

◆ GLOSSARY ◆

agency. The capacity, condition, or state of acting, operating, or exerting power or energy in a given environment.

android, droid. A mobile robot in human form.

Artificial Intelligence (AI). Intelligence, or mind, displayed by artificial life or machines, analogous to the natural intelligence of animals and humans; capable of perceiving its environment and taking action. AI mimics cognitive functions associated with mind, such as learning and problem solving. “Narrow AI” allows a machine to carry out specific tasks, while “general AI” is a machine with “all-purpose algorithms” to carry out intellectual tasks that humans are capable of, with abilities to reason, plan, “think” abstractly, solve problems, and learn from experience. AI can also be classified by types: Type I machines are reactive, acting on what they have been programmed to perceive at the present, with no memory or ability to learn from past experience (examples include IBM’s Deep Blue chess computer, Google’s AlphaGo, and the ancient bronze robot Talos and the self-moving tripods in the *Iliad*). Type II AI machines have limited capacity to make memories and can add observations to their preprogrammed representations of the world (examples: self-driving cars, chatbots, and Hephaestus’s automated bellows). Type III, as yet undeveloped, would possess theory of mind and the ability to anticipate others’ expectations or desires (fictional examples: *Star Wars*’ C-3PO, Hephaestus’s Golden Servants, the Phaeacian ships). Type IV AI of the future would possess theory of mind as well as self-awareness (fictional examples include Tik-Tok in John Sladek’s 1983 novel and Eva in the 2015 film *Ex Machina*). Since she is capable of deceit and persuasion, Pandora seems to fall between Types II and III.

artificial life. Systems, beings, or entities that simulate natural life, natural processes; or replicate aspects of biological phenomena; human or animal artifacts brought to life.

automation. The technology by which action is performed without human assistance.

automaton, automata. A self-moving mechanical or constructed device, usually resembling an animal or human, that is not directly operated by an agent. Some automata are machines that perform tasks according to predetermined instructions; some automata can respond with a range of responses to different circumstances.

bionic. Having artificial body parts that amplify human or animal powers.

biotechné. Ancient Greek *bio*, life, *techné*, craft, art, science, the application of knowledge to practice.

biotechnology. Technology based on manipulating biological organisms, living systems, or their components to develop, modify, or make products or processes.

black box. Complex entity, machine, or system whose outputs are known or observable but whose inner contents and internal workings are hidden, unknown, opaque, and mysterious to the user.

cyborg, cybernetic organism. A being, usually humanoid, that combines or integrates organic, biological components with artificial technology, a human-machine hybrid, often exceeding human capabilities.

device. An object, gadget, instrument, contrivance, or apparatus made for a particular purpose, often denoting a mechanical item.

fembot. A robot in the form of a human female.

machine. A mechanical structure or device based on one or more components (such as lever, pulley, wheel and axle, inclined plane, screw, wedge) that changes the direction or magnitude of a force.

machine learning. Computers and AI with the ability to learn independently, without being explicitly programmed.

mechanism, mechanical. Something made of parts that move or work together to perform an action; a machine or something resembling a machine.

programmed. Supplied with a predetermined set of (coded) instructions for automatic performance.

puppet, marionette, doll. An artificial model of a human or animal typically moved by hand, rods, wires, or strings.

rejuvenation. To make a living being young again, to restore youthful strength, vigor, and/or appearance.

robot, bot. Complex and ambiguous to define, but a robot usually is a machine or self-moving object with a power source that provides energy. It can be “programmed” to “sense” its surroundings, and has a kind of “intelligence” or way of processing data to “decide” to interact with the environment to perform actions or tasks. Talos, the bronze animated statue powered by ichor, fits this definition.

Uncanny Valley. The eerie and repellent sensation experienced by most human beings when encountering artificial life forms, especially humanoid entities, that appear to be almost but not precisely real. Affinity increases with verisimilitude but steeply drops off as the entity approaches being indistinguishable from reality. The hypothesis was first identified by roboticist Masahiro Mori in 1970.

CHAPTER 1. THE ROBOT AND THE WITCH: TALOS AND MEDEA

1. Apollonius *Argonautica* 4.1635–88; Apollonius (Hunter trans.) 2015, 6, 298–304. The Greek word *automaton*, “acting of one’s own will,” was first used in Homer *Iliad* 5.749 and 18.371–80 to describe the automatic door opening and automatic wheeled tripods built by Hephaestus for the gods; see chapter 7. Hound and javelin, Ovid *Metamorphoses* 7.661–862.
2. On the “slippery” terms *robot* and *automaton* for an ancient “object constructed to move on its own,” see glossary; cf. Bosak-Schroder (2016, 123, 130–31), who argues that the earliest automata in Greek literature were originally imagined as solely magical and only later attained mechanical life. The idea of automated tools that can finish a task without continued human input, along with the impulse to make them, is very ancient, beginning with the Stone Age *atlatl* (spear thrower) and the bow and arrow. Once the arrow is nocked, aimed, and released, the bow fires “this little spear further, straighter, and more consistently than human muscles ever could,” remarks Martinho-Truswell (2018).
3. For a classicist’s perspectives on Harryhausen’s Talos: Winkler 2007, 462–63.
4. Hesiod *Works and Days* 143–60. In Hesiod’s poem, the “Age of Bronze” was a symbolic chronology of the warlike Bronze Age generations that preceded present-day Iron Age humans; Apollonius’s poetic license makes the men of that age literally of bronze. Gantz 1993, 1:153. There was also a legendary Athenian inventor named Talos; see chapter 5. Various genealogies of Talos: Buxton 2013, 77–79.
5. Ancient Colchis is now the Republic of Georgia. “Medea’s oil,” *Suda* s.v. Medea.
6. Apollodorus *Library* 1.9.26; Apollonius *Argonautica* 3.400–1339.
7. Medea’s *technai*, devices: Pindar *Pythian* 4.
8. Another version of Medea and her relationships with Jason and the Argonauts: Diodorus Siculus 4.45–48. Motif of heroes’ and monsters’ sole vulnerability, Buxton 2013, 88–94.
9. Colossus of Rhodes, Pliny 34.18; Strabo 14.2.5. N. F. Rieger in Ceccerelli 2004, 69–86. Centuries earlier, Rhodes was also famous for its “living statues”; see chapters 5 and 9.
10. Why people tend to attribute life to machines and Artificial Intelligence, Bryson and Kime 2011; Shtulman 2017, 138; Zarkadakis 2015, 19–23, 25–27. Trust and empathy in human-robot interactions: Darling, Nandy, and Breazeal 2015; Lin, Abney, and Bekey 2014, 25–26; and Lin, Jenkins, and Abney 2017, chapters 7–12.

When “thinking machines express anxiety about their own demises” it is “surely a sign of ‘consciousness’”; Mendelsohn 2015. Can Artificial Intelligence be tricked? Reynolds 2017.

11. Sophocles *Daedalus* fr. 160, 161 R. Winkler 2007, 463.
12. In a story mentioned by Apollodorus (*Library* 1.9.26), the Argonaut Poeas shot Talos in the ankle, which recalls the death of the mythic hero Achilles by a poison arrow to his vulnerable heel. Rock-throwing giants were a common motif in ancient myth and art. Another source says Talos was a bronze bull, perhaps conflating him with the Minotaur, the bull-headed man kept by Minos in the Cretan Labyrinth (see chapter 4). Coins of Knossos show the Minotaur throwing stones, and some Talos coins of Phaistos show a bull on the reverse.
13. Ganz 1993, 1:365. Robertson 1977. Teardrop: Buxton 2013, 82 and fig. 3 caption. Metallic objects and statues were often painted whitish in red-figure vase iconography; for example, several images of Niobe being turned into stone show her body partly white. Another notable detail is the ornamental border around the top of the Ruvo krater that appears to represent blacksmith’s tongs; see figs. 7.4 and 7.5, and the similar design in the border at the top of the Niobe Painter’s krater depicting Pandora, who was also fabricated by Hephaestus, fig. 8.7.
14. Robertson 1977, 158–59. Buxton 2013, 81 and figs. 4–6.
15. Carpino 2003, 35–41, 87, quote 41. Medea and local Etruscan versions of Greek myths, de Grummond 2006, 4–5.
16. Gantz 1993, 1:341–65, on artistic and literary sources for Talos; Apollonius *Argonautica* 4.1638–88; Simonides fr. 568 PMG; Apollodorus *Library* 1.9.26 and J. Frazer’s note 1; 1.140; Photius *Bibliotheca* ed. Bekker, p. 443b, lines 22–25; Zenobius *Cent.* v. 85; Eustathius scholiast on *Odyssey* 20.302. Divine robotic devices are discussed in chapter 7.
17. Faraone 1992, 41. Quotes, Hallager 1985, 14, 16–21, 22–25. Cline 2010, 325, 523. For photos and a drawing of the Master Impression seal, Chania Museum of Archaeology, Crete, see CMS VS1A 142 at Arachne.uni-koeln.de.
18. Shapiro 1994, 94–98, on the lost *Argonautica* epic cycle.
19. Simonides fr. 204 PMG; scholion to Plato *Rep.* 337a. Blakely 2006, 223. Sardinia and Crete, Morris 1992, 203. Etruscans and Nuragic Sardinian links: http://www.ansamed.info/ansamed/en/news/sections/culture/2018/01/08/etruscan-settlement-found-in-sardinia-for-first-time_288c45c9-9ae3-4b5e-ab8d-cb9bf654b775.html.
20. Laestrygonians are also described by Apollodorus *Epitome* 7.13; Thucydides 6.2.1; Hyginus *Fabulae* 125; Ovid *Metamorphoses* 14.233; Strabo 1.2.9. A pair of wall paintings, ca. 50–40 BC (Vatican Museum, Rome), depicts the Laestrygonians as copper-colored giants wresting up boulders and heaving them at Odysseus’s sailors. Paratico 2014.
21. Kang 2011, 15–16, 19, 21, 312nn1–3.
22. Weinryb 2016, 154.
23. Gods don’t use technology; Talos is “biological” and not an automaton because an automaton must have “an internal mechanism,” Berryman 2003, 352–53; Aristotle

