

Clickable endnotes for
Knock On Wood:
Luck, Chance, and the Meaning of Everything
by
Jeffrey S. Rosenthal

This pdf document provides a clickable version of the endnotes for the book *Knock On Wood: Luck, Chance, and the Meaning of Everything*, by Jeffrey S. Rosenthal, published in 2018 by HarperCollins Canada.

In this document, all web links are clickable, and should (hopefully) take your web browser directly to the appropriate web page.

Of course, due to the dynamic nature of the web, some of these links might be out-of-date by the time you visit them. If you wish, then you may contact me at jeff@math.toronto.edu to suggest updates.

Also, due to last-minute edits to the book text, some of these endnotes may not quite correspond exactly to the published version.

For more information about the book itself, please see: <http://probability.ca/kow/>

For more information about book's author, see: <http://probability.ca/jeff/>

Chapter 1: Do You Believe in Luck? (p. 1)

1. Page 2, *I once did a radio interview*: on the CBC Radio program *Fresh Air*, with host Mary Ito, on March 16, 2014 (the day before St. Patrick's Day).

2. Page 3, *something which is forceful and magical*: Dictionaries don't help much, either. For example, Merriam-Webster at <https://www.merriam-webster.com/dictionary/luck> first defines luck as "a force that brings good fortune or adversity", i.e. forceful luck. But they quickly follow with a second definition, "the events or circumstances that operate for or against an individual", which sounds like dumb luck with no special force or meaning.

Chapter 2: Lucky Tales (p. 6)

1. Page 6, *Robbie Burns once put it*: in the 1785 poem *To A Mouse, On Turning Her Up In Her Nest With The Plough*, available at: <http://www.robertburns.org/works/75.shtml>

2. Page 7, *a series of accidents which supposedly occurred during various productions of Macbeth*: See e.g. the discussion at: <http://www.unexplained-mysteries.com/column.php?id=160421>
3. Page 8, *a popular daytime talk radio program*: hosted by Dini Petty, on 1050 CHUM radio in Toronto. My interview was recorded on September 13, 2005, then broadcast on October 14, 2005 and again on October 16, 2005.
4. Page 9, *they had explained all kinds of interesting craps karma rules*: One example of such a craps “school” is this class offered by *Dice Coach*: <https://www.dicecoach.com/settingclass.asp>
5. Page 12, *originally specifically fertility luck because of rabbits’ prolific breeding*: See e.g. the discussion and links at <https://omgfacts.com/the-creepy-history-of-lucky-rabbits-feet-55fc95c4dd67>
6. Page 12, *are also considered to be very lucky*: See e.g. <https://goodlucksymbols.com/four-leaf-clover/> and <http://acikmdy-journey.blogspot.ca/2016/04/the-meaning-of-four-leaf-clover.html>
7. Page 12, *a legend about a blacksmith using one to ward off the devil*: See e.g. the discussions at <http://psychiclibrary.com/beyondBooks/horseshoe-superstition/> and <http://www.indepthinfo.com/horseshoes/luck.htm> and <https://goodlucksymbols.com/good-luck-horseshoe/>
8. Page 12, *perhaps because of its association with gallows*: See e.g. the discussions at <http://psychiclibrary.com/beyondBooks/ladder-superstition/> and <https://people.howstuffworks.com/why-is-walking-under-ladder-unlucky.htm> and <http://www.timelessmyths.co.uk/walking-under-a-ladder.html>
9. Page 12, *the pagan spirits who reside in trees*: See e.g. Evan Andrews, “Why do people knock on wood for luck”, available at: <https://www.history.com/news/ask-history/why-do-people-knock-on-wood-for-luck>
10. Page 12, *marking a place for good spirits to concentrate*: See e.g. Hannah Keyser, “Why Do We Cross Our Fingers For Good Luck?” *Mental Floss*, March 21, 2014, <http://mentalfloss.com/article/55702/why-do-we-cross-our-fingers-good-luck>
11. Page 12, *perhaps because Judas supposedly spilled some at the Last Supper*: See e.g. the article “Why do people throw salt over their shoulders?” by D. Ronca, published at <https://people.howstuffworks.com/why-do-people-throw-salt-over-shoulders.htm> The spilled salt at the Last Supper was apparently invented by Leonardo da Vinci in his famous portrait, leading to this widespread superstition even though da Vinci himself was not superstitious; see e.g. pages 234–235 of the 2012 book *Leonardo and the Last Supper* by R. King (Bloomsbury, London).
12. Page 13, *birds have long been held to have special divining powers*: The belief that birds have special divining powers, which can be tapped by stroking the furcula (wishbone), dates back to Etruscans in around 700 B.C. See e.g. <https://people.howstuffworks.com/wishbones-lucky.htm> and <https://www.aaepa.com/2010/11/wishbone-traditionthe-lucky-break/>
13. Page 13, *Jade jewelry is believed to bring wealth and friends*: e.g. according to <https://www.thespruce.com/jade-meaning-ancient-strength-and-serenity-1274373> jade is “a good

luck feng shui stone”, which is “employed for various purposes – from creating wealth to attracting more friends”.

14. Page 13, *bad luck in the U.S. – but, interestingly, good luck in the U.K. and Japan*: see the various discussions at <https://icatcare.org/black-cat-week-unlucky-or-lucky> and <http://fullcirclenews.blogspot.ca/2007/08/black-cats.html> and <https://www.thesun.co.uk/fabulous/4676046/black-cat-crossing-path-good-luck-bad-luck-superstition-explained/>

15. Page 13, *the Serenity Prayer*: attributed to Reinhold Niebuhr in 1932; see e.g. the discussion in the article “Who Wrote the Serenity Prayer?” by F.R. Shapiro, published in *The Chronicle of Higher Education* on April 28, 2014, available at: <http://www.chronicle.com/article/Who-Wrote-the-Serenity-Prayer-/146159/>

Chapter 3: The Power of Luck (p. 14)

1. Page 14, *a beach in Hawaii*: Waikiki Beach, just south-east of Honolulu.

2. Page 15, *cleared up the confusion*: See e.g. the articles at http://archive.boston.com/news/local/massachusetts/articles/2011/04/28/twist_of_fate_brings_half_brothers_together_in_hawaii/ and <http://www.dailymail.co.uk/news/article-1382303/Do-mind-taking-picture--Long-lost-brothers-reunited-photo-op-Hawaii.html> and <http://www.wutang-corp.com/forum/showthread.php?t=108639> and <https://www.guideposts.org/blog/inexplicable-coincidence-on-a-hawaiian-beach>

3. Page 16, *Flaig casually mentioned this situation to his boss*: for further details see e.g. the article “Man’s journey to find birth mom ends at work” by P. Shellenbarger, published on December 19, 2007 in the *Seattle Times*. Available at: <https://www.seattletimes.com/nation-world/mans-journey-to-find-birth-mom-ends-8212-at-work/> See also the follow-up story at: http://www.mlive.com/news/grand-rapids/index.ssf/2009/05/reunion_of_man_birth_mother_wh.html

4. Page 17, *hundreds of gold and silver coins and jewellery and spoons*: See e.g. the details and photos in the article “Looking for a hammer: The largest hoard of Roman silver & gold found with a metal detector” by M. Georgievska, published on November 19, 2016 in *The Vintage News*, available at: <https://www.thevintagenews.com/2016/11/19/looking-for-a-hammer-the-largest-ward-of-roman-silver-gold-found-with-a-metal-detector/> And Lawes’ obituary by T. Gee, published on July 23, 2015 in *The Guardian*, available at: <https://www.theguardian.com/uk-news/2015/jul/23/eric-lawes>

5. Page 17, *flew over the Japanese city of Kokura*: See e.g. the detailed account by the Atomic Heritage Foundation at: <http://www.atomicheritage.org/history/hiroshima-and-nagasaki-bombing-timeline>

6. Page 19, *water crashed violently onto beaches around the world*: See e.g. the video at: <https://www.youtube.com/watch?v=rRpAzsehLGA>

7. Page 21, *his three-year-old son was diagnosed with cancer*: See e.g. the article “Michael Buble putting career on hold, three-year-old son Noah has cancer” by A. Woo and J. O’Kane, published on November 4, 2016 in the *Globe and Mail*, available at: <http://www.theglobeandmail.com/news/national/michael-buble-putting-career-on-hold-three-year-old-son-noah-has-cancer/>

article32674453/

8. Page 21, *the son now appears to be recovering*: e.g. the December 20, 2017 Us Weekly article “Michael Buble Is ‘Ready to Think About’ Working Again After Sons Cancer Battle” available at <https://www.usmagazine.com/celebrity-news/news/michael-buble-ready-to-work-again-after-sons-cancer-battle/> reports that the son is “doing well” with a “positive prognosis”.

9. Page 21, *is reported to have said*: quoted in the movie’s promotional information; see e.g. https://www.rottentomatoes.com/m/the_good_the_bad_and_the_ugly/

10. Page 21, *he won a million dollars in the New York “Merry Millionaire” lottery*: See e.g. the story “Lottery winner dies weeks after cashing in \$1 million scratch-off ticket” available at: <http://abc7chicago.com/3008129>

11. Page 22, *the 1942–43 winter turned out to be extra cold*: See e.g. page 145 of the book *Breaking Away from the Textbook: The enlightenment through the 20th century* by R.H. Pahl, which describes the 1942–43 “bitterly cold winter”, and writes that Hitler’s “attack was carefully planned – his troops went to war with plenty of airplanes, tanks, and troops, but Hitler did not add one thing into his plans: the Russian winter.” Similarly, *A Dictionary of Contemporary World History, 4th ed* by C. Riches and J. Palmowski, published in 2016 by Oxford University Press, describes the German army as “weakened by bitter cold and frost” prior to their January 1943 surrender.

12. Page 22, *a lovely commencement speech at his son’s graduation*: J. Roberts, commencement speech at the Grade 9 graduation ceremony at New Hampshire’s Cardigan Mountain grades 6–9 boys boarding school, on June 3, 2017. Originally publicised in the article “The best thing Chief Justice Roberts wrote this term wasn’t a Supreme Court opinion” by R. Barnes, published on July 2, 2017 in the *Washington Post*. Available at: https://www.washingtonpost.com/politics/courts_law/the-best-thing-chief-justice-roberts-wrote-this-term-wasnt-a-supreme-court-opinion/2017/07/02/b80a5afa-5e6e-11e7-9fc6-c7ef4bc58d13_story.html Later described and quoted in full in the article “‘I Wish You Bad Luck.’ Read Supreme Court Justice John Roberts’ Unconventional Speech to His Son’s Graduating Class” by K. Reilly, published on July 5, 2017 in *Time* magazine, available at: <http://time.com/4845150/chief-justice-john-roberts-commencement-speech-transcript/>

13. Page 23, *he imagined a scenario*: see <http://www.businessinsider.com/warren-buffett-on-the-ovarian-lottery-2013-12/>

Chapter 4: The Day I Was Born (p. 24)

1. Page 25, *refused to fly on the 13th of a month*: See e.g. <http://www.cbc.ca/news/canada/new-brunswick/friday-the-13th-1.3932644>

2. Page 25, *the entire Earth supposedly went dark*: See e.g. the article “Friday the 13th Superstitions Rooted in Bible and More” by J. Roach, published on May 14, 2011 in *National Geographic*, available at <https://news.nationalgeographic.com/news/2011/05/110513-friday-the-13th-superstitions-triskaidekaphobia/> Or the colorful recounting posted at <http://www.neatorama.com/2015/02/13/The-13th-Guest/>

3. Page 25, *It has also been argued*: See e.g. the article “Friday the 13th: why is it un-

lucky?” by D. Burnett, published on Friday, February 13, 2015 in the *Guardian* newspaper, available at: <https://www.theguardian.com/science/brain-flapping/2015/feb/13/friday-13th-unlucky-why-science-psychology> And also the related discussion at: <http://www.iflscience.com/editors-blog/friday-13th-really-unlucky-day/>

4. Page 25, *a novel called Friday the Thirteenth*: available for free at: <https://www.gutenberg.org/files/12345/12345-h/12345-h.htm>

5. Page 25, *a ship financed by and named after Lawson*: See e.g. the historical discussions at: <http://thomascranelibrary.org/shipbuildingheritage/history/historyindex.html> and <http://www.fleetsheet.com/lawson.htm> and <http://www.schoonerfreedom.com/my-favorite-schooner/>

6. Page 25, *he numbered his thirteenth manuscript pages “12a” instead*: see the article “A Reading to Recall the Father of Tevye” by C. Haberman, published in the *New York Times* on May 17, 2010. Available at: <http://www.nytimes.com/2010/05/18/nyregion/18nyc.html>

7. Page 26, *her birth registration was delayed by a few days*: See the article “Ma’am darling: the princess driven by loyalty and duty” by F. Rocco, published on February 25, 1998 in *The Independent*, available at: <https://www.independent.co.uk/news/maam-darling-the-princess-driven-by-loyalty-and-duty-1146783.html>

8. Page 26, *A motorcycle event on Lake Erie*: in Port Dover, Ontario; see <http://www.pd13.com/pages/1354815191/Origins> and https://en.wikipedia.org/wiki/Friday_the_13th_motorcycle_rally

9. Page 27, *she considered this to be so lucky*: see <http://www.biography.com/news/celebrity-superstitions>

10. Page 27, *happily reported on their members’ subsequent good health and fortune*: See “Friggatriskaidekaphobes Need Not Apply” by J. Ditta, published on January 13, 2012 in the New York Historical Society, available at: <http://blog.nyhistory.org/friggatriskaidekaphobes-need-not-apply/> And “Morituri te Salutamus” by S. Stein, published on March 13, 2015 in the Paris Review, available at: <https://www.theparisreview.org/blog/2015/03/13/morituri-te-salutamus/>

11. Page 27, *One self-proclaimed numerologist solemnly declared*: see <http://www.numerology.com/numerology-news/friday-the-13th-numerology>

12. Page 29, *One study published in the British Medical Journal in 1993*: “Is Friday the 13th bad for your health?”, by T.J. Scanlon, R.N. Luben, F.L. Scanlon, and N. Singleton, published in the *British Medical Journal* **307**, December 18–25, 1993, 1584–1586. Available at: <http://www.bmj.com/content/307/6919/1584> According to their Table I, the total traffic on the southern section of the M25 motorway was 1,283,853 over five Friday the 6th, and 1,265,495 over five Friday the 13th, for a ratio of $1,265,495 / 1,283,853 = 0.9857 \doteq 0.986 = 1 - 0.014$, corresponding to a 1.4% decrease, which is statistically significant because of the large total numbers involved. And, according to their Table V, the total South West Thames region hospital admissions due to transport accidents was 45 over six Friday the 6th, and 65 over six Friday the 13th, for a ratio of $65/45 = 1.4444 \doteq 1.44$, corresponding to a 44% increase. They claim this last result is statistically significant (“ $p < 0.05$ ”), but using “`poisson.test(c(45,65))`” in the free statistical software package

R (<https://cran.r-project.org/>), I actually compute a p-value of $0.06957 > 0.05$ indicating it is actually not quite statistically significant.

13. Page 29, *one of the study's authors later stated*: see the January 2012 article by R. Melina at: <https://www.livescience.com/17900-statistically-speaking-friday-13th-unlucky.html>

14. Page 30, *a Christmas tradition of encouraging*: see <http://www.bmj.com/about-bmj/resources-authors/article-types/christmas-issue> and <http://www.bmj.com/content/355/bmj.i6679>

15. Page 30, *One in 2002*: “Traffic Deaths and Superstition on Friday the 13th”, by S. Näyhä, published in December 2002 in the *American Journal of Psychiatry* **159:12**, 2110–2111. Available at: <http://ajp.psychiatryonline.org/doi/abs/10.1176/appi.ajp.159.12.2110>

16. Page 30, *a follow-up study considered all Finnish road accidents*: “Females do not have more injury road accidents on Friday the 13th”, by I. Radun and H. Summala, published in 2004 in the journal *BMC Public Health* **4:54**, available at: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/1471-2458-4-54>

17. Page 30, *the Dutch Centre for Insurance Statistics reported*: see the article at: <http://www.reuters.com/article/us-luck-odd-idUSHER25778420080612>

18. Page 31, *at least one commentator noted*: see the comment by Datacharmer quoted at: http://andrewgelman.com/2008/08/22/friday_the_13th_1/

19. Page 31, *some Swiss doctors analysed hospital emergency room admissions*: “Friday the 13th and Full-Moon: The ‘Worst Case Scenario’ or only Superstition?”, by A.K. Exadaktylos et al., published in the *American Journal of Emergency Medicine* **19(4)**, April 2001, 319–320.

20. Page 31, *the Telegraph newspaper published a 2005 article*: by M. Wright, published in the *Telegraph* on November 19, 2005. Available at: <http://www.telegraph.co.uk/finance/personalfinance/2926352/Coincidence-13-really-is-the-unlucky-number.html>

21. Page 31, *For the National Lottery between November 1994 and October 2015*: see the official National Lottery Lotto Number Frequency Table available at: <https://www.lottery.co.uk/lotto/statistics>

22. Page 31, *the overall average of 19.2*: Based on the draw period “Oct 2015 to Present” as retrieved on August 2, 2017 from <https://www.lottery.co.uk/lotto/statistics>. The overall average is found by taking the total number of draws included (189), multiplying by the number of balls drawn each time (6), and dividing by the number of available numbers (59), to obtain $189 * 6 / 59 = 19.22034 \doteq 19.2$.

23. Page 31, *11 times, slightly less than the overall average of 13.84*: See e.g. the Powerball Frequency Chart at: <https://www.ctlottery.org/Modules/FCharts/default.aspx?id=5>

24. Page 31, *402 times, a bit less than the overall average of 428.3*: Based on data from the Lotto 6/49 Statistics available at http://www.lotto649stats.com/overall_frequency.html, “1982 to Present Without Bonus”, retrieved on August 2, 2017.

