objects and Grasping Them," *Nature* 349 (1991): 154–156, <https://doi.org/10.1038/349154a0>.

30. This evidence is reviewed in Thomas Schenk, "An Allocentric Rather Than Perceptual Deficit in Patient D.F.," *Nature Neuroscience* 9 (2006): 1369–1370, <https://doi.org/10.1038/nn1784>; Thomas Schenk and Robert D. McIntosh, "Do We Have Independent Visual Streams for Perception and Action?" *Cognitive Neuroscience* 1, no. 1 (2010): 52–62, <https://doi.org/10.1080/17588920903388950>.

31. See Volker H. Franz and Karl R. Gegenfurtner, "Grasping Visual Illusions: Consistent Data and No Dissociation," *Cognitive Neuropsychology* 25, nos. 7–8 (2008): 920–950, <https://doi.org/10.1080/02643290701862449>; Karl K. Kopiske, Nicola Bruno, Constanze Hesse, Thomas Schenk, and Volker H. Franz, "The Functional Subdivision of the Visual Brain: Is There a Real Illusion Effect on Action? A Multi-Lab Replication Study," *Cortex* 79 (2016): 130–152, <https://doi.org/doi.org/10.1016/j.cortex.2016.03.020>.

32. Salvatore Aglioti, Joseph F. X. Desouza, and Melvyn A. Goodale, "Size-Contrast Illusions Deceive the Eye But Not the Hand," *Current Biology* 5, no. 6 (1995): 679–685, [https://doi.org/10.1016/S0960-9822\(95\)00133-3](https://doi.org/10.1016/S0960-9822(95)00133-3).

33. V. H. Franz, K. R. Gegenfurtner, H. H. Bühlhoff, and M. Fahle, "Grasping Visual Illusions: No Evidence for a Dissociation between Perception and Action," *Psychological Science* 11, no. 1 (2000): 20–25, <https://doi.org/10.1111/1467-9280.00209>.

34. David A. Westwood and Melvyn A. Goodale, "Converging Evidence for Diverging Pathways: Neuropsychology and Psychophysics Tell the Same Story," *Vision Research* 51, no. 8 (2011): 804–811, <https://doi.org/10.1016/j.visres.2010.10.014>; Thomas Schenk, Volker Franz, and Nicola Bruno, "Vision-for-Perception and Vision-for-Action: Which Model Is Compatible with the Available Psychophysical and Neuropsychological Data?" *Vision Research* 51, no. 8 (2011): 812–818. <https://doi.org/10.1016/j.visres.2011.02.003>; Kopiske et al., "The Functional Subdivision."

35. See Lawrence Weiskrantz, *Blindsight: A Case Study and Implications* (Oxford: Oxford University Press, 1986).

36. Important statements of and responses to this view can be found in John R. Campion, Richard Latto, and Y. M. Smith, "Is Blindsight an Effect of Scattered Light, Spared Cortex, and Near-Threshold Vision?" *Behavioral and Brain Sciences* 6, no. 3

(1983): 423–486, <https://doi.org/10.1017/S0140525X00016861>; Larry Weiskrantz, “Is Blindsight Just Degraded Normal Vision?” *Experimental Brain Research* 192 (2009): 413–416, <https://doi.org/10.1007/s00221-008-1388-7>; Ian Phillips, “Blindsight Is Qualitatively Degraded Conscious Vision,” *Psychological Review* 128, no. 3 (2021): 558–584, <https://doi.org/10.1037/rev0000254>.

37. Alan Cowey, “The Blindsight Saga,” *Experimental Brain Research* 200 (2010): 7, <https://doi.org/10.1007/s00221-009-1914-2>.

38. For an entertaining history of the Vicary story, see Anthony R. Pratkanis, “The Cargo-Cult Science of Subliminal Persuasion,” *Skeptical Inquirer* 16, no. 3 (1992): 260–272. The Judas Priest trial is described in Timothy E. Moore, “Scientific Consensus and Expert Testimony: Lessons from the Judas Priest Trial,” *Skeptical Inquirer* 20 (1996): 32–38.

39. For a review of early research on this topic, see John R. Vokey and J. Don Read, “Subliminal Messages: Between the Devil and the Media,” *American Psychologist* 40 (1985): 1231–1239, <https://doi.org/10.1037/0003-066X.40.11.1231>.

40. The work of Morten Overgaard of Aarhus University and his colleagues has been particularly convincing about this crucial point. See Michael Lohse and Morten Overgaard, “Emotional Priming Depends on the Degree of Conscious Experience,” *Neuropsychologia* 128 (2019): 96–102, <https://doi.org/10.1016/j.neuropsychologia.2017.10.028>; Morten Overgaard, “Visual Experience and Blindsight: A Methodological Review,” *Experimental Brain Research* 209 (2011): 473–479, <https://doi.org/10.1007/s00221-011-2578-2>; Morten Overgaard, Katrin Fehl, Kim Mouridsen, Bo Bergholt, and Axel Cleeremans “Seeing without Seeing? Degraded Conscious Vision in a Blindsight Patient,” *PLOS ONE* 3, no. 8 (2008): e3028, <https://doi.org/10.1371/journal.pone.0003028>; Thomas Z. Ramsøy and Morten Overgaard, “Introspection and Subliminal Perception,” *Phenomenology and the Cognitive Sciences* 3 (2004): 1–23, <https://doi.org/10.1023/B:PHEN.0000041900.30172.e8>. For further discussions on relevant methodological issues in research on subliminal perception, see David R. Shanks, Simone Malejka, and Miguel A. Vadillo, “The Challenge of Inferring Unconscious Mental Processes,” *Experimental Psychology* 68, no. 3 (2021): 113–129, <https://doi.org/10.1027/1618-3169/a000517>; Thomas Schmidt, “Invisible Stimuli, Implicit Thresholds: Why Invisibility Judgments Cannot Be Interpreted in Isolation,” *Advances in Cognitive Psychology* 11, no. 2 (2015): 31–41, <https://doi.org/10.5709/acp-0169-3>; Hagar Gelbard-Sagiv, Nathan Faivre, Liad Mudrik, and Christof Koch, “Low-Level Awareness Accompanies ‘Unconscious’ High-Level Processing during Continuous Flash Suppression,” *Journal of Vision* 16, no. 1 (2016): 3, <https://doi.org/10.1167/16.1.3>.

41. For example, see K. Anders Ericsson and Herbert A. Simon, *Protocol Analysis: Verbal Reports as Data* (Cambridge, MA: MIT Press, 1984); Ben R. Newell and David R. Shanks, “Unconscious Influences on Decision Making: A Critical Review,” *Behavioral and Brain Sciences* 37, no. 1 (2014): 1–19, <https://doi.org/10.1017/s0140525x12003214>.

Chapter 3

1. This seminal demonstration is reported in Tory E. Higgins, William S. Rholes, and Carl R. Jones, "Category Accessibility and Impression Formation," *Journal of Experimental Social Psychology* 13, no. 2 (1977): 141–154, [https://doi.org/10.1016/s0022-1031\(77\)80007-3](https://doi.org/10.1016/s0022-1031(77)80007-3). Higgins and colleagues describe some earlier related research that set the scene for their pioneering study.
2. This follow-up research, employing slightly different procedures but just as influential as the study by Higgins et al., is Thomas K. Srull and Robert S. Wyer, "The Role of Category Accessibility in the Interpretation of Information about Persons: Some Determinants and Implications," *Journal of Personality and Social Psychology* 37, no. 10 (1979): 1660–1672, <https://doi.org/10.1037/0022-3514.37.10.1660>. It is hard to exaggerate the influence of these two studies. Each has been cited (on Google Scholar as of January 2022) around twenty-five hundred times, meaning that this number of later research articles have cited—and hence presumably been influenced by—the Higgins et al. and Srull and Wyer studies. We revisit these two studies later in the chapter.
3. Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 57.
4. Semantic priming was first demonstrated by David E. Meyer and Roger W. Schvaneveldt, "Facilitation in Recognizing Pairs of Words: Evidence of a Dependence between Retrieval Operations," *Journal of Experimental Psychology* 90, no. 2 (1971): 227–234, <https://doi.org/10.1037/h0031564>.
5. Robert J. Sternberg and Karin Sternberg, *Cognitive Psychology*, 6th ed. (Belmont, MA: Wadsworth/Cengage Learning, 2012).
6. Richard L. Gregory, "The Medawar Lecture 2001 Knowledge for Vision: Vision for Knowledge," *Philosophical Transactions of the Royal Society B: Biological Sciences* 360, no. 1458 (2005): 1231–1251, <https://doi.org/10.1098/rstb.2005.1662>.
7. James H. Neely, "Priming," in *Encyclopedia of Cognitive Science*, ed. Lynn Nadel (London: Nature Publishing Group, 2003), 721.
8. Kahneman, *Thinking, Fast and Slow*, 53.
9. Chris Loersch and B. Keith Payne, "The Situated Inference Model," *Perspectives on Psychological Science* 6, no. 3 (2011): 234–252, <https://doi.org/10.1177/1745691611406921>.
10. The original papers citing these effects are "professors": Ap Dijksterhuis and Ad van Knippenberg, "The Relation between Perception and Behavior, or How to Win a Game of Trivial Pursuit," *Journal of Personality and Social Psychology* 74, no. 4 (1998): 865–877, <https://doi.org/10.1037/0022-3514.74.4.865>; "graphing" and "warmth": Lawrence E. Williams & John A. Bargh, "Keeping One's Distance: The Influence of Spatial Distance Cues on Affect and Evaluation," *Psychological Science* 19, no. 3 (2008): 302–308, <https://doi.org/10.1111/j.1467-9280.2008.02084.x>. Lawrence E. Williams

and John A. Bargh, "Experiencing Physical Warmth Promotes Interpersonal Warmth," *Science* 322, no. 5901 (2008): 606–607, <https://doi.org/10.1126/science.1162548>. Follow-up work questioning the reliability of the findings includes Harold Pashler, Noriko Coburn, and Christine R. Harris, "Priming of Social Distance? Failure to Replicate Effects on Social and Food Judgments," *PLOS ONE* 7, no. 8 (2012), <https://doi.org/10.1371/journal.pone.0042510>, David R. Shanks et al., "Priming Intelligent Behavior: An Elusive Phenomenon," *PLOS ONE* 8, no. 4 (2013), <https://doi.org/10.1371/journal.pone.0056515>; and Christopher F. Chabris, Patrick R. Heck, Jaclyn Mandart, Daniel J. Benjamin, and Daniel J. Simons, "No Evidence That Experiencing Physical Warmth Promotes Interpersonal Warmth," *Social Psychology* 50, no. 2 (2019): 127–132, <https://doi.org/10.1027/1864-9335/a000361>.

11. Various discussions, perspectives, and reviews can be found in Scott O. Lilienfeld and Irwin D. Waldman, *Psychological Science under Scrutiny: Recent Challenges and Proposed Solutions* (Chichester: Wiley, 2017).

12. The walking study, one of the most controversial experiments in behavioral science (cited over six thousand times), is John A. Bargh, Mark Chen, and Lara Burrows, "Automaticity of Social Behavior: Direct Effects of Trait Construct and Stereotype Activation on Action," *Journal of Personality and Social Psychology* 71, no. 2 (1996): 230–244, <https://doi.org/10.1037/0022-3514.71.2.230>.