- on automaton “self-moving” puppets, 358. Devices made by Hephaestus are “animated by divine power,” not technology, and gods do not use technology, Berryman 2009, 25–26 (Talos is omitted from discussion). Cf. Kang 2011, 6–7 and 311n7. But see De Groot 2008 and Morris 1992 on the overwhelming evidence from ancient literature and art that Greek gods were imagined as using technology and tools in projects, including self-moving entities. “Mechanistic” analogies could arise before “full-fledged automata” were feasible.
24. Bosak-Schroeder 2016, 123, 132. Cf. Berryman 2009, 22, “mechanistic conceptions” could not have been imagined before mechanics developed “as a discipline.” Contrast Martinho-Truswell 2018 on prehistoric inventions and see Francis 2009; archery, catapults, voting machines, and the winepress demonstrate practical mechanics.
 25. Definition, Truitt 2015a, 2. Ancient Greek automata as “self-moving,” Aristotle *Movement of Animals* 701b.
 26. This quote is from Berryman 2007, 36; Aristotle on natural and unnatural life, 36–39.
 27. Truitt 2015b, commenting on Cohen 1963.
 28. The myths of Pandora, Talos, the Golden Maidens, and other androids “distinguish these simulations, these artificial ‘humans’ from organic, natural life forms by the composition of the body,” not necessarily by “mechanistic” qualities. “Artificial life, in these myths, is made of the same substances” and methods “that human craftsmen use to make tools, buildings, and artworks” and statues. As with robots today, their functions are “labor, defense, and sex.” Raphael 2015, 186. See Berryman 2009, 49 and n119, *technē* is better translated as science rather than art.
 29. Popular links between metalworking and magic are widespread: Blakely 2006; Truitt 2015b; Truitt 2015a, guarding borders, 62–63; Faraone 1992, 19 and 29n11, 18–35. Weinryb 2016, 109, 128–34.
 30. Blakely 2006, 81, 209. Weinryb 2016, 153, 53–54, 154–56. Clarke 1973, 14, 21, 36.
 31. On the history of ancient Greek belief in the agency of statues, Bremmer 2013.
 32. Blakely 2006, 210–12.
 33. Cook 1914, 1:723–24; Buxton 2013, 86–87; Weinryb 2016, 4–7, 14, 44–52.
 34. Lost-wax process: Mattusch 1975; Hodges 1970, 127–29. Bronze techniques using wax and clay models, Hemingway and Hemingway 2003. Wooden armatures, see chapter 6. Realistic bronze statues from plaster casts of humans, chapter 5 and Konstam and Hoffmann 2004.
 35. Raphael 2015, 187. Berryman 2009, 27. Mayor 2007; Mayor 2016.
 36. Apollonius (Hunter trans.) 2015, 300; Raphael 2015, 183–84; Aristotle on automata, puppets, biology, physiology, and mechanics, Leroi 2014, 172–73, 199–202. De Groot 2008.
 37. Ichor: Homer *Iliad* 5.364–82. “Talos in fact has ichor, rather than blood in his vein,” although we “should perhaps not enquire too closely as to what flowed in Talos’s vein,” notes R. Hunter trans., *Apollonius* 2015, 189, 300, 304. Ichor in myth and medical treatises, Buxton 2013, 94–96.

38. Bloodletting was thought to have beneficial value in healing various ailments. Hippocrates *On the Nature of Man* 11; Aristotle *History of Animals* 512b 12–26. Bloodletting is depicted on the Peytal Aryballos, 480 BC, Louvre. Buxton 2013, 93. The location of Talos’s weak point, the ankle, conforms to the trope of vulnerability associated with feet, e.g., Achilles’s heel and Oedipus’s lame foot.
39. Plutarch *Moralia* 5.7.680C–83B; Dickie 1990 and 1991; Apollonius (Hunter trans.) 2015, 6, 302. On bronze and evil eye, Weinryb 2016, 131–33. Examples of realistic painted and inlaid bronze statues, Brinkmann and Wünsche 2007.
40. Truitt 2015a and b. Kang 2011, 22–25, 65–66. Buxton 2013, 74. Gray 2015. “In-betweenness” of Pandora, chapter 8 and Francis 2009, 14–15. In a sense, Talos could be said to have “narrow” or Type I reactive AI (see glossary). On the “Uncanny Valley” effect of realistic artificial life, see chapter 5; and Lin, Abney, and Bekey 2014, 25–26.
41. Newman 2014. The myth of Talos as an invincible ancient security system underlies the name of the “world’s largest hub of security intelligence” working “tirelessly to identify and counter cyber-crime attacks,” called Talos, maintained by Cisco Systems, since 2008. <http://www.talosintelligence.com/about/>.
42. Kang 2011, 65. On modern concerns about the ethics of replacing human judges with AI, see Bhorat 2017. Lin 2015; Lin, Abney, and Bekey 2014, 53, 60, and chapters 4 and 5. Thanks to Norton Wise for valuable suggestions on these questions. Spenser’s Iron Knight, Talus, was named for the mythic Talos but may have been modeled in part on Leonardo da Vinci’s robotic knight in armor (ca. 1495) clad in heavy medieval armor and powered by pulleys, cranks, gears, and levers.
43. See chapter 9 for ancient Persian “batteries.” Ambrosino 2017. Shtulman 2017, 53–56.
44. Tenn 1958. Talos served as “a primitive home alarm system,” Mendelsohn 2015.
45. Garten and Dean 1982, 118. Talos missiles were decommissioned in 1980. Talos in the Harryhausen film of 1963 also combined preprogrammed “brawn” with “brains.” Winkler 2007, 462–63.
46. History of efforts to create military robotics, Jacobsen 2015 and Tyagi 2018. Nissenbaum 2014. SOCOM TALOS project renewed its official call for proposals in December 2017–18.

CHAPTER 2. MEDEA’S CAULDRON OF REJUVENATION

1. Ovid *Metamorphoses* 7.159–293.
2. *Nostoi* frag. 7, and Medea’s plot against Pelias in the lost play by Sophocles, *Rhizotomoi*, “Root-Cutters,” see Gantz 1993, 1:191, 367; some accounts indicate that she placed Aeson in the boiling kettle. Godwin 1876, 41.
3. Medea’s rejuvenation plan in the Aeschylus play, according to scholia on Euripides *Medea*, see Denys Page, ed., *Euripides, Medea* (Oxford, 1938). Diodorus Siculus 4.78 on the revivifying effects of the steam bath invented by Daedalus. New technologies often misconstrued, Hawes 2014, 59–60; on Palaephatus and his date, see 37–91 and 227–38. Aristotle on metabolism, aging, and life spans, Leroi 2014, 260–65.

4. Ovid *Metamorphoses* 7.159–293; Clauss and Johnston 1997, 33–34; Godwin 1876, 41; Newlands 1997, 186–92. Only mercury corrupts gold. Maluf 1954. Exchange transfusions are lifesaving procedures for sickle-cell anemia and blood diseases of newborns. Blood exchange parabiosis experiments, in which young blood is transfused into an older body, Friend 2017, 60–61. Older mouse tissues were rejuvenated but the young donor mice aged faster.
5. Psamtik's suicide by drinking bull's blood, Herodotus 3.15.4; Plutarch *Themistocles* 31; and Midas, see Strabo 1.3.21. Stormorken 1957.
6. See "Ruse of the Talismanic Statue," Faraone 1992, 100–104.
7. Faraone 1992, 100.
8. Quotes from Diodorus Siculus 4.50–52; other sources include Pindar *Pythian* 4.138–67; 4.249–50; Apollonius of Rhodes *Argonautica* 4.241–43; Apollodorus *Library* 1.9.27–28; Ovid *Metamorphoses* 7.159–351; Pausanias 8.11.2–3; Hyginus *Fabulae* 21–24. A lost play of 455 BC by Euripides, *Peliades*, dramatized this myth. Gantz 1993, 1:365–68. Medea's transformation mirrors the goddesses' use of ambrosia as a rejuvenating salve, Homer *Iliad* 14.170 and *Odyssey* 18.188.
9. Diodorus Siculus (4.52.2) suggests that Medea hypnotized the daughters and created the illusion (*eidolon*) of a young lamb emerging from the pot.
10. Examples include an Etruscan olpe, Oriental style, ca. 630 BC with incised image of Medea inscribed "Metaia," black *bucchero*, from Caere (Cerveteri), Museo Archeologico Nazionale inv. 110976; de Grummond 2006, 4–6 and fig. 1.7. Two black-figure vases from Vulci show Medea and a ram in the cauldron in the British Museum, B 221 and B 328; black-figure vase has similar images by the Leagros Group, in the Harvard University Art Museum, 1960.315.
11. Red-figure krater in Boston Museum of Fine Arts, 1970.567; red-figure vase from Vulci, ca. 470 BC, British Museum E 163. Woodford 2003, 80–83, fig. 54, red-figure cup, 440 BC, Vatican Museum.
12. Dolly was cloned from an adult cell (cows had previously been cloned) by the Roslin Institute, University of Edinburgh. Dolly and other cloned sheep in the project died of a fatal contagious virus, but a 2016 study by Sinclair et al. of Dolly's skeletal remains (stored in the National Museum of Scotland) did not reveal evidence of premature aging of her bones. <http://www.roslin.ed.ac.uk/public-interest/dolly-the-sheep/a-life-of-dolly/>.
13. Buddhist perspectives on replicating life and cloning, see Han 2017, 67.
14. Apollodorus *Epitome* 5.5; scholiast on Apollonius *Argonautica* 4.815. Medea contemplates suicide in *Argonautica* 3.800–815.
15. On promotions of mortals to immortality, Hansen 2004, 271–73. Iolaus: Pindar *Pythian* 9.137; Euripides *Heraclidae*.
16. Ovid *Metamorphoses* 7.171–78; Newlands 1997, 186–87. In Homer's *Odyssey* 7.259, the witch-nymph Calypso's offer of immortality to Odysseus was seen as "irrational" by the skeptic Heraclitus: Hawes 2014, 96. See chapter 3 for that story.
17. Chiron, Apollodorus *Library* 2.5.4.
18. Dioscuri, Apollodorus *Library* 3.11.2.

