

# B I B L I O G R A P H I C A L   N O T E S

This is the more comprehensive version of the notes and references of the book, *THE GAP: The Science of What Separates Us From Other Animals*.



## Chapter 1: The Last Humans

- 3 **Wilhelm Herschel:** Holmes, 2008.
- 4 **John Herschel:** Herschel, 1830.
- 5 **Descended from the apes?:** For background on the murky history behind this quotation, see the Quote Investigator (February 9, 2011): <http://quoteinvestigator.com/2011/02/09/darwinism-hope-pray>.
- 5 **On the Origin of Species:** Darwin, 1859.
- 6 **The Descent of Man:** Darwin, 1871.
- 6 **the split occurred some six million years ago:** The genetic evidence suggests human and chimpanzee lines diverged 6.3 million years ago (Patterson et al., 2006); fossils of potential common ancestors, *Sahelanthropus tchadensis* (Brunet et al., 2002), *Orrorin tugenensis* (Senut et al., 2001), and *Ardipithecus kadabba* (Haile-Selassie, 2001), point to a similar time of divergence.
- 6 **(Footnote 3) 99.4 percent:** Wildman et al., 2003. Some estimates suggest the difference between the genomes is better approximated as 4 percent and complex factors such as structural changes ought to be considered (Varki et al., 2008).
- 8 **embodied cognition:** e.g., Isanski & West, 2010.
- 8 **judge a hill to be steeper:** Proffitt, 2006; but see Durgin et al., 2009.
- 8 **Richard Owen, the founder of:** Gross, 1993.
- 9 **Milan Kundera's astute reply:** Kundera, 1992; see also Humphrey, 1992.
- 9 **William James:** James, 1890.
- 9 **relief from pain:** Bateson, 1991.
- 9 **"In the distant future:** Darwin, 1859, p. 335.
- 9 **Even evolutionary psychology:** e.g., Barkow et al., 1992; Cosmides & Tooby, 1997.
- 10 **textbooks on evolutionary psychology:** e.g., Badcock, 2000; Buss, 1999.
- 10 **pioneers such as Wolfgang Köhler:** e.g., Köhler, 1917/1925; Yerkes & Yerres, 1928.

- 10 **arguments for rapid transitions:** Gould & Eldredge, 1977.
- 10 *Homo floresiensis:* Brown et al., 2004; see also subsequent debate: e.g., Brown, 2012; Oxnard et al., 2010.
- 11 *Gigantopithecus:* Ciochon, 1996.
- 11 **(Footnote 6) Traditionally these are:** Larick & Ciochon, 1996.
- 11 **(Footnote 6) *Australopithecus sediba:*** Berger et al., 2010.
- 12 **primary adverse force of nature:** Alexander, 1989.
- 12 *Guns, Germs, and Steel:* Diamond, 1997; see also Flannery, 1994.
- 12 **blankets infested with smallpox:** Fenn, 2000; Ranlet, 2000.
- 12 *The Better Angels of Our Nature:* Pinker, 2011a.
- 12 **goes back to prehistoric hunter-gatherers:** Bowles, 2009; Keeley, 1996.
- 12-13 **kill members of their own species:** Goodall 1986.
- 13 **Neanderthal inheritance:** Green et al., 2010; Green et al., 2006.
- 13 **Denisovans:** Derevianko, 2012; Krause et al., 2010.

## Chapter 2: Remaining Relatives

- 15 **our primate heritage:** Groves, 1989; Strier, 2000.
- 16 **it is social problems:** Humphrey, 1976; see also Jolly, 1966; Whiten & Byrne, 1988.
- 16 **It is hardly an exaggeration:** Köhler, 1917/1925, p. 293.
- 16 **Primates are fond of grooming:** e.g., Dunbar, 2010.
- 16 **a vervet monkey mother:** Cheney & Seyfarth, 1980.
- 17 **Achieving high rank:** de Waal, 1982; Goodall, 1986.
- 17 **Dunbar established that the greater:** Dunbar, 1992; Dunbar & Shultz, 2007.
- 17 **Primate foraging:** e.g., Boesch, 1994; Byrne & Russon, 1998; Visalberghi, 1987.
- 17 **Taxonomists subdivide primates:** e.g., Groves, 1989; Stanford et al., 2013.
- 18 **apes grow up slowly:** Bogin, 1999; Wich et al., 2004.
- 18 *Homo sylvestris:* Corbey, 2005.
- 18 **Carl Linnaeus:** Linnaeus, 1758.
- 19 **widely used classification:** e.g., Stanford et al., 2013.
- 20 **They comprise four distinct genera:** Geissmann, 2002. For more on gibbons, see <http://www.gibbons.de>.
- 21 **a better model of what our hominin:** Fitch, 2000.
- 21 **psychological testing of gibbons:** Hill et al., 2011.
- 21 **critically endangered:** All population estimates for the apes are based on the International Union for the Conservation of Nature (IUCN) Red list of Threatened Species 2012 (<http://www.iucnredlist.org>). See also reviews for the United Nations Environment Program, Great Ape Survival Partnership: <http://www.unep.org/grasp>.
- 22 **Hainan black crested gibbon:** Stone, 2011.
- 22 **vocalizations akin to laughter:** Provine, 2001; Van Hooff, 1972.
- 22 **Louis Leakey:** Leakey, 1959.
- 22 **"Leakey's Angels":** Fossey, 1983; Galdikas, 1980; Goodall, 1986.
- 22 **a few other committed undertakings:** see Whiten et al., 1999.

- 23 **climbing relatively slow and considered:** Povinelli & Cant, 1995.
- 24 **stay in the subadult (unflanged) stage:** Harrison & Chivers, 2007;  
Utami et al., 2002.
- 25 **Carel van Schaik:** van Schaik et al., 2003; van Schaik et al., 1996.
- 25 **Anne Russon and Birute Galdikas:** Russon & Galdikas, 1993.
- 26 **first draft of the gorilla genome:** Scally et al., 2012.
- 27 **first initiated by Dian Fossey:** Fossey, 1983.
- 27 **Recent fecal analyses:** Hofreiter et al., 2010.
- 27 **Dick Byrne:** e.g., Byrne & Byrne, 1993; Byrne & Russon, 1998.
- 28 **a gorilla was observed using a stick:** Breuer et al., 2005.
- 29 **a previously unknown large population:** "Wildlife Conservation  
Society Discovers 'Planet of the Apes,'" Wildlife Conservation Society,  
August 5, 2008, <http://archive.wcs.org/gorilladiscovery/press-release.html>.
- 29 **chimpanzees at Rockhampton Zoo:** e.g. Collier-Baker et al., 2005.
- 30 **the social lives of chimpanzees:** e.g., Goodall, 1986.
- 30 **"chimpanzee politics":** de Waal, 1982.
- 30 **boundaries that male groups patrol:** Goodall, 1986.
- 30 **it was widely believed:** e.g., Lorenz, 1963.
- 31 **Hunting primates:** Boesch, 1994.
- 31 **spear bushbabies:** Pruett & Bertolani, 2007.
- 31 **seek out medicinal plants:** Huffman, 1997.
- 31 **ways of fishing them out:** E.g., Whiten et al., 1999.
- 31 **stone hammers and anvils:** Boesch, 1990.
- 31 **stone tools 4,300 years ago:** Mercader et al., 2007.
- 31 **(Footnote 9) When Jane Goodall first:** Goodall, 1964. 31 **(Footnote  
9) Liberian stamp:** Whiten & McGrew, 2001.
- 32 **only described in 1929:** Schwarz, 1929.
- 32 **collaboratively hunt monkeys:** Surbeck & Hohmann, 2008; Hofreiter et  
al., 2010.
- 33 **a lot more sex:** de Waal, 1996.
- 34 **larger brains are more intelligent:** McDaniel, 2005.
- 34 **Do humans, then, simply have the largest brains?:** For absolute and  
relative brain weights of various species, see Jerison, 1973; Roth &  
Dicke, 2005.
- 34 **170 billion cells:** 86 billion neurons and nonneuronal cells: Azevedo et  
al., 2009.
- 35 **Douglas Adams:** Adams, 1979.
- 35 **Table 2.1:** Jerison, 1973; Roth & Dicke, 2005.
- 36 **Andrew Whiten and I:** Whiten & Suddendorf, 2007.
- 36 **(Footnote 12) Robin Dunbar:** Dunbar 2001.
- 36 **(Footnote 12) absolute size is the better predictor:** Deaner et al., 2007.
- 37 **differences in internal organization:** Preuss, 2000.
- 37 **linearly scaled-up primate brains:** Herculano-Houzel, 2009.
- 38 **relatively smaller in humans:** Holloway, 2008.
- 38 **first documented microscopic distinction:** Preuss et al., 1999.
- 38 **density is much higher in humans:** Elston et al., 2006.

- 38 **unravel the mysteries of the brain:** e.g., Dehaene, 2012; Del Cul et al., 2009; Greenfield, 2000; Weil & Rees, 2010.
- 38 **(Footnote 13) information flow has reversed:** Noack, 2012.
- 38 **(Footnote 14) Von Economo neurons:** Nimchinsky et al., 1999. For recent evidence for these neurons in elephants, whales, and macaques, see Butti et al., 2009; Evrard et al., 2012; Hakeem et al., 2009.