13. Two large-scale studies that demonstrate this key point are Tal Moran et al., "Incidental Attitude Formation via the Surveillance Task: A Preregistered Replication of the Olson and Fazio (2001) Study," *Psychological Science* 32 (2021): 120–131, <https://doi.org/10.1177/0956797620968526>; and Sean Hughes, Jamie Cummins, and Ian Hussey, "Effects on the Affect Misattribution Procedure Are Strongly Moderated by Awareness," PsyArXiv, March 18, 2021, <https://psyarxiv.com/d5zn8/>.

14. Stéphane Doyen, Olivier Klein, Cora-Lise Pichon, and Axel Cleeremans, "Behavioral Priming: It's All in the Mind, But Whose Mind?" *PLOS ONE* 7, no. 1 (2012), <https://doi.org/10.1371/journal.pone.0029081>.

15. There do not appear to have been any direct, large-sample replications of the Higgins et al. experiments. However, as noted in note 2 in chapter 3, Srull and Wyer reported a variation on the Donald procedure, and this influential study has been the subject of two major large-sample replication efforts, neither of which obtained a meaningful priming effect: Randy J. McCarthy et al., "Registered Replication Report on Srull and Wyer (1979)," *Advances in Methods and Practices in Psychological Science* 1 (2018): 321–336, <https://doi.org/10.1177/2515245918777487>; Randy McCarthy et al. "A Multi-Site Collaborative Study of the Hostile Priming Effect," *Collabra: Psychology* 7, no. 1 (2021), <https://doi.org/10.1525/collabra.18738>.

16. For another striking example of how priming effects can be fully explained by experimental demands, see Thandiwe S. E. Gilder and Erin A. Heerey, "The Role of Experimenter Belief in Social Priming," *Psychological Science* 29 (2018): 403–417, <https://doi.org/10.1177/0956797617737128>.

17. For additional details on methods for assessing awareness, see Ben R. Newell and David R. Shanks, "Unconscious Influences on Decision Making: A Critical Review," *Behavioral and Brain Sciences* 37, no. 1 (2014): 1–19, <https://doi.org/10.1017/s0140525x12003214>.

18. The pen experiment, as highly cited as the two unrelated-studies experiments described earlier, is reported in Fritz Strack, Leonard L. Martin, and Sabine Stepper, "Inhibiting and Facilitating Conditions of the Human Smile: A Nonobtrusive Test of the Facial Feedback Hypothesis," *Journal of Personality and Social Psychology* 54, no. 5 (1988): 768–777, <https://doi.org/10.1037/0022-3514.54.5.768>.

19. Eric-Jan Wagenmakers et al., "Registered Replication Report: Strack, Martin, & Stepper (1988)," *Perspectives on Psychological Science* 11, no. 6 (2016): 917–928, <https://doi.org/10.1177/1745691616674458>.

20. Fritz Strack, "Reflection on the Smiling Registered Replication Report," *Perspectives on Psychological Science* 11, no. 6 (2016): 929–930, <https://doi.org/10.1177/1745691616674460>.

21. A more recent multilab replication attempt, that included Strack, found "inconclusive evidence" for an effect of the pen-in-the-mouth task, a conclusion that might be considered generous. See Nicholas A. Coles et al., "A Multi-Lab Test of the Facial Feedback Hypothesis by the Many Smiles Collaboration," PsyArXiv, February 4, 2019, <https://doi:10.31234/osf.io/cvpuw>.

22. Ulrich Schimmack, "Reconstruction of a Train Wreck: How Priming Research Went off the Rails," Replicability-Index, December 31, 2020, <https://replicationindex.com/2017/02/02/reconstruction-of-a-train-wreck-how-priming-research-went-of-the-rails/>.

23. Kahneman's comments can be found in Schimmack, "Reconstruction of a Train Wreck."

24. Discussion of the ongoing fallout from Kahneman's discussion of the replicability of certain priming studies can be found in the following article and its associated commentaries: Jeffrey W. Sherman and Andrew M. Rivers, "There's Nothing Social about Social Priming: Derailing the 'Train Wreck,'" *Psychological Inquiry* 32, no. 1 (2021): 1–11, <https://doi.org/10.1080/1047840x.2021.1889312>. We also revisit this critique in chapter 7.

25. David R. Shanks et al., "Romance, Risk, and Replication: Can Consumer Choices and Risk-Taking Be Primed by Mating Motives?" *Journal of Experimental Psychology: General* 144, no. 6 (2015), <https://doi.org/10.1037/xge0000116>.

Chapter 4

1. This chapter draws on several articles by Craig McKenzie and Shlomi Sher. Key references are Shlomi Sher and Craig R. M. McKenzie, "Information Leakage from Logically Equivalent Frames," *Cognition* 101, no. 3 (2006): 467–494, <https://doi.org>

/10.1016/j.cognition.2005.11.001; Shlomi Sher and Craig R. M. McKenzie, "Framing Effects and Rationality," in *The Probabilistic Mind: Prospects for a Bayesian Cognitive Science*, ed. Nick Chater and Mike Oaksford (Oxford: Oxford University Press, 2009), 79; Craig R. M. McKenzie, Shlomi Sher, Lin M. Leong, and Johannes Müller-Trede, "Constructed Preferences, Rationality, and Choice Architecture," *Review of Behavioral Economics* 5, no. 3–4 (2018): 337–370, <https://doi.org/10.1561/105.00000091>.

2. Like many of the most eye-catching peculiarities about human judgment and decision making, framing was discovered by Amos Tversky and Daniel Kahneman: see Amos Tversky and Daniel Kahneman, "The Framing of Decisions and the Psychology of Choice," *Science* 211 (1981): 453–458, <https://doi.org/10.1126/science.7455683>.

3. An interesting aside here is that in 2011, the US government mandated that companies could only claim products to be 90 percent fat free if they also said they were 10 percent fat! For further discussion, see Cass R Sunstein, "Nudges That Fail," *Behavioral Public Policy* 1, no. 1 (2017): 4–25, <https://doi.org/10.1017/bpp.2016.3>.

4. A comprehensive discussion of how framing effects operate can be found in Irwin P. Levin, Sandra L. Schneider, and Gary J. Gaeth, "All Frames Are Not Created Equal: A Typology and Critical Analysis of Framing Effects," *Organizational Behavior and Human Decision Processes* 76, no. 2 (1998): 149–188, <https://doi.org/10.1006/obhd.1998.2804>.

5. The paper that introduced framing effects to the medical literature is Barbara J. McNeil, Stephen G. Pauker, Harold C. Sox Jr., and Amos Tversky, "On the Elicitation of Preferences for Alternative Therapies," *New England Journal of Medicine* 306, no. 21 (1982): 1259–1262, <https://doi.org/10.1056/NEJM198205273062103>.

6. Sher and McKenzie, "Information Leakage."

7. Sher and McKenzie, "Information Leakage."

8. Sher and McKenzie, "Information Leakage."

9. For further discussion of what might determine the salience of different attributes in people's psycholinguistic representations and more detail on the *reference-point hypothesis*, see Sher and McKenzie, "Framing Effects and Rationality."

10. Many studies have asked whether the position of an item on a menu affects diners' choices, and such an effect (if real) could be exploited as a useful nudge for encouraging healthy eating. In fact, the evidence is rather mixed, with some studies finding effects and others not. For two examples, one positive and the other not, see Eran Dayan and Maya Bar-Hillel, "Nudge to Nobesity II: Menu Positions Influence Food Orders," *Judgment and Decision Making* 6, no. 4 (2011): 333–342; and Rebecca Wyse et al., "Can Changing the Position of Online Menu Items Increase Selection of Fruit and Vegetable Snacks? A Cluster Randomized Trial within an Online Canteen Ordering System in Australian Primary Schools," *American Journal of Clinical Nutrition* 109, no. 5 (2019): 1422–1430, <https://doi.org/10.1093/ajcn/nqy351>.

11. Sher and McKenzie, "Information Leakage," 489.

12. This experiment is reported in Balazs Aczel, Aba Szollosi, and Bence Bago, "The Effect of Transparency on Framing Effects in within-Subject Designs," *Journal of Behavioral Decision Making* 31, no. 1 (2018): 25–39, <https://doi.org/10.1002/bdm.2036>.

13. The terms *choice architecture* and *nudge* were popularized in the hugely influential book by Richard Thaler and Cass R. Sunstein, *Nudge: Improving Decisions about Health, Wealth, and Happiness* (New Haven, CT: Yale University Press, 2008). A nudge is defined as any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives.

14. See Eric J. Johnson and Daniel Goldstein, "Do Defaults Save Lives?" *Science* 302, no. 5649 (2003): 1338–1339, <https://doi.org/10.1126/science.1091721>. This has become one of the most famous examples of how simple changes to a choice architecture (the setting of the default) can have a large impact on organ donation. For a more contemporary discussion of this and other influences of choice architecture, see Eric J. Johnson, *The Elements of Choice* (New York: Riverhead Books, 2021).

15. For the original versions and more details of these survey questions, see Craig R. M. McKenzie, Michael J. Liersch, and Stacey R. Finkelstein, "Recommendations Implicit in Policy Defaults," *Psychological Science* 17, no. 5 (2006): 414–420, <https://doi.org/10.1111/j.1467-9280.2006.01721.x>.

16. Although the idea that people can interpret the intentions behind default settings seems relatively uncontroversial, some work has questioned whether people know how to set defaults in order to influence particular outcomes. See Julian J. Zlatev, David P. Daniels, Hajin Kim, and Margaret A. Neale, "Default Neglect in Attempts at Social Influence," *Proceedings of the National Academy of Sciences* 114, no. 52 (2017): 13643–48, <https://doi.org/10.1073/pnas.1712757114>; and the comment by Minah Jung and colleagues that challenges the generality of the claims made by Zlatev et al.: Minah H. Jung, Chengyao Sun, and Leif D. Nelson, "People Can Recognize, Learn, and Apply Default Effects in Social Influence," *Proceedings of the National Academy of Sciences* 115, no. 35 (2018): E8105–E8106. <https://doi.org/10.1073/pnas.1810986115>.

17. This example is adapted from experiments reported in Craig R. M. McKenzie, Lim M. Leong, and Shlomi Sher, "Default Sensitivity in Attempts at Social Influence," *Psychonomic Bulletin & Review* 28, no 2 (2020): 695–702, <https://doi.org/10.3758/s13423-020-01834-4>.

18. This text comes from an experiment reported by Yavor Paunov, Michaela Wänke, and Tobias Vogel, "Ethical Defaults: Which Transparency Components Can Increase the Effectiveness of Default Nudges?" *Social Influence* 14, no. 3–4 (2019): 104–116, <https://doi.org/10.1080/15534510.2019.1675755>.

19. Discussions about the (in)effectiveness of defaults and nudging more generally as a tool for behavioral change go beyond what we can consider here. For illuminating perspectives on people's "nudgeability," see Denise de Ridder, Floor Kroese, and

Laurens van Gestel, "Nudgeability: Mapping Conditions of Susceptibility to Nudge Influence," *Perspectives on Psychological Science* 17, no. 2 (2021): 346–359, <https://doi.org/10.1177/1745691621995183>; and Job M. T. Krijnen, David Tannenbaum, and Craig R. Fox, "Choice Architecture 2.0: Behavioral Policy as an Implicit Social Interaction," *Behavioral Science and Policy* 3, no. 2 (2017): i–18, <https://doi.org/10.1353/bsp.2017.0010>.