CHAPTER 3. THE QUEST FOR IMMORTALITY AND ETERNAL YOUTH

1. Mayor 2016. “Cheating Death” 2016. Raphael 2015, 192–93. Boissoneault 2017. *Blade Runner* was loosely adapted from the science-fiction novel *Do Androids Dream of Electric Sheep?* by Philip K. Dick (1968). In Jo Walton’s science-fiction novel set in antiquity, *The Just City* (2015), 254, 300, robot-slaves are punished by having their memories deleted. In the popular TV series *Westworld* (HBO, 2016 premiere) the androids’ memories are swept clean each day.
2. Lefkowitz 2003, 90–91. Reeve 2017. Rogers and Stevens 2015, 221–22.
3. Aristotle (*On the Soul* 2.2.413a21–25) defines a living thing as able to take in nutrition (lowest common denominator) and to change (plants), capable of movement, motivation or desire, and perception (animals), and, for humans, having the added capacity for thought. For Aristotle, plants and animals change, but artificial artifacts cannot change. Steiner 2001, 95. Exceptions include Hephaestus, who is lame and hardworking; see chapter 7.
4. The Titan Prometheus is an exception—his aid to humans entailed high-stakes risks, and his immortality would be part of the punishment. John Gray’s *Soul of the Marionette* (2015) explores human freedom and immortality through the lens of Gnosticism.
5. Cave 2012, 6–7, 202, 205–9. Gilgamesh and immortality, Eliade 1967. Amazons die as heroes, Mayor 2014, 28–29.
6. Colarusso 2016, 11.
7. Hansen 2002, 387–89. Human life span of 120 years, Zimmer 2016.
8. Pindar cited by Pausanias 9.22.7; Plato *Republic* 611d; Ovid *Metamorphoses* 13.904–65. Palaephatus 27 *Glaukos of the Sea*. Glaukos, Hyginus *Fabulae* 136; Apollodorus *Library* 3.3.1–2.
9. *Alexander Romance* traditions, Stoneman 2008, 94, 98–100, 146–47; 150–69. Aerts 2014, 498, 521.
10. In the *Classic of Mountain and Seas*, Birrell 1999, 241.
11. Mercury fumes can be lethal but ingestion is not. Qin Shi Huang: Kaplan 2015, 53–59; Cooper 1990, 13–28; 44–45.
12. Alexander quotes Homer *Iliad* 5.340. The story appears in Plutarch *Moralia* 341b, *Moralia* 180e, and Plutarch *Alexander* 28, among others. Buxton 2013, 95–96.
13. Homer *Odyssey* 24.5.
14. Stoneman 2008, 152–53.
15. Gantz 1993, 1:154–56. Apollodorus *Library* 1.7, 2.5.4. Hard 2004, 271. Kaplan 2015, 24–28. Simons 1992, 27. Hyginus (*Astronomica* 2.15) says the torment lasted 30,000 years, elsewhere 30 years. Strabo (11.5.5) says 1,000 years. Liver regeneration is reflected in Chinese folklore in the utopian figure of *shih-jou*, a mound of meat that looks like ox liver and can never be completely consumed because it regenerates, Birrell 1999, 237.
16. Heracles and the Hydra, Hard 2004, 258. Mayor 2009, 41–49.

17. Hansen 2002, 36–38. Felton 2001, 83–84.
18. Sisyphus: Apollodorus *Library* 1.9.3–5 and Frazer’s note 3, Loeb ed., pp. 78–79; Homer *Odyssey* 11.593–600; scholiasts on Homer *Iliad* 1.180 and 6.153; Pherecydes *FGrH* 3 F 119.
19. *Homeric Hymn to Aphrodite* 218–38; Apollodorus *Library* 3.12.4 and Frazer’s note 4, Loeb ed., pp. 43–44. In antiquity, cicadas were associated with renewed youth and living forever, sloughing off old skin and emerging anew. Tithonus and Eos in classical art and literature, Gantz 1993, 1:36–37. Woodford 2003, 60–61. Lefkowitz 2003, 38–39.
20. Hansen 2004, 222, 273. Cohen 1966, 15, 16, 24.
21. Hansen 2004, 269–73. *Homeric Hymn to Aphrodite* 239–48.
22. Eos and Tithonus in medieval and modern arts, Reid 1993, 1:386–88.
23. Sappho’s Tithonus poem, West 2005, 1–9. D’Angour (2003) discusses Horace’s ode in view of Pythagorean notions. Tennyson’s “Tithonus,” Wilson 2004, 214n78. Ageless longevity is a universal theme in the folklore of utopias, Stoneman 2008, 99–100; 153–54. De Grey 2008 and 2007. In the final novel of Philip Pullman’s *His Dark Materials* trilogy (1995, 1997, 2000), God himself is revealed as a “twittering ghost.”
24. Leroi 2014, 260–65. Friend 2017, link between sexual abstinence and extending life, 65. Named for the mythic afterlife of heroes, “Elysium” health supplements aim to guarantee “overliving”: <https://www.fastcompany.com/3041800/one-of-the-worlds-top-aging-researchers-has-a-pill-to-keep-you-feeling-young>.
25. “Life detested,” Woodford 2003, 60. On anxiety ancient and modern about technoculture’s threat to “human finitude” and “humanity,” Cusack 2008, 232.
26. Cave 2012. Friend 2017. Harari 2017, 21–43. Buddhist transhumanism, Mori 2012; Borody 2013. What is the limit for human longevity? Scientists debate this controversial question; some findings suggest that the maximum life span with current technology is about 115–20 years: Zimmer 2016.
27. “The disposable soma” springs the “trap of Tithonus”: “Cheating Death” 2016 and “Longevity” 2016. Liu 2011, 242–43. Richardson 2013. Kaplan 2015, 68–73. Cave 2012, 64, 67–71. Friend 2017, 56–57; de Grey 2007, 8 and 379n2; de Grey 2008, “global nursing home.”
28. The replicants of *Blade Runner* die too soon, before they can become human, Raphael 2015. Talos, Buxton 2013, 78. The ancient Greek concept of living too long is explored through the mythic figures of Oedipus and Heracles and Shakespeare’s Macbeth and Lear in Wilson 2004, 2, 207nn2–3, 214.

CHAPTER 4. BEYOND NATURE: ENHANCED POWERS BORROWED FROM GODS AND ANIMALS

1. Plato’s legend and pre-Socratic writings, Gantz 1993, 1:166. Plato *Protagoras* 320d–321e. The etymologies are Plato’s, accepted in antiquity. In some ancient traditions, it was Prometheus who made the first humans and animals; see chapter 6 and Tassarini 1992, 61–62, 78–80.

2. Rogers and Stevens 2015, 1–3. On modern “Human Enhancement Technologies [HET],” see Lin 2012 and 2015. Martinho-Truswell 2018 points out that many creatures use tools, but humans are the only animals who “automate” tools, and the impulse is at least as old as the first *atlatl* and bow and arrow.
3. Prosthetics in ancient myth and history: James and Thorpe 1994, 36–37; LaGrandeur 2013. Zarkadakis 2015, 79–82.
4. Lin 2012; Patrick Lin is director of the Ethics + Emerging Sciences Group, California Polytechnic State University. History of religious qualms about artificial human enhancements and robots: Simons 1992, 28–32.
5. Ancient technology, Brunschwig and Lloyd 2000, 486–94.
6. Gantz 1993, 1:359–63. Medea collecting the Promethean drug from the gore of his liver was taken up by later authors: Propertius *Elegies* 1.12; Seneca *Medea* 705; Valerius Flaccus *Argonautica* 7.352. The ichor of the primeval giants killed by the gods spilled into the ground, causing evil-smelling springs, a belief reported by Strabo 6.3.5.
7. Apollonius, *Argonautica* 3.835–69; 3.1026–45; 3.1246–83. Pindar, *Pythian* 4.220–42. The tasks set for Jason by Aeetes were dramatized by Sophocles in his lost play *Colchides* (“The Colchians”), probably the source for Apollonius, Gantz 1993, 1:358–61.
8. Zarkadakis 2015, 79–82. Harari 2017, 289–91. See Lin 2012, 2015; for a series of reports and articles on the grave ethical issues surrounding “supersoldiers” and cyber weapons and enhancing fighters through technology and drugs, see Ethics + Emerging Sciences Group, <http://ethics.calpoly.edu/he.htm>. Research on neuro-computer technology to delete thoughts threatens mental integrity and cognitive liberty, Ienca and Andorno 2017.
9. The fire-breathing bulls episode also appears in Pindar *Pythian* 4.224–50 (ca. 462 BC), Shapiro 1994, 94–96.
10. Apollonius *Argonautica* 3.401–21; 3.492–535; 3.1035–62; 3.1170–1407. Godwin 1876, 41. This tactic is the same one that saved the hero Cadmus in Thebes. In that myth, Cadmus casts rocks among the Spartoi, “Sown Men,” who spring up from the planted teeth of another slain dragon. Rationalizing of the sown men, Hawes 2014, 140–41, 146.
11. Mayor 2016.
12. Mayor 2009, 193–94; Stoneman 2008, 77; Aerts 2014, 255.
13. Mayor 2009, 235–36, fig. 39, illustration of Alexander’s fire-breathing iron riders and horses on wheels in Firdowsi’s *Shahnama* manuscript of Great Il-Khanid AD 1330–40, Sackler Museum, Harvard University.
14. It is interesting that Firdowsi’s epic also describes an enchanted castle defended by automaton-archers. A later sixteenth-century illustrated manuscript shows the automatic archer shooting arrows at an invading army from its post on the castle walls; *Shahnama* by Firdowsi, Moghul, sixteenth-century illustrated MS 607, fol. 12v, Musée Condé, Chantilly, France.
15. Cusack 2008, on Talos, Nuada, Freyja, and the Hindu Savitr.
16. *Rig Veda* 1.13, 1.116–18, 10.39. Prosthetics technologies, Zarkadakis 2015, 79–81.