### Chapter 3: Minds Comparing Minds

- 40 **Daniel Dennett notes:** Balter, 2012d.
- 40 **for animal welfare:** e.g., Lea, 2001; Wise, 2000.
- 40 **“the senses and the intuitions:** Darwin, 1871, p. 126.
- 41 **trying to conceal the evidence:** Lindsay, 1880.
- 41 **Lloyd Morgan’s canon:** Morgan, 1894.
- 41 **Clever Hans:** Pfungst, 1911; Wynne, 2001.
- 42 **Edward Thorndike’s:** Thorndike, 1911.
- 43 **(Footnote 2) This case has been argued:** Shettleworth, 2010.
- 43 **(Footnote 3) mentally travel in time:** Suddendorf & Corballis, 1997, 2007.
- 43 **(Footnote 3) some killjoy explanations:** Collier-Baker et al., 2004; Suddendorf & Corballis, 2008b; Suddendorf et al., 2009a.
- 43 **(Footnote 3) chimpanzees can notice:** Haun & Call, 2008; Nielsen et al., 2005.
- 44 **William James:** James, 1890.
- 44 **(Footnote 4) evidence that babies assess:** Hamlin et al., 2007.
- 44 **(Footnote 4) challenged by simpler explanations:** Scarf et al., 2012.
- 45 **dreamtime:** e.g., Oodgeroo, 1994.
- 45 **various animals dream:** Darwin, 1871.
- 45 **pretend play in the second year:** e.g., Leslie, 1987.
- 45 **(Footnote 5) Some evidence suggests:** e.g., Wilson & McNaughton, 1994.
- 46 **Kakama carried a log:** Wrangham & Peterson, 1996.
- 46 **Andrew Whiten and Dick Byrne:** Byrne & Whiten, 1990; Whiten & Byrne, 1988.
- 47 **Sue Savage-Rumbaugh:** Savage-Rumbaugh, 1986.
- 47 **The gorilla Koko:** Patterson & Linden, 1981.
- 47 **the chimpanzee Viki:** Hayes, 1951.
- 47 **stronger behavioral evidence:** Leslie, 1987.
- 47 **only one other incident:** Matsuzawa, 2008.
- 48 **neither extreme view should overlook inconvenient facts:** Whiten & Suddendorf, 2007.
- 49 **Jean Piaget:** Piaget 1954; see also Flavell, 1963.
- 49 **stage 5 object permanence:** demonstrated in cats (Dumas & Doré, 1991), chimpanzees (Collier-Baker et al., 2005), dogs (Gagnon & Doré, 1994), dolphins (Jaakkola et al., 2010)), gorillas (Natale & Antinucci, 1989), magpies (Pollok et al., 2000), orangutans (Call, 2001b), parrots (Pepperberg et al., 1997), and various species of monkey (Natale & Antinucci, 1989).

- 49 **(Footnote 7): earlier than originally proposed:** Baillargeon, 1987.
- 50 **Monkeys typically fail:** Natale & Antinucci, 1989.
- 50 **great ape genera have passed:** Call, 2001b; Collier-Baker et al., 2005; Natale & Antinucci, 1989.
- 50 **domestic dogs were one of:** e.g., Gagnon & Doré, 1994.
- 51 **dogs had “cheated”:** Collier-Baker et al., 2004.
- 51 **passing all of Piaget’s object permanence tasks:** Call, 2001b; Collier-Baker & Suddendorf, 2006.
- 51 **Josep Call and others:** e.g., Call, 2004, 2006; Hill et al., 2011.
- 51 **(Footnote 8) marmosets and gibbons:** Mendes & Huber, 2004; Fedor et al., 2008.
- 52 **research on mirror self-recognition:** e.g., Suddendorf & Butler, 2013.
- 52 **Darwin briefly described:** Darwin, 1877
- 52 **Gordon Gallup developed:** Gallup, 1970.
- 52 **This experiment has been replicated:** For reviews, see Swartz et al., 1999; Tomasello & Call, 1997.
- 52 **(Footnote 9) gorillas failed:** e.g., Suarez & Gallup, 1981
- 52 **(Footnote 9) gorillas pass:** e.g., Posada & Colell, 2007.
- 53 **By twenty-four months close to all:** e.g., Amsterdam, 1972; Bard et al., 2006; Nielsen & Dissanayake, 2004.
- 53 **human and chimpanzee infants:** Bard et al., 2006.
- 53 **baboons, capuchins, and macaques all fail:** Anderson & Gallup, 2011.
- 53 **conditioned pigeons:** Epstein et al., 1981.
- 53 **(Footnote 10) There is some variation:** Kaertner et al., 2012
- 53 **(Footnote 10) Bedouin children:** Priel & Deschonen, 1986.
- 54 **dolphins demonstrated mirror self-recognition:** Reiss & Marino, 2001; <http://www.pnas.org/content/suppl/2001/05/02/101086398.DC1/0863Movie2.mov>.
- 54 **Two magpies and one elephant:** for magpies, see Prior et al. 2008 and <http://www.youtube.com/watch?v=4mD8velB83w>; for the elephant, see Plotnik et al., 2006 and <http://www.pnas.org/content/suppl/2006/10/26/0608062103.DC1/08062Movie3.mov>.
- 54 **all elephants failed:** Povinelli, 1989.
- 54 **we only have strong evidence:** Anderson & Gallup, 2011; Suddendorf & Butler, 2013.
- 54 **interpretation of this task has been controversial:** e.g. Bard et al., 2006; Connors et al., 2012; Gallup, 1982, 1998; Heyes, 1994; Lewis et al., 1989; Mitchell, 1997; Povinelli, 1995.
- 54 **(Footnote 11): failed to make capuchin monkeys “pass”:** Roma et al., 2007.
- 54 **(Footnote 12) not all passed the task:** Swartz et al., 1999; Tomasello & Call, 1997.
- 55 **Bobtail squid:** Jones & Nishiguchi, 2004.
- 55 **On the richer side:** e.g. Gallup, 1982, 1998.
- 55 **associated with the emergence of self-conscious emotions:** Lewis et al., 1989.
- 55 **with the use of personal pronouns:** Lewis & Ramsay, 2004.

- 55 **Celia Heyes:** Heyes, 1994, 1998.
- 55 **Ulric Neisser:** Neisser, 1997.
- 55 **Josef Perner:** Perner, 1991.
- 56 **marked our participants' legs:** Nielsen et al., 2006.
- 56 **(Footnote 14) Visual self-recognition in live video:** Suddendorf et al., 2007.
- 56 **(Footnote 14) Self-recognition in delayed videos:** Povinelli et al., 1996; Suddendorf, 1999a.
- 56 **(Footnote 14) mirrors and photos involves different:** Butler et al., 2012.
- 57 **in mirrors around the same time as:** e.g., Chapman, 1987; Lewis & Ramsay, 2004; Nielsen & Dissanayake, 2004.
- 57 **(Footnote 15): In a review of the research literature:** Suddendorf & Whiten, 2001.
- 58 **studies on gibbon self-recognition:** Hyatt, 1998; Lethmate & Dücker, 1973; Ujhelyi et al., 2000.
- 58 **Over the course of a two-year:** Suddendorf & Collier-Baker, 2009; <http://rspb.royalsocietypublishing.org/content/suppl/2009/02/24/rspb.2008.1754.DC1/rspb20081754supp04.mpg>.
- 61 **parsimony is important:** Sober, 1988.
- 62 **mirror self-recognition evolved between:** Suddendorf & Butler, 2013.

#### Chapter 4: Talking Apes

- 63 **Thanks to words:** Huxley, 1956, p 83.
- 63 **the bishop of Polignac:** Corbey, 2005.
- 63 **language is distinctly human:** Corballis, 2003; Deacon, 1997; Hauser et al., 2002; Pinker, 1994.
- 64 **animals also have:** Hauser, 1996.
- 64 **A bee signals the location:** Von Frisch, 1967.
- 64 **alert their group about predators:** Hollen & Radford, 2009.
- 64 **The most fundamental feature:** Although it is generally assumed that language is primarily for communication, some scholars have argued that it is primarily an internal instrument of thought: Berwick et al., 2013.
- 64 **(Footnote 2) This is the case for:** e.g., Corballis, 2003.
- 65 **Symbols are *about* something:** e.g., Perner, 1991.
- 66 **develop this representational insight:** e.g., DeLoache & Burns, 1994.
- 66 **even twenty-four-month-olds can:** Suddendorf, 2003.
- 67 **known as forming a "meta-representation":** e.g., Perner, 1991; Suddendorf, 1999c.
- 67 **meaning of a word is related to its sound:** Paget, 1930.
- 68 **(Footnote 5) similar to the game Pictionary:** Garrod et al., 2007.
- 69 **(Footnote 6) less likely to suffer:** Diamond, 2010.
- 71 **Human languages are *generative*:** e.g., Corballis, 2003.
- 72 **Recursion is considered a key:** e.g., Corballis, 2011; Hauser et al., 2002.
- 73 **this generative grammar:** For Chomsky's recent theorizing and the basic operation he now calls "merge," see Berwick et al., 2013.

- 73 **defines the language faculty:** Chomsky, 2005; Hauser et al., 2002; for a critique, see Jackendoff & Pinker, 2005; for the debate about recursion, see Coolidge et al., 2011; Corballis, 2011.
- 73 **predisposed to develop language:** Pinker, 1994.
- 73 **(Footnote 10) Skinner had been enticed:** Skinner, 1957.
- 74 **Most children acquire language:** There are some individual differences in language acquisition but no established group differences: Berwick et al., 2013.
- 74 **the tragic case of the girl Genie:** Rymer, 1994.
- 75 **one hundred thousand years ago:** Berwick et al., 2013; Chomsky, 2005.
- 75 **not present in all human languages:** Christiansen & Chater, 2008; Corballis, 2009; Evans & Levinson, 2009; Everett, 2005.
- 75 **Part of the problem may be:** Corballis, 2011.
- 75 **computational models from evolutionary biology:** Levinson & Gray, 2012; but see also Berwick et al., 2013.
- 75 **one study compared word order:** Dunn et al., 2011.
- 76 **Language is the source:** de Saint-Exupéry, 1943.
- 76 **Paul Grice:** Grice, 1989.
- 77 **(Footnote 11) I actually like the word:** Suddendorf, 2008.
- 78 **Michael Corballis and I have argued:** Suddendorf et al., 2009b; Suddendorf & Corballis, 1997.
- 78 **Friedrich Max Müller:** Corballis, 2011; Radick, 2007.
- 78 **"I wish someone would keep:** Cited by Radick, 2007, p. 31.
- 78 **Enter Richard Garner:** Radick, 2007; Suddendorf et al., 2012.
- 79 **Hugh Lofting's Dr. Dolittle:** Lofting, 1920.
- 79 **evolution proceeding in leaps:** Gould & Eldredge, 1977.
- 80 **language first evolved in gestural form:** e.g., Corballis, 2003.
- 80 **Dorothy Cheney and Robert Seyfarth:** Cheney & Seyfarth, 1990.
- 80 **These calls are gradually learned:** Hauser, 1988.
- 80 **periaqueductal gray:** Gruber-Dujardin & Stefan, 2010.
- 81 **close examinations of communication systems:** Hauser, 1996.
- 81 **they learn the songs:** Garland et al., 2011; Noad et al., 2000.
- 81 **just enough to say:** Smith et al., 2008; Mike Noad, personal communication; see also Handel et al., 2012.
- 81 **alarm calls of prairie dogs:** Slobodchikoff et al., 2009.
- 81 **a hidden communication system:** Mäthger et al., 2009.
- 81 **(Footnote 12) Great apes have much more voluntary control:** Corballis, 2011; Premack, 2007.
- 82 **I cried out a short and good "Hello!":** Kafka, 1917.
- 82 **control of the face and voice:** Premack, 2007.
- 82 **the African grey parrot Alex:** Pepperberg, 1981, 1987; Pepperberg et al., 1997.
- 83 **Louis Herman:** Herman et al., 1993.
- 83 **Seals have also been trained:** Schusterman & Gisiner, 1988.
- 83 **A border collie, Rico:** Kaminski et al., 2004.
- 83 **Famous examples include:** Washoe (Gardner & Gardner, 1969); Koko (Patterson & Linden, 1981); Chantek (Miles, 1994); Sarah (Premack & Premack, 1983); Kanzi (Savage-Rumbaugh et al., 1993).