25. Page 32, *are not statistically significant*: For Powerball, using “`poisson.test(11,13.84)`” in R gives a p-value of 0.5887. For Lotto 6/49, using “`poisson.test(402,428.3)`” gives a p-value of 0.209.

So, both p-values are well above 0.05, indicating no statistical significance.

Chapter 5: Our Love of Magic (p. 33)

1. Page 34, *one book lists over five hundred*: see *The Encyclopedia of Superstitions*, by R. Webster, Llewellyn Publications, 2008.
2. Page 35, *once said*: see: <https://www.youtube.com/watch?v=cFuqt1TmN1A&t=15m19s>
3. Page 36, *in its first four months, the movie grossed US\$677,718,395*: according to the *Box Office Mojo* estimate for Total Worldwide Gross for Doctor Strange from November 4, 2016 to March 16, 2017, available at: <http://www.boxofficemojo.com/movies/?id=marvel716.htm>
4. Page 39, *a professional magician friend*: Owen Anderson, <http://www.owenanderson.ca/> (“Fun-filled magic shows for kids and families across southern Ontario”)
5. Page 39, *an article by a New York-based travel writer*: “In Pursuit of Ghosts”, by A. Cheung, published in October 2016 on pages 22–31 of Issue 54 of the *re:Porter* magazine of Porter Airlines. Available at: <https://static.flyporter.com/Content/reporter/54.pdf>
6. Page 39, *a controversial U.S. judge nominee had spent much time investigating*: Brett J. Talley, nominated in November 2017 by President Donald Trump to the Federal District Court in Montgomery, Alabama. Talley was apparently part of The Tuscaloosa Paranormal Research Group from 2009-2010, and also wrote books about paranormal activities. See e.g. the article “Before He Was Tapped By Donald Trump, Controversial Judicial Nominee Brett J. Talley Investigated Paranormal Activity” by G. Resnick and S. Stein, published on November 13, 2017 in *The Daily Beast*, available at: <https://www.thedailybeast.com/before-he-was-nominated-for-federal-court-donald-trumps-controversial-judicial-nominee-brett-j-talley-hunted-ghosts>
7. Page 40, *Such popular games as*: See e.g. the list of most popular board games at <https://www.therichest.com/rich-list/most-popular/the-top-10-most-sold-board-games-ever/>
8. Page 41, *recently-acquired Yankees player*: Aaron Boone was traded from the Cincinnati Reds to the Boston Red Sox on July 31, 2003, and hit his eleventh-inning home run against the Yankees on October 16, 2003.
9. Page 42, *It was immediately declared*: See e.g. the article at: <http://www.cnn.com/2016/11/02/sport/world-series-game-7-chicago-cubs-cleveland-indians/>
10. Page 42, *A recent web posting*: <http://www.humansofnewyork.com/post/151386313471/id-been-harboring-a-crush-on-him-since-5th>
11. Page 42, *a scene from the movie*: available at: <https://www.youtube.com/watch?v=rrvKt7GNSco>
12. Page 47, *an Australian movie*: “My Year Without Sex”, by Sarah Watt: <http://www.imdb.com/title/tt1245358/> *accidentally drops one*: See e.g. the brief mention in the review at: <http://www.stuff.co.nz/entertainment/film/film-reviews/3015317/Film-review-My-Year-Without-Sex>
13. Page 47, *Anton Chekhov’s famous dictum*: See e.g. the discussion at: <https://www.>

Chapter 6: Sharpshooter Luck Traps (p. 48)

Chapter 7: Luck Revisited (p. 55)

1. Page 58, *a diamond ring was found wrapped around a carrot*: see <https://www.theguardian.com/world/2017/aug/16/canadian-woman-engagement-ring-carrot>

2. Page 63, *the probability was about one chance in a thousand*: Indeed, the probability of choosing four numbers correctly out of six numbers from 1 to 49 is $\binom{6}{4} \times \binom{43}{2} / \binom{49}{6} \doteq 0.0009686197$, or just under one chance in a thousand.

3. Page 65, *about 250 car models*: See e.g. <https://www.statista.com/statistics/200092/total-number-of-car-models-on-the-us-market-since-1990/>

Chapter 8: Lucky News (p. 67)

1. Page 67, *a 2008 study in a prestigious biology journal*: “You are what your mother eats: evidence for maternal preconception diet influencing foetal sex in humans”, by F. Mathews, P.J. Johnson, and A. Neil, published in 2008 in the *Proceedings of the Royal Society B: Biological Sciences* **275(1643)**, 1661–1668. Available at: <http://rspb.royalsocietypublishing.org/content/275/1643/1661>

2. Page 67, *picked up by news media around the world*: See e.g. http://www.exeter.ac.uk/news/archive/2008/april/title_626_en.html, and many other articles.

3. Page 68, *everything from pain reduction through acupuncture*: See e.g. the article “Acupuncture for Migraine Prevention: Still Reaching for Convincing Evidence”, by A.A. Gelfand, published in 2017 in the *Journal of the American Medical Association: Internal Medicine* **177(4)**, 516–517; available at: <https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2603487>

4. Page 68, *one study found that runners*: see the article “Induced beliefs about a fictive energy drink influences 200-m sprint performance” by R. de la Vega et al., published in September 2017 in the *European Journal of Sport Science* **17(8)**, 1084–1089, available at: <https://www.ncbi.nlm.nih.gov/pubmed/28651483>

5. Page 68, *Others quickly pointed out*: See e.g. “Cereal-induced gender selection? Most likely a multiple testing false positive”, by S.S. Young, H. Bang, and K. Oktay, published as a comment in 2009 in the same journal (*Proceedings of the Royal Society B: Biological Sciences* **276**, 1211–1212). Available at: <http://rspb.royalsocietypublishing.org/content/276/1660/1211> and <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2660953/> ; see also the ScienceDaily discussion at: <https://www.sciencedaily.com/releases/2009/01/090114075759.htm>

6. Page 69, *an amazing story was in the news*: See e.g. the NBC News story “Teen saves life of woman who saved him” of February 5, 2006, available at: http://www.nbcnews.com/id/11190559/ns/us_news-weird_news/t/teen-saves-life-woman-who-saved-him/

7. Page 70, *used to implore car drivers to drive safely*: See e.g. the image of an old Connecticut billboard with this slogan available at: http://library.duke.edu/digitalcollections/oaaaarchives_BBB2576/

8. Page 70, *an unusual 1955 short story by Flannery O'Connor*: available at: <http://faculty.smu.edu/nschwartz/2312/lifeyousave.htm>

9. Page 70, *a television production starring Gene Kelly*: An episode of the Schlitz Playhouse of Stars anthology series, entitled simply “The Life You Save”; see: <http://www.imdb.com/title/tt0394872/>

10. Page 70, *interviewed about this story on the television program William Shatner’s Weird or What*: see the excerpt at: <https://www.youtube.com/watch?v=yQVYQETOYh0>

11. Page 70, *I calculated this probability to be*: Using data from the American Heart Association at http://www.heart.org/HEARTORG/CPRAndECC/whatisCPR/CPRFactsandStats/CPR-Statistics_UCM_307542_Article.jsp, each year in the United States there are about 350,000 out-of-hospital cardiac arrests, of which about 46% get immediate help, of which about 25% survive. So, the number of “cardiac arrest saved by CPR” incidents each year (not even counting other ways CPR can save lives, such as the Heimlich maneuver) is about $350,000 \times 0.46 \times 0.25 \doteq 40,000$. Also, nearly one hundred million Americans (about 30%) know CPR, so the chance that one specific American who knows CPR will save a life this year is about $40,000 / 100,000,000$ or one in 2500. Let us imagine that Americans are divided into 6,000 local “communities” (either small towns, or distinct social groups within larger cities) of about 50,000 people each. Then if A and B are in the same community and both know CPR, then the chance that A will save B’s life this year is about one chance in $2500 \times 50000 = 1.25 \times 10^8$. So, the chance they will save each other’s life this year is about one in $(1.25 \times 10^8)^2 \doteq 1.5 \times 10^{16}$. If we choose two Americans who know CPR completely at random, then they have one chance in 6,000 of being in the same community, so their overall chance of saving each other’s lives this year is about one in $1.5 \times 10^{16} \times 6,000 = 9 \times 10^{19}$, or one chance in ninety billion billion.

12. Page 71, *actually approximately one chance in three*: Continuing the previous calculation, and assuming I will live a total of 80 years, if A and B each live in the same community and each know CPR, then the probability that A saves B’s life at *some* point during my lifetime is about $80 / (1.25 \times 10^8) \doteq 1 / (1.5 \times 10^6)$, or about one chance in 1.5 million. So, the chance they will *each* save each other’s life during my lifetime is about one chance in $(1.5 \times 10^6)^2 = 2.25 \times 10^{12}$. Furthermore, each community has about $50,000 \times 30\% = 15,000$ people who know CPR, so the number of such pairs A and B in each community is about $\binom{15,000}{2} \doteq (15,000)^2 / 2 = 112,500,000$. Since there are about 6,000 communities, we conclude that the probability of the existence of *some* such pair who save each other’s lives during my lifetime is about $6,000 \times 112,500,000 / (2.25 \times 10^{12})$ which equals 0.3, or about 1/3.

13. Page 71, *it is recorded by the Guinness World Records*: see <http://www.guinnessworldrecords.com/world-records/most-lightning-strikes-survived>

14. Page 71, *they were not gentle*: see also the explicit descriptions of his early encounters in the article “Lightning Strikes 4 Times” by H. Burchard, published on May 2, 1972 in *The Lakeland Ledger*, available at: <https://news.google.com/newspapers?nid=1347&dat=19720502&id=OScVAAAAIBAJ&sjid=af0DAAAAIBAJ&pg=7465,354926>

15. Page 71, *which ranks 27th out of 50 states*: according to the National Lightning Safety Institute, based on data compiled by R.L. Holle; see the second table at: http://lightningsafety.com/nlsi_lls/fatalities_us.html
16. Page 72, *In recent years, numerous celebrities including*: See e.g. the video excerpts posted at <https://www.youtube.com/watch?v=xfSLm7swfp4> and <https://www.youtube.com/watch?v=-Zm3-exDWIg> and <https://www.youtube.com/watch?v=zrE7dq1b9fc>
17. Page 74, *she gave an excellent, passionate speech*: See the transcript and video at e.g. <https://www.nytimes.com/2018/01/07/movies/oprah-winfrey-golden-globes-speech-transcript.html> or <https://www.youtube.com/watch?v=LyBims80kSY>
18. Page 75, *occurred on the Oprah Winfrey Show*: See the interview online at <https://www.youtube.com/watch?v=7uf-5yuRiPs> And the article “Why health advice on ‘Oprah’ could make you sick” by W. Kosova, published on May 29, 2009 in *Newsweek*, available at: <http://www.newsweek.com/why-health-advice-oprah-could-make-you-sick-80201> And the article “Kim Tinkham, the woman whom Oprah made famous, dead at 53” by B.B. van Bockstaele, published on December 8, 2010 in the *Digital Journal*, available at: <http://www.digitaljournal.com/article/301197> And the blog posts “Alternative Medicine: Double Corruption” at <https://anaximperator.wordpress.com/2011/02/23/alternative-medicine-double-corruption/> and “Quack Victim Kim Tinkham Dies of Breast Cancer” at <https://anaximperator.wordpress.com/2010/12/08/orac-of-respectful-insolence-just-announced-that-kim-tinkham-has-died-of-breast-cancer/>
19. Page 76, *a recent computer science paper*: “Deep neural networks are more accurate than humans at detecting sexual orientation from facial images” by M. Kosinski and Y. Wang. Posted on February 15, 2017 at: <https://osf.io/zn79k/>
20. Page 76, *It was quickly pointed out*: see the article “Advances in AI are used to spot signs of sexuality” published in *The Economist* on September 9, 2017, available at: <https://www.economist.com/news/science-and-technology/21728614-machines-read-faces-are-coming-advances-ai-are-used-spot-signs> And the BBC article “Row over AI that ‘identifies gay faces’” posted on September 11, 2017 at: <http://www.bbc.com/news/technology-41188560> And the follow-up study “Do algorithms reveal sexual orientation or just expose our stereotypes?” by B. Aguera y Arcas, A. Todorov, and M. Mitchell, available at: <https://medium.com/@blaisea/do-algorithms-reveal-sexual-orientation-or-just-expose-our-stereotypes-d998fafdf477>
21. Page 76, *one independent expert*: Professor Benedict Jones of the University of Glasgow, in the BBC article cited above.
22. Page 77, *Some psychologists recently published a study*: “Women Are More Likely to Wear Red or Pink at Peak Fertility”, by A.T. Beall and J.L. Tracy, published in 2013 in the journal *Psychological Science* **24(9)**, 1837–1841. Available at: http://ubc-emotionlab.ca/wp-content/files_mf/bealandtracypsonlinefirst.pdf
23. Page 77, *widely reported in the media*: See e.g. the article “Fertile Women More Likely to Wear Red” by R. Rettner, published on May 28, 2013 in *LiveScience*, available at: <https://www.livescience.com/34737-fertile-peak-women-wear-red.html> And the posting for *Discover Magazine* available at: <http://blogs.discovermagazine.com/seriouslyscience/2013/07/22/women-are-more-likely-to-wear-red-or-pink-at-peak-fertility/#.WaltiN8QTmE> And the

blog posting by J. Lehmiller at: <http://www.lehmiller.com/blog/2013/7/31/women-reach-for-red-and-pink-clothes-during-ovulation>

24. Page 77, *A statistician attacked their study*: “Too Good to Be True”, by A. Gelman, published in 2013 in *Slate Magazine* at: http://www.slate.com/articles/health_and_science/science/2013/07/statistics_and_psychology_multiple_comparisons_give_spurious_results.html

25. Page 78, *the psychologists’ response*: “Too Good Does Not Always Mean Not True”, posted online at: <http://ubc-emotionlab.ca/2013/07/too-good-does-not-always-mean-not-true/>

26. Page 78, *One recent article in Cosmopolitan*: “So THIS is why women’s periods tend to sync up” by C. Harvey-Jenner, published in *Cosmopolitan* on July 25, 2016, available at: <http://www.cosmopolitan.com/uk/body/health/news/a44886/why-womens-periods-sync-up/>

27. Page 79, *A 1971 psychology study*: “Menstrual Synchrony and Suppression”, by M.K. McLintock, published in 1971 in the journal *Nature* **229**, 244–245.

28. Page 79, *Some later papers criticised*: See e.g. “A critical review of menstrual synchrony research” by H.C. Wilson, published in 1992 in the journal *Psychoneuroendocrinology* **17(6)**, 565–591.

29. Page 79, *other studies tried and failed to replicate the results*: See e.g. “Two studies of menstrual synchrony: negative results”, by H.C. Wilson, S.H. Kiefhaber, and V. Gravel, published in 1991 in the journal *Psychoneuroendocrinology* **16(4)**, 353–359. And “Menstrual synchrony pheromones: cause for doubt”, by B.I. Strassmann, published in 1999 in the journal *Human Reproduction* **14(3)**, 579–580, available at: <https://academic.oup.com/humrep/article/14/3/579/632869/Menstrual-synchrony-pheromones-cause-for-doubt> And “Women Do Not Synchronize Their Menstrual Cycles” by Z. Yang and J.C. Schank, published in 2006 in the journal *Human Nature* **17(4)**, 433–447.

30. Page 79, *a detailed study of menstrual patterns of the Dogon people in Mali*: “The Biology of Menstruation in Homo Sapiens: Total Lifetime Menses, Fecundity, and Nonsynchrony in a Natural-Fertility Population” by B.I. Strassmann, published in February 1997 in the journal *Current Anthropology* **38(1)**, 123–129, which concluded that “the null hypothesis that the women’s menstrual onsets were independent cannot be rejected”.

31. Page 80, *it is now generally believed by scientists*: See e.g. the magazine article “Do Women Who Live Together Menstruate Together?” by A. Gosline in *Scientific American* on December 7, 2007, available at: <https://www.scientificamerican.com/article/do-women-who-live-together-menstruate-together/> And the newspaper article “Do womens periods really synchronise when they live together?” by L. Dillner in *The Guardian* on August 15, 2016, available at: <https://www.theguardian.com/lifeandstyle/2016/aug/15/periods-housemates-menstruation-synchronise> And the BBC report “Is it true that periods synchronise when women live together?” of September 7, 2016, available at: <http://www.bbc.com/news/magazine-37256161>

32. Page 80, *studies indicate that between 70% and 95% of women*: see “Menstrual synchrony: Awareness and subjective experiences” by M.A. Arden, L. Dye, and A. Walker, published in 2007 in the *Journal of Reproductive and Infant Psychology* **17(3)**, available at: <http://www.tandfonline.com/doi/abs/10.1080/02646839908404593> And “Demystifying Menstrual Synchrony: Women’s

Subjective Beliefs About Bleeding in Tandem With Other Women” by B. Fahs, published in 2016 in the journal *Women’s Reproductive Health* **3(1)**, 1–15.

33. Page 80, *most menstrual periods last for approximately 5 days*: e.g. at <https://my.clevelandclinic.org/health/articles/10132-normal-menstruation> the Cleveland Clinic writes that “Most women bleed for 3 to 5 days, but a period lasting only 2 days to as many as 7 days is still considered normal.”