17. These and the following archaeological examples of prosthetics, see Nostrand 2015.
18. James and Thorpe 1994, 36–37. Egyptian toe, Voon 2017. Nostrand 2015. Mori 2012; Borody 2013.
19. Cohen 1966, 16–18. Morris 1992, 17–35, 244–50; Hawes 2014, 49–53, 207–12; “first inventor motif,” 59–60, 109, 120–21, 210–11, 230–31. First “hero” inventor, Kris and Kurz 1981; “archetypal craftsman,” Berryman 2009, 26. Lane Fox 2009, 186–91. Ancient sources for Daedalus’s works, Pollitt 1990, 13–15. In the *Classic of Mountain and Seas*, Chinese mythology designates several inventor gods and culture heroes, such as Hsien-yuan, “Cart Shaft,” who first harnessed animals to draw vehicles; Chi Kuang, “Lucky Glare,” inventor of the chariot; Chi’iao Ch’ui, “Skill Weights,” god of inventive technology, Birrell 1999, 205, 220, 239, 256.
20. Apollodorus *Library* 3.15.1; Antoninus Liberalis *Transformations* 41.
21. *Spy in the Wild*, BBC-PBS Nature miniseries, 2017, features more than thirty animatronic creatures fitted with cameras to secretly observe animals in nature; the animals accept and interact with the robots, even mourning their “death.” Artistic works that deceive humans and animals in antiquity, Morris 1992, 232, 246. Spivey 1995.
22. Pornography and automata, Kang 2011, 108, 138–39, 165–66; Lin, Abney, and Bekey 2014, 58, 223–248; Higley 1997. Morris 1992, 246 on erotic interaction with lifelike statues; cf. Hersey 2009 and Wood 2002, 138–39.
23. Sources for the myth include Palaephatus 2 and 12; Apollodorus *Library* 3.1.3–4; Hyginus *Fabulae* 40; Hesiod frag. 145 MW; Bacchylides 26; Euripides’s lost play *The Cretans*; Sophocles’s lost play *Minos*; Isocrates 10 *Helen* 27; Diodorus Siculus 4.77; Ovid *Metamorphoses* 8.131–33 and 9.736–40; Ovid *Ars Amatoria* 1.289–326.
24. “Relief skyphos with Pasiphae, Daedalus, and the Heifer,” Los Angeles Museum of Art, AC1992.152.15; Roman mosaic floors, House of Poseidon, second century AD, Zeugma Mosaic Museum, Gaziantep, Turkey; third century AD, Lugo, Spain; Roman frescoes, first century AD, in Herculaneum and in Pompeii’s House of the Vettii (which shows the bow-drill) and Casa della Caccia Antica. De Puma 2013, 280. Pasiphae in medieval and modern arts, Reid 1993, 2:842–44.
25. Pasiphae and the Minotaur in ancient literature and art, Gantz 1993, 1:260–61, 265–66. Woodford 2003, 137–39. Rationalization in antiquity, Hawes 2014, 58, 126–27. Other ancient instances of humans copulating with animals such as horses and donkeys were reported, e.g., in Plutarch’s *Moralia*, *Parallel Stories* 29.
26. Gantz 1993, 1:261–64, 273–75.
27. Ancient Scandinavian sagas tell of the blacksmith Wayland who devised wonderful weapons and other marvels, including a garment made of real birds’ feathered skins, which allowed him to fly, Cohen 1966, 18.
28. Daedalus and Icarus ancient sources and art, Gantz 1993, 1:274–75; in medieval and modern arts, Reid 1993, 1:586–93. Beeswax and feathers were said to be the building materials of one of the first temples to Apollo, according to Pindar and other poets, Marconi 2009.
29. Morris 1992, 193.

30. Etruscan *bucchero* olpe found at Cerveteri (Caere), ancient Etruria, Lane Fox 2009, 189. Boeotian Corinthianizing alabastron of ca. 570 BC, in Bonn. Etruscan bulla, Walters Art Museum, Baltimore, 57.371. Morris 1992, 194–96. Daedalus on Etruscan gems, Ambrosini 2014, 176–78, and figs. 1–15b.
31. Icarus and Daedalus in art, Gantz 1993, 1:274; *LIMC* 3. “Fall of Icarus,” seascape wall painting from Pompeii, National Archaeological Museum of Naples. On the widespread folklore motif of an architect devising a way to fly from captivity, see Kris and Kurz 1979, 87–88.
32. Flying in Greek comedy: D’Angour 1999. Keen 2015, 106–19.
33. Stoneman 2008, 111–14. Aerts 2014, 27.
34. Stoneman 2008, 114–19. For medieval images of Alexander as aviator, Schmidt 1995.
35. Needham and Wang 1965, 587–88.
36. *Classic of Mountain and Seas*, Birrell 1999, 256.
37. Recorded in *Zizhi Tongjian*, the historical chronicle of Chinese history 403 BC to AD 959, compiled in AD 1084. Other ancient myths of flight by men, Cohen 1966, 95–96. See chapter 9 for forced flying punishments of criminals.
38. Among the ancient texts that discuss Daedalus’s flight are Apollodorus *Epitome* 1.12–15; Strabo 14.1.19; Lucian *Gallus* 23; Arrian *Anabasis* 7.20.5; Diodorus Siculus 4.77; Ovid *Metamorphoses* 8.183, *Heroides* 4, *Ars Amatoria* 2, *Tristia* 3.4; Hyginus *Fabulae* 40, Virgil *Aeneid* 6.14. McFadden 1988.

CHAPTER 5. DAEDALUS AND THE LIVING STATUES

1. Daedalus and Sardinia, Morris 1992, 202–3, 207–9; Diodorus Siculus 4.30; Pausanias 10.17.4. Tools, Vulpio 2012. The Nuragic iron compass is in Sanna Museum, Sassari, Sardinia.
2. Diodorus Siculus 4.78. See Morris 1992 for all the inventions attributed to Daedalus.
3. Blakemore 1980.
4. Michaelis 1992. Ayrton 1967, 179–84. Ayrton’s controversial modernist sculpture of the bronze robot Talos stands guard on Guildhall Street, Cambridge, UK.
5. Honeycomb building blocks, Marconi 2009. Marcus Terentius Varro’s conjecture, in *On Agriculture*, was proven by Hales 2001.
6. Lane Fox 2009, 190.
7. The shell and ant: Zenobius *Cent.* 4.92; also mentioned in Sophocles’s lost play *The Camicians*, Athenaeus 3.32.
8. For Daedalus’s time in Sicily, Morris 1992, 193–210. Apollodorus *Epitome* 1.14–15; Herodotus 7.169–70. Diodorus Siculus 4.78–79 gives a slightly different version of the events.
9. Apollodorus *Library* 3.15.8; Diodorus Siculus 1.97, 4.76–77; Pliny 36.9; Pausanias 1.21.4; Ovid *Metamorphoses* 8.236; Plutarch *Theseus* 19. This Athenian Talos is sometimes called Kalos or Perdix. Some versions say the saw was modeled on a fish spine. Daedalus in Athens, Morris 1992, 215–37; folding chair, 249–50; Talos grave, 260. There is no ancient account of the death of Daedalus.

10. Pseudo-Aristotle *On Marvelous Things Heard* 81; Stephanus of Byzantium s.v. Daedalus; Diodorus Siculus 1.97; Scylax *Periplus*; Pausanias 2.4.5 and 9.40.3. Daedalus statues, Donohue 1988, 179–83.
11. Bremmer 2013, 10–11. Several ancient accounts tell of statues of gods that were bound or fettered. Lucian *Philopseudes* (second century AD) satirizes beliefs in animated statues that arise at night to bathe, sing, wander, and foil thieves; Felton 2001. Vase paintings of animated statues coming to life on buildings, Marconi 2009.
12. Morris 1992, 30–31, 221–25, 360.
13. Socrates on Daedalus, Morris 1992, 234–37; 258–89 for the Attic deme Daedalidae; Daedalus in Athens, 257–68. Kang 2011, 19–21, Socrates’s statement shows that automata were viewed as slaves in antiquity. Cf. Walton 2015, a science-fiction novel set in a “utopia” based on Plato’s *Republic*, in which Socrates discovers that the robot-slaves, used as tools, turn out to have consciousness and a desire for freedom.
14. Bryson 2010; Lin 2015; “AI in Society: The Unexamined Mind” 2018.
15. Semen as the liquid that animates an embryo, Leroi 2014, 199. Quote, Berryman 2009, 72.
16. Keyser and Irby-Massie 2008, s.v. Demokritos of Abdera, 235–36. Kris and Kurz 1979, 67–68. Leroi 2014, 79–80, 199–200; Kang 2011, 19–20 (erroneously claims that Aristotle attributed statues’ movement to mercury), 98, 117–18. Berryman 2009, 26, 37, 75; noting that Aristotle uses the mercury analogy to criticize atomist theory. Morris 1992, 224–25, 232–33; Donohue 1988, 165–66, 179–83; Steiner 2001, 118–19. Semen, Hersey 2009, 69–71, 100. Democritus also studied magnets, Blakely 2006, 141 and n24.
17. James and Thorpe 1994, 131. Ali 2016, 473.
18. Blakely 2006, 16, 25, 159, 215–26.
19. Bremmer (2013) traces the chronological history and ancient sources for statues “with agency,” 13–15 on sweating, weeping, and bleeding statues. See also Poulsen 1945, 182–84; Donohue 1988; Cohen 1966, 26 n26; Felton 2001; Van Wees 2013.
20. For contradictions in the artistic arguments, see Morris 1992, 240–56. Felton 2001, 79–80.
21. Berryman 2009, 27–28, original italics; it seems “very unlikely” that “mechanistic conceptions” could have developed “prior to the existence of mechanics as a discipline,” 22. Some real devices invented before the time of Aristotle, such as catapults, voting machines, and wine and olive presses, could have inspired machine analogies. Cf. Francis 2009, 6–7.
22. On ancient Greeks’ innovation and imagination, D’Angour 2011, 139–42. Rogers and Stevens 2015. “At the origin of any creation or invention lie the imagination and the ability to dream,” notes Forte 1988, 50; inventions require the “effort of imagination.”
23. Simons 1992, 40. Francis 2009. “Where science fiction leads,” paraphrasing “The Next Frontier: When Thoughts Control Machines” 2018, 11.
24. On aesthetic and philosophical reactions to statues in antiquity, Steiner 2001. On various Greek artists and sculptors of lifelike artworks, see entries in Pollitt 1990. Realistic statues, Spivey 1995.