- 83 **Nim Chimpsky:** Terrace, 1979.  
 83 **dispute ensued:** e.g., Savage-Rumbaugh et al., 1980; Fouts, 1997.  
 83 **(Footnote 13) *Project Nim:*** Marsh, 2011.  
 84 **Valerie Kuhlmeier and Sally Boysen:** Kuhlmeier & Boysen, 2002;  
 Kuhlmeier et al., 1999; but see Penn et al., 2008.  
 84 **recent analysis of decades of data:** Lyn et al., 2011.  
 84 **(Footnote 14) Chimpanzees tend to have severe problems:** Matsuzawa, 2009.  
 85 **"Who are you?":** Patterson, 1991.  
 85 **The bonobo Kanzi:** Savage-Rumbaugh et al., 1993.  
 85 **(Footnote 15) Tamarins have been found:** Fitch & Hauser, 2004.  
 85 **(Footnote 15) starlings can learn recursive rules:** Gentner et al. 2006;  
 but see Corballis, 2007a.  
 86 **Steven Pinker, for example, insists:** Pinker, 1994.  
 86 **Sally Boysen, for example, taught:** Boysen & Hallberg, 2000; see also  
 Matsuzawa, 2009.

## Chapter 5: Time Travelers

- 89 **Forethought is the most important:** Russell, 1954, p. 179.  
 89 **time travel will never become a reality:** Holden, 2005.  
 90 **Norbert Bischof:** Bischof, 1985.  
 90 **thesis into a monograph:** Suddendorf, 1994; Suddendorf & Corballis,  
 1997.  
 91 **"It's a poor sort of memory:** Carroll, 1871.  
 91 **Clive Wearing:** Wearing, 2005.  
 91 **distinguish the following memory systems:** Squire et al., 1993.  
 91 **Endel Tulving:** Tulving, 1985, 2005.  
 91 **(Footnote 1) In a dramatic documentary: *Prisoner of Consciousness,***  
 Dollar, 1986.  
 92 **the ultimate function of this capacity:** Suddendorf & Busby, 2005;  
 Tulving, 2005.  
 92 **Jennifer Thompson thought:** Thompson-Cannino et al., 2009.  
 92 **the reliability of eyewitness testimony:** Loftus, 1992; Schacter, 1999.  
 93 **Remembering episodes is a reconstructive process:** Bartlett, 1932.  
 93 **recall your own good behavior better:** D'Argembeau & Van der Linden,  
 2008.  
 93 **Evolution works only on how memory:** Suddendorf & Busby, 2005.  
 93 **memory systems are inherently future-directed:** Bar, 2011; Suddendorf  
 & Corballis, 2007.  
 94 **two sides of the same coin?:** Schacter et al., 2007; Suddendorf & Corballis,  
 1997, 2007.  
 94 **similar problems imagining future events:** Hassabis et al., 2007; Klein  
 et al., 2002; Tulving, 1985.  
 94 **children's capacity to answer such questions:** Busby & Suddendorf,  
 2005; Suddendorf, 2010b. For other similarities in development, see  
 Atance 2008; Suddendorf & Moore, 2011.  
 94 **Introspectively, there are some:** D'Argembeau & Van der Linden, 2004;



- Trobe & Liberman, 2003.
- 94 **In old age we tend to report:** Addis et al., 2008.
- 94 **depressed and schizophrenic patients:** Williams et al., 1996; D'Argembeau et al., 2008.
- 94 **Brain imaging studies have found:** Addis et al., 2007; Okuda et al., 2003; Szpunar et al., 2007.
- 94 **there are some important differences:** Suddendorf, 2010a.
- 94 **One way for it to go forward:** Schacter & Addis, 2007; Suddendorf & Corballis, 2007.
- 94 **(Footnote 3) Science magazine:** Breakthrough, 2007.
- 95 **imagine situations you have never experienced:** Gilbert & Wilson, 2007; Suddendorf & Corballis, 2007.
- 95 **Imagined situations trigger emotions:** Damasio, 1998.
- 95 **Just as a theater production:** Suddendorf & Corballis, 2007.
- 96 **Take Ötzi:** Suddendorf, 2006.
- 97 **We engage in deliberate practice:** Suddendorf & Corballis, 1997, 2007.
- 97 **We differ also in how much we worry:** Zimbardo & Boyd, 1999.
- 97 **John Lennon sang:** "Beautiful Boy (Darling Boy)."
- 98 **Whereas a pride of full-bellied lions:** Suddendorf, 1994.
- 99 **Darwin Awards:** See <http://www.darwinawards.com>.
- 99 **shortcomings in any one of the components:** Suddendorf & Corballis, 2007.
- 99 **we share our plans and predictions:** Suddendorf et al., 2009b.
- 99 **We can learn from others' memory:** Social remembering can have negative and positive effects on memory accuracy, though both may be beneficial: Roediger & McDermott, 2011.
- 99 **much of human conversation is:** Szagun, 1978.
- 99 **Stumbling on Happiness:** Gilbert, 2006.
- 100 **How parents talk to their children:** Parent-child conversation and children's memory (e.g., Fivush et al., 2006; McGuigan & Salmon, 2004) and future time concepts (Hudson 2006).
- 100 **children begin to talk about past:** e.g., Busby Grant & Suddendorf, 2011; Nelson & Fivush, 2004.
- 100 **infantile amnesia:** e.g., Bauer, 2007; Nelson & Fivush, 2004.
- 100 **learn to kick a hanging mobile:** Rovee-Collier et al., 1980.
- 100 **the making of a rattle:** Barr et al., 1996.
- 101 **little indication that infants can explicitly recall:** e.g., Levine, 2004; Perner & Ruffman, 1995.
- 101 **insist that they have always known it:** Taylor et al., 1994.
- 101 **In one study we told children stories:** Busby Grant & Suddendorf, 2010.
- 101 **We presented children with a curious puzzle:** Suddendorf et al., 2011.
- 102 **William Friedman:** e.g., Friedman, 2005; see also Busby Grant & Suddendorf, 2009.
- 102 **(Footnote 4) In a follow-up:** This study was conducted by my PhD student Jon Redshaw and has not yet been published.
- 103 **What's time?:** Browning, 1896, p. 425.
- 103 **no real-life counterparts:** Suddendorf et al., 2009a.

- 104 **psychologist William Roberts:** Roberts, 2002.
- 104 **The chimpanzee Panzee:** Menzel, 2005.
- 104 **Rats appear to use:** e.g., Foster & Wilson, 2006; Tolman, 1948; Johnson & Redish, 2007.
- 104 **sophisticated navigational skills:** Collett & Collett, 2006.
- 104 **Nicola Clayton, Anthony Dickinson:** e.g., Clayton & Dickinson, 1998; Clayton et al., 2000; Clayton et al., 2001.
- 105 **such studies on other animals:** For reviews, see Dere et al., 2008; Suddendorf & Corballis, 2008a; Zentall, 2006.
- 105 **if it walks like a duck:** Eichenbaum et al., 2005.
- 105 **episodic-like memory is neither necessary nor sufficient:** Suddendorf & Busby, 2003; Suddendorf & Corballis, 2007.
- 106 **should be able to control their future prudently:** Suddendorf & Corballis, 2010.
- 106 **Long-term planning:** Dawkins, 2000.
- 106 **bacteria demonstrate future-directed capacities:** Mitchell et al., 2009.
- 107 **The wasp always inspects the nest:** Fabre, 1915.
- 107 **taste predicts later sickness:** Garcia et al., 1966.
- 107 **cannot learn that a sound or a sight:** Garcia & Koelling, 1966.
- 108 **gray squirrels learn to bite out:** Steele et al., 2001.
- 108 **select a stick of the appropriate length:** Mulcahy et al., 2005.
- 108 **sometimes carry stones:** Boesch & Boesch, 1984.
- 108 **Norbert Bischof and Doris Bischof-Köhler:** Bischof, 1985; Bischof-Köhler, 1985.
- 108 **laboratory monkeys that were fed biscuits:** Roberts, 2002.
- 109 **delay gratification for several minutes:** Beran, 2002; Dufour et al., 2007; Rosati et al., 2007.
- 109 **Perhaps the most prominent case:** Mulcahy & Call, 2006a. For critique of this evidence, see Suddendorf, 2006.
- 109 **(Footnote 6) One high-profile study:** Correia et al., 2007; see also Cheke & Clayton, 2012; Raby et al., 2007.
- 109 **(Footnote 6) In another study, two squirrel monkeys:** Naqshbandi & Roberts, 2006. For a killjoy critique, see Suddendorf & Corballis, 2008b, and for the failed replication with rhesus monkeys see Paxton & Hampton, 2009.
- 110 **subsequent studies:** Osvath & Osvath, 2008. For a killjoy critique, see Suddendorf et al., 2009a, and for a romantic rebuttal, see Osvath, 2010.
- 110 **In another study ten chimpanzees:** Dufour & Sterck, 2008.
- 110 **An unusual report:** Osvath, 2009; Osvath & Karvonen, 2012.

## Chapter 6 Mind Readers

- 113 **Of all the species on Earth:** Zimmer, 2003, p. 1079.
- 113 ***The Men Who Stare at Goats*:** Heslov, 2009.
- 114 **debate about how we do this:** e.g., Carruthers & Smith, 1996.
- 114 **much as we do science:** Gopnik, 1993.
- 114 **simulating their experiences:** Gordon, 1996.