20. Amos Tversky and Daniel Kahneman, "Judgment under Uncertainty: Heuristics and Biases," *Science* 185, no. 4157 (1974): 1124–1131, <https://doi.org/10.1126/science.185.4157.1124>.

21. Denis J. Hilton, "The Social Context of Reasoning: Conversational Inference and Rational Judgment," *Psychological Bulletin* 118, no. 2 (1995): 248–271, <https://doi.org/10.1037/0033-2909.118.2.248>.

22. Hilton, "Social Context of Reasoning."

23. Joseph P. Simmons, Robyn A. LeBoeuf, and Leif D. Nelson, "The Effect of Accuracy Motivation on Anchoring and Adjustment: Do People Adjust from Provided Anchors?" *Journal of Personality and Social Psychology* 99, no. 6 (2010): 917–932, <https://doi.org/10.1037/a0021540>.

24. A review of the effects of uninformative anchors on payments for consumer goods is provided by Konstantinos Ioannidis, Theo Offerman, and Randolph Sloof, "On the Effect of Anchoring on Valuations When the Anchor Is Transparently Uninformative," *Journal of the Economic Science Association* 6, no. 1 (2020): 77–94, <https://doi.org/10.1007/s40881-020-00094-1>, who in fact present meta-analytic evidence that anchoring effects are completely absent when people truly believe that the anchor value is random. On anchor plausibility, see Andrew R. Smith, Paul D. Windschitl, and Kathryn Bruchmann, "Knowledge Matters: Anchoring Effects Are Moderated by Knowledge Level," *European Journal of Social Psychology* 43 (2013): 97–108, <https://doi.org/10.1002/ejsp.1921>.

25. For evidence regarding people's awareness of their use of the anchor and supporting the claim that anchors only affect judgments when they are regarded as providing good estimates, see Adam J. L. Harris, Tom Phillips, Sam Bhaskaran, Jozefina Krasniqi, and David R. Shanks, "Awareness of Anchoring," unpublished report (2022); and Oliver Schweickart, Cory Tam, and Norman R. Brown, "When "Bad" Is Good: How Evaluative Judgments Eliminate the Standard Anchoring Effect," *Canadian Journal of Experimental Psychology* 75, no. 1 (2021): 56–63, <https://doi.org/10.1037/cep0000209>.

26. See Sangsuk Yoon, Nathan M. Fong, and Angelika Dimoka, "The Robustness of Anchoring Effects on Preferential Judgments," *Judgment and Decision Making* 14, no. 4 (2019), for a comprehensive analysis of the impact of random anchors (among other factors) and also Minah H. Jung, Hannah Perfecto, and Leif D. Nelson, "Anchoring in Payment: Evaluating a Judgmental Heuristic in Field Experimental Settings," *Journal of Marketing Research* 53, no. 3 (2016): 354–368, <https://doi.org/10.1509/jmr.14>

.0238, for additional relevant findings. One of our own articles examines the specific role of incidental anchors and finds the evidence lacking: David R. Shanks, Pietro Barbieri-Hermitte, and Miguel A. Vadillo, "Do Incidental Environmental Anchors Bias Consumers' Price Estimations?" *Collabra: Psychology* 6, no. 1 (2020): 19, <https://doi.org/10.1525/collabra.310>.

27. This thought experiment is described by the well-known judgment and decision-making scholar Robin Hogarth in a comment on an article we wrote in 2014: Ben R. Newell and David R. Shanks, "Unconscious Influences on Decision Making: A Critical Review," *Behavioral and Brain Sciences* 37, no. 1 (2014): 1–19, <https://doi.org/10.1017/s0140525x12003214>. He in turn attributed it to the famous social psychologist Richard Nisbett, who used the scenario in a talk Hogarth attended. In the comment, Hogarth relates that though he likes and remembers the scenario, he does not recall the specific point that Nisbett was illustrating. See Robin M. Hogarth, "Automatic Processes, Emotions, and the Causal Field," *Behavioral and Brain Sciences* 37, no. 1 (2014): 31–32, <https://doi.org/10.1017/S0140525X13000757>.

28. For further development of this argument see David R. Shanks and Ben R. Newell, "Authors' Response: The Primacy of Conscious Decision Making," *Behavioral and Brain Sciences* 37, no. 1 (2014): 45–61, <https://doi.org/10.1017/s0140525x13001507>.

29. For additional discussion of the subtleties of information leakage and some evidence questioning people's sensitivity to frames, see Adam J. L. Harris, Sarah C. Jenkins, Gloria W. S. Ma, and Aloysius Oh, "Testing the Adaptability of People's Use of Attribute Frame Information," *Cognition* 212 (2021): 104720, <https://doi.org/10.1016/j.cognition.2021.104720>.

Chapter 5

1. "The Female CEOs on This Year's Fortune 500 Just Broke Three All-Time Records," *Fortune*, June 2, 2021, <https://fortune.com/2021/06/02/female-ceos-fortune-500-2021-women-ceo-list-roz-brewer-walgreens-karen-lynch-cvs-thasunda-brown-duckett-tiaa/>.

2. "Corrective Services, Australia," Australian Bureau of Statistics, accessed December 21, 2021, <https://www.abs.gov.au/statistics/people/crime-and-justice/corrective-services-australia/latest-release>.

3. The relevant definition in the Oxford English Dictionary is: "Tendency to favour or dislike a person or thing, especially as a result of a preconceived opinion; partiality, prejudice . . . any preference or attitude that affects outlook or behavior, esp. by inhibiting impartial consideration or judgement."

4. The data in this section come from the following sources: "Annual Admissions Statistical Report," University of Oxford, accessed December 21, 2021, <https://www.ox.ac.uk/sites/files/oxford/Annual%20Admissions%20Statistical%20Report%202020.pdf>; "2019 Entry UCAS Undergraduate Reports by Sex, Area Background, and

Ethnic Group," UCAS, accessed December 21, 2021, <https://www.ucas.com/file/309981/download?token=u3STriXV>; "Black and Ethnic Minority Students at the University of Oxford," Full Fact, accessed December 21, 2021, <https://fullfact.org/education/bme-students-oxford/>.

5. "Understanding Unconscious Bias," Royal Society, accessed December 21, 2021, <https://royalsociety.org/topics-policy/publications/2015/unconscious-bias/>.

6. Reviews of research on the effectiveness of diversity training can be found in Hus-sain Alhejji, Thomas Garavan, Ronan Carbery, Fergal O'Brien, and David McGuire, "Diversity Training Programme Outcomes: A Systematic Review," *Human Resource Development Quarterly* 27, no. 1 (2016): 95–149, <https://doi.org/10.1002/hrdq.21221>, and Katerina Bezrukova, Chester S. Spell, Jamie L. Perry, and Karen A. Jehn, "A Meta-Analytical Integration of over 40 Years of Research on Diversity Training Evaluation," *Psychological Bulletin* 142, no. 11 (2016): 1227–1274, <https://doi.org/10.1037/bul0000067>.

7. This sort of backfire effect was shown by Lisa Legault, Jennifer N. Gutsell, and Michael Inzlicht, "Ironic Effects of Antiprejudice Messages: How Motivational Interventions Can Reduce (But Also Increase) Prejudice," *Psychological Science* 22, no. 12 (2011): 1472–1477, <https://doi.org/10.1177/0956797611427918>.

8. See Janine Willis and Alexander Todorov, "First Impressions: Making Up Your Mind after a 100-ms Exposure to a Face," *Psychological Science* 17, no. 7 (2006): 592–598, <https://doi.org/10.1111/j.1467-9280.2006.01750.x>; Y. Z. Foo, C. A. M. Sutherland, N. S. Burton, S. Nakagawa, and G. Rhodes, "Accuracy in Facial Trustworthiness Impressions: Kernel of Truth or Modern Physiognomy? A Meta-Analysis," *Personality and Social Psychology Bulletin* 48, no. 11 (2022): 1580–1596, <https://doi.org/10.1177/01461672211048110>.

9. This study is described in Arnaud Tognetti, Claire Berticat, Michel Raymond, and Charlotte Faurie, "Is Cooperativeness Readable in Static Facial Features? An Inter-Cultural Approach," *Evolution and Human Behavior* 34, no. 6 (2013): 427–432, <https://doi.org/10.1016/j.evolhumbehav.2013.08.002>.

10. This famous study was conducted by Corinne A. Moss-Racusin, John F. Dovidio, Victoria L. Brescoll, Mark J. Graham, and Jo Handelsman, "Science Faculty's Subtle Gender Biases Favor Male Students," *Proceedings of the National Academy of Sciences* 109, no. 41 (2012): 16474–16479, <https://doi.org/10.1073/pnas.1211286109>.

11. This and other important issues on gender bias in academia are reviewed in an authoritative recent review by Stephen J. Ceci, Shulamit Kahn, and Wendy M. Williams, "Some Evidence of Gender Bias in Two of Six Domains in Academic Science," *Psychological Science in the Public Interest* (2023).

12. Wendy M. Williams and Stephen J. Ceci, "National Hiring Experiments Reveal 2:1 Faculty Preference for Women on STEM Tenure Track," *Proceedings of the National Academy of Sciences* 112, no. 17 (2015): 5360–5365, <https://doi.org/10.1073/pnas.1418878112>.

13. Ceci, Kahn, and Williams, "Some Evidence of Gender Bias."
14. In one recent study of over 250,000 real hiring decisions in an online labor market, no evidence of a male bias was found: Jason Chan and Jing Wang, "Hiring Preferences in Online Labor Markets: Evidence of a Female Hiring Bias," *Management Science* 64, no. 7 (2018): 2973–2994, <https://doi.org/10.1287/mnsc.2017.2756>.
15. Ceci, Kahn, and Williams, "Some Evidence of Gender Bias."
16. This viewpoint is elaborated in Lee Jussim, Jarret T. Crawford, Stephanie M. Anglin, John R. Chambers, Sean T. Stevens, and Florette Cohen, "Stereotype Accuracy: One of the Largest Relationships and Most Replicable Effects in All of Social Psychology," in *Handbook of Prejudice, Stereotyping, and Discrimination*, 2nd ed., ed. Todd D. Nelson (Hillsdale, NJ: Erlbaum, 2016), 31–63. A robust social constructionist critique by John Dixon argues that stereotyping and prejudice emerge from institutionalized power relationships and hence become accepted ways of perceiving and treating others: John Dixon, "'Thinking Ill of Others without Sufficient Warrant?' Transcending the Accuracy-Inaccuracy Dualism in Prejudice and Stereotyping Research," *British Journal of Social Psychology* 56, no. 1 (2017): 4–27, <https://doi.org/10.1111/bjso.12181>.
17. Brian A. Nosek et al., "Pervasiveness and Correlates of Implicit Attitudes and Stereotypes," *European Review of Social Psychology* 18, no. 1 (2007): 36–88, <https://doi.org/10.1080/10463280701489053>.
18. Few other topics have proven more controversial: see Scott O. Lilienfeld, "Microaggressions: Strong Claims, Inadequate Evidence," *Perspectives on Psychological Science* 12, no. 1 (2017): 138–169, <https://doi.org/10.1177/1745691616659391>.
19. The available correlation evidence is reviewed by Ulrich Schimmack, "The Implicit Association Test: A Method in Search of a Construct," *Perspectives on Psychological Science* 16, no. 2 (2021): 396–414, <https://doi.org/10.1177/1745691619863798>. Schimmack shows, however, that when the psychometric properties of the IAT are taken into account, there is a very high correlation between the latent factors that underlie explicit and implicit attitudes. From this, he concludes that to the extent that the IAT measures anything meaningful, it measures the same thing as explicit attitude scales.
20. Gregory Mitchell and Philip E. Tetlock, "Popularity as a Poor Proxy for Utility: The Case of Implicit Prejudice," in *Psychological Science under Scrutiny: Recent Challenges and Proposed Solutions*, ed. Scott O. Lilienfeld and Irwin D. Waldman (Chichester: Wiley, 2017), 164–195.
21. Adam Hahn, Charles M. Judd, Holen K. Hirsch, and Irene V. Blair, "Awareness of Implicit Attitudes," *Journal of Experimental Psychology: General* 143, no. 3 (2014): 1369–1392, <https://doi.org/10.1037/a0035028>.
22. See Jan De Houwer, Tom Beckers, and Agnes Moors, "Novel Attitudes Can Be Faked on the Implicit Association Test," *Journal of Experimental Social Psychology* 43, no. 6 (2007): 972–978, <https://doi.org/10.1016/j.jesp.2006.10.007>; Klaus Fiedler and

Matthias Bluemke, "Faking the IAT: Aided and Unaided Response Control on the Implicit Association Tests," *Basic and Applied Social Psychology* 27, no. 4 (2005): 307–316, https://doi.org/10.1207/s15324834basp2704_3.