25. Haynes 2018. Pliny's artistic descriptions, books 34–36.
26. Quintilian *Inst.* 12.7–9; Lucian *Philopseudes* 18–20; Felton 2001, 78 and n10.
27. These examples and many more, in Pliny 34.19.59–35.36.71–96; painted marble, e.g., 35.40.133; the invention of ceramic portraits from shadow profiles of the living, 35.43.151. On artistic *phantasias*, Pollitt 1990, 222 and n2.
28. Plaster casts and clay and wax models of living people, Pliny 35.2.6, 35.43.151, and 35.44.153 (incorrectly cited as Pliny 36.44.153 by Konstam and Hoffmann 2004). Parrhasius, Seneca *Controversies* 10.5. Cf. earlier discussion of the “virtuosity” of the Riace sculptor, Steiner 2001. Kris and Kurz 1979.
29. Blakely 2006, 141–44, 157. Magnetic lodestone's properties were known to Thales of Miletus (sixth century BC); magnetism was described in Chinese chronicles, such as *Guiguzi* (fourth century BC) and *Lushi Chunqiu* (second century BC).
30. Lowe 2016, 249, 267. Heron of Alexandria devised a continuously hovering hollow sphere over a funnel opening of a closed vessel of boiling water, but the design is nonfeasible for a large statue; James and Thorpe 1994, 134; re-created by Kotsanas 2014, 61. Today, magnetic suspension or levitation (for example, maglev trains) can be achieved only by extremely powerful electromagnetic technologies and with rotation (as with Levitron toys).
31. Lowe 2016. Examples of floating statues, Rufinus, *Historia Ecclesiastica* ca. AD 550; Cedrenus, the Byzantine historian, ca. AD 1050, in *Synopsis Historion*; Nicephorus Callistus *Church History* 15.8. Stoneman 2008, 119, 261n38.
32. Claudian, “*De Magnete/Lodestone*,” *Minor Poems* 29.22–51. Lowe 2016, 248n6.
33. The Uncanny Valley effect was first articulated by the Japanese robotics engineer Masahiro Mori in 1970, inspired by attempts to make hyperrealistic prosthetics; Mori 1981 and 2012; Borody 2013; and see also Zarkadakis 2015, 68–73; Kang 2011, 22–24, 34–35, 41–43, 47–55, 207–20; Lin, Abney, and Bekey 2014, 25–26. Wonder, *thauma*, and wondrous works, *thaumata*, especially in ancient Greek art, D'Angour 2011, 150–56. On the strong mixed emotions aroused by hyperreal, seemingly animated sculptures in classical antiquity, Marconi 2009. Liu 2011, 201–48. Wonder in Indian automata tales, Ali 2016.
34. Cohen 2002, 65–66. Cf. Mori 1981 and 2012; Borody 2013, and see also Raghavan 1952. See Liu 2011, 243–46, for discussion of the remarkably similar Chinese tale in the *Book of Liezi*.
35. Pollitt 1990, 17; 15–18 for artificial life described in Homer.
36. O'Sullivan 2000. Aeschylus *Theoroi*; Euripides *Eurystheus*; Bremmer 2013, 10–11; Marconi 2009; Morris 1992, 217–37. Faraone 1992, 37–38. Kris and Kurz 1979, 66–67. The “shock of the new” in ancient art, D'Angour 2011, 150–56.

CHAPTER 6. PYGMALION'S LIVING DOLL AND PROMETHEUS'S FIRST HUMANS

1. Hesiod *Theogony* 507–616; *Works and Days* 42–105. The final play is lost; Prometheus in ancient literature and art, see Gantz 1993, 1:152–66; Glaser and Rossbach 2011; Prometheus in modern arts, Reid 1993, 2:923–37.

2. Hard 2004, 96. Raggio 1958, 45. Sappho frag. 207 (Servius on Virgil).
3. Simons 1992, quote 28; from mud metaphor to mechanical engineering metaphors, Zarkadakis 2015, 29–34.
4. According to Aesop *Fables* 516, “The clay that Prometheus used was not mixed with water but with tears.” Other sources for Prometheus’s creation of humans include Menander and Philemon, per Raggio 1958, 46; Aristophanes *Birds* 686; Aesop *Fables* 515 and 530; Apollodorus *Library* 1.7.1; Callimachus frag. 1, 8, and 493; Aelian *On Animals* 1.53; Pausanias 10.4.4; Ovid *Metamorphoses* 1.82 and 1.363 (Deucalion’s Flood); Horace *Odes* 1.16.13–16; Propertius *Elegies* 3.5; Statius *Thebaid* 8.295; Juvenal *Sat.* 14.35; Lucian *Dialogi deorum* 1.1; Hyginus *Fabulae* 142; Oppian *Halieutica* 5.4; Suidias (Suda) s.v. Gigantiai. Enlivened by fire: Raggio 1958, 49; Dougherty 2006, 50, citing Servius commentary on Virgil *Eclogues* 6.42.
5. Early European travelers visited the ravine: in the eighteenth century Sir William Gell reported that some stones there emitted an odor; in the nineteenth century Colonel Leake found the pair of boulders but discerned no smell; George Frazer noticed reddish earth but no large rocks. See Peter Levi’s note 19 in vol. 1 of 1979 Penguin edition of Pausanias.
6. Pygmalion myth and ancient statue lust, Hansen 2017, 171–75.
7. Buddhist tale of a mechanical girl for sex, Lane 1947, 41–42, and Kris and Kurz 1979, 69–70. Ambrosino 2017. Kang (2005) points out the misogynistic impulse in Pygmalion’s creation of a perfect woman and compares modern narratives of female sex robots, which, unlike the ancient myth, have unhappy endings.
8. Marshall (2017) compares the female replicants of the *Blade Runner* films to Pygmalion’s creation.
9. Some interpret Apollodorus *Library* 3.14.3 to suggest that a son, Paphos, and a daughter, Metharme, were born to Pygmalion’s living statue. Similarly, the plot of *Blade Runner 2049* turns on the magical existence of two children, a girl and a boy who is an exact copy, born to the replicant Rachael, who died in childbirth. See chapter 8 for a Roman-era fantasy about the offspring of the ancient replicant female Pandora.
10. Pygmalion: Ovid *Metamorphoses* 10.243–97; Heraclides Ponticus (lost work) cited by Hyginus *Astronomica* 2.42; Hyginus *Fabulae* 142; Philostephanus of Styrene cited in Clement of Alexandria *Protepticus* 4; Arnobius *Against the Heathen* 6.22. Hansen 2004, 276. Hersey 2009, 94. Reception of Pygmalion myth, Grafton, Most, and Settis 2010, 793–94; Wosk 2015.
11. Raphael 2015, 184–86.
12. Hersey 2009. “Pygmalionism” differs from statue lust; it requires a lover to mimic a statue and then come to life.
13. Philostratus *Lives of the Sophists* 2.18.
14. Homer *Iliad* 2.698–702 and commentary at 701 by Eustathius; Apollodorus *Epitome* 3.30; Ovid *Heroides* 13.151; Hyginus *Fabulae* 104; for other ancient sources, see George Frazer’s commentary in the Loeb ed. of Apollodorus *Epitome*, pp. 200–201n1.
15. Wood 2002, 138–39. Hersey 2009, 90–97. Athenaeus *Learned Banquet* 13.601–606; citing the poets Alexis, Adaeus of Mytilene, Philemon, and Polemon. Truitt 2015a, 101.