- 114 **requires mental scenario building:** Suddendorf & Corballis, 1997.  
 114 **(Footnote 1) "intentional stance":** Dennett, 1987.  
 115 **special affinity for social stimuli:** e.g., Moore, 2006; Nelson, 2001.  
 115 **they prefer to look at open eyes:** Batki et al., 2000.  
 115 **The developmental psychologist Chris Moore:** Moore, 2013.  
 115 **infants start to point:** Liszkowski et al., 2004.  
 115 **motivated to keep making links:** e.g., Tomasello et al., 2005.  
 115 **(Footnote 2) blind children are typically delayed:** Peterson et al.,  
 2000.  
 115 **(Footnote 3) in one study Israeli parents:** Feldman et al., 2006.  
 117 **Nested processes are also involved:** e.g., Dennett, 1987; Perner, 1991.  
 117 **original paper on mental time:** Suddendorf & Corballis, 1997.  
 117 **William Hazlitt:** Hazlitt, 1805, p. 1.  
 117 **mental disorders are extreme versions:** Baron-Cohen, 2002; Crespi &  
 Badcock, 2008.  
 118 **disorders of theory of mind:** e.g., Baron-Cohen, 1995; Brune, 2005;  
 Brune & Brune-Cohrs, 2006; Peterson et al., 2005.  
 118 **facial expressions of our basic feelings:** Ekman, 1993; but see also  
 Russell, 1994.  
 118 **"On the lack of evidence:** Penn & Povinelli, 2007.  
 118 **David Premack and Guy Woodruff:** Premack & Woodruff, 1978.  
 119 **Three commentators scratched where it itched:** Bennett, 1978; Den-  
 nett, 1978; Harman, 1978.  
 119 **Heinz Wimmer and Josef Perner:** Wimmer & Perner, 1983.  
 120 **Extensive research on false-belief tasks:** Wellman et al., 2001.  
 120 **earlier in children who have older siblings:** Ruffman et al., 1998.  
 120 **better on language tasks:** Astington & Jenkins, 1999.  
 120 **deaf children:** Peterson & Siegal, 2000.  
 120 **attribute them to themselves:** Gopnik & Astington, 1988.  
 120 **how they come to know:** Gopnik & Graf, 1988; O'Neill et al., 1992;  
 O'Neill & Gopnik, 1991.  
 121 **John Flavell:** Flavell et al., 1983.  
 121 **to lie is to knowingly implant a false belief:** e.g., Suddendorf, 2011;  
 Talwar & Lee, 2008.  
 121 **psychologists were nearly obsessed:** Bloom & German, 2000.  
 122 **the TV sitcom *Friends*:** Junge & Lembeck, 1999.  
 122 **Robin Dunbar:** Dunbar, 2007.  
 122 **faux pas:** Baron-Cohen et al., 1999.  
 122 **manage the impressions we give:** Tedeschi, 1981.  
 123 **They form expectations:** Csibra et al., 1999.  
 123 **They copy what someone else intends:** Meltzoff, 1995.  
 123 **attend what they attend to:** Baldwin & Moses, 1994.  
 123 **In fact, even toddlers:** Clements & Perner, 1994; Onishi & Baillargeon,  
 2005; Low & Perner, 2012.  
 124 **Ian Apperly and Stephen Butterfill:** Apperly & Butterfill, 2009.  
 124 **Henry Wellman, Candi Peterson, and colleagues:** Peterson et al., 2005;  
 Shahaecian et al., 2011; Wellman & Liu, 2004.  
 124 **Human eyes physically differ:** Kobayashi & Kohshima, 2001.

- 124 **shed tears to express:** Humans are the only primates to shed tears, (Bard, 2003). Note that tears seem to contain a chemosignal (Gelstein et al., 2011).
- 124 **(Footnote 5) Chimpanzee mothers and infants:** Bard, 1994.
- 125 **This is “theory of mind” in action:** Suddendorf & Whiten, 2003.
- 125 **The work of primatologists like:** e.g., Goodall, 1986.
- 125 **tactical deceptions in primate societies:** Whiten & Byrne, 1988.
- 126 **Daniel Povinelli reported studies:** Povinelli et al., 1990, 1992.
- 126 **lean interpretations of their behavior:** e.g., Povinelli & Bering, 2002; Povinelli & Eddy, 1996.
- 126 **(Footnote 6) brain sizes have increased in tandem:** Jerison, 1973.
- 127 **capacity to reinterpret behavior in mental terms:** Povinelli et al., 2000.
- 127 **alternative explanation to this proposal:** Suddendorf & Whiten, 2003.
- 127 **(Footnote 7) chimpanzee aggressively chasing a female:** de Waal, 1986.
- 128 **Michael Tomasello and Josep Call:** e.g., Tomasello et al., 1999; Call et al., 1998.
- 128 **Even dogs and monkeys:** Emery, 2000.
- 128 **In collaboration with Brian Hare:** Hare et al., 2000.
- 128 **Rhesus monkeys similarly:** Flombaum & Santos, 2005.
- 129 **In an extension of Hare:** Hare et al., 2001.
- 129 **some great apes appear to recognize:** Tomasello & Carpenter, 2005.
- 129 **distinguish accidental from purposeful:** Call & Tomasello, 1998.
- 129 **discriminate between someone who is unwilling:** Call et al., 2004.
- 129 **distinguish appearance from reality:** Krachun et al., 2009a.
- 129 **when a competitor cannot see them:** Hare et al., 2006.
- 129 **Grey squirrels, for instance:** Leaver et al., 2007.
- 129 **Similarly, scrub jays:** Clayton et al., 2007. For a killjoy critique, see van der Vaart et al., 2012.
- 130 **no nonhuman animal has passed false-belief tasks:** Call & Tomasello, 1999; Kaminski et al., 2008; Krachun et al., 2009b.
- 130 **no other animal has anything like a theory of mind:** Heyes, 1998; Penn et al., 2008; Penn & Povinelli, 2007.
- 130 **They may have a limited:** Call, 2001a; Whiten & Suddendorf, 2001.
- 131 **lean and rich interpretations of data:** Call & Tomasello, 2008; Hare, 2011; Povinelli & Vonk, 2003; Tomasello et al., 2003.
- 131 **what they call “shared intentionality”:** Herrmann et al., 2007; Tomasello et al., 2005.
- 131 **a collaborative task with an adult:** Warneken et al., 2006.
- 131 **poor at using and providing social cues:** Hare & Tomasello, 2004; Liszkowski et al., 2009; Melis et al., 2009.
- 131 **when the options are far apart:** Mulcahy & Call, 2009; Mulcahy & Suddendorf, 2011.
- 131 **virtually only to request:** Call & Tomasello, 1994; Povinelli et al., 1997.
- 131 **only some 5 percent:** Lyn et al., 2011.
- 132 **A recent large-scale examination:** Herrmann et al., 2007.

- 132 **may not be comparable:** de Waal et al., 2008.  
 132 **they only reason about observables:** Heyes, 1998; Penn & Povinelli, 2007.

## Chapter 7: Smarter Apes

- 133 **Man is most uniquely:** Hoffer, 1973, p. 19.  
 134 **Bees use optic flow:** Chahl et al., 2004.  
 135 **some Australian crows:** Birds learn, 2007.  
 135 **Research on intelligence:** Neisser et al., 1996.  
 136 **“intelligence is what the tests test”:** Boring, 1923.  
 136 **various indicators of “success”:** Gottfredson, 1997.  
 136 **test scores have been increasing:** Flynn, 2000.  
 137 **resulting theories of intelligence:** Deary et al., 2010; Neisser et al., 1996.  
 137 **practical intelligence is quite distinct:** Sternberg, 1999.  
 137 **certain politicians spring to mind:** A widely cited email hoax in 2001 claimed that some US presidents, including the then incumbent, had below-average IQ. For an attempt at assessment, see Simonton, 2006.  
 137 **multiple intelligences:** Gardner, 1993.  
 138 **emotional intelligence:** Salovey & Mayer, 1990.  
 138 **Pinker offers the following definition:** Pinker, 1997, p. 62.  
 138 **(Footnote 4) William James called “having interest”:** James, 1890.  
 139 **Man is a rational animal:** Russell, 2009, p. 45.  
 139 **numerous biases and heuristics:** Tversky & Kahneman, 1974; Gigerenzer, 2001.  
 139 **In hindsight we are sure:** Hawkins & Hastie, 1990.  
 140 **seven (plus or minus two) chunks:** Miller, 2003.  
 140 **a mere three to five chunks:** Cowan, 2001.  
 140 **speak of “working memory”:** e.g., Conway et al., 2005.  
 140 **working memory is the stage:** Suddendorf & Corballis, 2007.  
 140 **embedded processes are only possible:** Read, 2008.  
 140 **(Footnote 5) Alan Baddeley:** Baddeley, 1992, 2000.  
 141 **half of the variability in IQ:** Oberauer et al., 2005; Oberauer et al., 2008.  
 141 **steadily between ages four and eleven:** Alloway et al., 2006.  
 141 **Graeme Halford:** Halford et al., 2007; Halford et al., 1998.  
 141 **and theory of mind:** Gordon & Olsen, 1998.  
 141 **crucial factor in human cognitive evolution:** Balter, 2010; Coolidge & Wynn, 2005.  
 141 **(Footnote 6): Recent research suggests:** Oberauer et al., 2008.  
 142 **to *decontextualize*:** Gerrans, 2007.  
 142 **Robert Sternberg suggests:** Sternberg, 1999.  
 142 **“Imagination is more important:** Viereck, 1929, p.117.  
 143 **The imagination is one:** Darwin, 1871, p. 45.  
 143 **recursion is a key mechanism:** Corballis, 2007b, 2011.  
 143 **In so-called divergent-thinking:** Suddendorf & Fletcher-Flinn, 1997, 1999.