23. Hart Blanton, James Jaccard, Erin Strauts, Gregory Mitchell, and Philip E. Tetlock, "Toward a Meaningful Metric of Implicit Prejudice," *Journal of Applied Psychology* 100, no. 5 (2015): 1468–1481, <https://doi.org/10.1037/a0038379>.

24. Mitchell and Tetlock, "Popularity as a Poor Proxy."

25. Anthony G. Greenwald and Calvin K. Lai, "Implicit Social Cognition," *Annual Review of Psychology* 71 (2020): 419–445, <https://doi.org/10.1146/annurev-psych-010419-050837>. A perfectly reliable test would give exactly the same answer on two occasions. Greenwald and Lai estimated the test-retest reliability of the IAT at 0.50. What does this number mean in practice? A value of 0.50 can be interpreted in the following way. Imagine that two people, A and B, take an IAT and the test yields a higher score for A than B. If they take the test again, the probability that A will again score higher than B is a very modest 67 percent, against a chance score of 50 percent if the accuracy of the test is no better than tossing a coin.

26. Yoav Bar-Anan and Michelangelo Vianello, "A Multimethod Multi-Trait Test of the Dual-Attitude Perspective," *Journal of Experimental Psychology: General* 147, no. 8 (2018): 1264–1272, <https://doi.org/10.1037/xge0000383>.

27. Klaus Rothermund and Dirk Wentura, "Underlying Processes in the Implicit Association Test: Dissociating Salience from Associations," *Journal of Experimental Psychology: General* 133, no. 2 (2004): 139–165, <https://doi.org/10.1037/0096-3445.133.2.139>.

28. Rickard Carlsson and Jens Agerström, "A Closer Look at the Discrimination Outcomes in the IAT Literature," *Scandinavian Journal of Psychology* 57, no. 4 (2016): 278–287, <https://doi.org/10.1111/sjop.12288>.

29. See Hart Blanton, Christopher N. Burrows, and James Jaccard, "To Accurately Estimate Implicit Influences on Health Behavior, Accurately Estimate Explicit Influences," *Health Psychology* 35, no. 8 (2016): 856–860, <https://doi.org/10.1037/hea0000348>, and Frederick L. Oswald, Gregory Mitchell, Hart Blanton, James Jaccard, and Philip E. Tetlock, "Predicting Ethnic and Racial Discrimination: A Meta-Analysis of IAT Criterion Studies," *Journal of Personality and Social Psychology* 105, no. 2 (2013): 171–192, <https://doi.org/10.1037/a0032734>.

30. Patrick S. Forscher et al., "A Meta-Analysis of Procedures to Change Implicit Measures," *Journal of Personality and Social Psychology* 117, no. 3 (2019): 522–559, <https://doi.org/10.1037/pspa0000160>.

31. The studies are Teresa J. Rosegrant and James C. McCroskey, "The Effects of Race and Sex on Proxemic Behavior in an Interview Setting," *Southern Journal of Communication* 40, no. 4 (1975): 408–418, <https://doi.org/10.1080/10417947509372282>; and Carl O. Word, Mark P. Zanna, and Joel Cooper, "The Nonverbal Mediation of

Self-Fulfilling Prophecies in Interracial Interaction," *Journal of Experimental Social Psychology* 10, no. 2 (1974): 109–120, [https://doi.org/10.1016/0022-1031\(74\)90059-6](https://doi.org/10.1016/0022-1031(74)90059-6).

32. "Understanding Unconscious Bias," Royal Society, accessed December 21, 2021, <https://royalsociety.org/topics-policy/publications/2015/unconscious-bias/>.

33. Rindy C. Anderson and Casey A. Klofstad, "Preference for Leaders with Masculine Voices Holds in the Case of Feminine Leadership Roles," *PLOS ONE* 7, no. 12 (2012): e51216, <https://doi.org/10.1371/journal.pone.0051216>.

Chapter 6

1. This quotation from Franklin's writings comes from University of Virginia Press, "Founders Online: From Benjamin Franklin to Joseph Priestley, 19 September 1772," accessed January 27, 2022, <https://founders.archives.gov/documents/Franklin/01-19-02-0200>. The original source is *The Papers of Benjamin Franklin*, vol. 19, *January 1 through December 31, 1772*, ed. William B. Willcox (New Haven: Yale University Press, 1975).

2. This page from Darwin's journal is part of a treasure trove of information at the Darwin Correspondence Project, "Darwin on Marriage," accessed January 27, 2022, <https://www.darwinproject.ac.uk/tags/about-darwin/family-life/darwin-marriage>.

3. For a comprehensive discussion of contemporary formal and prescriptive approaches to decision making, see Ben R. Newell, David A. Lagnado, and David R. Shanks, *Straight Choices: The Psychology of Decision Making*, 3rd ed. (London: Psychology Press, 2022).

4. This is an excerpt from a sketch by the British comedians, actors, and writers Stephen Fry and Hugh Laurie. In the sketch, Laurie is a patient (Mr. Pepperdyne) visiting a doctor (played by Fry) who tries to convince Laurie to take a course of cigarettes to help with his breathing. The excerpt is Fry's response to Laurie's query about whether too much cholesterol is bad for you. Stephen Fry and Hugh Laurie, "Doctor Tobacco," *A Bit of Fry and Laurie*, accessed January 28, 2022, https://abitooffryandlaurie.co.uk/sketches/doctor_tobacco.

5. The magic number 7 (plus or minus 2) is a reference to one of the most influential articles in the psychology of memory: George A. Miller, "The Magical Number Seven Plus or Minus Two: Some Limits on Our Capacity for Processing Information," *Psychological Review* 63, no. 2 (1956): 81–97, <https://doi.org/10.1037/h0043158>.

6. The jam study, along with other demonstrations of the purported dangers of introspection, is published in Timothy D. Wilson and Jonathan W. Schooler, "Thinking Too Much: Introspection Can Reduce the Quality of Preferences and Decisions," *Journal of Personality and Social Psychology* 60, no. 2 (1991): 181–192, <https://doi.org/10.1037//0022-3514.60.2.181>.

7. Wilson and Schooler, "Thinking Too Much."
8. Ap Dijksterhuis cites many of these anecdotal examples in support of the basic tenets of unconscious thought theory in Ap Dijksterhuis and Madelijn Strick, "A Case for Thinking without Consciousness," *Perspectives on Psychological Science* 11, no. 1 (2016): 117–132, <https://doi.org/10.1177/1745691615615317>.
9. David Kadavy, "'Yesterday' Came to Paul McCartney in a Dream. Was It a Creative Miracle?" *Getting Art Done*, April 16, 2018, <https://medium.com/getting-art-done/yesterday-came-to-paul-mccartney-in-a-dream-was-it-a-creative-miracle-79839cb303fe>.
10. Ap Dijksterhuis, Maarten W. Bos, Loran F. Nordgren, and Rick B. van Baaren, "On Making the Right Choice: The Deliberation-without-Attention Effect" *Science*, 311, no. 5763 (2006): 1005–1007, <https://doi.org/10.1126/science.1121629>. This article introduced the idea that "unconscious thought" could be beneficial for decision making. It sparked a good deal of controversy and was followed by several failures to replicate the apparent advantages of not thinking (see notes 11 and 12).
11. This pattern of results was found by many researchers seeking to replicate the unconscious thought effect, including one of our studies: Ben R. Newell, Kwan Yao Wong, Jeremy C. H. Cheung, and Tim Rakow, "Think, Blink or Sleep on It? The Impact of Modes of Thought on Complex Decision Making," *Quarterly Journal of Experimental Psychology* 62, no. 4 (2009): 707–732, <https://doi.org/10.1080/17470210802215202>.
12. Newell et al., "Think, Blink or Sleep on It?"; Wen Ying Moi and David R. Shanks, "Can Lies Be Detected Unconsciously?" *Frontiers in Psychology* 6 (2015): 1221, <https://doi.org/10.3389/fpsyg.2015.01221>.
13. Mark R. Nieuwenstein, Tjardie Wierenga, Richard D. Morey, Jelte M. Wicherts, Tessa N. Blom, Eric-Jan Wagenmakers, and Hedderik van Rijn, "On Making the Right Choice: A Meta-Analysis and Large-Scale Replication Attempt of the Unconscious Thought Advantage," *Judgment and Decision Making* 10, no. 1 (2015): 1–17.
14. Malcolm Gladwell, *Blink: The Power of Thinking without Thinking* (Harlow: Penguin Books, 2006). Gladwell cites Ambady's work extensively in his development of the idea that split-second, intuitive judgments can be highly accurate.
15. The original study is reported in Nalini Ambady and Robert Rosenthal, "Half a Minute: Predicting Teacher Evaluations from Thin Slices of Nonverbal Behavior and Physical Attractiveness," *Journal of Personality and Social Psychology* 64, no. 3 (1993): 431–441, <https://doi.org/10.1037//0022-3514.64.3.431>.
16. Gladwell, *Blink*, 23.
17. The husband-and-wife team of John and Julie Gottman run a relationship counseling business that applies the "Gottman method." For details, see the Gottman Institute (www.gottman.com).

18. Robert J. Waldinger, Marc S. Schulz, Stuart T. Hauser, Joseph P. Allen, and Judith A. Crowell, "Reading Others' Emotions: The Role of Intuitive Judgments in Predicting Marital Satisfaction, Quality, and Stability," *Journal of Family Psychology* 18, no. 1 (2004): 58–71, <https://doi.org/10.1037/0893-3200.18.1.58>.