16. Scobie and Taylor 1975, 50. Hersey 2009, 132. Cohen 1966, 66–67. Innovations in art evoked awe in antiquity, D'Angour 2011, 148–56. An early prototype is Harmony, a realistic AI sexbot from Abyss Creations, made for sex and “companionship,” Maldonado 2017. On sex robots, see Devlin 2018.
17. The Tocharian version (sixth to eighth century AD) of a lost Sanskrit text of unknown date, translated by Lane (1947, 41–45). For Hindu and Buddhist automata, see Cohen 2002, 70–71, for discussion of this tale. See also Raghavan 1952; Ali 2016.
18. Cohen 2002, 69, 71, original italics. On Buddhism and robots, Simons 1992, 29–31; Buddhism and biotechnology, see essay by David Loy in Walker 2000, 48–59; on Buddhism and robots, see Mori 1981 and 2012; Borody 2013. On Chinese Buddhism and replicas, Han 2017. On Buddhist perspectives on robots and AI, see Lin, Abney, and Bekey 2014, 69–83.
19. Kang 2011, 15–16; Kang does not address the ancient literary and artistic evidence for Prometheus's construction of the first humans using artisans' tools and methods.
20. The differences between Neoplatonism and Christianity were expounded by the Church Father Tertullian, who was active in the third century AD when these sarcophagi were made. Raggio 1958, 46–50 and figs. Tertullian *Apologeticum* 18.3. Roman mosaic of Prometheus creating the first man, Shahba, Syria, third century AD. Roman sarcophagus showing Prometheus with first man lying at his feet, fourth century AD, Naples museum. See Tassinari 1992 on Neoplatonic, Pythagorean, Orphic, Christian, and Gnostic links to Prometheus as creator.
21. Simons 1992, 24–28, also contrasts Pygmalion and Prometheus.
22. I am grateful to Gabriella Tassinari for discussing the difficulties of determining the dates (and authenticity) of the gems in her catalogue and in other museum collections. For each gem discussed and illustrated in this chapter, see the sources for dating cited in Tassinari 1992; 75–76 for Prometheus working on the form of a woman. I thank Erin Brady for providing an English translation of Tassinari's monograph.
23. Raggio 1958, 46. Apollodorus *Library* 1.7.1; Pausanias 10.4.4. Tassinari 1992, 61–62, citing works by Philemon, Menander, Erinna, Callimachus, Apollodorus, Aesop, Ovid, Juvenal, and Horace referring to Prometheus as the creator of man. See chapter 4, on Prometheus's concerns for the vulnerable human race.
24. Ambrosini 2014; Richter 2006, 53, 55, 97; Dougherty 2006, 17. De Puma 2013, 283. *LIMC* 7 (Jean-Robert Gisler). Spier 1992, 70, 87, nos. 144 and 200, for examples and bibliography. Craftsmen and artisans on Etruscan gems, Ambrosini 2014; for artisans working on herms or busts, 182. Larissa Bonfante, per. corr. March 11, 2017. The customers who owned the gems like those in figs. 6.3–6.11 may have been fellow craftsmen taking pride in their craft, Tassarini 1992.
25. Tassinari 1992, 73–75, 78–80. The antiquity of the gems in figs. 6.3 and 6.4 is not in doubt.
26. Gems showing Prometheus assembling the first man are catalogued by Tassinari (1992). Hatched borders, as in figs 6.7 and 6.10, were favored by Etruscan engravers. Richter 2006, 48, 53, 55, on 97 notes that gem no. 437, plate 14, is not a warrior with a mutilated body because the decapitated head and limbs are not included;

- compare Boston Museum of Fine Arts, third century BC, Etruscan gem acc. no. 23.599, depicting *maschalismos*, with two warriors with weapons hacking up an enemy's body. *Maschalismos*, Tassinari 1992, 72; and De Puma 2013, 280–95, esp. 286, discussion of gem no. 7.100. Ambrosini 2014, 182–85, Etruscan gems depicting sculptors working on herms, busts, and statues of women.
27. The exceptional imagery of the second type of gems leads some scholars to question whether some could be neoclassical copies. Thanks to Laura Ambrosini, Ulf Hansson, Ingrid Krauskopf, Claire Lyons, Gabriella Tassinari, and Jean Turfa for discussion and bibliography. Martini 1971, 111, cat. no. 167, pl. 32,5; Krauskopf 1995; Ambrosini 2011, 79, no. 5, fig. 126a–c and bib. Tassinari 1992, 81–82.
 28. Carafa 1778, 5–6, plate 23, for the engraving of the first gem with horse and ram; see Scarisbrick, Wagner, and Boardman 2016, 141, fig. 129, for the quoted text, color photos of the gem, ring, and cast, now in the Beverley Gem Collection, Alnwick Castle, United Kingdom. See also Tassinari 1992, 78–79. Skeletons rare in art, Dunbabin 1986.
 29. The dates of figs. 6.7 and 6.10 are unresolved (numbers 63 and 54, respectively, in Tassinari 1992 catalogue; figs. 6.8 and 6.10 were not analyzed by Tassinari in 1992; fig. 6.11 (number 59 in Tassinari 1992) is certainly ancient. Thanks to Gabriella Tassinari, personal communications, January–February 2018.
 30. Richey 2011, quote 194, 195–96, 202–3; Needham 1991, 2:53–54; Liu 2011, 243–44. Cf. Ambrosino 2017 on the innards of cyborg humanoids.
 31. Mattusch 1975, 313–15.
 32. Mattusch 1975, 313–15; Aristotle *History of Animals* 515a34–b; cf. *Generation of Animals* 743a2 and 764b29–31; *Parts of Animals* 654b29–34. See De Groot 2008 on Aristotle and mechanics. Cf. Berryman 2009, 72–74, who argues that Aristotle's language is not mechanistic.
 33. Cohen 2002, 69. On free will, see Harari 2017, 283–85.
 34. The pioneer of Artificial Intelligence, Alan Turing, devised a test in 1951 to reveal whether a machine is sentient, Zarkadakis 2015, 48–49, 312–13. See also Cohen 1963 and 1966, 131–42; Mackey 1984; Berryman 2009, 30; Kang 2011, 168–69. Since Turing, other AI-human tests have been developed: Boissoneault 2017. Paranoid sci-fi themes of androids and false selfhood, Zarkadakis 2015, xv, 53–54, 70–71, 86–87.
 35. Boissoneault 2017; Zarkadakis 2015, 36–38, 112–15.
 36. Mackey 1984; Gray 2015; Mendelsohn 2015; Shelley 1831 [1818]; Weiner 2015; Cohen 1966; Harari 2017.
 37. Dougherty 2006. Note that this Athenian torch race honoring Prometheus had nothing to do with the ancient Olympic Games. The modern Olympic torch relay was introduced by the Nazis for the Berlin Olympics, 1936.
 38. Raggio 1958, e.g., 50–53. Reception of Prometheus, see Grafton, Most, and Settis 2010, 785.
 39. Godwin's *Lives of the Necromancers* was published in 1834. Galvanism experiments and Shelley's other influences: Zarkadakis 2015, 38–40; Hersey 2009, 106, 146–50;

- Kang 2011, 218–22. Zarkadakis 2015, 63–66. Frightening robots figure in E.T.A. Hoffman's German short stories from Shelley's time, "The Automata" (1814) and "The Sandman" (1816) about a wax automaton named Olympia: Cohen 1966, 61–62.
40. Florescu 1975. A striking feature of the 1931 Karloff monster, the two metal bolts on his neck representing crude electrodes, placed on his jugular veins, bringing to mind the placement of the metal bolt on the ankle of the bronze robot Talos (chapter 1). See chapter 9 for the primitive electrical "Baghdad batteries." Kant, "The Modern Prometheus," Rogers and Stevens 2015, 3, and on Shelley's *Frankenstein*, 1–4. Weiner 2015, 46–74.
 41. Prometheus making the first humans was a favored theme in "antiquarian" neo-classical gems carved by European craftsmen in the seventeenth to nineteenth century, collected by Tassie and Prince Poniatowski; Tassinari 1996.
 42. Shelley and Lucan: Weiner 2015, 48–51, 64–70; Lucan *Civil War* 6.540–915. On Egyptian demotic tales of necromancy, Mansfield 2015. On mechanical motion eliciting the Uncanny Valley reaction, Zarkadakis 2015, 69; Mori 2012.
 43. Shelley 1831. Raggio 1958. Quote, Simons 1992, 27–28. Rogers and Stevens 2015, 1–5.
 44. Hyginus *Astronomica* 2.15, *Fabulae* 31, 54, 144.
 45. David-Neel 1959, 84.
 46. Tales of artificial flying birds appear in ancient Hindu and Mongolian literature too, including a pair of mechanical swans (*yantrahamsa*) "programmed" to steal royal jewels and a legendary Garuda bird that was "steered by pins and pegs." Cohen 2002, 67–69.

CHAPTER 7. HEPHAESTUS: DIVINE DEVICES AND AUTOMATA

1. For the smith god in ancient literature and art, Gantz 1993, 1:74–80. Hephaestus's father was Zeus according to Homer, but he had no father according to Hesiod. For the works of Hephaestus, Pollitt 1990, 15–18. Prosthetic limbs and replacement body parts as artificial human enhancements, chapter 4. Zarkadakis 2015, 79–80.
2. Paipetis 2010 and Vallianatos 2017. On the vivid, kinetic descriptions of Achilles's shield in Homer, in which an "impossible" object is described with hyperrealism and movement, see Francis 2009, 6–13. See also Kalligeropoulos and Vasileiadou 2008.
3. Homer *Iliad* 18.136, 18.368–72, 19.23. "Artificial world," Raphael 2015, 182.
4. Francis 2009, 11–13.
5. Bronze cuirasses and greaves with delineated musculature were used from the sixth century BC on, with many examples recovered from archaeological excavations. Steiner 2001, 29. Other warrior cultures, such as Rome, India, and Japan, also wore anatomical cuirasses.
6. On a fresco from Pompeii, first century AD, Hephaestus, surrounded by tools and half-finished projects, shows Thetis the shield he has made for Achilles.