- 144 **Designing is the capacity:** e.g., Suddendorf & Dong, 2013.
- 144 **Some animals use tools:** Beck, 1980; Bentley-Condit & Smith, 2010.
- 144 **Queensland jumping spider:** Wilcox & Jackson, 2002.
- 145 **Embedded thinking:** Suddendorf, 1999c
- 145 **J. David Smith and colleagues:** Smith et al., 1995.
- 145 **Subsequent studies:** e.g., Smith et al., 2003; Son & Kornell, 2005. A recent study found that in humans individual differences in introspective accuracy are associated with differences in brain structure, such as anterior prefrontal cortex gray matter volume and white-matter connections (Fleming et al., 2010).
- 145 **claim the middle ground:** Smith et al., 2012.
- 146 **Wolfgang Köhler's classic experiments:** Köhler, 1917/1925.
- 146 **he might have been a spy:** Ley, 1997.
- 146 **In one study gorillas and orangutans:** Mulcahy et al., 2005.
- 147 **other species manufacture tools:** Bentley-Condit & Smith, 2010.
- 147 **research station on the island of Mare:** e.g., Hunt, 1996; Hunt & Gray, 2004.
- 147 **use a tool to obtain another tool:** Taylor et al., 2007.
- 147 **Nathan Emery and Nicola Clayton:** Emery & Clayton, 2004.
- 147 **Ravens, for example, are capable:** Heinrich, 1995.
- 147 **Taylor and colleagues recently:** Taylor et al., 2010.
- 148 **They made the most elementary mistakes:** Herrmann et al., 2008; Povinelli, 2000.
- 148 **natural stick tools:** Mulcahy et al., 2013.
- 148 **Several other results suggest:** e.g., Furlong et al., 2008; Yocom & Boyesen, 2011.
- 148 **In one ingenious study:** Mendes et al., 2007.
- 148 **Several other apes tested:** Hanus et al., 2011.
- 148 **Rooks, corvids that are not known:** Bird & Emery, 2009.
- 148 **New Caledonian crows can learn:** Taylor et al., 2011.
- 149 **After ninety trials only one:** Visalberghi & Limongelli, 1994.
- 149 **Chimpanzees fared slightly better:** Mulcahy & Call, 2006b; Povinelli, 2000.
- 149 **Povinelli and his colleagues Penn and Holyoak:** Penn et al., 2008.
- 149 **some chimpanzees can avoid the trap:** Seed et al., 2009.
- 149 **New Caledonian crows were recently shown:** Taylor et al., 2009.
- 149 **(Footnote 10) hidden humans as causal agents:** Taylor et al., 2012. But see subsequent debate: e.g., Dymond et al., 2013.
- 150 **David Premack taught chimpanzees:** Premack, 1976, 1988.
- 150 **One study also found that a chimpanzee:** Gillan et al., 1981.
- 150 **the argument by Povinelli and colleagues:** Penn et al., 2008.
- 150 **stark individual differences:** Flemming et al., 2008; Premack, 2012.
- 150 **such spontaneous inferences:** Call, 2006.
- 150 **Call placed food in one of two cups:** Call, 2004.
- 151 **Figure 7.1: the female orangutan Punya:** Hill, 2012.
- 152 **Andrew Hill followed up:** Hill et al., 2011.
- 152 **(Footnote 13) we recently gave New Caledonian:** Taylor et al.,

- unpublished.
- 153 **Tetsuro Matsuzawa and colleagues:** e.g., Kawai & Matsuzawa, 2000.
- 154 **Ayumu could even beat humans:** Inoue & Matsuzawa, 2007.
- 154 **In follow-up research humans:** Cook & Wilson, 2010; Silberberg & Kearns, 2009.
- 154 **Dwight Read:** Read, 2008.
- 154 **working-memory capacity in human evolution:** Balter, 2010; Coolidge & Wynn, 2005.
- 155 **“laser-beam intelligence.”:** Cheney & Seyfarth, 1990; Premack, 2007.
- 155 **“response breadth”:** Sterelny, 2003.
- 155 **Irving Biederman has called humans “infovores”:** The word, 2006; Amir et al., 2011.
- 155 **A classic study on zoo animals:** Glickman & Sroges, 1966.
- 155 **thirty-eight different ways:** Whiten & Suddendorf, 2007.
- 156 **One study recorded the diversity:** Parker, 1974a, 1974b; see also Torrigoe, 1985.
- 156 **(Footnote 14) Rates of behavioral innovation:** Reader & Laland, 2003; see also Russon et al., 2010.

## Chapter 8: A New Heritage

- 157 **The primary difference:** Dennett, 1995, p. 331.
- 158 **(Footnote 1) “linguistic relativity”:** e.g., Evans & Levinson, 2009; Hunt & Agnoli, 1991.
- 159 **Other animals cooperate:** e.g., de Waal, 2005; Wilson, 1975.
- 159 **bacteria outnumber human cells:** Sleator, 2010.
- 160 **as one super-organism:** e.g., Genet, 1997.
- 160 **William D. Hamilton:** Hamilton, 1964.
- 161 **researchers used this exercise:** Madsen et al., 2007.
- 161 **Robert Trivers:** Trivers, 1971.
- 161 **(Footnote 4) the Cinderella effect:** Daly & Wilson, 1988, 2005.
- 162 **whether true altruism exists:** e.g., Harman, 2010; Rachlin, 2002; Ridley, 1997.
- 162 **(Footnote 5) Niko Tinbergen:** Tinbergen, 1963.
- 163 **may be called sociopaths:** Mealey, 1995.
- 163 **As Dawkins argued so persuasively:** Dawkins, 1976.
- 163 **(Footnote 6) cheater-detection mechanisms:** Cosmides et al., 2005.
- 164 **“indirect reciprocity”:** Haidt, 2007.
- 165 **New forms of cultural learning:** Tomasello, 1999, p. 526.
- 165 **Cumulative culture has a role:** Boyd et al., 2011; Dennett, 1995; Sterelny, 2003; Whiten et al., 2011.
- 165 **a second inheritance system:** Whiten, 2005.
- 165 **Richard Dawkins suggests:** Dawkins, 1976.
- 165 **(Footnote 7) Isaac Newton famously:** Newton wrote this in a letter to Robert Hooke in 1676.
- 166 **debates about the precise similarities:** Godfrey-Smith, 2012; Mesoudi et al., 2006; Sterelny, 2003.
- 166 **evolves in response to local demands:** Sterelny, 2003.

- 166 **(Footnote 9) Once the island of Tasmania:** Diamond, 1997; Flannery, 1994; Taylor, 2010.
- 167 **a capacity for imitation from birth:** Meltzoff & Moore, 1977, 1989; but see Anisfeld, 1991; Jones, 2006; Suddendorf et al., 2013.
- 167 **By nine months infants can:** Barr et al., 1996; Meltzoff, 1988.
- 167 **infants begin to imitate rationally:** Gergely et al., 2002.
- 167 **From about eighteen months:** Asendorpf & Baudonniere, 1993; Nielsen & Dissanayake, 2004.
- 167 **Mark Nielsen showed:** Nielsen, 2006.
- 168 **The psychiatrist Justin Williams:** Williams et al., 2001.
- 168 **(Footnote 10) Our proposal has garnered:** e.g., Kana et al., 2011; Oberman & Ramachandran, 2007; Rogers & Williams, 2006; Williams et al., 2006.
- 169 **the chameleon effect:** Chartrand & Bargh, 1999.
- 169 **Research suggests that when:** van Baaren et al., 2004.
- 169 **a study on Mayan children:** Maynard, 2002.
- 169 **(Footnote 11) behavioral synchrony is associated:** Feldman, 2012.
- 169 **(Footnote 11) Lack of social mirroring:** Kouzakova et al., 2010.
- 170 **teaching appears to be a cross-cultural:** Hewlett et al., 2011; Tomasello et al., 1993a.
- 170 **with performance on theory of mind tasks:** Davis-Unger & Carlson, 2008.
- 171 **We can pass on questions:** Corballis & Suddendorf, 2010.
- 172 **reciprocal altruism requires:** Stevens & Hauser, 2004.
- 172 **Vampire bats:** Denault & McFarlane, 1995; Wilkinson, 1990.
- 172 **Cuddlier primates depend:** Cheney & Seyfarth, 1990; de Waal, 1989.
- 172 **share of the other's food:** de Waal, 1997.
- 172 **In one study chimpanzees:** Melis et al., 2006a.
- 172 **(Footnote 13) Elinor Ostrom:** Ostrom, 2009.
- 173 **preferentially from high-status individuals:** Horner et al., 2010.
- 173 **In 1953 a Japanese macaque:** Kawai, 1965.
- 173 **psychic connections:** Sheldrake, 2009; Watson, 1979; but see Shermer, 1997.
- 174 **diffusion experiments:** Whiten & Mesoudi, 2008.
- 174 **In one study researchers trained:** Whiten et al., 2005.
- 174 **In a recent study on orangutans:** Dindo et al., 2011.
- 175 **The systematic comparison has yielded:** Whiten et al., 1999; Whiten et al., 2001.
- 175 **work on Sumatran orangutans:** van Schaik et al., 2003.
- 175 **Cetaceans, as well:** Rendell & Whitehead, 2001.
- 175 **dolphins break off sponges:** Krutzen et al., 2005.
- 175 **learn foraging strategies:** Sargeant & Mann, 2009.
- 175 **New Caledonian crows:** Holzhaider et al., 2010; Hunt & Gray, 2003; Hunt & Gray, 2004; Kenward et al., 2005.
- 175 **capable of behavioral traditions:** Whiten & van Schaik, 2007.
- 176 **different types of social learning:** Whiten & Ham, 1992.
- 176 **Even an octopus:** Fiorito & Scotto, 1992.
- 176 **Learning by copying others:** Byrne & Russon, 1998.



- 176 **(Footnote 14) often dubbed “emulation”:** e.g., Hurley, 2008; Tennie et al., 2004.
- 177 **chimpanzee and macaque infants:** Ferrari et al., 2006; Myowa-Yamakoshi et al., 2004.
- 177 **mirror neuron system was first:** Rizzolatti & Craighero, 2004; Rizzolatti et al., 1996.
- 177 **Male lyrebirds sing:** Zann & Dunstan, 2008.
- 177 **Male humpback whales:** Smith et al., 2008.
- 177 **Mike Noad observed:** Noad et al., 2000.
- 177 **in other humpback populations:** Garland et al., 2011.
- 178 **Off the coast of Brazil:** Morete et al., 2003.
- 178 **Louis Herman has shown:** Herman, 2002.
- 178 **notable exceptions are the great apes:** Byrne & Russon, 1998; Russon & Galdikas, 1993.
- 178 **mirror everything the chimpanzee:** Nielsen et al., 2005.
- 178 **documented in other great apes:** Haun & Call, 2008.
- 178 **chimpanzee Viki to copy:** Hayes & Hayes, 1952.
- 178 **“do as I do” paradigm:** Byrne & Tanner, 2006; Custance et al., 1995; Miles et al., 1996.
- 178 **Similar attempts with monkeys:** Mitchell & Anderson, 1993.
- 178 **presented chimpanzees with a puzzle box:** Whiten et al., 1996.
- 178 **(Footnote 15) One study did find:** Paukner et al., 2009.
- 179 **in other experiments chimpanzees:** Whiten, 2005. One study suggests that enculturated chimpanzees can imitate rationally: Buttelmann et al., 2007.
- 179 **In a seminal study Victoria Horner:** Horner & Whiten, 2005.
- 180 **Figure 8.2:** Photo reprinted from Nielsen & Widjojo, 2011, with permission of Nova Science Publishers, Inc.
- 180 **(Footnote 16) “transmission biases”:** e.g., Boyd et al., 2011.
- 181 **Mark Nielsen recently examined:** Nielsen & Tomaselli, 2010.
- 181 **teaching in the animal kingdom:** Caro & Hauser, 1992; Hoppitt et al., 2008; Thornton & Raihani, 2010.
- 181 **evidence comes from meerkats:** Thornton & McAuliffe, 2006.
- 182 **Adult whales have been observed:** Guinet & Bouvier, 1995.
- 182 **Christophe Boesch:** Boesch, 1991.
- 183 **In a recent study chimpanzees:** Dean et al., 2012.