19. Similar to unconscious thought theory, some researchers have questioned the validity of Gottman's whole prediction enterprise. For a quick summary, see Laurie Abraham, "A Dissection of John Gottman's Love Lab," *Slate*, March 8, 2010, <https://slate.com/human-interest/2010/03/a-dissection-of-john-gottman-s-love-lab.html>. For a more detailed analysis of the statistical problems that beset accurate forecasting of marriages, see Richard E. Heyman and Amy M. Smith Slep, "The Hazards of Predicting Divorce without Cross-Validation," *Journal of Marriage and the Family* 63, no. 2 (2001): 473–479, <https://doi.org/10.1111/j.1741-3737.2001.00473.x>.

20. Nalini Ambady, "The Perils of Pondering: Intuition and Thin Slice Judgments," *Psychological Inquiry* 21, no. 4 (2010): 271–278, <https://doi.org/10.1080/1047840x.2010.524882>.

21. Ambady, "The Perils of Pondering," 276.

22. The study by Ambady (2010) discussed in the previous section does appear to offer some evidence that providing reasons leads to objectively worse decisions, given that there was a ground truth regarding the relationship status of the couples. However, the sample sizes in this experiment were rather small (and the effect size implausibly large), suggesting that until replicated, it should not warrant too much attention. More research on this issue is needed. For other intriguing suggestive results about the detrimental impact of articulating reasons for a prediction, see Jamin Brett Halberstadt and Gary M. Levine, "Effects of Reasons Analysis on the Accuracy of Predicting Basketball Games," *Journal of Applied Social Psychology* 29, no. 3 (1999): 517–530, <https://doi.org/10.1111/j.1559-1816.1999.tb01399.x>.

23. The quotation about recognition comes from Herbert A. Simon, "What Is an 'Explanation' of Behavior?" *Psychological Science* 3, no. 3 (1992): 150–161, <https://doi.org/10.1111/j.1467-9280.1992.tb00017.x>. This article, based on Simon's keynote address to the annual convention of the American Psychological Society in June 1991, is a cogent and thought-provoking piece that asks fundamental questions about what it means to explain behavior.

24. In a letter to Dr. H. L. Gordon on May 3, 1949, Albert Einstein Archives 58–217, cited in Walter Isaacson, *Einstein: His Life and Universe* (New York: Simon & Schuster, 2007).

25. For more on the theory that insight is accompanied by flashes of suspicion rather than flashes of inspiration, see Nick Chater, *The Mind Is Flat: The Remarkable Shallowness of the Improvising Brain* (New Haven: Yale University Press, 2018).

26. There have been decades of research on learning and memory under anesthesia. For a recent assessment, see Victor X. Fu, Karel J. Sleurink, Joséphine C. Janssen,

Bas P. L. Wijnhoven, Johannes Jeekel, and Markus Klimek, "Perception of Auditory Stimuli during General Anesthesia and Its Effects on Patient Outcomes: A Systematic Review and Meta-Analysis," *Canadian Journal of Anesthesia* 68 (2021): 1231–1253, <https://doi.org/10.1007/s12630-021-02015-0>.

Chapter 7

1. This question comes from the Cognitive Reflection Test, published in Shane Frederick, "Cognitive Reflection and Decision Making," *Journal of Economic Perspectives*, 19, no. 4 (2005): 25–42, <https://doi.org/10.1257/089533005775196732>. The CRT, as it has become known, is an extremely popular short test for (apparently) measuring people's degree of automatic versus deliberative (reflective) processing.

2. The quotes from the World Bank Report can be found in World Bank Group, *World Development Report 2015: Mind, Society, and Behavior* (Washington, DC: World Bank, 2015), <https://openknowledge.worldbank.org/handle/10986/20597>.

3. See Jonathan St. B. T. Evans, "Dual-Processing Accounts of Reasoning, Judgement and Social Cognition," *Annual Review of Psychology* 59 (2008): 255–278, <https://doi.org/10.1146/annurev.psych.59.103006.093629>, and Steven A. Sloman, "The Empirical Case for Two Systems of Reasoning," *Psychological Bulletin* 119 (1996): 3–22, <https://doi.org/10.1037/0033-2909.119.1.3>.

4. See Jonathan St. B. T. Evans, and Jodie Curtis-Holmes, "Rapid Responding Increases Belief Bias: Evidence for the Dual-Process Theory of Reasoning," *Thinking and Reasoning* 11, no. 4 (2005): 382–389, <https://doi.org/10.1080/13546780542000005>. The discussion of Evans's experiment in this section is based on insightful work by Rachel Stephens and her colleagues: Rachel G. Stephens, Dora Matzke, and Brett K. Hayes, "Disappearing Dissociations in Experimental Psychology: Using State-Trace Analysis to Test for Multiple Processes," *Journal of Mathematical Psychology* 90 (2019): 3–22, <https://doi.org/10.1016/j.jmp.2018.11.003>. Much of Stephens's analysis is based on state-trace analysis, an important tool for assessing assumptions about unobservable, latent mental states.

5. These trends can be quantified. If we average the endorsement rates in the two valid conditions, valid and believable (VB) and valid and unbelievable (VU), and subtract the average endorsement rates in the two invalid conditions, invalid and believable (IB) and invalid and unbelievable (IU), we obtain a validity score of 0.33 in the no-time-pressure condition. A corresponding calculation subtracting the unbelievable (VU and IU) from the believable (VB and IB) syllogism endorsement rates yields a believability score of 0.31. In the time pressure condition, the validity score is lower, 0.13, and the believability score higher, 0.55, than their equivalents in the no time pressure condition. So time pressure reduces the impact of validity on decisions but increases the impact of believability.

6. Stephens et al., "Disappearing Dissociations in Experimental Psychology."

7. John R. Stroop, "Studies of Interference in Serial Verbal Reactions," *Journal of Experimental Psychology* 18, no. 6 (1935): 643–662, <https://doi.org/10.1037/h0054651>.
8. Arthur R. Jensen and William D. Rohwer Jr., "The Stroop Color-Word Test: A Review," *Acta Psychologica* 25, no. 1 (1966): 36–93, [https://doi.org/10.1016/0001-6918\(66\)90004-7](https://doi.org/10.1016/0001-6918(66)90004-7).
9. Colin M. MacLeod, "Half a Century of Research on the Stroop Effect: An Integrative Review," *Psychological Bulletin* 109, no. 2 (1991): 163–203, <https://doi.org/10.1037/0033-2909.109.2.163>.
10. Derek Besner and Jennifer A. Stolz, "What Kind of Attention Modulates the Stroop Effect?" *Psychonomic Bulletin & Review* 6, no. 1 (1999): 99–104, <https://doi.org/10.3758/bf03210815>.
11. Derek Besner and Jennifer A. Stolz, "Unconsciously Controlled Processing: The Stroop Effect Reconsidered," *Psychonomic Bulletin & Review* 6, no. 3 (1999): 449–455, <https://doi.org/10.3758/bf03210834>. This article presents several arguments against the idea that the Stroop effect provides evidence for automatic processing. For a recent review of this topic, see Derek Besner, "Visual Word Recognition: Attention, Intention, Context, and Processing Dynamics," *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale* 76, no. 1 (2022): 57, <https://doi.org/10.1037/cep0000274>.
12. Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011), 29.
13. For further discussion of the reality of the two systems and the dangers of dichotomies, see Olivier Corneille and Mandy Hütter, "Implicit? What Do You Mean? A Comprehensive Review of the Delusive Implicitness Construct in Attitude Research," *Personality and Social Psychology Review* 24, no. 3 (2020): 212–232, <https://doi.org/10.1177/1088868320911325>; Gideon Keren and Yaacov Schul, "Two Is Not Always Better Than One: A Critical Evaluation of Two-System Theories," *Perspectives on Psychological Science* 4, no. 6 (2009): 533–50. <https://doi.org/10.1111/j.1745-6924.2009.01164.x>; David E. Melnikoff and John A. Bargh, "The Mythical Number Two," *Trends in Cognitive Sciences* 22, no. 4 (2018): 280–293, <https://doi.org/10.1016/j.tics.2018.02.001>; Magda Osman, "A Case Study: Dual-Process Theories of Higher Cognition—Commentary on Evans & Stanovich," *Perspectives on Psychological Science* 8, no. 3 (2013): 248–252.
14. See Agnes Moors and Jan De Houwer, "Automaticity: A Theoretical and Conceptual Analysis," *Psychological Bulletin* 132, no. 2 (2006): 297–326, <https://doi.org/10.1037/0033-2909.132.2.297>.
15. Nick Chater, "Is the Type 1/Type 2 Distinction Important for Behavioral Policy?" *Trends in Cognitive Sciences* 22, no. 5 (2018): 369–371, <https://doi.org/10.1016/j.tics.2018.02.007>.

Chapter 8

1. Ed Yong, "Replication Studies: Bad Copy," *Nature* 485, no. 7398 (2012): 298–300, <https://doi.org/10.1038/485298a>.
2. A detailed assessment of the controversy surrounding these priming effects is available in the following article and its associated commentaries: Jeffrey W. Sherman and Andrew M. Rivers, "There's Nothing Social about Social Priming: Derailing the 'Train Wreck,'" *Psychological Inquiry* 32, no. 1 (2021): 1–11, <https://doi.org/10.1080/1047840x.2021.1889312>.
3. Diederik Stapel's memoir was originally published in Dutch in 2012 as *Ontsporing* (Amsterdam: Prometheus, 2012). The excerpts in this chapter come from an English translation by Nick Brown entitled *Faking Science: A True Story of Scientific Fraud*, accessed January 27, 2022, <http://nick.brown.free.fr/stapel>.
4. The full report of this study was published in the prestigious journal *Science* in 2011. It was then retracted—removed from the scientific record—later that year following the revelations about Stapel's practices. The article can still be accessed, with the accompanying retraction notice, here: Diederik A. Stapel and Siegwart Lindenberg, "Coping with Chaos: How Disordered Contexts Promote Stereotyping and Discrimination," *Science* 332, no. 6026 (2011): 251–253, <https://doi.org/10.1126/science.1201068>.
5. Stapel, *Faking Science*, 119.
6. The Levelt Report was commissioned by Tilburg University (where Stapel was employed when the fraud was uncovered) and encompassed investigators from Tilburg as well as Stapel's previous places of employment, the universities of Amsterdam and Groningen. Levelt, Noort and Drenth Committees, *Flawed Science: The Fraudulent Research Practices of Social Psychologist Diederik Stapel* (University of Tilburg, 2012), https://pure.mpg.de/rest/items/item_1569964/component/file_1569966/content.
7. *The Colbert Report*, January 27, 2011, Comedy Central.
8. See Daryl J. Bem, "Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect," *Journal of Personality and Social Psychology* 100, no. 3 (2011): 407–425, <https://doi.org/10.1037/a0021524>.
9. *Ibid.*, 410.
10. CBS poll, "Poll: Most Believe in Psychic Phenomena," accessed January 27, 2022, <https://www.cbsnews.com/news/poll-most-believe-in-psychic-phenomena/>. Other surveys are cited in Sander van der Linden, "How Come Some People Believe in the Paranormal?" *Scientific American*, September 1, 2015, <https://www.scientificamerican.com/article/how-come-some-people-believe-in-the-paranormal/>.
11. Joseph Jastrow, *Fact and Fable in Psychology* (New York: Houghton Mifflin, 1901), 55.