34. Page 81, *Oxford anthropology professor Alexandra Alvergne*: Alexandra Alvergne, associate professor in biocultural anthropology at the University of Oxford, as quoted in the BBC article “Is it true that periods synchronise when women live together?” by C. McDonald, available at: <http://www.bbc.com/news/magazine-37256161>

Chapter 9: Supremely Similar (p. 82)

1. Page 82, *a nice news story about a woman named Bernice Clarke*: <http://www.cbc.ca/news/canada/north/nunavut-woman-finds-biological-father-1.3709705>

2. Page 84, *an interesting newspaper article*: “Two friends in Calgary discover they are really long-lost brothers” by M. Lederman, published on July 26, 2013 in the *Globe and Mail* newspaper; available at: <https://beta.theglobeandmail.com/news/national/at-50-and-46-friends-discover-they-are-really-long-lost-brothers/article13469118/>

3. Page 84, *millions of adopted children have successfully contacted their birth parents*: According to <https://www.childtrends.org/indicators/adopted-children/> about two percent of U.S. children are adopted, and according to <https://www.parents.com/parenting/adoption/parenting/level-of-involvement-for-birth-parents/> 36% of adoptees have some contact with their birth families, corresponding to approximately $323,000,000 \times 0.02 \times 0.36$ or about 2.3 million adoptees. Indeed, the article “Releasing pre-adoption birth records: a survey of Oregon adoptees” by J.C. Rhodes et al., published in 2002 in the journal *Public Health Reports* **117(5)**, 463–471, notes that in a single month in the year 2000 in the state of Oregon alone, 2,529 adoptees requested birth records, of which about 15% (33 of 221 in their sample) or 379 of them then successfully found their birth mother.

4. Page 87, *the legend has grown*: See many discussions such as https://en.wikipedia.org/wiki/Lincoln-Kennedy_coincidences_urban_legend and <http://www.snopes.com/history/american/lincoln-kennedy.asp> and http://www.csicop.org/si/show/coincidences_remarkable_or_random and <http://www.school-for-champions.com/history/lincolnjfk.htm#.V6o7Z9GHelM> and https://www.buzzfeed.com/briangalindo/10-weird-coincidences-between-abraham-lincoln-and-john-f-ken?utm_term=.el083PJo2V#.1b71x2zpqZ

5. Page 89, *Loads of surnames consist of seven letters*: See e.g. the list of 1,184 such surnames at <https://surnames.behindthename.com/names/length/7>

Chapter 10: Interlude: The Case of the Haunted House (p. 91)

Chapter 11: Protected by Luck (p. 105)

1. Page 106, *the fraction of thieves is higher*: For example, suppose 2% of people are thieves,

and 2% of people are so helpful and outgoing that they will spontaneously and honestly offer to help you. Then, if you choose a random person, there is only a 2% chance they are a thief. But among those who *offer* to help, fully *half* of them (50%) are thieves – a much higher fraction.

2. Page 106, *A travel writer complained in National Geographic*: see the article “Six Things Solo Travel Teaches You”, by C. Miller, published in *National Geographic* magazine on August 24, 2016. Available at: <http://www.nationalgeographic.com/travel/travel-interests/tips-and-advice/six-things-solo-alone-travel-teaches-you/>

3. Page 107, *recently told a group of sheriffs*: on February 7, 2017; see e.g. the article “Trump makes false statement about U.S. murder rate to sheriffs group” by T. Jackman, published in the *Washington Post*, available at: https://www.washingtonpost.com/news/true-crime/wp/2017/02/07/trump-makes-false-statement-about-u-s-murder-rate-to-sheriffs-group/?utm_term=.38a951410723

4. Page 107, *the earlier description in his inauguration address*: available at: <https://www.whitehouse.gov/inaugural-address>

5. Page 107, *it was still a lower rate*: See e.g. the *United States Crime Rates 1960–2016* table by The Disaster Center, available at <http://www.disastercenter.com/crime/uscrime.htm>; see also the FBI Uniform Crime Reporting tables for 1993–2012 at https://ucr.fbi.gov/crime-in-the-u.s/2012/crime-in-the-u.s.-2012/tables/1tabledatadecoverviewpdf/table_1_crime_in_the_united_states_by_volume_and_rate_per_100000_inhabitants_1993-2012.xls and for 1997–2016 at <https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/tables/table-1>

6. Page 108, *as “the summer of the gun”*: See e.g. the news retrospective at: <http://globalnews.ca/video/2750283/a-look-back-to-2005-the-summer-of-the-gun>

7. Page 108, *a police detective declared*: Detective Sergeant Savas Kyriacou, as quoted in the December 27, 2005 CBC News article available at: <http://www.cbc.ca/news/canada/toronto-has-lost-its-innocence-police-say-of-boxing-day-shooting-1.569480>

8. Page 108, *one newspaper columnist wrote*: in the article “Turning murder into politics” by C. Blizzard, published on May 25, 2007 in the *Toronto Sun*.

9. Page 108, *the number of homicides had indeed increased*: In the City of Toronto, there were 64 homicides in 2004, and 80 in 2005, and $80/64 = 1.25$. With a city population of about 2.5 million, this corresponds to homicide rates per 100,000 residents of about 2.5566 in 2004, and 3.1958 in 2005. See e.g. p. 2 of the Coalition for Gun Control report “Gangs and Guns” archived at <https://www.webcitation.org/5tYeuI09Y?url=http://www.guncontrol.ca/English/Home/Works/gangsandguns.pdf> and the police lists available at http://data-torontops.opendata.arcgis.com/datasets/homicide/data?orderBy=Occurrence_year

10. Page 108, *the rate of 3.9 back in the year 1991*: There were 89 homicides in the City of Toronto in 1991, and a population of about 2.28 million, hence a rate of about 3.9108; see e.g. the above Coalition for Gun Control report, or the articles at <http://www.ctvnews.ca/despite-rise-police-say-t-o-murder-rate-low-1.268936> and https://www.thestar.com/news/crime/2011/01/01/toronto_police_struggling_to_solve_murders.html

11. Page 108, *far lower than most U.S. cities*: e.g. according to the FBI's 2005 *Crime in the United States* Table 6, available at https://www2.fbi.gov/ucr/05cius/data/table_06.html, in 2005 New York City had 539 murders and nonnegligent manslaughters in a population of 8,115,690, corresponding to a rate of $539/8115690*100000 = 6.64$; the City of Los Angeles had 489 in a population of 3,871,077 for a rate of $489/3871077*100000 = 12.63$, the City of Atlanta had 90 in a population of 430,666 for a rate of $90/430666*100000 = 20.90$; the City of Detroit had 354 in a population of 900,932 for a rate of $354/900932*100000 = 39.29$; etc.

12. Page 108, *and even many other Canadian cities*: e.g. according to Statistics Canada's CANSIM Table 253-0004, in 2005 the Winnipeg census metropolitan area had a homicide rate of 3.72, the Regina census metropolitan area had a homicide rate of 3.96, and the Edmonton census metropolitan area had a homicide rate of 4.19.

13. Page 108, *still lower than the country's national average homicide rate*: In the year 2005, according to Statistics Canada's CANSIM Table 253-0004, there were 2.06 homicides per hundred thousand population in Canada as a whole, and just 1.98 homicides per hundred thousand population in the Toronto census metropolitan area.

14. Page 108, *fewer shark attacks and deaths worldwide than 2000*: See e.g. the CNN report at <http://www.cnn.com/2002/US/05/21/shark.attacks/> and the University of Florida research report at <http://news.ufl.edu/archive/2002/02/summer-of-the-shark-in-2001-more-hype-than-fact-new-numbers-show.html> Worldwide there were 76 unprovoked shark attacks in 2001 leading to 5 deaths, which was actually *less* than the 85 attacks and 12 deaths the previous year. However, there were three such deaths in the United States in 2001, compared to just one in 2000 and none in 2002.

15. Page 109, *over twice as many Americans die in automobile accidents*: According to the National Safety Council's estimate at <https://www.nsc.org/road-safety/safety-topics/fatality-estimates> there were 40,327 motor-vehicle deaths in 2016 in the United States, compared to 17,250 murders according to the above Disaster Center study, which is 2.34 times as many.

16. Page 109, *the number of homicides decreased*: From the data in Toronto Police Service's Public Safety Data Portal homicide spreadsheet available at <http://data-torontops.opendata.arcgis.com/datasets/homicide> the numbers of homicides in the City of Toronto by year from 2005 through 2016 were: 80, 70, 86, 70, 62, 63, 51, 56, 57, 58, 57, 74. Hence, every year from 2006 through 2016 was lower than the 80 in 2005, some of them significantly lower (e.g. 2011 had 51, a decrease of just over 36% since $51/80$ is just under 0.64). And, for 2006, $70/80 = 0.875$, corresponding to a 12.5% decrease.

17. Page 109, *a lot of bike thefts*: For example, according to page 12 of the 2011 Annual Statistical Report of the Toronto Police Service, available at <http://www.torontopolice.on.ca/publications/files/reports/2011statsreport.pdf>, there were a total of 3,139 bicycles stolen in the City of Toronto in the year 2011.

18. Page 111, *a handful of airplane crashes each year*: See e.g. the data and graphs at <http://www.planecrashinfo.com/cause.htm>

19. Page 111, *nearly a billion airplane passengers a year*: e.g. <https://www.bts.gov/content/annual-passengers-all-us-scheduled-airline-flights-domestic-international-and-foreign>

indicates 928,900,000 airline passengers in the United States in the year 2016.

20. Page 111, *only one commercial flight in five million*: See e.g. “TO70S Civil Aviation Safety Review 2016”, available at: <http://to70.com/safety-review-2016/>

21. Page 111, *about one chance in 30 million of dying*: e.g. <http://www.statisticbrain.com/airplane-crash-statistics/> gives the odds of being killed on a single airline flight as 1 in 29.4 million.

22. Page 111, *more than one flight in five is delayed*: See e.g. the arrival performance tables at <https://public.tableau.com/profile/flightstats#!/vizhome/AirlineMonthlyOTP2014/MajorAirlinesbyRegion>

23. Page 112, *bear attacks are so exceedingly rare*: As my friend realised, there are approximately 2 deaths per year in the United States due to bear attacks, compared to 5 from snakes, 48 from bees and wasps, and over 3,500 from drowning. See e.g. the article “Bear Attacks - Killer Statistics That May Surprise You” by M. Rogers, published in 2017 in *The Alaska Life*, available at: <https://www.thealaskalife.com/outdoors/bear-attacks-statistic/>

24. Page 112, *currently has over 10,000 nuclear weapons, and once had over 64,000*: According to the detailed inventory counts from *Our World in Data* available at <https://ourworldindata.org/nuclear-weapons/> there was a high of 64,449 nuclear weapons in 1986, down to 10,145 in 2014 (the last year available).

25. Page 112, *the bombs that killed so many in Hiroshima and Nagasaki*: The Hiroshima and Nagasaki bombs were equivalent to about 15 and 21 kilotons (not megatons) of TNT, respectively. So, a four megaton bomb (say) is about 267 times as large as Hiroshima, and 190 times as large as Nagasaki.

26. Page 112, *stuck hanging from a tree in a field*: See the photo archived at: https://upload.wikimedia.org/wikipedia/commons/b/b0/Goldsboro_Mk_39_Bomb_1-close-up.jpeg

27. Page 112, *two experts claim they saw evidence*: See page 28 of the article in the April 1981 issue of *Mother Jones* magazine, available from: <https://books.google.ca/books?id=tOYDAAAAMBAJ> See also the discussion at: <http://www.ibiblio.org/bomb/brush.html>

28. Page 112, *others say it was actually three of the four safety interlocks*: http://www.ibiblio.org/bomb/hansen_doc.html

29. Page 112, *plummeted to earth without a parachute*: The Pentagon’s narrative quoted at <http://www.ibiblio.org/bomb/initial.html> states that the bomb “fell free and broke apart upon impact”.

30. Page 112, *six of the bomb’s seven arming steps had already taken place*: See the article “Orange resident recalls holding future in his hands” by K. Sharon, published in the Orange County Register on December 31, 2012. Available at: <http://www.ocregister.com/2012/12/31/orange-resident-recalls-holding-future-in-his-hands/> The seven steps were described as: 1. The arming wires had been pulled; 2. The pulse generators had been activated; 3. The explosive actuators had been fired; 4. Timers had started; 5. Barometric switches had been engaged; and 6. Low-voltage batteries were actuated. The seventh was a separate ARM/SAFE switch. Strangely, when the ARM/SAFE switch was later found, it was apparently set to ARM. This led to confusion –

apparently still unresolved – about why the bomb didn’t explode after all.

31. Page 113, *a recently declassified 1969 memo*: A two-page memo by P.F. Jones, supervisor of the nuclear weapons safety department at Sandia national laboratories, in response to (and disagreement with) the book “Kill and Overkill” by R. Lapp; written on October 22, 1969, titled “GOLDSBORO REVISITED or HOW I LEARNED TO MISTRUST THE H-BOMB or TO SET THE RECORD STRAIGHT”; available for viewing online at: <https://www.theguardian.com/world/interactive/2013/sep/20/goldsboro-revisited-declassified-document>

32. Page 113, *could have killed millions*: See e.g. the discussion in the article “US nearly detonated atomic bomb over North Carolina secret document” by E. Pilkington, published in *The Guardian* on September 20, 2013, which states: “Had the device detonated, lethal fallout could have been deposited over Washington, Baltimore, Philadelphia and as far north as New York city putting millions of lives at risk.” Article available at: <https://www.theguardian.com/world/2013/sep/20/usaf-atomic-bomb-north-carolina-1961>

33. Page 113, *one critic wrote*: “Random acts”, by J. Wilson, published in *NOW Magazine* in Toronto on November 17, 2005.

34. Page 114, *crime rates are generally decreasing*: See e.g. the FBI crime statistics at <https://ucr.fbi.gov/crime-in-the-u.s/2016/crime-in-the-u.s.-2016/tables/table-1> and elsewhere, which show clear downward trends in the murder and violent crime rates.

35. Page 114, *a wonderful monthly science outreach event*: Hosted by the *Perimeter Institute for Theoretical Physics* in Waterloo, Ontario, Canada. Video of the talk is still available at: https://www.youtube.com/watch?v=hWp6SBr_ZYU

Chapter 12: Statistical Luck (p. 116)

1. Page 116, *the best job of all by Career Cast*: see <http://www.careercast.com/jobs-rated/best-jobs-2017> which says “As the world becomes more quantitative and data-focused, mathematics takes center stage, with Statistician topping the best jobs of 2017.”

2. Page 116, *the best business job by U.S. News*: see <https://money.usnews.com/careers/best-jobs/rankings/best-business-jobs> ; they also rank statistician as fourth best overall (after dentist, nurse practitioner, and physician assistant), see <https://www.usnews.com/info/blogs/press-room/articles/2017-01-11/us-news-announces-the-2017-best-jobs>

3. Page 116, *She developed new ways of presenting the data in chart form*: See e.g. the article “Florence Nightingale: The passionate statistician” by J. Rehmeyer, published on November 26, 2008 in *Science News*, available at <https://www.sciencenews.org/article/florence-nightingale-passionate-statistician> And the article “Florence Nightingale: The compassionate statistician” by E. Magnello, published on December 8, 2010 in *Plus Magazine*, available at <https://plus.maths.org/content/florence-nightingale-compassionate-statistician> A higher-resolution image of Nightingale’s famous polar area diagram of causes of mortality in the army is available at <https://upload.wikimedia.org/wikipedia/commons/1/17/Nightingale-mortality.jpg> And, an image of Nightingale’s nomination into the Royal Statistical Society is posted at <https://twitter.com/HetanShah/status/940195192342237189>

4. Page 119, *I had the students complete a survey*: the survey data is still available, at

<http://probability.ca/jeff/teaching/1617/sta130/studentdata.txt> There were a total of 80 students, consisting of 41 males (of whom 14 or 34% were in a romantic relationship while 27 were not) and 39 females (of whom 11 or 28% were while 28 were not).

5. Page 120, *A standard statistical test*: I used the standard normal-approximation t-test for comparisons of proportions, via the R command “`prop.test(matrix(c(14,11,27,28), nrow=2))`”. This test gave a p-value of 0.7401, and a 95% confidence interval of (-0.168, 0.287), meaning that the males could plausibly have as much as 28.7% more relationships, or as much as 16.8% fewer.

6. Page 120, *the standard statistical test*: I used the standard normal-approximation t-test for comparisons of means, via the R command “`t.test()`”. This test gave a p-value of $8.479e-11$, which equals $1 / 11,793,677,973$, and gave a 95% confidence interval of (9.18, 15.68) centimeters, or about (3.6, 6.2) inches, meaning that on averages male could plausibly be between 3.6 and 6.2 inches taller than females.

7. Page 121, *used in medical research all the time*: I thank Louella Lobo for encouraging me to discuss this aspect, and for all of her support.

8. Page 121, *A 2016 study investigated*: “Innate Immunity and Asthma Risk in Amish and Hutterite Farm Children”, by M.M. Stein et al., published in the *New England Journal of Medicine* **375(5)** (August 2016), pp. 411–421. Available at: <http://www.nejm.org/doi/full/10.1056/NEJMoa1508749>

9. Page 122, *a 2016 study testing a new drug Dupilumab*: “Two Phase 3 Trials of Dupilumab versus Placebo in Atopic Dermatitis”, by E.L. Simpson et al. Published in 2016 in *The New England Journal of Medicine*. Available at: <http://www.nejm.org/doi/full/10.1056/NEJMoa1610020>

10. Page 122, *considered the risks and benefits of hormone replacement therapy*: “Risks and Benefits of Estrogen Plus Progestin in Healthy Postmenopausal Women”, by the Women’s Health Initiative. Published in 2002 in the *Journal of the American Medical Association* **288(3)**. Available at: <http://jama.jamanetwork.com/article.aspx?articleid=195120> The paper also had to adjust for the fact that different women were followed for different numbers of years.