## Chapter 9: Right and Wrong

- 185 **Of all the differences between:** Darwin, 1871, p. 97.
- 186 **Johann Kremer:** *Johann Kremers Tagebuch in Auszügen*, [http://auschwitz-ag.org/unternehmen\\_auschwitz/6.2.7B.htm](http://auschwitz-ag.org/unternehmen_auschwitz/6.2.7B.htm); see also Klee et al., 1991.
- 186 **(Footnote 2) Alfred North Whitehead:** Whitehead, 1956, p. 145.
- 187 **cooperation and cultural evolution:** Gintis et al., 2008.
- 187 **According to Frans de Waal:** de Waal, 2006.
- 187 **“cold” and “hot” processes:** e.g., McIlwain, 2003.
- 187 **Michael Tomasello and colleagues:** Liskowski et al., 2008; Tomasello,

- 2009; Warneken & Tomasello, 2006, 2009.
- 187 **(Footnote 3) In psychopaths lack of sympathy:** Blair, 2001; Mealey, 1995.
- 188 **clear signs of sympathy:** Bischof-Köhler, 1989; Zahn-Waxler et al., 1979.
- 188 **They initially require much prompting:** Svetlova et al., 2010.
- 188 **choices that avoid inequality:** e.g., Fehr et al., 2008.
- 189 **Thomas Hobbes observed:** Pinker, 1997, 2011a.
- 190 **what de Waal referred to as level 2:** de Waal, 2006.
- 191 **"In the last analysis, every kind:** Einstein, 1950, p. 71.
- 191 **Most groups prohibit:** Hauser, 2006; Haidt, 2007; Mikhail, 2007.
- 191 **(Footnote 5) Game theory:** Axelrod & Hamilton, 1981.
- 192 **Ernst Fehr:** e.g. Fehr & Gächter, 2002.
- 192 **people are willing to punish:** Boyd et al., 2003; Fehr & Fischbacher, 2003; Henrich et al., 2006.
- 192 **studies on hunter-gatherer societies:** Hill et al., 2009.
- 192 **experiments in economics:** Fehr & Fischbacher, 2004
- 192 **We believe in a better world:** e.g., Harre, 2011.
- 193 **treat members of their own group differently:** Brewer, 1979; Hewstone et al., 2002; Tajfel, 1982.
- 193 **rituals, ethnic signaling, and other:** Hill et al., 2009.
- 193 **A key factor facilitating:** For recent evolutionary perspectives on religion, see Bering, 2011; Dawkins, 2006; Dennett, 2007; Hitchens, 2007.
- 194 **Richard Shweder and colleagues:** Shweder et al., 1987.
- 194 **With the Enlightenment:** Pinker, 2011a.
- 195 **As man advances in civilisation:** Darwin, 1871, pp. 122–123.
- 195 **Universal Declaration of Human Rights:** See <http://www.un.org/en/documents/udhr/>.
- 195 **De Waal's third level:** de Waal, 2006.
- 196 **and later by Lawrence Kohlberg:** Kohlberg, 1963; Piaget, 1932.
- 196 **imagine a situation in which you:** Hauser, 2006; Mikhail, 2007; Nichols & Mallon, 2006.
- 196 **moral intuitions often precede:** e.g., Haidt, 2007; Huebner et al., 2009.
- 196 **universal moral grammar:** Mikhail, 2007; Hauser, 2006; for a skeptical response, see Sterelny, 2010.
- 196 **(Footnote 7) These draw in part:** Greene & Haidt, 2002; Nesse, 1998; Trivers, 1971.
- 197 **reasoning is marred by certain biases:** Gilbert, 2006; Gilbert & Wilson, 2007, 2009.
- 197 **motivated to choose future-directed actions:** Suddendorf, 2011.
- 198 **the marshmallow test:** Mischel & Mischel, 1983; Mischel et al., 1989.
- 198 **Differences in children's self-control:** Casey et al., 2011; Shoda et al., 1990.
- 198 **(Footnote 8) Darwin wrote:** Darwin, 1871, p.123.
- 199 **inventor Thomas Midgely:** see "Thomas Midgely," *Wikipedia*, [http://en.wikipedia.org/wiki/Thomas\\_Midgely](http://en.wikipedia.org/wiki/Thomas_Midgely).
- 199 **Donald Rumsfeld observed:** Rumsfeld, 2002.
- 200 **In a medical saliva test:** Ditto & Lopez, 1992.

- 200 **in apparently self-deceptive ways:** von Hippel & Trivers, 2011.
- 200 **remember their own good behavior better:** D'Argembeau & Van der Linden, 2008.
- 200 **(Footnote 10) To call this self-deception:** Pinker, 2011b.
- 201 **The fact that man knows:** Twain, 1906, p. vi.
- 201 **(Footnote 11) A similar social explanation:** Suddendorf, 2011.
- 202 **Animal conflicts with members:** Maynard Smith & Price, 1973.
- 202 **Jane Goodall found:** Goodall, 1986.
- 202 **At 1710 Melissa, with:** Goodall, 1986, p. 351.
- 203 **Chimpanzee infanticide may happen:** Murray et al., 2007.
- 203 **It has also been observed in:** Goodall, 1986; Henzi et al., 2010.
- 204 **comfort others who are suffering:** Boesch, 1992; de Waal, 1996; Goodall, 1986.
- 204 **Researchers analyzed spontaneous:** de Waal & Aureli, 1996.
- 204 **Chimpanzees' physiological responses:** Parr, 2001.
- 204 **rodents are sensitive to pain of:** Bartal et al., 2011; Langford et al., 2006; Rice & Gainer, 1962.
- 204 **the gorilla was hand-reared:** Silk, 2010.
- 205 **stories of helping, such as Washoe:** Fouts, 1997.
- 205 **fundamentally good-natured:** de Waal, 1996.
- 205 **groom each other and so build alliances:** e.g., Hemelrijk & Ek, 1991.
- 205 **subsequently help each other:** Boesch, 1992; Yamamoto et al., 2009
- 205 **one might call friendships:** Seyfarth & Cheney, 2012.
- 205 **in one study chimpanzees:** Melis et al., 2008.
- 205 **Chimpanzees also help humans:** Warneken & Tomasello, 2006, 2009.
- 205 **Mothers rarely give:** Ueno & Matsuzawa, 2004.
- 205 **share because they are harassed:** Gilby, 2006.
- 205 **(Footnote 14) Karl Pribam's finger:** Peterson, 2006.
- 205 **(Footnote 15) One study suggests that:** Gomes & Boesch, 2009.
- 206 **chimpanzees failed to help other:** Jensen et al., 2006; Silk et al., 2005.
- 206 **study reported some prosocial choices:** Horner et al., 2011.
- 206 **marmosets, tamarins, and capuchin monkeys:** Burkart et al., 2007; Cronin et al., 2010; Lakshminarayanan & Santos, 2008.
- 206 **Some primate species:** Hohmann, 2009.
- 206 **Limits to sharing severely restricts:** Melis et al., 2006b.
- 206 **Interestingly, three-year-old:** Hamann et al., 2011.
- 206 **food and alarm calls:** Cheney & Seyfarth, 1990; Hauser & Marler, 1993.
- 207 **"a suite of interrelated:** Bekoff & Pierce, 2009, p.7.
- 207 **Recent work on rhesus macaques:** Mahajan et al., 2011.
- 207 **requires "shared intentionality,":** Rakoczy et al., 2008; Tomasello, 2009; Tomasello et al., 2005.
- 207 **Shirley Strum:** Strum, 2008; see also von Rohr et al., 2011.
- 208 **Another prominent case:** Brosnan & de Waal, 2003. De Waal (2006) discusses fairness in primates as part of level 1 morality.
- 208 **work out of frustration:** Dubreuil et al., 2006; Roma et al., 2006; Wynne, 2004; but see van Wolkenten et al., 2007.
- 208 **Other studies have found some:** Brosnan et al., 2005; Range et al., 2009; but see Brauer et al., 2009; Jensen et al., 2007.

- 208 **primates breaking up fights:** de Waal, 1982, 1996; Goodall, 1986.
- 208 **"community concern":** de Waal, 2006.
- 208 **In one study rhesus monkeys:** Hauser & Marler, 1993.
- 208 **moral norms are critical:** Fehr & Fischbacher, 2004; Stevens & Hauser, 2004; Tomasello, 2009.
- 208 **(Footnote 18) only humans blush:** Darwin, 1873.
- 208 **(Footnote 18) remedial display:** Leary & Meadows, 1991.
- 209 **precursors of social norms:** von Rohr et al., 2011.
- 209 **A moral being is one:** Darwin, 1871, p. 610.
- 209 **level 3 clearly sets humans apart:** Bekoff & Pierce, 2009; de Waal, 2006.
- 209 **desires, in deliberate ways:** Frankfurt, 1982.
- 209 **normative self-government:** Korsgaard, 2006.
- 210 **lexigrams "good" and "bad":** Lyn et al., 2008.
- 210 **should be given legal personhood:** Wise, 2000.
- 211 **delay receiving a small reward:** Dufour et al., 2007; Rosati et al., 2007.
- 211 **In one study chimpanzees waited:** Evans & Beran, 2007.
- 211 **the Great Ape Project:** Cavalieri & Singer, 1995.
- 211 **In 2002, Frodo:** Demonic ape, 2004; for other chimpanzee attacks on humans, see Hockings et al., 2010.
- 212 **in 1386 a court:** Beirne, 1994; Evans, 1906/1987.
- 212 **needs and preferences into account:** Stamp Dawkins, 2012.
- 212 **Steven Pinker has documented:** Pinker, 2011a.