7. Homer *Iliad* 5.745–50; Mendelsohn 2015, 1.
8. The net, Homer *Odyssey* 8.267ff. Hera's special chair in literature and art, Gantz 1993, 1:75–76.
9. Argus Panoptes: Hesiod *Aegimius* frag. 5. Apollodorus *Library* 2.1.2; Ovid *Metamorphoses* 1.264. Many-eyed Argus appears on a red-figure hydria, fifth century BC, Museum of Fine Arts, Boston, Lefkowitz 2003, 216–17 fig. Argus Painter name vase, stamnos, 500–450 BC, Vienna Kunsthistorisches Museum 3729; Meleager Painter krater, 400 BC, Ruvo Museo Jatta 36930; another double-headed Argus, black-figure amphora, 575–525 BC, British Museum B164. The Pan Painter vase with janiform head and eyes: Misailidou-Despotidou 2012.
10. Soldiers and sleep: Lin 2012, 2015; Lin et al. 2014.
11. On modern “black box” technology inscrutable to users and makers, see introduction and Knight 2017.
12. Apollodorus *Epitome* 5.15–18. *LIMC* 3,1:813–17. According to Bonfante and Bonfante 2002, 202, Pecse is the Etruscan name for the Trojan Horse.
13. Bonfante and Bonfante (2002, 198) suggest that Etule is the Etruscan name for Aetolus, who was confused with his brother Epeius, maker of the Trojan Horse. Metapontum founded by Epeius and his tools displayed in the Temple of Athena: Pseudo-Aristotle *On Marvelous Things Heard* 840A.108, “in the district called Gargaria, near Metapontum, they say that there is a temple of the Hellenian Athene where the tools of Epeius are dedicated, with which he made the wooden horse. . . . Athena appeared to him in a dream and demanded that he should dedicate the tools to her.” Per Justin 20.2, Metapontum was founded by Epeius, the hero who constructed the wooden horse at Troy; in proof of which the inhabitants showed his tools in the Temple of Athena/Minerva.
14. De Grummond 2006, 137–38, fig. VI.31. Images of blacksmiths, craftsmen, and Sethlans on Etruscan gems, Ambrosini 2014, 177–81. Plaster or clay molds for bronze casting, Konstam and Hoffmann 2004. Athena making clay horse, Cohen 2006, 110–11. Another vase painting shows Athena constructing the Trojan Horse, kylix by the Sabouroff Painter, fifth century BC, Archaeological Museum, Florence.
15. Apollodorus *Library* 2.4.7–7, 3.192; Hyginus *Fabulae* 189 and *Astronomica* 2.35; Ovid *Metamorphoses* 7.690–862; Pausanias 9.19.1.
16. Pausanias 10.30.2; Antoninus Liberalis *Metamorphoses* 36 and 41. Telchines and Dactyles associated with animated statues, Blakely 2006, 16, 24, 138, 159, 203, 209, 215–23. Kris and Kurz 1979, 89. Golden Hound versions: Faraone 1992, 18–35; Steiner 2001, 117. See chapter 8 for Pandora, who was made of clay, yet later authors could not resist claiming that she gave birth to offspring. A similar “miracle” is the theme in the 2017 film *Blade Runner 2049*.
17. Faraone 1992, 18–19, 29n1. Marconi 2009.
18. Faraone 1992, 19–23, 13n8. *Pharmaka* “animates” the statues with a kind of “soul” or life but does not necessarily make them move. Hollow statues as vessels that are vivified by being filled with substances, Steiner 2001, 114–20.

19. Asimov's laws, Kang 2011, 302. Future of Life Institute's Beneficial AI Conference 2017; FLI's board included Stephen Hawking, Frank Wilczek, Elon Musk, and Nick Bostrom. <https://futurism.com/worlds-top-experts-have-created-a-law-of-robotics/>. See also Leverhulme Centre for the Future of Intelligence: <http://lcfi.ac.uk/>.
20. Martinho-Truswell 2018.
21. Four-wheeled carts, Morris 1992, 10. A small, shallow bronze basin-cart on three wheels, an ancient example of *pen*, bonsai basin, was excavated in a sixth/fifth century BC archaeological site in China, indicating that the idea of a wheeled tripod was put into practice elsewhere in antiquity, Bagley et al. 1980, 265, 272, color plate 65. Photo and explanation of the replica of Hephaestus's wheeled tripod, Kotsanas 2014, 70. the museum is in Katakolo, near Pyrgos, Greece: <http://kotsanas.com/gb/index.php>.
22. See chapter 9 for more automata in the form of humans and animals made by Philo; for diagrams and photos of a working model of the wine servant, Kotsanas 2014, 52–55.
23. Truitt 2015a, 121–22, plate 27. Badi' az-Zaman Abu I-Izz ibn ar-Razaz al-Jazari (AD 1136–1206): Zielinski and Weibel 2015, 9.
24. Homer *Iliad* 18.360–473. Pasiphae's cow and the Trojan Horse were also mounted on wheels in literature and art. On Hephaestus, his forge and automata, Paipetis 2010, 95–112.
25. Diodorus Siculus 9.3.1–3 and 9.13.2; Plutarch *Solon* 4.1–3.
26. Berlin Painter, Attic hydria from Vulci, ca. 500–480 BC; the quote comes from the Vatican Museum text, cat. 16568; Beazley archive 201984. The priestess seated on the tripod of the Delphic oracle appears on an Attic kylix by the Kodros Painter, from Vulci, ca. 440 BC, Berlin inv. F 2538.
27. Hephaestus in the winged chair decorated with crane's head and tail on an Attic red-figure kylix attributed to the Ambrosios Painter, Berlin 201595, now lost. Triptolemus in his winged chariot with two serpent heads and tails appears in several ancient vase paintings, e.g., a skyphos of about 490–480 BC attributed to Makron, British Museum E140, Beazley 2014683. The Berlin Painter's stamnos showing Triptolemus in his flying chair, ca. 500–470 BC, is in the Louvre inv. G371; the Berlin Painter's kylix with Triptolemus is in Museo Gregoriano Etrusco, Vatican Museums. On the winged chairs, see Matheson 1995b, 350–52.
28. Only a fragment of Pindar's poem survives, Faraone 1992, 28 and 35n86. Marconi 2009.
29. Mendelsohn 2015.
30. Steiner 2001, 117. Francis 2009, 8–10; the Golden Maidens are neither real humans nor inert matter, and so belong in a unique category of being, 9n23.
31. Raphael 2015, 182. Human-computer interface and thought-controlled machines, Zarkadakis 2015; "The Next Frontier: When Thoughts Control Machines" 2018. The Golden Maidens would appear to be Type III AI; see glossary. On black box dilemmas, see "AI in Society: The Unexamined Mind" 2018.

32. Mendelsohn 2015. Cf. Paipetis 2010, 110–12.
33. Big data, AI, and machine learning, Tanz 2016; see also Artificial Intelligence, “general AI,” in the glossary.
34. “Magic is linked to science in the same way as it is linked to technology. It is not only a practical art, it is also a storehouse of ideas,” Blakely 2006, 212. Maldonado 2017 reports that the sex robot-companion called “Harmony,” made by Realbotix for Abyss Creations, was endowed with a “data dump”: she is programmed with about five million words, the entirety of Wikipedia, and several dictionaries.
35. Valerius Flaccus *Argonautica* 1.300–314. Paipetis 2010. LaGrandeur 2013, 5. Homer *Odyssey* 8.267. In Hindu texts and Sanskrit epics, Vimāna is a flying palace or chariot controlled by the mind. A fleet of intelligent ships controlled by “the mind or minds” figures in *The Culture* science-fiction series (1987–2012) by Iain M. Banks; thanks to Ingvar Maehle for this reference. The Phaeacian ships appear to be Type III AI; see glossary.
36. Mansfield 2015, 8–10; Lichtheim 1980, 125–51; and Raven 1983 on magical, realistic, and animated wax figures in Egyptian texts and archaeological examples.
37. Paipetis 2010, 97–98.
38. On the ancient human impulse to automate tasks and tools to save labor and improve on human abilities, Martinho-Truswell 2018. The automatic bellows appear to be Type II AI; see glossary.
39. Aristotle’s comment (1253b29–1254a1) that self-animated devices could perform slave’s work, fitting the “economic” function of robots, suggests that the invention of such devices would abolish slavery. John Stuart Mill (1806–1873) studied Aristotle; it is interesting to compare his statement about automaton workers in *On Liberty* to Aristotle’s remarks: “Supposing it were possible to get houses built, corn grown, battles fought, causes tried, and even churches erected and prayers said, by machinery—by automatons in human form,” writes Mill. It would be a shame to replace with automatons “the men and women who at present inhabit the more civilized parts of the world, and who assuredly are but starved specimens of what nature can and will produce.” After all, “human nature is not a machine to be built after a model, and set to do exactly the work prescribed for it.” It is the nature of living things to “grow and develop,” and humankind should concentrate on “perfecting and beautifying” human beings themselves. Thanks to Ziyaad Bhorat for bringing this passage to my attention. See Walker 2000 for prescient essays on the dangers of newly emerging genetic engineering and biotechnology. See Bryson 2010 for the caution that robots and AI ought to remain “slaves” of humans.
40. Mendelsohn 2015. LaGrandeur 2013, 9–10. *Robota* derives from Slavic words for drudgery and medieval servitude, Kang 2011, 279; on robot rebellion, 264–96. Čapek, see Simons 1992, 33. Rogers and Stevens 2015. Walton 2015.
41. Berryman 2009, 22, 24–27. Berryman’s earlier 2003 paper mentioned Talos.
42. Truitt 2015a, 3–4, the duties of Hephaestus’s twenty tripods are conflated with those of the golden assistants.
43. Kang 2011, 15–22.