12. Ibid, 74.
13. Eric-Jan Wagenmakers, Ruud Wetzels, Denny Borsboom, and Han L. J. van der Maas, "Why Psychologists Must Change the Way They Analyze Their Data: The Case of Psi: Comment on Bem (2011)," *Journal of Personality and Social Psychology* 100, no. 3 (2011): 426–432, <https://doi.org/10.1037/a0022790>.
14. For additional discussion of statistical reasons to question Bem's findings, see Gregory Francis, "Too Good to Be True: Publication Bias in Two Prominent Studies from Experimental Psychology," *Psychonomic Bulletin & Review* 19, no. 2 (2012): 151–156, <https://doi.org/10.3758/s13423-012-0227-9>.
15. Klaus Fiedler and Joachim I. Krueger, "Afterthoughts on Precognition: No Cogent Evidence for Anomalous Influences of Consequent Events on Preceding Cognition," *Theory and Psychology* 23, no. 3 (2013): 323–333, <https://doi.org/10.1177/0959354313485504>.
16. Fiedler and Krueger, "Afterthoughts on Precognition," 326.
17. Arthur Conan Doyle, *The Sign of Four* (London: Penguin Classics, 2001).

Chapter 9

1. Paul Lodder, How Hwee Ong, Raoul P. P. P. Grasman, and Jelte M. Wicherts, "A Comprehensive Meta-Analysis of Money Priming," *Journal of Experimental Psychology: General* 148, no. 4 (2019): 688–712, <https://doi.org/10.1037/xge0000570>.
2. This extraordinary research was published in the highly prestigious journal *Science* by Kathleen D. Vohs, Nicole L. Mead, and Miranda R. Goode, "The Psychological Consequences of Money," *Science* 314, no. 5802 (2006): 1154–1156, <https://doi.org/10.1126/science.1132491>. The study on children's selfishness is reported in Agata Gašiorowska, Lan Nguyen Chaplin, Tomasz Zalesklewicz, and Sandra Wygrab, and Kathleen D. Vohs, "Money Cues Increase Agency and Decrease Prosociality among Children: Early Signs of Market-Mode Behaviors," *Psychological Science* 27, no. 3 (2016): 331–344, <https://doi.org/10.1177/0956797615620378>.
3. Much of this research on the effects of "achievement" primes has been conducted by Gary Latham and his colleagues. See Xiao Chen, Gary P. Latham, Ronald F. Piccolo, and Guy Itzhakov, "An Enumerative Review and a Meta-Analysis of Primed Goal Effects on Organizational Behavior," *Applied Psychology* 70, no. 1 (2020): 216–253, <https://doi.org/10.1111/apps.12239>. For a critical review of this research, including a demonstration that the studies manifest funnel-plot asymmetry similar to that shown in figure 8.1, see David R. Shanks and Miguel A. Vadiillo, "Publication Bias and Low Power in Field Studies on Goal Priming," *Royal Society Open Science* 8 (2021): 210544, <https://doi.org/10.1098/rsos.210544>.

4. See Eugene M. Caruso, Kathleen D. Vohs, Brittani Baxter, and Adam Waytz, "Mere Exposure to Money Increases Endorsement of Free-Market Systems and Social Inequality," *Journal of Experimental Psychology: General* 142, no. 2 (2013): 301–306, <https://doi.org/10.1037/a0029288>.

5. John Bargh is probably the most influential proponent of the view that priming effects are both ubiquitous and (often) unconscious. For instance, see John A. Bargh, "The Historical Origins of Priming as the Preparation of Behavioral Responses: Unconscious Carryover and Contextual Influences of Real-World Importance," *Social Cognition* 32 (2014): 209–224, <https://doi.org/10.1521/soco.2014.32.suppl.209>; John A. Bargh, *Before You Know It: The Unconscious Reasons We Do What We Do* (New York: Simon & Schuster, 2017); John A. Bargh and Tanya L. Chartrand, "The Mind in the Middle: A Practical Guide to Priming and Automaticity Research," in *Handbook of Research Methods in Social and Personality Psychology*, 2nd ed., ed. Harry T. Reis and Charles M. Judd (New York: Cambridge University Press, 2014), 311–344. When money priming studies probe participants to see if they are aware of the influence of the prime on their behavior, they typically report no such awareness; for example, see Leonie Reutner, Jochim Hansen, and Rainer Greifeneder, "The Cold Heart: Reminders of Money Cause Feelings of Physical Coldness," *Social Psychological and Personality Science* 6, no. 5 (2015): 490–495, <https://doi.org/10.1177/1948550615574005>.

6. Doug Rohrer, Harold Pashler, and Christine R. Harris, "Discrepant Data and Improbable Results: An Examination of Vohs, Mead, and Goode (2006)," *Basic and Applied Social Psychology* 41, no. 4 (2019): 263–271, <https://doi.org/10.1080/01973533.2019.1624965>.

7. The data in this figure are from a meta-analysis by Miguel A. Vadillo, Tom E. Hardwicke, and David R. Shanks, "Selection Bias, Vote Counting, and Money-Priming Effects: A Comment on Rohrer, Pashler, and Harris (2015) and Vohs (2015)," *Journal of Experimental Psychology: General* 145, no. 5 (2016): 655–663, <http://dx.doi.org/10.1037/xge0000157>.

8. Lodder et al., "A Comprehensive Meta-Analysis."

9. Ibid.

10. The original report of unconscious flag priming is Travis J. Carter, Melissa J. Ferguson, and Ran R. Hassin, "A Single Exposure to the American Flag Shifts Support toward Republicanism up to 8 Months Later," *Psychological Science* 22 (2011): 1011–1018, <https://doi.org/10.1177/0956797611414726>. The later report on the contents of this group's file drawer is Travis J. Carter, Gayarthri Pandey, Niall Bolger, Ran R. Hassin, and Melissa J. Ferguson, "Has the Effect of the American Flag on Political Attitudes Declined over Time? A Case Study of the Historical Context of American Flag Priming," *Social Cognition* 38, no. 6 (2020): 489–520, <https://doi.org/10.1521/soco.2020.38.6.489>.

11. A large but unsuccessful attempt to replicate flag priming was reported by Richard A. Klein et al., "Investigating Variation in Replicability: A "Many Labs" Replication

Project," *Social Psychology* 45, no. 3 (2014): 142–152, <http://dx.doi.org/10.1027/1864-9335/a000178>. Klein's study is described in much more detail in the next chapter.

12. Joshua R. Polanin, Emily E. Tanner-Smith, and Emily A. Hennessy, "Estimating the Difference between Published and Unpublished Effect Sizes: A Meta-Review," *Review of Educational Research* 86, no. 1 (2016): 207–236, <https://doi.org/10.3102/0034654315582067>.

13. Readers interested in finding out more about these priming effects and evidence that they are at best elusive will be able to access the relevant studies from these sources. For romantic priming, see David R. Shanks et al., "Romance, Risk, and Replication: Can Consumer Choices and Risk-Taking Be Primed by Mating Motives?" *Journal of Experimental Psychology: General* 144, no. 6 (2015): E142–E58, <http://dx.doi.org/10.1037/xge0000116>. For religious priming, see Shoko Watanabe and Sean M. Laurent, "Past Its Prime? A Methodological Overview and Critique of Religious Priming Research in Social Psychology," *Journal for the Cognitive Science of Religion* 6, no. 1–2 (2021): 31–55, <https://doi.org/10.1558/jcsr.38411>. For intelligence priming, see Michael O'Donnell et al., "Registered Replication Report: Dijksterhuis and van Knippenberg (1998)," *Perspectives on Psychological Science* 13, no. 2 (2018): 268–294, <https://doi.org/10.1177/1745691618755704>. A meta-analysis of the effects of scents on consumer behavior was conducted by Holger Roschk and Masoumeh Hosseinpour, "Pleasant Ambient Scents: A Meta-Analysis of Customer Responses and Situational Contingencies," *Journal of Marketing* 84, no. 1 (2019): 125–145, <https://doi.org/10.1177/0022242919881137>. Although this analysis found an aggregate effect of scents on behavior, the authors reported no tests for publication bias and have not made their data set available for further exploration.

14. This term was introduced by Simmons and colleagues in an article that, probably more than any other, shone a spotlight on biases in the research process in psychology: Joseph Simmons, Leif D. Nelson, and Uri Simonsohn, "False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allows Presenting Anything as Significant," *Psychological Science* 22 (2011): 1359–1366, <https://doi.org/10.1177/0956797611417632>.

15. A compelling example in the domain of yet another variety of priming (power priming) is provided by Thandiwe S. E. Gilder and Erin A. Heerey, "The Role of Experimenter Belief in Social Priming," *Psychological Science* 29 (2018): 403–417, <https://doi.org/doi.org/10.1177/0956797617737128>. For further discussion, see Olivier Klein et al., "Low Hopes, High Expectations: Expectancy Effects and the Replicability of Behavioral Experiments," *Perspectives on Psychological Science* 7 (2012): 572–584, <https://doi.org/10.1177/1745691612463704>.

16. Daryl J. Bem, "Writing the Empirical Journal Article," in *The Compleat Academic: A Career Guide*, 2nd ed., ed. John M. Darley, Mark P. Zanna, and Henry L. Roediger III (Washington, DC: American Psychological Association, 2003), 185–219.

17. To be fair, researchers are now more and more commonly completing standardized checklists when they publish their research. These checklists comprise statements confirming or clarifying basic aspects of the research such as whether all outcomes have been reported, whether the hypotheses and data analyses were preregistered, and so on. These answers (or indeed just the simple statement, “For all experiments reported in this article, we report how we determined our sample size, all data exclusions, all manipulations, and all measures”) then provide some reassurance to anyone reading the article and allow a more valid assessment of the credibility of the findings. See Balazs Aczel et al., “A Consensus-Based Transparency Checklist,” *Nature Human Behavior* 4 (2020): 4–6. <https://doi.org/10.1038/s41562-019-0772-6>.

18. The problems with HARKing, and indeed the term itself, were introduced by Norbert L. Kerr, “HARKing: Hypothesizing after the Results Are Known,” *Personality and Social Psychology Review* 2, no. 3 (1998): 196–217, https://doi.org/10.1207/s15327957pspr0203_4.

19. This remarkable claim was made in a thoughtful but provocative article by John P. A. Ioannidis, “Why Most Published Research Findings Are False,” *PLOS Medicine* 2 (2005): 696–701, <https://doi.org/10.1371/journal.pmed.0020124>.

20. For discussion of the interpretation of funnel plot asymmetry, see Jonathan A. C. Sterne et al., “Recommendations for Examining and Interpreting Funnel Plot Asymmetry in Meta-Analyses of Randomised Controlled Trials,” *British Medical Journal* 343 (2011): d4002, <https://doi.org/10.1136/bmj.d4002>.

21. Annie Franco, Neil Malhotra, and Gabor Simonovits, “Underreporting in Psychology Experiments: Evidence from a Study Registry,” *Social Psychological and Personality Science* 7, no. 1 (2015): 8–12, <https://doi.org/10.1177/1948550615598377>.

22. R. Silberzahn et al., “Many Analysts, One Data Set: Making Transparent How Variations in Analytic Choices Affect Results,” *Advances in Methods and Practices in Psychological Science* 1 (2018): 337–356, <https://doi.org/10.1177/2515245917747646>.

23. A reporting checklist designed to provide this transparency for multi-analyst studies has been developed by Balazs Aczel et al., “Consensus-Based Guidance for Conducting and Reporting Multi-Analyst Studies,” *eLife* 10 (2021): e72185, <https://doi.org/10.7554/eLife.72185>.