## Chapter 10: Mind the Gap

- 215 **[Man] owes his success:** Russell, 1954, p. 1.
- 216 **(recall my theater metaphor):** Suddendorf & Corballis, 2007.
- 216 **rats can cognitively sweep ahead:** Johnson & Redish, 2007.
- 217 **recorded during sleep and rest:** Wilson & McNaughton, 1994; Karlsson & Frank, 2009.
- 217 **the maze layout and its options:** Gupta et al., 2010; Gupta et al., 2012.
- 217 **The challenges of navigation:** Recent debate about the implications of this research for the question of mental time travel in animals: Corballis, 2013a, 2013b; Suddendorf, 2013.
- 217 **Great apes have a basic capacity to imagine:** Suddendorf & Whiten, 2001.
- 217 **not entirely unlike (adult) scientists:** Gopnik, 2012.
- 217 **They begin to deploy counterfactual reasoning:** Harris et al., 1996; Rafetseder et al., 2010
- 218 **recursion is uniquely human:** Corballis, 2007b, 2011; Hauser et al., 2002.
- 218 **Children also learn how thought:** Children's executive control predicts later measures of health and success: Moffitt et al., 2011; for programs aiding its development, see Diamond & Lee, 2011.
- 218 **consciousness is a broadcasting system:** Baars, 2005.
- 218 **(Footnote 1) The theater metaphor does not:** see Dennett & Kinsbourne, 1992.

- 219 **improve the accuracy of their mental scenarios:** Gilbert, 2006.
- 219 **Humans have taken this sociality:** Barrett, Henzi, & Kendall, 2007; Frith & Frith, 2010.
- 219 **As Michael Tomasello and colleagues have:** Herrmann et al., 2007; Tomasello, 2009; Tomasello et al., 2005; Tomasello & Herrmann, 2010.
- 222 **the film *Madagascar 2*:** Darnell & McGrath, 2008.
- 222 **sexual selection advantage:** Miller, 1998, 2000.
- 223 **capacity to form drug addictions:** Ahmed, 2012.
- 223 **on the evolution of our minds:** Nesse & Berridge, 1997.
- 224 **"enculturated," perform slightly better:** Tomasello et al., 1993b.
- 224 **No other animal passes:** Herschel, 1830, pp. 1–2.
- 224 **(Footnote 4) Donald Hebb:** Meaney, 2001; for recent discussion of the innateness concept, see Mameli & Bateson, 2011.
- 224 **(Footnote 5) It is not entirely clear:** de Waal et al., 2008.
- 225 **Human brains grow more outside the womb:** DeSilva & Lesnik, 2006.
- 225 **Stephen Jay Gould has argued:** Gould, 1978.
- 225 **anthropologist Barry Bogin:** Bogin, 1999; Locke & Bogin, 2006.
- 225 **breastfeeding typically ends:** Kennedy, 2005; Sellen & Smay, 2001.
- 225 **brain peaking in mass:** Cabana et al., 1993.
- 226 **Chimpanzee birth intervals:** Hill et al., 2009.
- 226 **cortical grey matter becomes thinner:** Huttenlocher, 1990.
- 226 **white matter increases:** Paus et al., 1999.
- 226 **Executive self-control gradually improves:** Luna et al., 2004; Luna et al., 2001.
- 227 **cooperative breeding:** Hill et al., 2009.
- 227 **The Musuo in Chinese Himalaya:** Handwerk, 2009.
- 227 **(Footnote 7) some aspects of the brain:** e.g., Asato et al., 2010; Lebel et al., 2012.
- 228 **low survival rates:** Lancaster & Lancaster, 1983.
- 228 **While some great apes outlive:** Walker & Herndon, 2008.
- 228 **Grandmothers provide a range of support:** Hawkes, 2003; Hawkes et al., 1998; but see Hill et al., 2009.
- 228 **helps propagate genes:** Lahdenpera et al., 2004; Sear & Mace, 2008.
- 228 **surviving to age seventy and beyond:** Gurven & Kaplan, 2007.
- 228 **notions of wisdom:** Staudinger & Gluck, 2011.
- 229 **"the cognitive niche":** Pinker, 2010; Tooby & DeVore, 1987.
- 229 **humans frequently caused mass extinctions:** e.g., Alroy, 2001; Holdaway & Jacomb, 2000; Roberts et al., 2001; Turney et al., 2008.
- 229 **(Footnote 8) marmosets breed in small groups:** Tardif, 1997.

## Chapter 11: The Real Middle Earth

- 231 **eighty graves nearby:** 3.000 Jahre alte Gräber, 2005.
- 232 **oldest continuously recorded family tree:** Wang 2009.
- 232 **Australian Aboriginals have:** Flannery, 1994.
- 233 **With modern genetics:** See the website of the Human Genome Project: [http://www.ornl.gov/sci/techresources/Human\\_Genome/elsi/human-migration.shtml](http://www.ornl.gov/sci/techresources/Human_Genome/elsi/human-migration.shtml).

- 234 **Analyses of the Y chromosomes:** Hammer et al., 1998; Thomson et al., 2000.
- 234 **Analyses of mitochondrial DNA:** Cann et al., 1987; Vigilant et al., 1991; Watson et al., 1997; see also Ayala, 1995; Soares et al., 2009.
- 234 **The oldest anatomically modern:** McDougall et al., 2005; Leakey, 1969.
- 234 **The earliest mitochondrial haplogroup:** van Oven & Kayser, 2009.
- 234 **(Footnote 1) A recent study challenges:** Cruciani et al., 2011.
- 234 **(Footnote 1) Genghis Khan:** Zerjal et al., 2003.
- 235 **Figure 11.1:** Derevianko, 2012; Mellars, 2006; Soares et al., 2009; Stanford et al., 2013.
- 235 **the birds rapidly went extinct:** Holdaway & Jacomb, 2000.
- 235 **the ecosystem collapsed:** Diamond, 2005.
- 236 **some interbreeding with the newcomers:** Green et al., 2010; Reich et al., 2011.
- 236 *Australopithecus africanus:* Dart, 1925.
- 237 **Some paleoanthropologists are more inclined:** Robson & Wood, 2008.
- 237 **A typical starting point:** Suddendorf, 2004.
- 237 **(Footnote 3) Even in biology there is:** Groves, 2012a, 2012b; Mayr, 1940.
- 238 **Figure 11.2:** Groves, 2012a; Jurmain et al., 2011; Robson & Wood, 2008; Stanford et al., 2013.
- 239 **theories about the subsequent anthropogenesis:** aimed throwing (Calvin, 1982); brain cooling (Falk, 1990); endurance running (Bramble & Lieberman, 2004); collective punishment and enforcement of rules (Bingham, 1999); pair bonding and cooperative breeding (Deacon, 1997); fire and cooking (Wrangham, 2001); baby sling (Taylor, 2010); symbols (Deacon, 1997; Lock & Peters, 1996; Noble & Davidson, 1996).
- 239 **initially split 7 million years ago:** Patterson et al., 2006; for questions about the split from gorillas, see Marks et al., 1988.
- 239 **(Footnote 4) the aquatic ape theory:** Morgan, 1982; for a critique, see Langdon, 2006.
- 240 **Chimpanzees and humans are more closely:** Sibley & Ahlquist, 1984.
- 240 **more similar to that of the gorilla:** Scally et al., 2012.
- 240 *Sahelanthropus tchadensis:* Brunet et al., 2002; but see Wolpoff et al., 2002.
- 240 **cranial capacity of:** Unless otherwise specified hominin cranial capacities throughout this chapter are based on Robson & Wood, 2008.
- 240 *Orrorin tugenensis:* Senut et al., 2001.
- 240 *Ardipithecus kadabba:* Haile-Selassie, 2001.
- 240 *Ardipithecus ramidus:* Lovejoy et al., 2009; White et al., 2009. For cranial capacity, see Suwa et al., 2009.
- 240 **perhaps evolved independently:** Kivell & Schmitt, 2009.
- 240 **derived from bipedal clambering:** Thorpe et al., 2007.
- 240 **East Side Story:** Coppens, 1994.
- 241 **spread of grasslands:** Bobe & Behrensmeier, 2004.
- 241 **Bipedalism is not necessarily:** Pontzer et al., 2009; Sockol et al., 2007.

- 241 **shape the infant's maturing brain:** Gibbons, 2008.
- 241 **capable of power and precision grips:** Young, 2003.
- 242 **"man the hunted":** Hart & Sussman, 2005.
- 242 **famously called Lucy:** Johanson, 2004.
- 243 **the lunate sulcus:** Dart, 1925.
- 243 **fossilized footprints:** Leakey & Hay, 1979; Crompton et al., 2012.
- 243 **(Footnote 7) Dart's conclusion was challenged:** Falk, 1980; Falk et al., 2000; Holloway, 1981; Holloway et al., 2004.
- 243 **(Footnote 7) In a personal history:** Holloway, 2008
- 243 **(Footnote 8) like those of modern humans:** Ward et al., 2011.
- 243 **(Footnote 8) 3.4-million-year-old foot:** Haile-Selassie et al., 2012.
- 244 **The pubic louse, DNA comparison:** Reed et al., 2007.
- 244 **louse that lives in clothes:** Toups et al., 2011; see also Kittler et al., 2003. The earliest evidence of garments, flax fibers, are some thirty thousand years old (Kvavadze et al., 2009).
- 244 **3.39-million-year-old bones:** McPherron et al., 2010; but see Dominguez-Rodrigo et al., 2012.
- 244 **oldest stone tools:** Semaw, 2000; Dominguez-Rodrigo et al., 2005.
- 244 ***Australopithecus garhi*:** Asfaw et al., 1999.
- 244 ***Australopithecus bahrelghazali*:** Brunet et al., 1996.
- 245 ***Kenyanthropus platyops*:** Leakey et al., 2001.
- 245 ***Australopithecus sediba*:** Berger et al., 2010.
- 246 **probably ate a variety of foods:** Grine, 1986; Ungar & Sponheimer, 2011.
- 246 **bone tools to dig:** Backwell & d'Errico, 2008.
- 246 **appeared around 2.4 million years ago:** Stedman et al., 2004.
- 246 ***Homo habilis*:** Leakey et al., 1964.
- 247 **1.95-million-year-old butchering site:** Braun et al., 2010.
- 247 **transported objects:** Braun et al., 2009; Plummer, 2004.
- 247 **tools were of good throwing size:** Cannell, 2002.
- 247 **the hand of early *Homo*:** Young, 2003.
- 248 ***Homo rudolfensis*:** McHenry & Coffing, 2000.
- 248 **really began with *Homo erectus*:** Wood & Collard, 1999.
- 248 **Their footprints are essentially:** Bennett et al., 2009.
- 248 **Nariokotome Boy:** Brown et al., 1985.
- 249 **more quickly than modern humans:** Graves et al., 2010.
- 249 **(Footnote 11) split into several species:** e.g., Groves, 2012a.
- 249 **(Footnote 12) Robson and Wood:** Robson & Wood, 2008.
- 250 **consumed more meat:** Stanford et al., 2013.
- 250 **efficient long-distance running:** Bramble & Lieberman, 2004.
- 250 **Reduced fur and whole-body:** Ruxton & Wilkinson, 2011.
- 250 **becoming a top predator:** e.g., Shipman & Walker, 1989.
- 250 **outhunted other large carnivores:** Human ancestors, 2012.
- 250 **grandmother effect:** Hawkes et al., 1998; O'Connell et al., 1999.
- 250 **(Footnote 13) Overheating has also been:** Falk, 1990.
- 251 **cooking of food was the crucial step:** Wrangham, 2009; Wrangham, 2001.