11. Page 123, *some other studies have reached somewhat different conclusions*: e.g. It was concluded that “there were no significant differences between [hormone replacement and placebo] groups in the primary outcome [heart attacks] or in any of the secondary cardiovascular outcomes” in a study of 2763 postmenopausal women with coronary disease reported in the article “Randomized Trial of Estrogen Plus Progestin for Secondary Prevention of Coronary Heart Disease in Postmenopausal Women” by S. Hulley et al., published in 1998 in the *Journal of the American Medical Association* **280(7)**, 605–613. Available at: <https://jamanetwork.com/journals/jama/fullarticle/187879>

12. Page 123, *all medical studies are at risk of luck traps*: See e.g. the entertaining 2011 TED talk by B Goldacre, available at: https://www.ted.com/talks/ben_goldacre_battling_bad_science

13. Page 123, *the Wall Street Journal published an article*: See the article “Is Your Stockpicker Lucky or Good?” by S. Jakab, published on November 24, 2017 in the *Wall Street Journal*, available at: <https://www.wsj.com/articles/is-your-stockpicker-lucky-or-good-1511519400> Reporting on the paper “What’s Past is Not Prologue” by J. White, J. Rosenbluth, and V. Haghani,

posted online on September 12, 2017 at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3034686 (Thanks to Paul Rossi for the link.)

14. Page 124, *the true answer that 143 flips are required*: One way to think of this is as follows. If we flip each coin “n” times, and let “X” be the number of heads on the 60% coin *minus* the number of heads on the 50% coin, then we will guess correctly whenever X is greater than zero. Here X has mean $n*0.1$ and variance $n*0.49$. So, using the normal approximation with the continuity correction, $\text{Prob}(X > 0)$ is approximately the probability that a normal random variable with mean $n*0.1$ and variance $n*0.49$ will be larger than 0.5. This probability equals 0.9503843 when $n=143$, but only 0.9497462 when $n=142$. Alternatively, Appendix A of the paper by White et al. uses double binomial sums, and obtains the same answer 143.

15. Page 124, *the Intergovernmental Panel on Climate Change Fifth Assessment Report*: See page 2 of the full report available at: <http://www.ipcc.ch/report/ar5/syr/>

16. Page 125, *Al Gore’s Climate Reality Project says*: see <https://www.climateRealityProject.org/climate-101>

17. Page 125, *And the U.S. Global Change Research Program writes*: see <https://www.globalchange.gov/climate-change>

18. Page 125, *President Donald Trump tweeted*: see <https://twitter.com/realdonaldtrump/status/265895292191248385>

19. Page 125, *has written an entire book: The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future* by J. Inhofe, published in 2012 by WND Books, described at: <http://wndbooks.wnd.com/the-greatest-hoax-2/> See also Inhofe’s related quotes at: <https://www.desmogblog.com/james-inhofe>

20. Page 125, *filmmaker Martin Dunkirk made an entire documentary: “The Great Global Warming Swindle”*, television documentary by M. Dunkirk, aired on the United Kingdom television Channel 4 on March 8, 2007; see e.g. <http://www.imdb.com/title/tt1020027/> and the article “Global warming labeled a ‘scam’ ” by A. Webb, published in the *Washington Times* on March 6, 2007, and available in cached form at: <https://web.archive.org/web/20070308093308/http://www.washtimes.com/world/20070306-122226-6282r.htm>

21. Page 126, *a detailed index of changes in the average annual global surface temperature*: See the description at <https://climate.nasa.gov/vital-signs/global-temperature/> and the raw data at https://climate.nasa.gov/system/internal_resources/details/original/647_Global_Temperature_Data_File.txt

22. Page 126, *The corresponding p-value*: For example, a t-test for the difference of means in those two 37-year periods gives a p-value less than 2.2×10^{-16} , and a linear regression of annual temperature versus year gives a regression coefficient of 0.007152 degrees Celsius per year with a p-value less than 2.2×10^{-16} , both extremely statistically significant.

23. Page 127, *the widespread availability of online play*: See e.g. the discussion at: <http://www.backgammonmasters.com/the-growing-popularity-of-backgammon.shtml> and the numerous backgammon web sites listed at: <http://www.bkgm.com/servers.html>

24. Page 127, *a common complaint on many backgammon discussion forms*: See e.g. the

many posts linked from <http://www.bkgm.com/rgb/rgb.cgi?menu+computerdice> and <http://www.bkgm.com/rgb/rgb.cgi?view+1484> and many other places.

25. Page 127, *the backgammon software companies had to defend themselves*: See e.g. the quoted “reviews” of the software *Backgammon NJ* posted at <http://www.njsoftware.com/note.html> which are essentially just trying to prove that they do not cheat.

26. Page 127, *publish an article in their newsletter about cheating*: see the article “Backgammon Programs Cheat: Urban Myth??”, by J. Rollason, published in the AI Factory newsletter of January 2010, available at: http://www.aifactory.co.uk/newsletter/2010_01_backgammon_myth.htm (Thanks to my brother Alan for the link.) At one point they write that there are around 153 doubles per user, whereas actually they obtained an average of $15,286,212 / 200,000 = 76.43$ doubles per user (for the user and computer opponent combined). I have use the correct figures in my calculations herein.

27. Page 127, *the probability works out to about 4.2%*: This follows from the R command `pbinom(76*.6, 76, 0.5, lower.tail=FALSE)`, which gives an answer of 0.04232305.

28. Page 128, *include a page of testimonials*: For one of many such examples, see: <https://www.siskiyouvitalmedicine.com/client-testimonials/>

29. Page 129, *Michaela Jakubczyk-Eckert, who got breast cancer*: See the details of her story at: <http://www.ariplex.com/ama/amamiche.htm> (Warning: includes graphic images.)

30. Page 129, *As noted by science blogger and doctor David H. Gorski*: <http://scienceblogs.com/insolence/2006/11/08/a-different-kind-of-testimonial/>

31. Page 130, *a very high survival rate*: For example, the American Cancer Society claims five-year survival rates of nearly 100% for stage 0 and stage 1 breast cancer, and 93% for stage 2, and 72% for stage 3, and even 22% for stage 4; see <https://www.cancer.org/cancer/breast-cancer/understanding-a-breast-cancer-diagnosis/breast-cancer-survival-rates.html>

Chapter 13: Repeated Luck (p. 131)

1. Page 131, *playing water basketball with a friend*: The friend was my old Harvard student colleague and roommate Marc Goldman.

2. Page 135, *This can be computed using the binomial distribution*: The corresponding commands in R, for each of the five gamblers, are respectively: `pbinom(15, 30, 18/38, lower.tail=FALSE)`, `pbinom(54, 100, 18/38, lower.tail=FALSE)`, `pbinom(28, 50, 18/38, lower.tail=FALSE)`, `pbinom(12, 20, 18/38, lower.tail=FALSE)`, and `pbinom(1000, 2000, 18/38, lower.tail=FALSE)`, leading respectively to the p-values 0.3181193, 0.07668926, 0.0863184, 0.08747805, and 0.009815736.

3. Page 135, *I was invited to speak to an annual gathering of insurance brokers*: To the Empire Financial Group (<https://www.empire.ca/>), on April 25, 2006, at the Hyatt Regency Maui Resort & Spa, in Hawaii.

4. Page 136, *nicely illustrated by an xkcd cartoon*: “Significant”, by xkcd. Available at: <https://xkcd.com/882/>

5. Page 137, *the 1998 study*: “Ileal lymphoid nodular hyperplasia, non-specific colitis, and per-

vasive developmental disorder in children”, by A.J. Wakefield, S.H. Murch, A. Anthony, J. Linnell, D.M. Casson, M. Malik, et al. Published in 1998 in the medical research journal *The Lancet* **351(9103)**, 637–641. Later retracted. Available at: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(97\)11096-0/abstract](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(97)11096-0/abstract)

6. Page 137, *led to new measles outbreaks*: see http://webarchive.nationalarchives.gov.uk/20140505192926/http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733833790

7. Page 137, *other scientists were unable to replicate Wakefield’s results*: See e.g. “A Population-Based Study of Measles, Mumps, and Rubella Vaccination and Autism” by K. Meldgaard Madsen et al., published in 2002 in the *New England Journal of Medicine* **347**, 1477–1482. Available at: <http://www.nejm.org/doi/full/10.1056/NEJMoa021134>

8. Page 137, *the paper was retracted in 2010*: see [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(10\)60175-4/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(10)60175-4/fulltext)

9. Page 137, *The U.K. General Medical Council investigated, and found*: See e.g. *The Guardian* articles “Andrew Wakefield found ‘irresponsible’ by GMC over MMR vaccine scare” on January 28, 2010, available at <https://www.theguardian.com/society/2010/jan/28/andrew-wakefield-mmr-vaccine> and “MMR row doctor Andrew Wakefield struck off register” on May 24, 2010, available at <https://www.theguardian.com/society/2010/may/24/mmr-doctor-andrew-wakefield-struck-off>

10. Page 137, *A follow-up editorial in the British Medical Journal*: The editorial “Wakefields article linking MMR vaccine and autism was fraudulent”, published in 2011 in the *British Medical Journal* **342**, 7452. Available at: <http://www.bmj.com/content/342/bmj.c7452.full>

11. Page 137, *funded an additional study on primates*: see <http://www.safeminds.org/blog/2015/10/05/why-arent-i-surprised-that-the-media-got-it-wrong-again/>

12. Page 137, *even that study concluded that*: “Administration of thimerosal-containing vaccines to infant rhesus macaques does not result in autism-like behavior or neuropathology”, by B.S. Gadad et al. Published in 2015 in the *Proceedings of the National Academy of Science* **112(40)**. Available at: <http://www.pnas.org/content/112/40/12498.full>

13. Page 138, *A 2011 medical research paper said yes*: “Gluten causes gastrointestinal symptoms in subjects without celiac disease: a double-blind randomized placebo-controlled trial”, by J.R. Biesiekierski et al., published in March 2011 in the *American Journal of Gastroenterology* **106(3)**, 508–514; summary available at: <https://www.ncbi.nlm.nih.gov/pubmed/21224837>

14. Page 138, *a follow-up paper came to the opposite conclusion*: “No Effects of Gluten in Patients With Self-Reported Non-Celiac Gluten Sensitivity After Dietary Reduction of Fermentable, Poorly Absorbed, Short-Chain Carbohydrates” by J.R. Biesiekierski et al., published in August 2013 in the journal *Gastroenterology* **145(2)**, 320–328, available at: [http://www.gastrojournal.org/article/S0016-5085\(13\)00702-6/fulltext](http://www.gastrojournal.org/article/S0016-5085(13)00702-6/fulltext)

15. Page 139, *he introduced hand-washing protocols*: See e.g. the discussion in the segment “The Doctor Who Championed Hand-Washing And Briefly Saved Lives” by R. Davis from January 2015, available at: <http://www.npr.org/sections/health-shots/2015/01/12/375663920/the-doctor-who-championed-hand-washing-and-saved-women-s-lives>

16. Page 139, *familiar to everyone as pasteurisation*: Pasteur’s patent for this process can be viewed at: <https://www.google.com/patents/US135245>

17. Page 139, *medical/scientific community was skeptical*: See e.g. the long article “Science, Politics and Spontaneous Generation in Nineteenth Century France: The Pasteur-Pouchet Debate” by J. Farley and G.L. Geison, published in 1974 in the *Bulletin of the History of Medicine* **48.2**, 161–198.

18. Page 140, *worth about US\$28,000 today*: According to https://en.wikipedia.org/wiki/French_franc#Latin_Monetary_Union, the French franc in 1865 was equivalent to about 0.29 grams of gold. And, according to <http://www.goldpriceoz.com/gold-price-us/>, at the time of this writing, gold cost US\$1209.80 per troy ounce. Furthermore, 1 gram is equal to 0.032151 troy ounces. This gives a value for Pasteur’s prize of: $2500 \times 0.29 \times 0.0321507 \times 1209.8 = US\$28,199.80$.

19. Page 140, *Pasteur had numerous further related successes*: See e.g. the biography at <https://www.biography.com/people/louis-pasteur-9434402> and the article “5 things Louis Pasteur did to change the World” by M. Andrei at <https://www.zmescience.com/other/feature-post/louis-pasteur-changed-world/>

20. Page 141, *it has been pointed out*: See e.g. the widely-cited article “Why Most Published Research Findings Are False” by J.P.A. Ioannidis, published in 2005 in *PLoS Medicine*, available at: <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0020124>

21. Page 141, *one study tried re-testing 100 psychology experiments*: see the article “Estimating the reproducibility of psychological science” by the Open Science Collaboration, published in 2015 in the journal *Science* **349(6251)**. Available at: <http://science.sciencemag.org/content/349/6251/aac4716> See also the discussion at: <https://www.theguardian.com/science/2015/aug/27/study-delivers-bleak-verdict-on-validity-of-psychology-experiment-results>

22. Page 142, *Healthline.com offers a handy chart*: <http://www.healthline.com/health/green-phlegm>

23. Page 142, *the Cleveland Clinic provides an interactive tool*: <https://health.clevelandclinic.org/2017/06/what-the-color-of-your-snot-really-means/>

24. Page 142, *a Harvard medical doctor boldly declares*: “Don’t judge your mucus by its color”, by R.H. Shmerling, published in *Harvard Health Publications* on February 8, 2016. Available at: <http://www.health.harvard.edu/blog/dont-judge-your-mucus-by-its-color-201602089129>

25. Page 142, *an Australian biomedical professor declares*: “Health Check: does green mucus mean you’re infectious and need antibiotics?” by J. Turnidge. Available at: <http://theconversation.com/health-check-does-green-mucus-mean-youre-infectious-and-need-antibiotics-63193>

26. Page 142, *research has gone back and forth*: See e.g. the amusing article “Café or Nay?” by C. Aschwenden, published in 2011 in the magazine *Slate*, available at: http://www.slate.com/articles/health_and_science/medical_examiner/2011/07/caf_or_nay.html

27. Page 142, *the studies are very mixed*: See e.g. the article “Medical benefits of dental floss unproven” by J. Donn, published in 2016 in *AP News*, available at: <https://apnews.com/f7e66079d9ba4b4985d7af350619a9e3/medical-benefits-dental-floss-unproven> And the meta-analysis articles “The efficacy of dental floss in addition to a toothbrush on plaque and

parameters of gingival inflammation: a systematic review” by C.E. Berchier et al., published in November 2008 in the *International Journal of Dental Hygiene* **6(4)**, 265–279, available at: <https://www.ncbi.nlm.nih.gov/pubmed/19138178> ; and “Flossing for the management of periodontal diseases and dental caries in adults” by D. Sambunjak et al., published on December 7, 2011 in the *Cochrane Database Systematic Review*, available at: <https://www.ncbi.nlm.nih.gov/pubmed/22161438> ; and “Efficacy of inter-dental mechanical plaque control in managing gingivitis—a meta-review” by S. Sälzer et al., published in April 2015 in the *Journal of Clinical Periodontology*, available at: <https://www.ncbi.nlm.nih.gov/pubmed/25581718>

28. Page 142, *one big group research project*: written up as the article “Many analysts, one dataset: Making transparent how variations in analytical choices affect results” by R. Silberzahn et al., posted online in April 2017 at: <https://psyarxiv.com/qkwst/>

29. Page 142, *promoted in 2009 by Italian doctor Paolo Zamboni*: See the original article “Chronic cerebrospinal venous insufficiency in patients with multiple sclerosis”, by P. Zamboni et al., published in 2009 in the *Journal of Neurology, Neurosurgery & Psychiatry* **80(4)**. Available at: <http://jnnp.bmj.com/content/80/4/392>

30. Page 142, *declare a “definitive debunking”*: See e.g. the news report at: <http://www.cbc.ca/news/health/multiple-sclerosis-liberation-therapy-clinical-trial-1.4014494>

31. Page 142, *Some have referred to this as a “crisis”*: See e.g. the article “Psychologists Replication Crisis Cant Be Wished Away”, by E. Yong. Published on March 4, 2016 in *The Atlantic*. Available at: <https://www.theatlantic.com/science/archive/2016/03/psychologists-replication-crisis-cant-be-wished-away/472272/>

32. Page 142, *a call from a harried radio news producer*: From a producer at the CBC Radio program *The Current*, on October 29, 2010. He was preparing to interview Dr. Ioannidis, after reading an article about invalid medical studies (“Lies, Damned Lies, and Medical Science” by D.H. Freedman, published in the November 2010 Issue of *The Atlantic* magazine, available at: <https://www.theatlantic.com/magazine/archive/2010/11/lies-damned-lies-and-medical-science/308269/>), and was uncertain how to proceed, and e-mailed me with a request “to chat with you. I need to clarify some of my own thinking on this”.