24. Cardena’s review is in Etzel Cardena, “The Experimental Evidence for Parapsychological Phenomena: A Review,” *American Psychologist* 73, no. 5 (2018): 663–677, <https://doi.org/10.1037/amp0000236>. Another up-to-date meta-analysis of parapsychological research, which goes to considerable lengths to evaluate and correct for publication bias, is Patrizio E. Tressoldi and Lance Storm, “Stage 2 Registered Report: Anomalous Perception in a Ganzfeld Condition—A Meta-Analysis of More than 40 Years Investigation,” *F1000Research* 10 (2021): 234, <https://doi.org/10.12688/f1000research.51746.1>.

Chapter 10

1. See Brian Deer, "How the Case against the MMR Vaccine Was Fixed," *BMJ* 342 (2011): c5347, <https://doi.org/10.1136/bmj.c5347>.
2. This estimate is from Matthew C. Makel, Jonathan A. Plucker, and Boyd Hegarty, "Replications in Psychology Research: How Often Do They Really Occur?" *Perspectives on Psychological Science* 7, no. 6 (2012): 537–542, <https://doi.org/10.1177/1745691612460688>.
3. This ground-breaking project is reported in Richard A. Klein et al., "Investigating Variation in Replicability: A "Many Labs" Replication Project," *Social Psychology* 45, no. 3 (2014): 142–152, <http://dx.doi.org/10.1027/1864-9335/a000178>. Reassuringly, ten of the thirteen effects chosen by Klein and colleagues replicated strongly. Of the three that did not, two were priming effects: flag priming (discussed in chapter 9) and money priming.
4. Doug Rohrer, Harold Pashler, and Christine R. Harris. "Do Subtle Reminders of Money Change People's Political Views?" *Journal of Experimental Psychology: General* 144, no. 4 (2015): e73-e85, <https://doi.org/10.1037/xge0000058>.
5. For a comprehensive review of the history and importance of preregistration as a tool to reduce bias, see Tom E. Hardwicke and Eric-Jan Wagenmakers, "Reducing Bias, Increasing Transparency, and Calibrating Confidence with Preregistration," *Nature Human Behaviour* (2023), <https://osf.io/d7bcu/download>.
6. For instance, see John K. Sakaluk, "Exploring Small, Confirming Big: An Alternative System to the New Statistics for Advancing Cumulative and Replicable Psychological Research," *Journal of Experimental Social Psychology* 66 (2016): 47–54, <https://doi.org/10.1016/j.jesp.2015.09.013>.
7. This evidence comes from Robert M. Kaplan and Veronica L. Irvin, "Likelihood of Null Effects of Large NHLBI Clinical Trials Has Increased over Time," *PLOS ONE* 10, no. 8 (2015): e0132382, <https://doi.org/10.1371/journal.pone.0132382>.
8. See Christopher W. Jones, Lukas G. Keil, Wesley C. Holland, Melissa C. Caughey, and Timothy F. Platts-Mills, "Comparison of Registered and Published Outcomes in Randomized Controlled Trials: A Systematic Review," *BMC Medicine* 13 (2015): 282, <https://doi.org/10.1186/s12916-015-0520-3>.
9. Sylvain Mathieu, An-Wen Chan, and Philippe Ravaud, "Use of Trial Register Information during the Peer Review Process," *PLOS ONE* 8, no. 4 (2013): e59910, <https://doi.org/10.1371/journal.pone.0059910>.
10. The ease and impact of retrospective comparisons of preregistrations against published results should not be underestimated and may, for reputational reasons, encourage researchers in the future to be increasingly careful to minimize significant

discrepancies. For example, see Ben Goldacre et al., “COMParE: A Prospective Cohort Study Correcting and Monitoring 58 Misreported Trials in Real Time,” *Trials* 20 (2019): 118, <https://doi.org/10.1186/s13063-019-3173-2>.

11. A review of the history and current status of registered reports, by one of the pioneers of this format, is Christopher D. Chambers and Loukia Tzavella, “The Past, Present and Future of Registered Reports,” *Nature Human Behaviour* 6, (2022): 29–42, <https://doi.org/10.1038/s41562-021-01193-7>.

12. This project is reported in Courtney K. Soderberg et al., “Initial Evidence of Research Quality of Registered Reports Compared with the Standard Publishing Model,” *Nature Human Behaviour* 5, no. 8 (2021): 990–997, <https://doi.org/10.1038/s41562-021-01142-4>. It must be noted that in a postassessment survey, the majority of reviewers acknowledged that they were able to tell the difference between the registered reports and comparison articles, and so were not blind. However registered reports were rated stronger than comparison articles even in those cases where the reviewer did not correctly identify which was which.

13. See Christopher Allen and David M. A. Mehler, “Open Science Challenges, Benefits and Tips in Early Career and Beyond,” *PLOS Biology* 17, no. 12 (2019): e3000246, <https://doi.org/10.1371/journal.pbio.3000246>; Anne M. Scheel, Mitchell R. M. J. Schijen, and Daniël Lakens, “An Excess of Positive Results: Comparing the Standard Psychology Literature with Registered Reports,” *Advances in Methods and Practices in Psychological Science* 4, no. 2 (2021), <https://doi.org/10.1177/25152459211007467>.

14. Allen and Mehler, “Open Science Challenges”; Scheel et al., “An Excess of Positive Results.”

15. These are calculated from data compiled by Paul Lodder, How Hwee Ong, Raoul P. P. P. Grasman, and Jelte M. Wicherts, “A Comprehensive Meta-Analysis of Money Priming,” *Journal of Experimental Psychology: General* 148, no. 4 (2019): 688–712, <https://doi.org/10.1037/xge0000570>.

16. This decline effect was first reported by Tom J. Johnsen and Oddgeir Friberg, “The Effects of Cognitive Behavioral Therapy as an Anti-Depressive Treatment Is Falling: A Meta-Analysis,” *Psychological Bulletin* 141, no. 4 (2015): 747–768, <https://doi.org/10.1037/bul0000015>, although their evidence has not gone unquestioned: Ioana A. Cristea, Simona Stefan, Eirini Karyotaki, Daniel David, Seven D. Hollon, and Pim Cuijpers, “The Effects of Cognitive Behavioral Therapy Are Not Systematically Falling: A Revision of Johnsen and Friberg (2015),” *Psychological Bulletin* 143, no. 3 (2017): 326–340, <https://doi.org/10.1037/bul0000062>.

17. Tom Stafford has made a powerful argument that our experimental practices strikingly distort the apparent importance of different influences on our behavior and make the nonreporting of some influences seem more meaningful than it truly is. Imagine that priming effects are small but real. In an experiment, we administer

a prime to one group of participants but not to another. Because of randomization, our experiment controls all other influences on behavior and isolates the impact of the prime, which (with large enough samples) might be statistically significant. But this effect is at the level of the group: when we consider any given individual, the prime might be much less influential on their behavior than numerous other factors. Hence, nonreporting of this influence, which might seem to indicate unawareness, reveals nothing more than relative unimportance to the individual. The following analogy emphasizes the issue. Imagine that a large medical trial establishes that eating an extra apple a day lowers blood pressure to a statistically significant degree. But if we take an individual at random, it is obvious that compared to their salt intake, exercise, and whether they smoke, eating or not eating an apple is trivial for explaining their blood pressure. Stafford puts it as follows: “The logic of many of our behavioral experiments encourages a perspectival shift in which factors which have the major influence on each individual’s choices are rendered invisible, while an experimental factor which has a minor influence on each individual’s choice is highlighted” (p. 2). See Tom Stafford, “The Perspectival Shift: How Experiments on Unconscious Processing Don’t Justify the Claims Made for Them,” *Frontiers in Psychology* 5 (2014): 1067, <https://doi.org/10.3389/fpsyg.2014.01067>.

18. The findings in this paragraph are based on Tom E. Hardwicke et al., “Citation Patterns Following a Strongly Contradictory Replication Result: Four Case Studies from Psychology,” *Advances in Methods and Practices in Psychological Science* 4, no. 3 (2021), <https://doi.org/10.1177/25152459211040837>.

19. For the evidence and quotations regarding the experiment, see Richard A. Griggs and George I. Whitehead, “Coverage of the Stanford Prison Experiment in Introductory Social Psychology Textbooks,” *Teaching of Psychology* 41, no. 4 (2014): 318–324, <https://doi.org/10.1177/0098628314549703>.

20. See Stephen Reicher and S. Alexander Haslam, “Rethinking the Psychology of Tyranny: The BBC Prison Study,” *British Journal of Social Psychology* 45, no. 1 (2006): 1–40, <https://doi.org/10.1348/014466605X48998>.

21. Jared M. Bartels and Patricia Schoenrade, “The Implicit Association Test in Introductory Psychology Textbooks: Blind Spot for Controversy,” *Psychology Learning & Teaching* (2021), <https://doi.org/10.1177/14757257211055200>.

22. As documented by Luis Morís Fernández, Tom E. Hardwicke, and Miguel A. Vadillo, “Retracted Papers Clinging on to Life: An Observational Study of Post-Retraction Citations in Psychology,” *PsyArXiv*, April 26, 2022, <https://psyarxiv.com/cszy/>.

23. The maxim is named after the British economist Charles Goodhart. For evidence that quantity of publications has suffered this fate, see Michael Fire and Carlos Guestrin, “Over-Optimization of Academic Publishing Metrics: Observing Goodhart’s Law in Action,” *GigaScience* 8, no. 6 (2019), <https://doi.org/10.1093/gigascience/giz053>.

24. This effect size estimate is based on Fredrik Santoft, Erland Axelsson, Lars-Göran Öst, Maria Hedman-Lagerlöf, Jens Fust, and Erik Hedman-Lagerlöf, "Cognitive Behavior Therapy for Depression in Primary Care: Systematic Review and Meta-Analysis," *Psychological Medicine* 49, no. 8 (2019): 1266–1274, <https://doi.org/10.1017/S0033291718004208>.

25. R. Chris Fraley and Simine Vazire, "The N-Pact Factor: Evaluating the Quality of Empirical Journals with Respect to Sample Size and Statistical Power," *PLOS ONE* 9, no. 10 (2014): e109019, <https://doi.org/10.1371/journal.pone.0109019>.

26. Samantha F. Anderson, Ken Kelley, and Scott E. Maxwell, "Sample-Size Planning for More Accurate Statistical Power: A Method Adjusting Sample Effect Sizes for Publication Bias and Uncertainty," *Psychological Science* 28, no. 11 (2017): 1547–1562, <https://doi.org/10.1177/0956797617723724>, provide an estimated median sample size of about 48 in between-groups experiments in psychological science.

27. On average effect sizes, see T. D. Stanley, Evan C. Carter, and Hristos Doucouliagos, "What Meta-Analyses Reveal about the Replicability of Psychological Research," *Psychological Bulletin* 144, no. 12 (2018): 1325–46. <https://doi.org/10.1037/bul0000169>. On the (lack of) change in statistical power over the past half-century, see Paul E. Smaldino and Richard McElreath, "The Natural Selection of Bad Science," *Royal Society Open Science* 3 (2016): 160384, <https://doi.org/10.1098/rsos.160384>.