- 251 **evidence for early fire use:** Goren-Inbar et al., 2004; Berna et al., 2012.
- 251 **(Footnote 14) *Quest for Fire*:** Annaud, 1981.
- 251 **(Footnote 15) evidence of heat treatment:** Brown et al., 2009; Lombard, 2012.
- 252 **they are evident in Spain:** Carbonell et al., 2008.
- 252 **"Java Man":** Swisher et al., 1994.
- 252 **40,000 and 70,000 years ago:** Yokoyama et al., 2008.
- 252 **27,000 years ago:** Swisher et al., 1996.
- 252 **diversity of foods:** Ungar et al., 2006; Ungar & Sponheimer, 2011.
- 252 **Acheulean stone-tool industry:** e.g., Wynn, 2002.
- 252 **(Footnote 16) The role of refugia:** Stewart & Stringer, 2012.
- 253 **tools were carried over distances:** Hallos, 2005.
- 253 **1.76 million years ago:** Lepre et al., 2011.
- 253 **tools became thinner and more:** Stout, 2011.
- 254 **aimed throwing to bring down prey:** Calvin, 1982; Zhu & Bingham, 2011; see also Hopkins et al., 2012.
- 254 **look like a Broca's area:** Holloway, 1976; Wu et al., 2011.
- 254 **Robin Dunbar highlights the role:** Dunbar, 1992, 1996, 2001.
- 255 **skull from Dmanisi:** Lordkipanidze et al., 2005.
- 255 **(Footnote 18) relation between the thickness:** Jungers, 1988.
- 255 **(Footnote 20) possibly shared intentionality:** Shipton, 2010.
- 256 ***Homo antecessor*:** deCastro et al., 1997.
- 256 **A spine of a five-hundred-thousand-year-old:** Bonmati et al., 2010.
- 256 **cooperated to bring down big game:** Villa & Lenoir, 2009.
- 256 **four-hundred-thousand-year-old spears:** Thieme, 1997; see also Churchill & Rhodes, 2009.
- 256 **In 2010 evidence for stone blades:** Johnson & McBrearty, 2010.
- 256 **From around three hundred thousand years ago:** Ambrose, 2001; Lombard, 2012; but see Shea, 2006.
- 257 **early as five hundred thousand years ago:** Wilkins et al., 2012.
- 257 **over two hundred fossils:** Stanford et al., 2013; Trinkaus, 1995.
- 258 **pale skin and red hair:** Lalueza-Fox et al., 2007.
- 258 **up to western Siberia:** Krause et al., 2007b.
- 258 **largely depended on meat:** Richards et al., 2000.
- 258 **including fish and dolphins:** Stringer et al., 2008.
- 258 **Neanderthals practiced cannibalism:** Defleur et al., 1999; Thorpe, 2003.
- 258 **draft sequence of their genome:** Green et al., 2010.
- 258 **DNA extracted from thirteen:** Dalen et al., 2012.
- 260 **in spite of severe disabilities:** Trinkaus, 1985.
- 260 **they cared for the sick:** Dettwyler, 1991.
- 260 **Neanderthal burials:** Langley et al., 2008; Solecki, 1975; but see Balter, 2012a.
- 260 **having made composite tools:** Langley et al., 2008.
- 260 **grown up more quickly:** Ramirez Rozzi & Bermudez De Castro, 2004.
- 260 **worn shells as jewelry:** Zilhao et al., 2010.
- 260 **Archaeologists are hotly debating:** Balter, 2012b.



- 260 **Philip Lieberman has long argued:** Lieberman, 1991.
- 260 **Neanderthal hyoid bone:** Arensburg et al., 1990.
- 260 **hyoid bone from an earlier archaic:** Martinez et al., 2008.
- 260 **hyoid bone of an *Australopithecus aferensis*:** Alemseged et al., 2006;  
also, a partial *H. erectus* hyoid was found (Capasso et al., 2008).
- 261 **version of a gene strongly implicated:** Krause et al., 2007a.
- 261 **gesturing preceded talking:** Corballis, 2003, 2004; for controversies  
over language evolution, see, e.g., Bickerton, 1995; Corballis, 2009;  
Deacon, 1997; Lock & Peters, 1996; Noble & Davidson, 1996.
- 261 **modern human life history:** Smith et al., 2007.
- 261 **evidence for a fully modern human mind:** e.g., d’Errico & Stringer,  
2011; Henshilwood et al., 2004, 2009; Lombard, 2012.
- 261 **at Skuhl Cave:** Grun et al., 2005.
- 261 **82,000-year-old shell beads:** Bouzouggar et al., 2007.
- 261 **long-range projectile weapons:** Churchill & Rhodes, 2009.
- 261 **(Footnote 21) A mutation of the FOXP2 gene:** Enard et al., 2002.
- 262 **compound adhesives:** Wadley, 2010.
- 262 **40,000 years ago artifacts:** Balter, 2012c.
- 262 **Chauvet Cave:** Clottes et al., 1995.
- 262 ***Cave of Forgotten Dreams*:** Herzog, 2010.
- 262 **prehistoric cave of Geissenklösterle:** Balter, 2012b.
- 262 **the painting tells a story:** E.g., Irwin, 2000.
- 263 **behavioral complexity increased:** Langley et al., 2008.
- 263 **In some instances the technologies:** d’Errico & Stringer, 2011.
- 263 **The archaeological record complicates:** Lombard, 2012.
- 263 **fossil teeth from over 700 individuals:** Caspari & Lee, 2004.
- 264 **Denisovans are the Asian:** Derevianko, 2012; Krause et al., 2010; Reich  
et al., 2010.
- 264 **appear to have interbred:** Reich et al., 2011.
- 264 ***Homo floresiensis*, tiny hominins:** Brown et al., 2004; Morwood et al.,  
2005.
- 264 **sophisticated stone tools:** Brumm et al., 2006.
- 264 **debates about whether these specimens:** e.g., Argue et al., 2006;  
Brown, 2012; Falk et al., 2009; Martin et al., 2006; Oxnard et al., 2010.
- 264 **(Footnote 22) There are some problems:** O’Connell et al., 1999.
- 264 **(Footnote 23) In 2012, strange:** Curnoe et al., 2012.
- 265 **“at all times throughout the world:** Darwin, 1871, p. 132.
- 265 **conflict might select:** e.g., Bowles, 2009; Lehmann & Feldman, 2008.
- 265 **(Footnote 25) Darwin wrote:** Darwin, 1871, p. 132.
- 265 **(Footnote 25) group selection continues to be:** e.g., Dawkins,  
2008; Mesoudi & Whiten, 2008; Wilson & Sober, 1994; Wil-  
son & Wilson, 2007; see also [http://edge.org/conversation/  
the-false-allure-of-group-selection#edn9](http://edge.org/conversation/the-false-allure-of-group-selection#edn9).
- 266 **oldest indication of violence:** Keeley, 1996; Thorpe, 2003.
- 266 **northern Iraq (Shanidar 3):** Churchill et al., 2009.
- 266 **The jaw of a 30,000-year-old:** Ramirez Rozzi et al., 2009.
- 266 **paradigm shift:** Gibbons, 2011.

266 **African data also suggest interbreeding:** Hammer et al., 2011.

## Chapter 12: Quo Vadis?

- 269 **eight times the biomass:** Smil, 2002.
- 270 **the first script was:** Schmandt-Besserat, 1981, 1992.
- 270 **The first cities and temples:** The first temple is thought to be at an eleven-thousand-year-old site, Gobekli Tepe, in Turkey (Peters & Schmidt, 2004); but see also Banning, 2011.
- 270 **including their languages:** Bouckaert et al., 2012.
- 270 **(Footnote 2) Those who continued:** Brody, 2000.
- 271 **historical novel *Creation*:** Vidal, 1981.
- 271 **(Footnote 3) Writing systems in other parts:** e.g., del Carmen Rodriguez Martinez et al., 2006; Dematte, 2010.
- 271 **(Footnote 3) Stanislas Dehaene:** Dehaene, 2009.
- 272 **"The library connects us:** Sagan, 1980, p. 282.
- 272 **The great library of Alexandria:** El-Abbadi & Fathallah, 2008.
- 273 **Within a century the number of books:** Sagan, 1980.
- 273 ***Philosophical Transactions of the Royal Society*:** See <http://royalsocietypublishing.org/journals/>.
- 273 **John Herschel:** Herschel, 1830.
- 274 ***Systema Naturae*:** Linnaeus, 1758.
- 275 **to make models and predictions:** e.g., Borjeson et al., 2006.
- 275 **Environmental impact studies:** e.g., Linke et al., 2011; Stewartoaten et al., 1986.
- 275 **recognized as global problems:** Diamond, 2005; Rockstrom & Klum, 2012; Singer, 2002.
- 278 **Darwinian man:** Gilbert & Sullivan, 2010.
- 278 **critical to complement the genetic data:** Varki et al., 1998; Varki et al., 2008.
- 278 **narrow down the search space:** Suddendorf & Butler, 2013.
- 280 **genetic changes in human populations:** Milot et al., 2011.
- 280 **brain sizes *decreased*:** McAuliffe, 2010; Ruff et al., 1997.
- 280 **brain size and IQ:** McDaniel, 2005; for factors influencing hominid brain size evolution, see Bailey & Geary, 2009.
- 280 **"I do not know with what:** Johnson, 2005.
- 281 **Countless civilizations have collapsed:** Diamond, 2005.
- 281 ***Rise of the Planet of the Apes*:** Wyatt, 2011.
- 281 **we have domesticated ourselves:** Groves, 1999; Hare et al., 2005, 2012.
- 281 **overall decline in violence:** Pinker, 2011a.
- 282 **Some evidence suggests that brain size:** Jantz, 2001.
- 283 **Plan it for the apes:** See the website of the Great Apes Survival Partnership (GRASP): <http://www.un-grasp.org>.

## R E F E R E N C E S

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