33. Page 143, *One psychology paper describes an amusing story*: “Scientific Utopia II. Restructuring Incentives and Practices to Promote Truth Over Publishability”, by B.A. Nosek, J.R. Spies, and M. Motyl, published in 2012 in the journal *Perspectives on Psychological Science* **7(6)**. Available at: <http://journals.sagepub.com/doi/full/10.1177/1745691612459058>

34. Page 143, *the web site fivethirtyeight.com offers*: see <https://fivethirtyeight.com/features/science-isnt-broken/>

35. Page 144, *some statisticians have suggested*: See e.g. the 73-author paper “Redefine statistical significance”, posted on July 22, 2017 at: <https://osf.io/preprints/psyarxiv/mky9j/> Also the follow-up discussion “Big names in statistics want to shake up much-maligned P value”, by D.S. Chawla, published in July 2017 in the journal *Nature*, available at: <http://www.nature.com/news/big-names-in-statistics-want-to-shake-up-much-maligned-p-value-1.22375>

36. Page 144, *Others have suggested*: See e.g. the article “Metascience could rescue the replication crisis ” by J.W. Schooler, published in 2014 in *Nature* **515(7525)**, available at: <http://www.nature.com/news/metascience-could-rescue-the-replication-crisis-1.15383>

//www.nature.com/news/metascience-could-rescue-the-replication-crisis-1.16275

37. Page 144, *ban the use of p-values entirely in its pages*: in the journal *Basic and Applied Social Psychology* (BASP); their editorial on page 1 of volume **37** (2015) explicitly says that “BASP is banning NHSTP”, meaning the “null hypothesis significance testing procedure”, i.e. the use of p-values. Available at: <http://www.tandfonline.com/doi/abs/10.1080/01973533.2015.1012991?journalCode=hbas20>

38. Page 144, *generated much controversy among statisticians*: See e.g. the discussion in the article “Psychology journal bans P values” in 2015 in the journal *Nature* **519(7541)**, available at: <http://www.nature.com/news/psychology-journal-bans-p-values-1.17001> And the comment from the *American Statistical Association* posted at: <http://community.amstat.org/blogs/ronald-wasserstein/2015/02/26/asa-comment-on-a-journals-ban-on-null-hypothesis-statistical-testing> And the later blog post by D. Lakens at: <http://daniellakens.blogspot.ca/2016/02/so-you-banned-p-values-hows-that.html>

39. Page 144, *a follow-up article in the medical journal The Lancet*: “Venous abnormalities and multiple sclerosis: another breakthrough claim?”, by J. Qiu, published in 2010 in the journal *The Lancet: Neurology* **9(5)**, 464–465. Available at: [http://www.thelancet.com/journals/lanneur/article/PIIS1474-4422\(10\)70098-3/fulltext](http://www.thelancet.com/journals/lanneur/article/PIIS1474-4422(10)70098-3/fulltext)

40. Page 145, *As many have noted*: See e.g. the editorial “Reality check on reproducibility” published in the journal *Nature* in 2016, available at: <https://www.nature.com/news/reality-check-on-reproducibility-1.19961>

Chapter 14: Lottery Luck (p. 146)

1. Page 147, *was convicted in 2015*: See e.g. <http://www.desmoinesregister.com/story/news/crime-and-courts/2015/07/20/hot-lotto-verdict/30411901/>

2. Page 147, *he confessed the details of his scheme*: See e.g. <http://www.desmoinesregister.com/story/news/crime-and-courts/2017/06/29/tipton-pleads-guilty-iowa-lottery-rigging-scandal/438039001/> and <http://www.desmoinesregister.com/story/news/investigations/2017/08/22/iowa-lottery-cheat-sentenced-25-years/566642001/>

3. Page 147, *have reached over 1.5 billion dollars*: See e.g. <http://www.telegraph.co.uk/news/worldnews/northamerica/usa/12162274/Worlds-largest-lottery-winners-come-forward-to-claim-share-of-1.58bn-jackpot.html>

4. Page 147, *larger than the annual budget of most cities*: e.g. the city of Buffalo had 2016–2017 total revenues of 1.439 billion dollars; see https://www.ci.buffalo.ny.us/Mayor/Home/Leadership/FiscalReporting/Archived_Budgets/20162017AdoptedBudget

5. Page 147, *a randomly-chosen American will be killed by lightning this year*: There are about 31 U.S. lightning fatalities per year according to data from <http://www.lightningsafety.noaa.gov/fatalities.shtml>, out of a U.S. population of about 320 million, corresponding to one American in just over ten million, or about 28 times more likely than one chance in 292 million.

6. Page 147, *a randomly-chosen American will one day be president*: The United States had 45 presidents in its first 241 years, or about one president every 5.4 years. The average age at

inauguration is 55.0 years (see http://www.presidenstory.com/stat_age.php). Hence, there are about 55.0/5.4 or just over 10 future presidents currently alive. So, a randomly-chosen person has 10 chances in 320 million, or one chance in 32 million, of being a future president. This is just over nine times more likely than one chance in 292 million.

7. Page 148, *you will die in an automobile accident while driving across town*: As discussed on page 83 of my previous book *Struck by Lightning*, each drive across town has approximately one chance in seven million of resulting in death. This is just under 42 times more likely than one chance in 292 million.

8. Page 148, *a randomly-chosen woman of childbearing age will give birth within the next 1.7 seconds*: There are 62.9 births per year per 1,000 American women aged 15-44 years, according to <https://www.cdc.gov/nchs/fastats/births.htm>. So, the probability that a randomly-chosen woman of this age will give birth in the next second is $62.9/1000/365/24/60/60$, or about one chance in 501 million. So, in 1.7 seconds it is about one chance in $501/1.7$ million, roughly equal to one chance in 292 million.

9. Page 148, *once every 5.6 million years*: On average you will win once every 292 million weeks, which corresponds to $292 \text{ million} / 52 = 5.6$ million years.

10. Page 148, *approach people lined up at a lottery ticket kiosk*: for Global Television News (Ontario), on the day of a large \$54 million Lotto 6/49 jackpot, on Wednesday, October 26, 2005.

11. Page 149, *one web site offers*: see <http://lotto649stats.com/>

12. Page 150, *an author who claims to offer*: He is Richard Lustig, author of the book *Learn to Increase Your Chances of Winning the Lottery*. See e.g. <http://www.ctvnews.ca/canada/how-to-boost-your-horrible-odds-of-winning-the-powerball-1.2735726>.

13. Page 151, *on April 6 there were eight different tickets*: See e.g. <http://windsor.ctvnews.ca/lotto-6-49-ticket-worth-1-6m-sold-in-windsor-1.2849566>

14. Page 152, *my most dramatic evaluation of luck ever*: For more details about the lottery retailer scandal, see my article “Statistics and the Ontario Lottery Retailer Scandal” published in 2014 in *Chance Magazine* **27(1)**, available at: <http://probability.ca/lotteryscandal/>

15. Page 153, *other studies later confirmed*: The Ontario Lottery and Gaming Corporation, which runs the lottery, soon conducted their own survey, and got a factor of 1.95. Corporate Research Associates Inc. later conducted a more detailed survey in Atlantic Canada, and obtained a factor of 1.52, virtually identical to the Fifth Estate figure of 1.5.

16. Page 154, *When I did the calculation*: This can be computed in R using the command `ppois(199, 57, lower.tail=FALSE)`, which gives an answer of 4.653685e-49.

17. Page 155, *As soon as the television program was shown*: the full broadcast is available at: <http://www.cbc.ca/fifth/episodes/from-the-archives/luck-of-the-draw>

18. Page 156, *They dared to claim*: See e.g. the article “Province to probe the windfalls of lottery retailers” by R. Ferguson and C. Rush, published in the *Toronto Star* on October 26, 2006, archived online at: <http://probability.ca/jeff/writing/starlott.html>

19. Page 156, *They even hired their own statistical consultants*: See e.g. the summaries archived

at: <http://probability.ca/sbl/OLG-FAQ.html#10>

20. Page 156, *citing my name and statistical calculations*: See e.g. the official proceedings of the Legislative Assembly of Ontario for October 25, 2006, available at: http://www.ontla.on.ca/house-proceedings/transcripts/files_html/2006-10-25_L113A.htm#P232_25936

21. Page 156, *The Ontario Ombudsman then investigated, and issued a report*: available at: <https://www.ombudsman.on.ca/resources/reports-and-case-summaries/reports-on-investigations/2007/a-game-of-trust>

22. Page 157, *separate media investigations*: For more details, see again my article “Statistics and the Ontario Lottery Retailer Scandal” cited above, and the many references therein.

23. Page 158, *the California lottery company instigated*: For more details, see: http://www.nbcnews.com/id/38778571/ns/dateline_nbc-the_hansen_files_with_chris_hansen/#.V-k5IiXPHSO

24. Page 158, *told the lady that it was worthless*: These events took place in Oldham, just outside of Manchester. The customer was Maureen Holt, age 77 and a great-grandmother. The clerk was Farrakh Nizzar, who was to be deported back to Pakistan after serving his sentence. For more details, see the *Manchester Evening News* stories “Lottery gran on conman: ‘Everyone calls him Lucky but he wasn’t very lucky this time’ ” on August 1, 2012, available at <http://www.manchestereveningnews.co.uk/news/greater-manchester-news/lottery-gran-on-conman-everyone-calls-692165> and “New lottery ‘win’ alert after shopkeeper tried to con great-gran from Oldham out of £1m” on August 27, 2012, available at <http://www.manchestereveningnews.co.uk/news/greater-manchester-news/new-lottery-win-alert-after-693924>

Chapter 15: Lucky Me (p. 159)

1. Page 162, *a large conference of police fraud investigators*: The Toronto Police Service Fraud Investigators Conference, on December 10–14, 2007.

2. Page 165, *The article was the lead story in the newspaper’s Arts section*: “The deal breaker: If you’re a guest on Howie Mandel’s show, you should bring Jeffrey Rosenthal – not your dad”, by J. Kelly Nustruck, published on page B1 of the *National Post* on May 30, 2006. Archived at: <http://www.probability.ca/lotteryscandal/ref/2006-05-30-post.txt>

3. Page 167, *I was in demand as a musical improviser*: For more about this, see e.g. my article “Improv and Music: an Unusual Duo”, published in the *Theatresports Toronto* newsletter in November 2001, available at: <http://probability.ca/jeff/writing/improvmusic.html>

4. Page 167, *I got to be an on-stage musician in a full-length play*: for a performance of the Warren Graves play *The Mumberley Inheritance* at the Scarborough Village Theatre in June 2015, directed by Mike Ranieri. See the show poster at <http://probability.ca/jeff/MI/poster.jpg> and information at <https://www.facebook.com/mumberley/> and reviews at <https://ontarioartsreview.ca/2015/06/05/the-mumberley-inheritance-v-2-0-giggle-giggle-giggle/> and <https://www.insidetoronto.com/news-story/5675231-cast-s-comedic-ability-highlighted-in-the-mumberley-inheritance/>

5. Page 167, *a big New Year’s Eve variety show in a large theatre*: At the Richmond Hill Centre for the Performing Arts; the show’s announcement is at <http://sa1.seatadvisor.com/sabo/>

servlets/EventInfo?eventId=1159161 and <https://www.facebook.com/events/859257057564334/> I was providing musical accompaniment for the well-known improv troupe *Not To Be Repeated* (see e.g. their television show described at <http://www.imdb.com/title/tt0305127/>).

6. Page 169, *I continued juggling the fruits*: someone kindly sent me a photo of the incident, which I posted at http://probability.ca/jeff/images/juggling_shapiro.jpg

7. Page 171, *with newspaper headlines like*: See e.g. the article “Numbers don’t always tell the whole story” by J. Yang, published on January 30, 2010 in the *Toronto Star*, available at: https://www.thestar.com/news/gta/2010/01/30/numbers_dont_always_tell_the_whole_story.html Or the article “Not so rare for rarities to occur in waves: Professor”, published on January 29, 2010 in *Toronto Metro*, available at: <http://www.metronews.ca/news/toronto/2010/01/29/not-so-rare-for-rarities-to-occur-in-waves-professor.html>

Chapter 16: Lucky Sports (p. 173)

1. Page 174, *offered a billion dollars*: see <https://www.forbes.com/sites/kellyphillipserb/2014/01/21/warren-buffett-offers-1-billion-for-perfect-march-madness-bracket/#72862857100b>

2. Page 176, *a little article about my method and scores*: still available at: <http://www2.tsn.ca/ncaa/story/?id=418503>

3. Page 176, *there was a major upset*: See e.g. <http://www.sports-reference.com/cbb/boxscores/2013-03-21-oklahoma-state.html>

4. Page 176, *There was soon another upset*: see <http://www.ncaa.com/game/basketball-men/d1/2013/03/21/harvard-new-mexico>

5. Page 177, *they had never before won any game at the tournament*: see http://www.espn.com/mens-college-basketball/tournament/history/_/team1/6128

6. Page 178, *My predictions aired on the television news that evening*: still available at: <http://globalnews.ca/news/2235467/toronto-blue-jays-have-88-52-chance-of-making-the-playoffs-stats-professor/>

7. Page 178, *the Jays lost 6–4 that night*: see <http://www.baseball-reference.com/boxes/TOR/TOR201509220.shtml>

8. Page 178, *win their division, six games ahead of the Yankees*: see http://www.baseball-reference.com/leagues/MLB/2015-standings.shtml#all_standings_E

9. Page 179, *the Leafs had won 38 games and lost 40 (8 in overtime)*: see <http://www.hockey-reference.com/boxscores/index.cgi?month=4&day=11&year=2006>

10. Page 180, *His column ran the next day*: “According to the school of biased observation, it’s fated that the Leafs are going to the cup this year”, by M. Strobel, published in *The Toronto Sun* on Thursday, April 13, 2006, p. 6, archived at: <http://probability.ca/lotteryscandal/ref/2006-04-13-sun.txt> ; see also the e-mail I sent him, archived at: <http://probability.ca/lotteryscandal/ref/NHLMesg.txt>

11. Page 180, *Tampa Bay finished two points ahead of them*: see <https://www.nhl.com/standings/2005>

12. Page 180, *among players with at least 3,000 plate appearances*: see the full list at: https://www.baseball-reference.com/leaders/batting_avg_career.shtml

13. Page 180, *the longest hitting streak in the history of Major League Baseball*: see the list at: <http://www.baseball-almanac.com/feats/feats-streak.shtml>

14. Page 181, *over the course of his career*: See e.g. the official Joe Dimaggio baseball statistics at: <http://m.mlb.com/player/113376/joe-dimaggio>

15. Page 181, *getting at least one hit in a specific series of 56 consecutive games*: I computed this in R with the command `pbinom(0, 4, 0.3246, lower.tail=FALSE)56`, which works out to about one chance in 472,118. This simplified calculation assumes exactly four at-bats in each game, and that the different games are independent. Correcting these assumptions would be possible but not simple. Anyway DiMaggio was fairly consistent, with batting averages between .290 and .357 except his final season (.263) and his best 1939 year (.381), suggesting that these assumptions aren't so unreasonable.

16. Page 181, *But I still compute that*: For this I used a simple Monte Carlo simulation. I randomly simulated a sequence of 1,736 games, each having at least one hit with probability 0.7919133. I then computed the longest hitting streak within the sequence. Repeating this simulation 100,000 times, I found that the absolute longest hitting streak was 75, but the *average* longest hitting streak was 27.21943, and furthermore the fraction of simulations with a 56-game or longer streak was 0.00067, or about one chance in 1,500. My simple R computer program is available for inspection at <http://probability.ca/kow/Rdimag.txt>. It might be possible to compute this probability analytically using the “Inclusionexclusion principle” formula, though the calculations seem messy; enterprising readers are invited to attempt that computation and let me know.

17. Page 181, *the prize remains unclaimed*: See e.g. the article “MLBAM’s Beat the Streak chases history” by E. Fisher, available at <https://www.sportsbusinessdaily.com/Journal/Issues/2016/05/16/Leagues-and-Governing-Bodies/MLBAM-beat-the-streak.aspx> To enter the Beat the Streak contest, visit <http://mlb.mlb.com/mlb/fantasy/bts/>

18. Page 181, *DiMaggio would have earned an extra \$10,000*: This is what DiMaggio supposedly “confided to a teammate”, see e.g. <http://www.history.com/this-day-in-history/joe-dimaggio-ends-56-game-hitting-streak> and <https://www.newsday.com/sports/baseball/yankees/joe-dimaggio-s-56-game-hit-streak-20-fun-facts-1.3028286>

19. Page 182, *Professional Football Writers Association all-rookie team*: See e.g. http://www.nola.com/saints/index.ssf/2016/01/new_orleans_saints_stephone_an_1.html and <https://www.fanragsports.com/stephone-anthonys-disappointing-second-season-end-ir/> and <http://www.nfl.com/news/story/0ap3000000848297/article/dolphins-acquire-lb-stephone-anthony-from-saints>

20. Page 183, *most likely it is some combination of the two*: For a nice illustration of this combination in different professional sports games, see e.g. the video at <https://www.youtube.com/watch?v=HNlgISa9Giw> based on the book *The Success Equation* by M. Mauboussin, published in 2012 by Harvard Business Review Press.