28. See Andreas Lundh, Joel Lexchin, Barbara Mintzes, Jeppe B. Schroll, and Lisa Bero, "Industry Sponsorship and Research Outcome," *Cochrane Database of Systematic Reviews* (2017): MR000033, <https://doi.org/10.1002/14651858.MR000033.pub3>.

29. Examples include: Ap Dijksterhuis, Maarten W. Bos, Loran F. Nordgren, and Rick B. van Baaren, "On Making the Right Choice: The Deliberation-without-Attention Effect," *Science* 311, no. 5763 (2006): 1005–1007, <https://doi.org/10.1126/science.1121629>, with unsuccessful replication by Mark R. Nieuwenstein et al., "On Making the Right Choice: A Meta-Analysis and Large-Scale Replication Attempt of the Unconscious Thought Advantage," *Judgment and Decision Making* 10, no. 1 (2015): 1–17; Lawrence E. Williams and John A. Bargh, "Experiencing Physical Warmth Promotes Interpersonal Warmth," *Science* 322, no. 5901 (2008): 606–607, <https://doi.org/10.1126/science.1162548>, with unsuccessful replication by Christopher F. Chabris, Patrick R. Heck, Jaclyn Mandart, Daniel J. Benjamin, and Daniel J. Simons, "No Evidence That Experiencing Physical Warmth Promotes Interpersonal Warmth: Two Failures to Replicate Williams and Bargh (2008)," *Social Psychology* 50, no. 2 (2019): 127–132, <https://doi.org/10.1027/1864-9335/a000361>; and Antoine Bechara, Hanna Damasio, Daniel Tranel, and Antonio R. Damasio, "Deciding Advantageously before Knowing the Advantageous Strategy," *Science* 275, no. 5304 (1997): 1293–1295, <https://doi.org/10.1126/science.275.5304.1293>, with unsuccessful replication by Tiago V. Maia and James L. McClelland, "A Reexamination of the Evidence for the Somatic Marker Hypothesis: What Participants Really Know in the Iowa Gambling Task," *Proceedings of the National Academy of Sciences* 102, no. 45 (2004): 16075–16080, <https://doi.org/10.1073/pnas.0406666101>.

30. Fraley and Vazire, “The N-Pact Factor.”

31. It must be acknowledged that everything else is rarely equal and that a poorly designed study with 10,000 participants is still a poorly designed study. Also larger sample sizes do not necessarily entail greater statistical power, which depends on the exact experimental design. For instance, within-subjects studies in many branches of cognitive psychology can get away with small sample sizes by averaging across many measurements from each experimental participant. For a thoughtful discussion, see Philip L. Smith and Daniel R. Little, “Small Is Beautiful: In Defense of the Small-N Design,” *Psychonomic Bulletin & Review* 25, 2083–2101 (2018), <https://doi.org/10.3758/s13423-018-1451-8>.

32. For coercive citation, see Allen W. Wilhite and Eric A. Fong, “Coercive Citation in Academic Publishing,” *Science* 335, no. 6068 (2012): 542–543, <https://doi.org/10.1126/science.1212540>. For journal reluctance to publish corrections or retractions, see Goldacre et al., “COMPare.”

33. Johannes Bohannon, Diana Koch, Peter Homm, and Alexander Driehaus, “Chocolate with High Cocoa Content as a Weight-Loss Accelerator,” *International Archives of Medicine* 8 (2015).

34. For instance, compelling evidence for this from the field of economics is reported by Nicholas Swanson et al., “Research Transparency Is on the Rise in Economics,” *AEA Papers and Proceedings* 110 (2020): 61–65, <https://doi.org/10.1257/pandp.20201077>.

Chapter 11

1. “World Health Organisation—COVID-19-China,” accessed April 29, 2022, <https://www.who.int/emergencies/disease-outbreak-news/item/2020-DON229>.

2. “Johns Hopkins University and Medicine Coronavirus Resource Centre,” accessed March 31, 2022, <https://coronavirus.jhu.edu/map.html>.

3. The discussion of the application of TPB to social distancing is based on data reported in Laurel P. Gibson, Renee E. Magnan, Emily B. Kramer, and Angela D. Bryan, “Theory of Planned Behavior Analysis of Social Distancing during the Covid-19 Pandemic: Focusing on the Intention–Behavior Gap,” *Annals of Behavioral Medicine* 55, no. 8 (2021): 805–812, <https://doi.org/10.1093/abm/kaab041>.

4. Liat Ayalon et al., “A Systematic Review of Existing Ageism Scales,” *Ageing Research Reviews*, 54 (2019): 100919, <https://doi.org/10.1016/j.arr.2019.100919>.

5. This example is discussed at greater length in Markus I. Eronen and Laura F. Bringmann, “The Theory Crisis in Psychology: How to Move Forward,” *Perspectives on Psychological Science* 16, no. 4 (2021): 779–788, <https://doi.org/10.1177/1745691620970586>.

6. The very large field within the behavioral sciences that is devoted to designing and validating tests is called *psychometrics*. Decades of work in psychometrics

have shown that good tests—ones that validly measure the underlying construct (such as an unconscious attitude) that they seek to measure—require a number of features. These are best described as distinct varieties of validity. A good test must predict meaningful aspects of behavior and yield scores that are similar to other tests designed to measure the same construct (convergent validity) while differing from tests that measure other constructs (discriminant validity). If the IAT provides a good measure of unconscious attitudes, then it should generate scores across a sample of individuals that, on the one hand, correlate with scores from other tests designed to measure these same unconscious attitudes, while on the other hand do not correlate with scores from tests designed to measure other constructs (conscious attitudes being the obvious case here). At the same time, IAT scores should predict some aspect of behavior such as job applicant ratings (predictive validity). Once it has been established that a test is psychometrically sound, it can be administered to a large sample of individuals, alongside other tests, and the results used to build a structural equation model or *nomological net* of the sort derived from the COVID-19 social distancing example (figure 11.1).

7. Ulrich Schimmack, “The Implicit Association Test: A Method in Search of a Construct,” *Perspectives on Psychological Science* 16 (2021): 396–414, <https://doi.org/10.1177/1745691619863798>; Edouard Machery, “Anomalies in Implicit Attitudes Research,” *WIREs Cognitive Science* 13, no. 1 (2022): e1569, <https://doi.org/10.1002/wcs.1569>.

8. The project is described in Justin F. Landy et al., “Crowdsourcing Hypothesis Tests: Making Transparent How Design Choices Shape Research Results,” *Psychological Bulletin* 146 (2020): 451–479, <https://doi.org/10.1037/bul0000220>.

9. Ulrich Schimmack, “The Validation Crisis in Psychology,” *Meta-Psychology* 5 (2021), <https://doi.org/10.15626/MP.2019.1645>.

10. Guillermo Campitelli and Paul Gerrans, “Does the Cognitive Reflection Test Measure Cognitive Reflection? A Mathematical Modeling Approach,” *Memory & Cognition* 42, no. 3 (2014): 434–447, <https://doi.org/10.3758/s13421-013-0367-9>; Caterina Primi, Kinga Morsanyi, Francesca Chiesi, Maria Anna Donati, and Jayne Hamilton, “The Development and Testing of a New Version of the Cognitive Reflection Test Applying Item Response Theory (IRT),” *Journal of Behavioral Decision Making* 29, no. 5 (2016): 453–469, <https://doi.org/10.1002/bdm.1883>.

11. The illustration of these concepts using the fictional embodiment priming theory is further developed in Klaus Oberauer and Stephan Lewandowsky, “Addressing the Theory Crisis in Psychology,” *Psychonomic Bulletin & Review* 26, no. 5 (2019): 1596–1618, <https://doi.org/10.3758/s13423-019-01645-2>. Additional discussion on the challenges of theory building can be found in Iris van Rooij and Giosuè Baggio, “Theory before the Test: How to Build High-Verisimilitude Explanatory Theories in Psychological Science,” *Perspectives on Psychological Science* 16, no. 4 (2021): 682–697, <https://doi.org/10.1177/1745691620970604>.

12. Oberauer and Lewandowsky, "Addressing the Theory Crisis." For a forceful critique of preregistration see Aba Szollosi, et al., "Is Preregistration Worthwhile?" *Trends in Cognitive Sciences* 24, no. 2 (2020): 94–95, <https://doi.org/10.1016/j.tics.2019.11.009>.
13. Ivan Grahek, Mark Schaller, and Jennifer L. Tackett, "Anatomy of a Psychological Theory: Integrating Construct-Validation and Computational-Modeling Methods to Advance Theorizing," *Perspectives on Psychological Science* 16, no. 4 (2021): 803–815, <https://doi.org/10.1177/1745691620966794>.
14. For instance, in the domain of memory and amnesia, a model with a single latent and conscious memory process has been shown to be sufficient to explain complex patterns of data: Christopher J. Berry, David R. Shanks, Maarten Speekenbrink, and Richard N. A. Henson, "Models of Recognition, Repetition Priming, and Fluency: Exploring a New Framework," *Psychological Review* 119, no. 1 (2012): 40–79, <https://doi.org/10.1037/a0025464>.
15. Eronen and Bringmann, "The Theory Crisis."
16. "1918 Pandemic (H1N1 virus)," accessed April 29, 2022, <https://www.cdc.gov/flu/pandemic-resources/1918-pandemic-h1n1.html>.
17. George A. Soper, "The Lessons of the Pandemic," *Science* 49, no. 1274 (1919): 501–506, <https://www.jstor.org/stable/1642775>.
18. Soper, "The Lessons."
19. For instance, Jay J. Van Bavel et al., "Using Social and Behavioural Science to Support COVID-19 Pandemic Response," *Nature Human Behaviour* 4 (2020): 460–471, <https://doi.org/10.1038/s41562-020-0884-z>; Robert West, Susan Michie, G. James Rubin, and Richard Amlôt, "Applying Principles of Behavior Change to Reduce SARS-CoV-2 Transmission," *Nature Human Behavior* 4 (2020): 451–459, <https://doi.org/10.1038/s41562-020-0887-9>.

© 2023 Massachusetts Institute of Technology

This work is subject to a Creative Commons CC-BY-NC-ND license.
Subject to such license, all rights are reserved.



The MIT Press would like to thank the anonymous peer reviewers who provided comments on drafts of this book. The generous work of academic experts is essential for establishing the authority and quality of our publications. We acknowledge with gratitude the contributions of these otherwise uncredited readers.

This book was set in Stone Serif and Stone Sans by Westchester Publishing Services.

Library of Congress Cataloging-in-Publication Data

Names: Newell, Benjamin R., 1972– author. | Shanks, David R.

Title: Open minded : searching for truth about the unconscious mind /
Ben R. Newell and David R. Shanks.

Description: Cambridge, Massachusetts : The MIT Press, [2023] | Includes
bibliographical references and index.

Identifiers: LCCN 2022038725 (print) | LCCN 2022038726 (ebook) |
ISBN 9780262546195 (paperback) | ISBN 9780262375368 (epub) |
ISBN 9780262375375 (pdf)

Subjects: LCSH: Subconsciousness. | Thought and thinking. | Self-consciousness
(Awareness)

Classification: LCC BF315 .N479 2023 (print) | LCC BF315 (ebook) |
DDC 154.2—dc23/eng/20230316

LC record available at <https://lcn.loc.gov/2022038725>

LC ebook record available at <https://lcn.loc.gov/2022038726>