Chapter 17: Lucky Polls (p. 184)

1. Page 184, *correctly predict which candidate would win in every single one of the fifty U.S. states*: See e.g. the article at: <http://www.dailymail.co.uk/news/article-2229790/US-Election-2012-Statistician-Nate-Silver-correctly-predicts-50-states.html>
2. Page 184, *most pollsters confident that the Remain side would win*: See e.g. the pre-referendum poll summaries at: <http://www.independent.co.uk/news/uk/politics/eu-referendum-poll-brexit-remain-vote-leave-live-latest-who-will-win-results-populus-a7097261.html> and <https://ig.ft.com/sites/brexit-polling/> and <https://whatukthinks.org/eu/opinion-polls/poll-of-polls/>
3. Page 185, *a formal inquiry was called. Their report*: “Report of the Inquiry into the 2015 British general election opinion polls” by P. Sturgis et al., published in March 2016 by the British Polling Council and the National Centre for Research Methods; available from: <http://eprints.ncrm.ac.uk/3789/>
4. Page 185, *the BBC reported that*: see the BBC article “Election 2015: How the opinion polls got it wrong” by D. Cowling, available at: <http://www.bbc.com/news/uk-politics-32751993>
5. Page 185, *The Guardian called the error “notorious”*: see the article “New research suggests why general election polls were so inaccurate” by T. Clark, published on November 13, 2015 in *The Guardian*, available at: <https://www.theguardian.com/politics/2015/nov/13/new-research-general-election-polls-inaccurate>
6. Page 185, *and forecasters admitted that*: see <https://yougov.co.uk/news/2015/05/08/general-election-opinion-polls-brief-post-mortem/> and <https://fivethirtyeight.com/features/what-we-got-wrong-in-our-2015-uk-general-election-model/>
7. Page 187, *the magazine mailed survey questions to ten million different households*: See e.g. the discussion in the article “Big data: A big mistake?” by T. Harford, published in the journal *Significance* **11(5)**, December 2014, 14–19. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1740-9713.2014.00778.x/full> And also the summary by D. DeTurck at <https://www.math.upenn.edu/~deturck/m170/wk4/lecture/case1.html>. Note that the 3,000 sample size was actually for Gallup’s smaller poll which attempted to predict the results of the *Literary Digest* poll; see P. Squire’s article below.
8. Page 187, *One and a half years later*: The *Literary Digest* was taken over by *Time Magazine* and ceased to exist as a separate publication on May 23, 1938; see the announcement at: <http://content.time.com/time/magazine/article/0,9171,882981,00.html>. The election had been held on November 3, 1936, which was one year and six months and twenty days earlier.
9. Page 187, *he predicted that Roosevelt would win 56% of the popular vote to Landon’s 44%*: See the bottom graph at: <http://www.gallup.com/poll/110548/gallup-presidential-election-trial-heat-trends.aspx>
10. Page 188, *more affluent or angry or otherwise pro-Republican*: See e.g. the article “Why the 1936 Literary Digest Poll Failed” by P. Squire, published in 1988 in the journal *Public Opinion Quarterly* **52(1)**, 125–133.
11. Page 188, *In the days leading up to the vote, most polls*: See e.g. the summary at: <http://www.latimes.com/nation/politics/trailguide/la-na-election-day-2016-a-last-look-at->

the-polls-clinton-lead-1478618744-htmlstory.html

12. Page 188, *Clinton did win the popular vote*: by about 48.2% to 46.1%; see e.g. <http://www.cnn.com/2016/12/21/politics/donald-trump-hillary-clinton-popular-vote-final-count/>

13. Page 188, *so many polls taken*: See e.g. the summary graphic at: https://www.dailywire.com/sites/default/files/uploads/2016/11/rcp_general_election_4_11.7.2016_0.jpg For a much deeper look at pre-election poll media interpretations, see e.g. the article “The Real Story Of 2016” by N. Silver, posted on January 19, 2017 at: <http://fivethirtyeight.com/features/the-real-story-of-2016/>

14. Page 189, *an interview while visiting Canada*: on November 23, 2016; see <https://www.theglobeandmail.com/news/news-video/video-canada-not-immune-to-hate-wave-cnn-commentator-van-jones/article33004444/>

15. Page 189, *The answer was, 9.6%*: The final election count had been 48.2% for Clinton, 46.1% for Trump, and 5.7% for other candidates. Suppose a polling company had tried to phone 10,000 people, who were actually perfectly representative: 4,820 Clinton supporters, 4,610 Trump supporters, and 570 Other. If the response rate was 10% for Clinton and for Other supporters, and 9.6% for Trump supporters, then the polling company will get $4820 \times 10\% = 482$ Clinton responses, and $4610 \times 9.6\% \doteq 443$ Trump responses, and $570 \times 10\% = 57$ Other responses. So, total number of responses will be $482 + 443 + 57 = 982$, of which Clinton has $482/982 \doteq 49.1\%$, and Trump has $443/982 \doteq 45.1\%$, giving Clinton a margin of victory of 4%.

16. Page 189, *Trump took 62% of the vote in the 2015 presidential race*: See e.g. <https://uselectionatlas.org/RESULTS/state.php?year=2016&fips=1>

17. Page 190, *with President Trump publicly endorsing Moore*: See e.g. the CNN report at: <http://www.cnn.com/2017/12/04/politics/trump-moore-endorsement-twitter/>

18. Page 190, *one poll showed Moore up by 9%, one showed him down by 10%, and one showed an exact tie*: respectively the Emerson College poll at https://www.realclearpolitics.com/docs/Emerson_College_Alabama_Dec_11.pdf and the Fox News poll at <http://www.foxnews.com/politics/2017/12/11/fox-news-poll-enthused-democrats-give-jones-lead-over-moore-in-alabama.html> and the Monmouth University poll at https://www.monmouth.edu/polling-institute/reports/MonmouthPoll_AL_121117/ and the summary of polls at <https://fivethirtyeight.com/features/everything-you-need-to-know-about-alabamas-senate-election/>

19. Page 190, *Nate Silver himself could do no more than write*: see the article “What The Hell Is Happening With These Alabama Polls?” by N. Silver, published on December 11, 2017 at: <https://fivethirtyeight.com/features/what-the-hell-is-happening-with-these-alabama-polls/> For what it’s worth, Silver argued that Moore was polling higher in automated “interactive voice response” (or IVR or “robocall”) polls than in traditional live-caller polls, and speculated that this might be due to e.g. automated polls not reaching younger voters with cellphones.

20. Page 190, *one frustrated observer aptly tweeted*: see the tweet by B. LoGiurato, available at: <https://twitter.com/BrettLoGiurato/status/940240018005745664>

21. Page 191, *a radio interviewer once asked me*: The great Andy Barrie, on CBC radio’s Metro Morning, at 6:40 a.m. on Thursday Dec 22, 2005, in the runup to the January 2006 Canadian federal

election.

Chapter 18: Interlude: A Lucky Look at Sayings (p. 192)

1. Page 192, *they are defined as*: see <http://www.dictionary.com/browse/aphorism>
2. Page 192, *fewer than one child in half a million will be abducted*: e.g. the 2011 FBI report “Child Abductions: Known Relationships are the Greater Danger” by A.-J. Douglas available at <https://leb.fbi.gov/2011/august/crimes-against-children-spotlight-child-abductions-known-relationships-are-the-greater-danger> says that while there are over 200,000 child abductions in the United States each year, most of them are related to family custody battles, and only about 115 of the reported abductions each year involve strangers abducting children for ransom or to kill or keep them. Out of a total of 74.2 million children in the U.S., this represents about one child in 575,000.
3. Page 193, *This is an old Latin proverb*: see <https://www.merriam-webster.com/dictionary/audentesfortunajuvat>
4. Page 193, *Star Trek’s always-modest Captain Kirk once put it*: In the 1986 movie *Star Trek IV: The Voyage Home*; see e.g. <http://www.imdb.com/title/tt0092007/quotes>
5. Page 194, *the winner of the 2016 Nobel Prize in Literature once wrote*: Bob Dylan, in the 1975 song “Simple Twist of Fate”. See Bob Dylan, “Simple Twist of Fate Lyrics”, MetroLyrics, <http://www.metrolyrics.com/simple-twist-of-fate-lyrics-bob-dylan.html>. The Nobel Prize announcement is at: https://www.nobelprize.org/nobel_prizes/literature/laureates/2016/
6. Page 194, *a positive Irish attitude*: See e.g. <http://www.urbandictionary.com/define.php?term=luckoftheirish>
7. Page 194, *specific Irish successes during the 19th century U.S. gold rush*: See e.g. <https://www.irishcentral.com/roots/history/where-does-the-term-the-luck-of-the-irish-come-from> which quotes Professor E.T. O’Donnell of Holy Cross College.
8. Page 195, *and concluded that*: see the article “The Luck Factor” by R. Wiseman, published in 2003 in *The Skeptical Inquirer*. Available at: http://www.richardwiseman.com/resources/The_Luck_Factor.pdf
9. Page 195, *the 1639 quotation*: credited by Oxford Reference to John Clarke’s *Paroemiologia Anglo-Latina*; see <http://www.oxfordreference.com/view/10.1093/acref/9780199539536.001.0001/acref-9780199539536-e-151>
10. Page 195, *Lefty Gomez was fond of saying*: see <http://www.baseball-almanac.com/quotes/quolgom.shtml>
11. Page 195, *invented a “luck statistic”*: see the discussion in the article “Better to Be Lucky Than Good? Sometimes Its True” by M. Tracy, published in the *New York Times* on December 18, 2015. Available at: <https://www.nytimes.com/2015/12/19/sports/ncaabasketball/better-to-be-lucky-than-good-sometimes-its-true.html>
12. Page 196, *told the journalist Thomas McKelvey Cleaver*: See the article available at: http://philippine-defenders.lib.wv.us/pdf/bios/gillett_bio.pdf

13. Page 198, *used this phrase in my own improvisational comedy player profile*: available at: <http://probability.ca/jeff/nonwork/profile.html>

14. Page 198, *musicians from B.B. King and Ringo Starr to Jewel and Shania Twain*: See e.g. the list at <http://www.therichest.com/rich-list/poorest-list/10-rags-to-riches-millionaire-musicians/\hskip1em\relaxandmanyothers,too>.

15. Page 198, *as the New York Times recently put it*: in the article “Youll Never Be Famous – And Thats O.K.” by E.E. Smith, published in the *New York Times* on September 4, 2017; available at: <https://www.nytimes.com/2017/09/04/opinion/middlemarch-college-fame.html>

16. Page 201, *uttered by Marshall McLuhan*: Quoted on page 367 of the 2005 book *Paradigms Lost: Learning from Environmental Mistakes, Mishaps and Misdeeds* by D.A. Vallero. See also <https://www.brainyquote.com/quotes/quotes/m/marshallmc100969.html> and the discussion at <http://www.evancarmichael.com/library/josephine-gross/We-Are-All-Stewards-on-Spaceship-Earth.html>

Chapter 19: Justice Luck (p. 203)

1. Page 203, *two men entered an Irish pub*: See e.g. the account in the article “Armed men accused of holding up a Baltimore County bar where cops were celebrating an officer’s retirement” by J. Anderson, published in *The Baltimore Sun* on August 30, 2017, available at: <http://www.baltimoresun.com/news/maryland/crime/bs-md-co-retirement-party-robbery-20170830-story.html> Or the related accounts at <http://www.wbaltv.com/article/armed-suspects-rob-pub-full-of-police-officers-attending-party/12149896> and <http://wreg.com/2017/09/01/men-accused-of-trying-to-hold-up-bar-during-police-retirement-party/>

2. Page 204, *they scaled the east fence*: See e.g. the accounts at <https://www.theguardian.com/world/2017/oct/05/canada-prison-escapees-caught-escape-room> and <http://www.cbc.ca/news/canada/edmonton/edmonton-institution-women-prisoners-caught-1.4318566> and <https://globalnews.ca/news/3782025/edmonton-police-searching-for-2-escaped-prisoners/> as well as the police warning displayed at <http://www.ctvnews.ca/canada/police-issue-warning-after-two-women-escape-from-prison-1.3617229>

3. Page 207, *the Supreme Court of California agreed*: See their decision in full at: https://scholar.google.com/scholar_case?case=2393563144534950884

4. Page 208, *the remarkable case of Sally Clark*: For more discussion of this case, see my article “Probability, Justice, and the Risk of Wrongful Conviction”, published in June 2015 in *The Mathematics Enthusiast* **12**, 11–18, available at: <http://probability.ca/jeff/ftpdir/probjustice.pdf>

5. Page 209, *it has been estimated*: See e.g. the article “Multiple sudden infant deaths – coincidence or beyond coincidence?”, by Ray Hill, published in 2004 in the journal *Pediatric and Perinatal Epidemiology* **18**, pp. 320–326.

6. Page 209, *Royal Statistical Society noted*: see their news release of October 23, 2001, entitled “Royal Statistical Society concerned by issues raised in Sally Clark case”, available at: <http://www.rss.org.uk/Images/PDF/influencing-change/2017/SallyClarkRSSstatement2001.pdf>

7. Page 210, *a scholarly article about SIDS' strong genetic linkage*: A. Steinschneider, Prolonged apnea and the sudden infant death syndrome: clinical and laboratory observations. *Pediatrics* **50(4)** (1972), 646–654.

8. Page 210, *She was convicted in 1995 of five murders*: See e.g. the article “Mother Guilty in the Killings of Five Babies” by G. Judson, published on April 22, 1995 in the *New York Times*.

9. Page 211, *a news story broke*: See e.g. <https://www.thestar.com/news/canada/2017/06/01/elizabeth-wettlaufer-woodstock-nurse-guilty-murder.html> and later <http://www.cbc.ca/news2/interactives/sh/TBk79oWhpi/elizabeth-wettlaufer-nurse-senior-deaths/>

10. Page 211, *He reported that*: See e.g. the summary in the article “On the (ab)use of statistics in the legal case against the nurse Lucia de B.”, by R. Meester, M. Collins, R. Gill, and M. van Lambalgen, published in 2007 in the journal *Law, Probability and Risk*. Available at: arxiv.org/pdf/math/0607340.pdf

11. Page 212, *Two patients were found to have elevated levels*: A baby girl who died was found to have excess digoxin levels, and a baby boy’s coma may have been caused by an overdose of chloral hydrate; see e.g. the discussion at <http://www.luciadeb.nl/english/summary.html>.

12. Page 212, *she had previous worked*: See e.g. the article “Court to Rule on Dutch Nurse Accused in 13 Deaths” by M. Simons, published in the *New York Times* on Oct. 8, 2002. Available at: <http://www.nytimes.com/2002/10/08/world/court-to-rule-on-dutch-nurse-accused-in-13-deaths.html>

13. Page 212, *had supposedly stolen two books from a library*: See e.g. the article “Conviction for patients’ deaths does not add up” by B. Goldacre, published in *The Guardian* on April 10, 2010. Available at: <https://www.theguardian.com/commentisfree/2010/apr/10/bad-science-dutch-nurse-case>

14. Page 213, *various statisticians started to voice these objections*: e.g. the Meester et al. article cited above wrote that “the data . . . is used twice: first to identify the suspect, and after that again in the computations of Elffers’ probabilities”. They made numerous “adjustments”, and eventually increased the p-value from “1 in 342 million” to 0.022 (i.e. 1 chance in 45), a p-value which is surely too large to convict.

15. Page 213, *Lucia de Berk received an apology*: See e.g. the article “Apology for nurse jailed for murdering seven patients”, Associated Press, April 14, 2010. Available at: <http://www.independent.co.uk/news/world/europe/apology-for-nurse-jailed-for-murdering-seven-patients-1944577.html>

Chapter 20: Astrological Luck (p. 214)

1. Page 214, *According to one survey*: The Wellcome Trust Monitor Survey, in Britain, discussed at: <http://theconversation.com/some-people-think-astrology-is-a-science-heres-why-28642>

2. Page 214, *astrological system based on twelve-year cycles*: See e.g. the description at <https://www.chinahighlights.com/travelguide/chinese-zodiac/> and many other sources.

3. Page 214, *As one observer put it*: S. Hseuh, in a TED talk in February 2016; see the discussion

and video at https://www.ted.com/talks/shaolan_the_chinese_zodiac_explained.

4. Page 214, *ended by saying “Scorpios, Capricorns and Geminis preferred”*: see the article “When Young Chinese Ask, Whats Your Sign? They Dont Mean Dragon or Rat”, by A. Qin, published in the *New York Times* on July 22, 2017. Available at: <https://www.nytimes.com/2017/07/22/world/asia/china-western-astrology.html>

5. Page 215, *a recent study which suggests*: see the article “What makes some people think astrology is scientific”, by N. Allum, available at: <http://scx.sagepub.com/content/33/3/341.abstract>, which found a +0.22 correlation between subjects’ belief in astrology, and their rating of the importance of “obedience” in children.

6. Page 216, *the gravitational force from planets is about as insignificant*: For example, the closest Mars ever gets to Earth is about 55 million kilometers, and Mars weighs about 6.4×10^{23} kilograms. So, a 50-kilogram doctor standing 0.5 meters from the mother exerts a gravitational force which is $(6.4 \times 10^{23}/50) / (55 \times 10^9/0.5)^2 \doteq 0.99$ times as large, i.e. about the same.

7. Page 216, *astrologers are quick to point out*: See e.g. the lengthy rebuttal article “Why it is no longer acceptable to say astrology is rubbish on a scientific basis” available at: <http://www.astrology.co.uk/tests/basisofastrology.htm>

8. Page 216, *the month in which babies are born can have an impact on what diseases they will contract*: See e.g. the article “Birth Month Affects Lifetime Disease Risk: A Phenome-Wide Method”, by M.R. Boland et al., published in the *Journal of the American Medical Informatics Association* in July 2015, available at: <http://jamia.oxfordjournals.org/content/early/2015/06/01/jamia.ocv046>

9. Page 217, *individuals are slightly more likely to marry people at the same birth rank as themselves*: See e.g. the article “Birth order effects in the formation of long-term relationships”, by J.K. Hartshorne et al., published in 2009 in the *Journal of Individual Psychology* **65(2)**, and the related article “How Birth Order Affects Your Personality” in the *Scientific American* issue of January 1, 2010, available at: <http://www.scientificamerican.com/article/ruled-by-birth-order/>

10. Page 217, *my horoscope for today in my local newspaper: Toronto Star’s horoscope for Libra for July 27, 2016*. Available at: <https://www.thestar.com/diversions/horoscope/2016/07/27/horoscope-for-wednesday-july-27-2016.html>

11. Page 218, *an amusing story about horoscope-writing*: Described on pages 61–62 of the book *Flim Flam*, by James Randi, Prometheus Books, New York City, 1982. The horoscopes were written for the Montreal publication *Midnight*, c. 1945, under the pen name “Zo-ran” (short for “Zodiacs by Randi”).

12. Page 218, *One important experiment along these lines*: “A double-blind test of astrology”, by Shawn Carlson, published in *Nature*, volume **318**, December 5, 1985, pp. 419–425. We focus here on “Part 2” of his experiment. See also the related discussion at: http://skeptico.blogspot.com/skeptico/2005/02/what_do_you_mea.html

13. Page 219, *The astrologers’ prediction accuracies*: Specifically, they ranked all three profiles in terms of how well they corresponded to the subject, and the correct profile was ranked #1 at rate 0.34 ± 0.044 , #2 at rate 0.40 ± 0.044 , and #3 at rate 0.25 ± 0.044 .

14. Page 219, *Another study looked at the distribution*: J.D. McGervey, “A statistical test of sunsign astrology”, *The Skeptical Enquirer*, Summer 1977. Described on pages 45–46 of his book *Probabilities in Everyday Life*, Nelson-Hall, Chicago, 1986.

15. Page 220, *all quite close to their average*: Indeed, this distribution passes the “chi-squared test” with p-value 0.0901, indicating that it is consistent with the star signs being completely random.

16. Page 220, *some astrology web sites claim that Capricorns*: At <http://www.more.com/money/career-advice/best-career-your-zodiac-sign>, under Capricorn it says “Best jobs: ... and anything scientific”, and does not otherwise mention science. At <http://www.excite.com/education/blog/best-careers-according-to-your-zodiac-sign>, it lists science under Capricorn, Aquarius, and Scorpio. And at <https://exemplore.com/astrology/Astrology-Best-Professions-for-Each-Zodiac-Sign>, it does not mention scientist at all.

17. Page 220, *another study looked at the effect*: “Astrological Birth Signs in Suicide: Hypothesis or speculation?”, by E. Salib, published in 2003 in the journal *Medicine, Science and the Law* **43(2)**, pages 111–114. Available at: <http://www.ncbi.nlm.nih.gov.myaccess.library.utoronto.ca/pubmed/12741653>

18. Page 221, *well within what would be expected by random chance alone*: This distribution passes the “chi-squared test” with $p = 0.3063$.

19. Page 221, *One in 1974*: “Astrological Indicators of Personality”, by B.I. Silverman and M. Whitmer, published in *The Journal of Psychology* **87**, pp. 89–95.

20. Page 221, *Another study in 2008*: “Science Versus the Stars: A Double-Blind Test of the Validity of the NEO Five-Factor Inventory and Computer-Generated Astrological Natal Charts”, by A.J. Wyman and S. Vyse, published in 2008 in *The Journal of General Psychology* **135(3)**, pp. 287–300.

21. Page 221, *A 1980 study*: “Occupation and Astrology or Season of Birth: A Myth?”, by G.A. Tyson, published in 1980 in *The Journal of Social Psychology* **110**, pp. 73–78.

22. Page 222, *The one exception was female medical students*: For these students, they found a chi-squared value of 21.93 with 11 degrees of freedom, corresponding to a p-value of 0.0249.

23. Page 222, *Another study in 1996*: “Astrological Signs as Determinants of Extroversion and Emotionality: An Empirical Study”, by D. Clarke, T. Gabriels, and J. Barnes, published in 1996 in *The Journal of Psychology* **130(2)**, pp. 131–140. For the one comparison of positive sun and moon signs versus negative for both, they found a t-test value of 2.21 with 70 degrees of freedom, corresponding to a p-value of 0.015.

24. Page 222, *a large-scale study in 2006*: “The relationship between date of birth and individual differences in personality and general intelligence: A large-scale study”, by P. Hartmann, M. Reuter, and H. Nyborg, published in 2006 in *Personality and Individual Differences* **40**, pp. 1349–1362.

25. Page 223, *one astrologer wrote that*: “Empirical Astrology: Why it is no longer acceptable to say astrology is rubbish on a scientific basis”. Available at: <http://www.astrology.co.uk/tests/basisofastrology.htm>

26. Page 224, *Some of these objections are passionately argued*: See e.g. “Empirical Astrology” (above), and also the article “U-Turn in Carlson’s Astrology Test” by R. Currey, published in July 2011 in the astrology journal *Correlation* **27(2)**, and available at: <http://www.astrology-research.com/researchlibrary/>

27. Page 224, *since terminated*: see the blog posting at: <http://web.randi.org/home/jref-status>

28. Page 224, *Many people tried to claim this prize*: See e.g. the article “Fakers and Innocents: The One Million Dollar Challenge and Those Who Try for It” by J. Randi, published in the July/August 2005 issue of *Skeptical Inquirer* **29.4**, available at: http://www.csicop.org/show/fakers_and_innocents_the_one_million_dollar_challenge_and_those_who_try_for

29. Page 224, *no one ever received a single penny*: See e.g. the discussion in the article “The Unbelievable Skepticism of the Amazing Randi” by A. Higginbotham, published on November 7, 2014 in *New York Times Magazine*, available at: <https://www.nytimes.com/2014/11/09/magazine/the-unbelievable-skepticism-of-the-amazing-randi.html>

30. Page 224, *one astrologer complained that the test was unfair*: see the article “Astrology & James Randi”, available at: <http://www.astrologer.com/tests/randitest.htm>

31. Page 225, *a 2014 article about astrology which listed the birthdays and star signs of all members of the U.S. Congress*: “Can the Zodiac Explain Why Washington, DC, Is So Messed Up?” in *Mother Jones* magazine, July/August 2014, available at: <http://www.motherjones.com/politics/2014/08/zodiac-astrology-politicians-birthdays-elections>

32. Page 225, *Aries are best suited to being a politician*: My quick web search found the following assertions (and no others) about the best zodiac signs for politicians. “Careers suited to Aries: Politician, ...” at: <http://www.excite.com/education/blog/best-careers-according-to-your-zodiac-sign>; “Aries ... Best jobs: ... politics ...” at: <http://www.more.com/money/career-advice/best-career-your-zodiac-sign>; “Politics: Aries, Gemini, Leo, Sagittarius” at: <https://exemplore.com/astrology/Astrology-Best-Professions-for-Each-Zodiac-Sign>; “What Career Should You Have According To Your Zodiac Sign? ... Aries ... Government and politics” at: <http://www.sun-gazing.com/career-according-zodiac-sign/>

33. Page 226, *Pisces are best suited to being nurses*: My quick web search found the following assertions (and no others) about the best zodiac signs for nurses. “The 4 Best Careers For Your Zodiac Sign ... Cancer: ... Nursing” at: <http://www.jobs.net/Article/CB-120-Talent-Network-Hospitality-The-4-Best-Careers-For-Your-Zodiac-Sign>; “Pisces ... Best jobs: ... nurse ...” at: <http://www.more.com/money/career-advice/best-career-your-zodiac-sign>; “Career suited to Taurus: ... Nurse” at: <http://www.excite.com/education/blog/best-careers-according-to-your-zodiac-sign>; “the intuitive qualities that are supposedly inherent to Pisces make us good for careers that involve compassion, like nursing ...” at: <http://www.bustle.com/articles/90647-what-job-should-you-have-based-on-your-zodiac-sign-this-infographic-might-tell-you>; “Aries ... Many areas of medicine can be a great choice for you ... nurse or surgeon ... Taurus ... you’ll feel happy working as nurse ... Gemini ... You can enjoy your busy shifts as a doctor or a nurse. Pisces ... You’re a perfect candidate for jobs in healthcare. You can become a registered nurse, physician therapist or personal care aide. Any job that lets you connect with your patients is a good fit for you. Cancer ... comfortable in jobs working

directly with patients ... or a nursing assistant” at: <https://www.aimseducation.edu/blog/zodiac-sign-healthcare-career-choice/> ; “check out these sun signs which would best suit nursing: TAURUS, CANCER, LEO, VIRGO, LIBRA, SCORPIO, CAPRICORN, AQUARIUS, PISCES” at: <http://www.findyourfate.com/career/nursing.html> ; “Pisces: ... Nurse ...” at: <http://www.sun-gazing.com/career-according-zodiac-sign/>.

34. Page 226, *I obtained, through a contact*: I am grateful to Pauline Zvejnieks and Michael Hamilton-Jones for providing me with this data.

35. Page 228, *counts of the total numbers of all births*: Data from Statistics Canada giving the number of live births in Ontario on each date in the year 2012 (rounded to the nearest multiple of five).

36. Page 230, *they are indeed statistically significant*: If I make a 2×12 table of the two vectors of counts, and then use R’s `chisq.test()` function to perform a chi-squared test of independence, it gives a p-value of 5.3×10^{-14} , which is extremely small and thus very highly significant.

37. Page 230, *one entrepreneur examined the Chinese astrology belief*: see the TED talk by S. Hseuh cited earlier.

38. Page 230, *virtually every effort to scientifically confirm astrological predictions has failed*: See e.g. the list compiled in the article “Astrology Fails the Test of Science” by M. Mayberry, published in September 1990 in *Truth Magazine*, available at: <http://www.truthmagazine.com/archives/volume34/GOT034263.html>

39. Page 230, *spent many years*: See e.g. the detailed discussion in Chapter 10 of the book *Astrology: Science or Superstition?* by H.J. Eysenck and D.K.B. Nias, Maurice Temple Smith, London, 1982.

40. Page 232, *many scientists criticised Gauquelin’s methodology*: See e.g. the book *The Mars Effect* by C. Benski et al., published in 1996 by Prometheus Books, or the summary available at: <https://www.amazon.com/Mars-Effect-Claude-Benski/dp/0879759887>

41. Page 232, *some skeptics published an article claiming the Mars Effect did not hold*: “Results of the U.S. Test of the ‘Mars Effect’ are Negative, by P. Kurtz, M. Zelen, and G.O. Abell, published in Winter 1979/80 issue of the *Skeptical Inquirer* **4(2)**, 19-26.

42. Page 232, *accused them of covering up some evidence*: See the article “sSTARBABY” by D. Rawlins, published in October 1981 in *FATE Magazine* **34**, 67–98, available at: <http://cura.free.fr/xv/14starbb.html> See also the response to these allegations by J.J. Lippard at: <https://www.discord.org/~lippard/jjl-on-crybaby.txt> and in his longer document “Skeptics and the Mars Effect: A Chronology of Events and Publications”, available from <http://www.planetos.info/marchron.html> or at <https://www.discord.org/~lippard/mars-effect-chron.rtf>

43. Page 232, *boldly declared*: See e.g. the quote at: <http://www.quotes.net/mquote/818023> or the excerpt at: <https://www.youtube.com/watch?v=vFRTgr7MfWw>

44. Page 233, *one magazine generously provides: SoFeminine Magazine*. Available at: <http://www.sofeminine.co.uk/> The numerology reading for my own birth date of October 13, 1967 can be found at: <http://www.sofeminine.co.uk/astro/numerologie/07metiers/07metiers1>.

asp?j=13&m=10&a=1967&Submit=Enter

45. Page 234, *one astrologer found*: see the article “Zodiac Sign Found Most Among U.S. Presidents” by C. Lane, posted on March 18, 2016 at the *Astrology Library*, available at: <https://astrolibrary.org/zodiac-sign-us-presidents/>

Chapter 21: Mind Over Matter? (p. 235)

1. Page 235, *They can get fooled by visual tricks*: See e.g. the discussion and video at: <https://www.insidescience.org/video/how-do-optical-illusions-work>

2. Page 236, *Randi cleverly created and broadcast a video*: Available at: <https://www.youtube.com/watch?v=q7BQKu0YP8Y>

3. Page 237, *his “Project Alpha”*: see: <http://www.skeptdic.com/projectalpha.html>

4. Page 237, *Classic “stock spiel” phrases include*: See e.g. “The Acceptability of ‘Fake’ versus ‘Bona Fide’ Personality Test Interpretations”, by N.D. Sundberg. Published in 1955 in the *Journal of Abnormal and Social Psychology* **50**, 145–157; “The P.T. Barnum Effect” by C.R. Snyder and R.J. Shenkel. Published in 1975 in *Psychology Today* **8**, 52–54; and “Cold Reading: How to Convince Strangers that You Know All About Them” by R. Hyman, published in 1981 in the book *Paranormal Borderlands of Science*, Prometheus Books, Buffalo, New York, pp. 79–96.

5. Page 238, *A classic experiment by psychologist Bertram Forer back in 1949*: “The Fallacy of Personal Validation: A Classroom Demonstration of Gullibility” by B.R. Forer. Published in 1949 in the *Journal of Abnormal and Social Psychology* **44**, 118–123. Available at: http://apsychoserver.psych.arizona.edu/JJBAREprints/PSYC621/Forer_Thefallacyofpersonalvalidation_1949.pdf

6. Page 239, *one spoof image*: available at: <http://starecat.com/you-will-continue-to-interpret-vague-statements-as-uniquely-meaningful-chinese-fortune-cookie-quote/>

7. Page 239, *he published a paper claiming*: “Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect”, by D.J. Bem. Published in 2011 in the *Journal of Personality and Social Psychology* **100**, 407–425. Available from <http://dbem.ws/>

8. Page 239, *Bem eventually found*: in “Experiment 1” of his paper.

9. Page 240, *an accompanying editorial*: Editorial comment, by C.M. Judd and B. Gawronski, published in 2011 in the *Journal of Personality and Social Psychology* **100**(3), p. 406. Available at: <http://psycnet.apa.org/journals/psp/100/3/406/>

10. Page 240, *Newton’s laws of motion*: See e.g. <https://www.grc.nasa.gov/www/k-12/airplane/newton.html> or any introductory physics textbook

11. Page 240, *deterministic*: As written at <http://order.ph.utexas.edu/chaos/determinism.html>, “Determinism is the philosophical belief that every event or action is the inevitable result of preceding events and actions. Thus, in principle at least, every event or action can be completely predicted in advance, or in retrospect.”

12. Page 240, *make it possible to travel backwards in time*: See e.g. the discussion in the article “Time Travel: Theories, Paradoxes & Possibilities” by E. Howell, published on June 21, 2013 on

space.com, available at: <https://www.space.com/21675-time-travel.html> and many other places

13. Page 241, *Locations of particles are no longer absolute*: See e.g. the posting “The wave function as a probability” at <http://www.physicspages.com/2011/01/09/the-wave-function-as-a-probability/> or any introductory quantum mechanics textbook.

14. Page 241, *which then allows for unusual effects like “quantum tunneling”*: See e.g. the article “Quantum tunneling time” by P.C.W. Davies, published in 2005 in the *American Journal of Physics* **73**, 23, or any introductory quantum mechanics textbook.

15. Page 241, *Particles can become “entangled”*: See e.g. the article “Sorry, Einstein - Physicists Just Reinforced The Reality of Quantum Weirdness in The Universe” posted on *Science Alert* on February 8, 2017, available at: <https://www.sciencealert.com/sorry-einstein-physicists-just-reinforced-the-reality-of-quantum-weirdness-in-the-universe> or the book *Entanglement* by A. Aczel (Four Walls Eight Windows publishers, New York, 2001), or many other sources.

16. Page 241, *this just might perhaps lead to the possibility of “retrocausality”*: See e.g. the article “Physicists provide support for retrocausal quantum theory, in which the future influences the past” by L. Zyga, posted on July 5, 2017 at: <https://phys.org/news/2017-07-physicists-retrocausal-quantum-theory-future.html> And the article “Is a time symmetric interpretation of quantum theory possible without retrocausality?” by M.S. Leifer and M.F. Pusey, published in July 2017 in the *Proceedings of the Royal Society of London A* **473(2202)**, available from: <http://rspa.royalsocietypublishing.org/content/473/2202/20160607> And the article “This Quantum Theory Predicts That The Future Might Be Influencing The Past” by M. McRae, published on July 6, 2017 in *Science Alert*, available at: <https://www.sciencealert.com/this-quantum-theory-predicts-the-future-might-influence-the-past> And the extensive discussion in the article “A Very Common Fallacy in Quantum Mechanics: Superposition, Delayed Choice, Quantum Erasers, Retrocausality, and All That” by D. Ellerman, posted in 2011 to: <https://arxiv.org/abs/1112.4522> And many other references too.

17. Page 241, *quantum mechanics may be the key to understanding the mystery of human consciousness*: See e.g. the popular article “Can Quantum Physics Explain Consciousness?” by J. Ouellette, published on November 7, 2016 in *The Atlantic* magazine, available at: <https://www.theatlantic.com/science/archive/2016/11/quantum-brain/506768/>

18. Page 242, *a Swedish mental health researcher attempted to replicate Bem’s experiment*: The researcher is Gergö Hadlaczky; see his web page at: <http://ki.se/en/people/gerhad> His experiments are reported in the paper “Precognitive Habituation: An attempt to replicate previous results”, by G. Hadlaczky, available at: https://www.researchgate.net/publication/223467682_Precognitive_habituation_An_attempt_to_replicate_previous_results

19. Page 242, *tried to replicate Bem’s other two experiments*: “Correcting the Past: Failures to Replicate Psi” by J. Galak, R.A. LeBoeuf, L.D. Nelson, and J.P. Simmons, published in 2012 in the *Journal of Personality and Social Psychology* **103(6)**, 933–948. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2001721

20. Page 242, *also tried and failed to replicate Bem’s effects*: “Failing the Future: Three Unsuccessful Attempts to Replicate Bem’s ‘Retroactive Facilitation of Recall’ Effect” by S.J. Ritchie,

R. Wiseman, and C.C. French. Published in 2012 in *PLoS ONE* **7(3)**: e33423. Available at: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0033423>

21. Page 242, *refused to publish this replication attempt*: see “Journal rejects studies contradicting precognition” by P. Aldhous. Published in 2011 in the *New Scientist Daily News*. Available at: <https://www.newscientist.com/article/dn20447-journal-rejects-studies-contradicting-precognition> See also <https://thepsychologist.bps.org.uk/volume-25/edition-5/replication-replication-replication>

22. Page 243, *many psychologists have been calling for*: See e.g. “Interesting results: Can they be replicated?”, by L. Winerman. Published in 2013 in the *Monitor on Psychology* **44(2)**. Available at: <http://www.apa.org/monitor/2013/02/results.aspx>

23. Page 243, *in a follow-up paper*: “Feeling the Future: A Meta-analysis of 90 Experiments on the Anomalous Anticipation of Random Future Events” by D.J. Bem, P. Tressoldi, T. Rabeyron, and M. Duggan. Unpublished 2014 manuscript available from: <http://dbem.ws/>

24. Page 243, *the methodology for this meta-analysis has also been criticised*: See e.g. the review “Bem is Back: A Skeptic’s Review of a Meta-Analysis on Psi” by E.J. Wagenmakers, posted in 2014 at: <http://osc.centerforopenscience.org/2014/06/25/a-skeptics-review/>

25. Page 243, *the International Affective Picture System, or IAPS*: <http://csea.phhp.ufl.edu/>

26. Page 243, *explicitly prohibits placing their images “on the internet in any form”*: as specified at: <http://csea.phhp.ufl.edu/media/iapsmessage.html>

27. Page 244, *they attributed it to*: see the Associated Press article “Twins give birth minutes apart in same hospital” released on December 22, 2011, available at: <https://www.today.com/news/twins-give-birth-minutes-apart-same-hospital-wbna45769823>

28. Page 244, *My own neighbour wrote an entertaining book for young adults: Face-Off*, by M. Betcherman, 2014; described at <https://penguinrandomhouse.ca/books/392207/> and available at e.g. <https://www.amazon.com/Face-Off-Michael-Betcherman/dp/1500314188/>

29. Page 244, *there is also that old joke*: This appeared (though about brothers, not twins) in the book *Without Feathers* by W. Allen, Ballantine Books, 1986, described at: <https://www.penguinrandomhouse.com/books/2410/without-feathers-by-woody-allen/9780345336972/>

30. Page 245, *will have some striking similarities just by dumb luck*: See e.g. the article “Can twins sense each other?” by K. Kirkpatrick at <https://science.howstuffworks.com/life/genetic/can-twins-sense-each-other.htm> and the related posting “Is ‘twin communication’ a real thing?” at http://bodyodd.nbcnews.com/_news/2011/12/28/9750598-is-twin-communication-a-real-thing

31. Page 245, *Two psychologists conducted an experiment: “ESP and Thought Concordance in Twins: a Method of Comparison”*, by S.J. Blackmore and F. Chamberlain, published in April 1993 in the *Journal of the Society for Psychological Research* **59(831)**, 89–96.

32. Page 246, *As Robin Williams once put it*: see <http://www.tickld.com/x/fbk/30-priceless-quotes-said-by-robin-williams-truly-a-legend/p-26>

33. Page 246, *as attributed to comedian Steven Wright*: See e.g. <https://www.brainyquote.com/quotes/quotes/s/stevenwrig578926.html>

34. Page 246, *who claimed that he could kill goats*: See e.g. the discussion at: http://neweartharmy.com/Fact_or_Fiction.html

35. Page 246, *under various names*: Related Army-funded programs on remote viewing before Stargate apparently included SCANATE, SRI, ACSI, SED, GONDOLA WISH, GRILL FLAME, INSCOM, ICLP, SUN STREAK, and SAIC; see e.g. the history at <https://fas.org/irp/program/collect/stargate.htm>.

36. Page 246, *commissioned a report*: The report is available at: <http://www.lfr.org/lfr/csl/library/airreport.pdf> or <https://www.cia.gov/library/readingroom/document/cia-rdp96-00791r000200180006-4>

37. Page 247, *presenting me with a prestigious academic prize*: see the official announcement archived at <http://probability.ca/jeff/copssaward> and a photo of Utts presenting me the award at <http://probability.ca/jeff/images/copssaward.jpg>

38. Page 247, *she was born on a Saturday*: See her answer at the top of page 20 of her interview with A. Rossman, published in 2014 in the *Journal of Statistics Education* **22(2)**, available at: <http://ww2.amstat.org/publications/jse/v22n2/rossmanint.pdf>

39. Page 247, *she remarked in an article*: see page 1379 of “Appreciating Statistics” by J. Utts, published in 2016 in the *Journal of the American Statistical Association* **111**.

40. Page 248, *found other problems with the SAIC experiments*: See e.g. “Experiment One of the SAIC Remote Viewing Program: A critical reevaluation”, by R. Wiseman and J. Milton, published in 1999 in the *Journal of Parapsychology* **62(4)**, 297-308. Available at: <http://www.richardwiseman.com/resources/SAICcrit.pdf>

41. Page 248, *The Princeton Engineering Anomalies Research (PEAR)*: see <https://web.archive.org/web/20180329071828/www.princeton.edu/~pear>

42. Page 248, *They admitted that*: see: <https://web.archive.org/web/20171206203522/http://www.princeton.edu/~pear/experiments.html>

43. Page 248, *one scientist examined their results, and claimed*: see “Psychic powers: What are the odds?” by J. McCrone, published in 1994 in the journal *The New Scientist*, as quoted at: <http://skepdic.com/pear.html>

44. Page 248, *Another scientist asserted*: see “The PEAR Proposition: Fact or Fallacy?” by S. Jeffers, published in 2006 in the *Skeptical Inquirer* **30.3**. Available at: http://www.csicop.org/si/show/pear_proposition_fact_or_fallacy

45. Page 248, *A separate analysis indicated*: see the book *The Search for Psychic Power: ESP and Parapsychology Revisited* by C.E.M. Hansel, published in 1989 by Prometheus Books, as quoted at: <http://skepdic.com/pear.html>

46. Page 249, *a later combined attempt by three different laboratories*: see “Mind/Machine Interaction Consortium: PortREG Replication Experiments” by R. Jahn et al., published in 2000 in the *Journal of Scientific Exploration* **14(4)**, 499–555. Available at: <https://web.archive.org/>

web/20171130193844/https://www.princeton.edu/~pear/pdfs/2000-mmi-consortium-portreg-replication.pdf

47. Page 249, *these experiments were widely criticised*: See e.g. Critique of the PEAR Remote-Viewing Experiments” by G.P. Hansen, J. Utts, and B. Markwick, published in 1992 in the *Journal of Parapsychology* **56(2)**, 97–113. Available at: <http://www.tricksterbook.com/ArticlesOnline/PEARCritique.htm>

48. Page 249, *media reports referred, fairly or not*; see “Report: Princeton to close ESP lab” published in *USA Today* on February 11, 2007. Available at: http://usatoday30.usatoday.com/news/education/2007-02-11-princeton-esp_x.htm

49. Page 249, *Ministry of Defence (MoD) undertook a study*: Archived online at: <http://webarchive.nationalarchives.gov.uk/20121026065214/http://www.mod.uk/DefenceInternet/FreedomOfInformation/DisclosureLog/SearchDisclosureLog/RemoteViewing.htm> See e.g. the media reports at http://news.bbc.co.uk/2/hi/uk_news/6388575.stm and <http://www.standard.co.uk/news/defence-chiefs-spent-18000-on-a-mystic-experiment-to-find-bin-ladens-lair-7085768.html>

Chapter 22: Lord of the Luck (p. 250)

1. Page 250, *over 80% of the world’s people are religious*: e.g. the Pew Research Center study available at <http://www.pewforum.org/2012/12/18/global-religious-landscape-exec/> estimates that in 2010, 84% of the world’s population had some religious affiliation.

2. Page 251, *Linus once wisely noted*: See e.g. the cached image at: <https://s-media-cache-ak0.pinimg.com/736x/f8/30/75/f83075f25f6845ba9a4de1eb3687b1c8--snoopy-charlie-snoopy-peanuts.jpg>

3. Page 253, *the bible seems to imply*: See e.g. the discussion at <https://answersingenesis.org/age-of-the-earth/how-old-is-the-earth/>

4. Page 253, *judge character declares*: quoted at e.g. https://www.rottentomatoes.com/m/thirteen_conversations_about_one_thing/reviews/?page=2&type=user

5. Page 253, *As a physicist character in the movie September once said*: the character Lloyd, played by Jack Warden; written and directed by Woody Allen; see the scene at: <https://www.youtube.com/watch?v=kW-drCJhqSE>

6. Page 255, *argued in a video*: The video is available at e.g. <https://www.youtube.com/watch?v=nfv-Qn1M58I>

7. Page 256, *contain seeds*: See e.g. the discussion at <http://treesandshrubs.about.com/od/fruitsnuts/f/Do-Bananas-Have-Seeds.htm>

8. Page 257, *he replied*: see <https://www.youtube.com/watch?v=-suvkwNYSQo>

9. Page 258, *announcing the wrong 2015 Miss America winner*: See e.g. the article “Steve Harvey announces wrong Miss Universe winner” by L. Greene, published on December 21, 2015 in the *New York Daily News*, available at: <http://www.nydailynews.com/entertainment/steve-harvey-announces-wrong-universe-winner-article-1.2472285> Or the actual video available

at e.g. <https://www.youtube.com/watch?v=3DKDaSd-4nY>

10. Page 258, *boldly stated in an interview*: see <https://www.youtube.com/watch?v=VWJ9y1ZkS2s>

11. Page 258, *there are nearly half a billion atheists around the world*: Based on a survey published in the *Oxford handbook of Atheism*, summarised with the phrase “there are approximately 450-500 million non-believers in God worldwide” in the article “How Many Atheists Are There?” by P. Zuckerman, posted in October 2015 at: <https://www.psychologytoday.com/blog/the-secular-life/201510/how-many-atheists-are-there> See also Ariela Keysar and Juhem Navarro-Rivera, “A World of Atheism: Global Demographics,” in *The Oxford Handbook of Atheism*, edited by Stephen Bullivant and Michael Ruse (Oxford: Oxford University Press, 2013): 553–586.

12. Page 258, *only 7% of members of the U.S. National Academy of Sciences*: see the discussion at: <http://www.nature.com/nature/journal/v394/n6691/full/394313a0.html>

13. Page 258, *64% of Fellows of the U.K. Royal Society*: see: <https://link.springer.com/article/10.1186/1936-6434-6-33>

14. Page 258, *It also includes lots of celebrities*: See e.g. the list at <http://www.thinkatheist.com/profiles/blogs/27-celebrities-you-probably> and many others.

15. Page 259, *has been widely documented*: See e.g. <http://www.bbc.com/news/world-europe-26044852> and many other sources.

16. Page 259, *it was announced that the third-highest Vatican cardinal George Pell*: See e.g. <https://www.theguardian.com/australia-news/2017/jun/29/george-pell-takes-leave-from-vatican-to-fight-sex-abuse-charges-in-australia>

17. Page 259, *ended an estimated half-million lives*: See e.g. the summary of estimates available at: <http://necrometrics.com/20c300k.htm#India>

18. Page 260, *took more than 3,500 lives*: See e.g. <http://cain.ulst.ac.uk/sutton/tables/Status.html>

19. Page 260, *was a parishioner at his local Catholic church*: see <http://nypost.com/2012/12/17/some-victims-funerals-will-be-held-at-gunmans-church/>

20. Page 260, *7% of university students said they would kill if God told them to*: In a sample of 1,208 university psychology students, 7% answered yes to the statement “If God told me to kill I would do it in His name”; see the article “I Would Kill in God’s Name: Role of Sex, Weekly Church Attendance, Report of a Religious Experience, and Limbic Lability”, by M.A. Persinger, published in 1997 in the journal *Perceptual and Motor Skills*, and also the article “Variables that Predict Affirmative Responses to the Item If God Told Me to Kill I Would Do it in His Name: Implications for Radical Religious Behaviours” by M.A. Persinger, published in 2016 in the *Journal of Socialomics*, available at: <https://www.omicsgroup.org/journals/variables-that-predict-affirmative-responses-to-the-item-if-god-told-meto-kill-i-would-do-it-in-his-name-implications-for-radical-2471-8726-1000166.php?aid=73879>

21. Page 260, *These and other examples*: see also e.g. <http://listverse.com/2010/02/23/10-people-who-give-christianity-a-bad-name/>

22. Page 260, *do not believe in God at all*: e.g. in the interview at <http://www.bild.de/news/bild-english/inglourious-basterd-star-on-angelina-jolie-and-six-kids-9110388.bild.html>, when asked “Do you believe in God?”, Pitt replied, “No, no, no!”. See also <http://www.nydailynews.com/entertainment/gossip/brad-pitt-20-percent-atheist-80-percent-agnostic-article-1.394661> and http://www.celebatheists.com/wiki/Brad_Pitt and http://www.celebatheists.com/wiki/Angelina_Jolie

23. Page 260, *given many millions of dollars to charitable causes*: See e.g. <http://www.mtv.com/news/1499708/bono-brad-pitt-launch-campaign-for-third-world-relief/> and <http://people.com/celebrity/brad-angelina-start-charitable-group/> and <http://www.foxnews.com/story/2008/03/21/angelina-jolie-and-brad-pitt-charity-bravo.html?sPage=fnc/entertainment/celebrity/pitt>

24. Page 260, *Warren Buffett says he does not know if there is a God*: See e.g. the interesting video excerpt at <https://www.youtube.com/watch?v=ZNXOCZm3lk>

25. Page 260, *donating billions of dollars to charities*: See e.g. <https://www.insidephilanthropy.com/wall-street-donors/warren-buffett.html> and <https://www.forbes.com/sites/chasewithorn/2016/07/14/warren-buffett-just-donated-nearly-2-9-billion-to-charity/>

26. Page 260, *non-religious people actually donate more*: see the analysis and discussion and links at <http://www.patheos.com/blogs/friendlyatheist/2013/11/28/are-religious-people-really-more-generous-than-atheists-a-new-study-puts-that-myth-to-rest/> and <http://religiondispatches.org/new-study-three-quarters-of-american-giving-goes-to-religion/>

27. Page 260, *a recent study of over a thousand children in six countries*: “The Negative Association between Religiousness and Children’s Altruism across the World”, by J. Decety et al., published in 2015 in the journal *Current Biology*; available online from [http://www.cell.com/current-biology/abstract/S0960-9822\(15\)01167-7](http://www.cell.com/current-biology/abstract/S0960-9822(15)01167-7). Reported at e.g. <http://www.telegraph.co.uk/news/religion/11979235/Muslims-and-Christians-less-generous-than-atheists-study-finds.html> and <http://www.sciencemag.org/news/2015/11/nonreligious-children-are-more-generous>

28. Page 260, *Tony Perkins is the president*: see <http://www.frc.org/about-frc>

29. Page 260, *a conservative Christian organisation which asserts that*: from <http://www.frc.org/homosexuality>

30. Page 260, *He argued in a 2015 interview*: with conservative rabbi Jonathan Cahn. Hear the interview at: <http://www.rightwingwatch.org/post/jonathan-cahn-hurricane-joaquin-may-hit-dc-as-punishment-for-gay-marriage/> or directly at: <https://soundcloud.com/rightwingwatch/cahn-hurricane-joaquin-may-hit-dc-as-punishment-for-gay-marriage> See also the discussion at e.g. <https://www.dailykos.com/stories/2015/10/5/1428159/-FRC-Tony-Perkins-Jonathan-Cahn-claimed-Joaquin-will-hit-DC-as-Punishment-for-Marriage-Equality> and <https://www.theguardian.com/commentisfree/2016/aug/18/tony-perkins-floods-louisiana-gay-christian-conservative>

31. Page 261, *his own home in Southern Louisiana was destroyed by massive flooding*: See e.g. <http://www.independent.co.uk/news/world/americas/christian-home-destroyed-flood-tony->

perkins-natural-disasters-gods-punishment-homosexuality-a7196786.html and <http://www.bbc.co.uk/newsbeat/article/37116661/us-pastor-who-believes-floods-are-gods-punishment-flees-flooded-home> and <http://deadstate.org/guy-who-says-god-sends-natural-disasters-to-punish-gays-has-his-home-destroyed-in-a-natural-disaster/> and <http://nationalpost.com/news/world/god-is-trying-to-send-us-a-message-pastor-who-believes-god-wants-to-punish-gays-driven-from-home-by-floods> and <http://www.esquire.com/news-politics/news/a47783/tony-perkins-anti-gay-flood/> and his own interview at <https://soundcloud.com/family-research-council/20160816-tony-perkins>

32. Page 261, *Albert Einstein himself once put it*: In his article “Religion and Science”, published in the *New York Times Magazine* on November 9, 1930, pages 1–4, available at: <http://www.sacred-texts.com/aor/einstein/einsci.htm>

33. Page 263, *overwhelming scientific evidence for evolution*: for starters see e.g. http://evolution.berkeley.edu/evolibrary/article/lines_01 and the video at <https://www.youtube.com/watch?v=lIEo05KdPvg>

34. Page 263, *lectured about the billions of galaxies each with billions of stars*: See e.g. the video at https://www.youtube.com/watch?v=5Ex_M-0wSA In fact, Sagan talked about this so often that Johnny Carson satirised him using the phrase “billions and billions”, though apparently Sagan never actually said those words; see his answer to one of the questions in the transcript “Carl Sagan Takes Questions: More From His ‘Wonder and Skepticism’ CSICOP 1994 Keynote”, published in the *Skeptical Inquirer* **29.4** in July/August 2005, available at: http://www.csicop.org/si/show/carl_sagan_takes_questions

35. Page 263, *might even be infinite*: See e.g. the summary article “How many stars are there in the universe?” by F. Cain, available at: <https://www.universetoday.com/102630/how-many-stars-are-there-in-the-universe/>

36. Page 263, *thousands of planets have already been detected*: See e.g. the ongoing exoplanet catalog available at: <http://exoplanet.eu/catalog/>

Chapter 23: Lucky Reflections (p. 264)

1. Page 264, *This tragic error is explained*: See e.g. the clip at: <https://www.youtube.com/watch?v=SzVAyGry2Ic>

2. Page 266, *a recent British movie called The Hippopotamus*: see <http://www.imdb.com/title/tt3758708/>

3. Page 268, *a novel by our old atheist actor friend Stephen Fry*: see <http://www.penguinrandomhouse.com/books/56854/hippopotamus-by-stephen-fry/>

4. Page 268, *a survival rate of only about 14%*: See e.g. the American Cancer Society discussion “Pancreatic Cancer Survival Rates, by Stage”, available at: <https://www.cancer.org/cancer/pancreatic-cancer/detection-diagnosis-staging/survival-rates.html>

5. Page 268, *My mom took her final breath*: see her obituary at: <http://www.legacy.com/obituaries/thestar/obituary.aspx?n=helen-stephanie-roenthal&pid=186480364>