CHAPTER 8. PANDORA: BEAUTIFUL, ARTIFICIAL, EVIL

1. *Dolos*, trick, snare, trap; Hesiod *Theogony* 589; *Works and Days* 83. “Mr. Afterthought,” Faraone 1992, 104.
2. Pandora in ancient art and literature, Gantz 1992, 1:154–59, 162–65; Hard 2004, 93–95; Shapiro 1994, 64–70; Panofsky and Panofsky 1991; Reeder 1995, 49–56; Glaser and Rossbach 2011. Hesiod *Works and Days* 45–58 and *Theogony* 560–71, *kalon kakon* 585; Aeschylus frag. 204; Hyginus *Fabulae* 142 and *Astronomica* 2.15; Sophocles’s lost play *Pandora*; Babrius *Aesop’s Fables* 58. Reception of Hesiod and the Pandora myth, Grafton, Most, and Settis 2010, 435–36, 683–84.
3. Early Christian writings compare Pandora and Eve: Panofsky and Panofsky 1991, 11–13.
4. Morris 1992, 32–33; Steiner 2001, 25–26, 116–17, 186–90; Francis 2009, 13–16; Brown 1953, 18; Mendelsohn 2015; Lefkowitz 2003, 25–26.
5. Morris 1992, 30–33, 230–31. Francis 2009, 14.
6. Steiner 2001, 116, Hesiod in the *Theogony* presents Pandora as “nothing more than a compilation of her clothing and adornment”; while in *Works and Days* she is composed of interior attributes as well. Faraone 1992, 101.
7. Steiner 2001, 191n25. Hesiod’s language and similes “draw attention simultaneously to the vividness and vigor” of this “fabricated living statue” and to the fact that she “is a representation, not the ‘real’ thing. Why use this language” otherwise? Pandora is the “first manufactured identity”; she is “quite literally built . . . not a product of nature.” Francis 2009, 14. Cf. Faraone 1992, 101–2.
8. Faraone 1992, 102–3, discusses Pandora’s creation as an animated statue. On alternative versions claiming that Prometheus was the maker of the first woman, see Tassinari 1992, 75–76.
9. On myths describing the Trojan Horse as an animated statue and ancient “tests” to determine whether it and other realistic statues were real or artificial, Faraone 1992, 104–6. Turing test and the like: Kang 2011, 298; Zarkadakis 2015, 48–49, 312–13; Boissoneault 2017.
10. Hesiod’s poems do not mention offspring. As they did for Pygmalion’s Galatea (see chapter 6), later writers embellished the myth by giving Pandora a daughter by Epimetheus, Pyrrha, wife of Deucalion: Apollodorus *Library* 1.7.2; Hyginus *Fabulae* 142; Ovid *Metamorphoses* 1.350; Faraone 1992, 102–3. No myths recount Pandora’s death. Pandora is “outside the natural cycles”: Steiner 2001, 187.
11. Raphael 2015, quote 187; compare Steiner 2001, 25. Plato *Laws* 644e on human agency and chapter 6.
12. Mendelsohn 2015. Faraone 1992, 101. On the similarities between Pandora and the golden servants of Hephaestus, Francis 2009, 13. Pandora does not speak in any surviving myths.
13. For ancient representations of Pandora in Italy, Boardman 2000.
14. Reeder 1995, 284–86.

15. Gantz 1993, 1:163–64; Shapiro 1994, 69; Neils 2005, 38–39. Satyrs with hammers, Polygnotus Group vase, Matheson 1995a, 260–62. Penthesilea Painter vase, Boston Museum of Fine Arts 01.8032.
16. Neils 2005, 39. The sown army of automaton soldiers also rose from the earth, chapter 4.
17. Gantz 1993, 1:157–58 and n12; Mommsen in CVA Berlin V, pp. 56–59, Tafel 43, 3–4, and Tafel 47, 6, citing Panofka. Thanks to David Saunders for valuable discussion of this vase. For Etruscan gems depicting Prometheus or Hephaestus working on a small female figure in their laps, see Tassinari 1992, 75–76.
18. Reeder 1995, 281 (quote); 279–81.
19. Shapiro 1994, 66.
20. Steiner 2001, 116–17.
21. As far as I know, this intriguing border pattern on the Niobid and Ruvo kraters has not been noticed by scholars. The British Museum calls it a “dart and lotus” design; others have referred to a slightly similar motif as “Lesbian kyma.” A variation of this design appears on the volute kraters Naples H2421 and Bologna 16571 attributed to the Boreas Painter, ca. 480 BC. The design on the Niobid Painter’s Pandora vase appears to more strongly represent blacksmith’s tongs or an artisan’s compass (fabled to have been invented by Daedalus or his nephew Talos). Some also point out that it could represent a blacksmith’s bellows. I thank Bob Durrett, Steven Hess, Fran Keeling, David Meadows, and David Saunders for discussing this border design with me.
22. Shapiro 1994, 67. The frieze below Pandora on the Niobid Painter’s vase depicts dancing satyrs, suggesting an association with Sophocles’s lost satyr play about Pandora. See also Reeder 1995, 282–84. Pandora holds a wreath or leafy branch in each hand.
23. The Geta Vase is in Agrigento, Sicily; the Niobid massacre krater is in the Louvre.
24. Rarity and meaning of frontal faces and emotions on vases, Korshak 1987; Csapo 1997, 256–57; Hedreen 2017, 163 and n17.
25. The archaic smile appears on the face of a dying warrior on the Temple of Aphaia, Aegina, Greece, and on the face of Antiope being abducted by Theseus, Temple of Apollo, Eretria.
26. The screenplay was written by Lang and his wife, Thea von Harbrou, based on her novel of 1924. Simons 1992, 185; Dayal 2012; Kang 2011, 288–95; Zarkadakis 2015, 50–51.
27. The female robot in *Metropolis* is capable of becoming a simulacrum of Maria. The actress Brigitte Helm was born in 1906; filming began in 1925.
28. Description of the evil fembot, by the actor who played the “mad scientist,” Klein-Rogge 1927.
29. Shapiro 1994, 65.
30. Harrison 1999, 49–50.
31. The Pergamon copy of Phidias’s Athena and base is in the Pergamon Museum, Berlin. The small replica, the Lenormant Athena and base, is in the National Archaeological

- Museum, Athens. Other small Roman copies also exist. Fragments of the marble Pandora frieze and “strange” smiling woman’s head: Neils 2005, 42–43, fig. 4.13.
32. Pandora’s *pithos* was metal, not earthenware: Neils 2005, 41. Pandora myth in post-classical art and literature: Panofsky and Panofsky 1991, mistranslation, 14–26. Pandora in the arts: Reid 1993, 2:813–17.
 33. In later variants of the story, the forbidden jar comes into Epimetheus’s possession by other means or is opened by him instead of Pandora, e.g., in Philodemus, first century BC, and Proclus, fifth century AD, Panofsky and Panofsky 1991, esp. 8 and nn11–12.
 34. Neils 2005, 40. This pair of *pithoi* reflects the dual positive and ominous uses of large jars in antiquity, for storing food and other vital commodities and as coffins for burying poor folk. Confusingly, two writers of the sixth century BC, Theognis frag. 1.1135 and Aesop *Fables* 525 and 526/Babrius 58, claimed that Pandora brought Zeus’s jar of blessings to earth and that Elpis/Hope was a positive thing in that urn; see discussion below.
 35. British Museum 1865,0103.28: Neils 2005, 38–40 and figs. 4.1–2 and 4.6–8. *LIMC* 3, s.v. Elpis, no. 13; Reeder 1995, 51 fig. 1–4.
 36. Neils 2005, 41–42.
 37. The Early Christian Father Origen (b. AD 185) found the pagan myth of Pandora “laugh-provoking,” Panofsky and Panofsky 1991, 12–13; see 7n12 for Macedonius Consul’s cynical epigram (sixth century AD) that begins, “I smile when I look at Pandora’s jar.”
 38. Harrison 1986, 116; Neils 2005, 43.
 39. Gantz 1993, 1:157. Aesop (*Fables* 525 and 526, early sixth century BC) wrote that a jar of Good Things had been entrusted to mankind by Zeus, “but man had no self-control and he opened the jar—all the Good Things flew out.” They were chased away by the stronger evils in the world, and flew back up to Olympus to reside with the gods. Now they are doled out to humans one at a time, to “escape notice of the Evil Things which are ever-present. Hope remained in the jar, however, the one Good Thing left to humankind to console them with the promise of the Good Things we have lost.” In the late sixth century BC, Theognis (*Elegies*) tells a similar tale, remarking that hope was the “only deity left on earth, for the rest have flown.” Aesop and Theognis agree with Hesiod that Hope alone stayed behind, and they view Hope in a positive light.
 40. Fairy-tale versions, Panofsky and Panofsky 1991, 110–11. Aristotle *On Memory* 1.449b25–28.
 41. According to Plato (*Gorgias* 523a), it was Zeus who told Prometheus to deprive men of the foreknowledge of death. In *Protagoras* 320c–322a, Plato refers indirectly to Epimetheus’s mistake.
 42. Thanks to Josiah Ober for help in setting up a standard two-by-two, four-box matrix with rows designated “good” and “evil” and columns “activated” and “unactivated.” For various modern opinions, see, e.g., Hansen 2004, 258; Lefkowitz 2003, 233.
 43. Ethical challenges of advancing robotics and AI technologies: Lin, Abney, and Bekey 2014, 3–4, the qualms about automata and human enhancement via technology

have very deep roots, going back to antiquity, already posing concerns that would anticipate the “cautionary tales” in modern literature “about insufficient programming, emergent behavior, errors, and other issues that make robots unpredictable and potentially dangerous”; 362, “The mere uttering of the word ‘robot’ opens up a Pandora’s box of images, myths, wishes, illusions, and hopes, which humanity has, over centuries, applied to automata.”

44. Compare the evil robot Tik-Tok in Sladek 1983. The premise of the android-hosted amusement park of the *Westworld* TV series is that human guests may indulge their darkest fantasies upon the bodies of the androids, whose programming prevents them from harming humans.

CHAPTER 9. BETWEEN MYTH AND HISTORY: REAL AUTOMATA AND LIFELIKE ARTIFICES IN THE ANCIENT WORLD

1. “Black box” technology, Knight 2017. “Relative modernism,” Bosak-Schroeder 2016.
2. Berryman 2009, 69–75. James and Thorpe 1994, 200–225. Marsden 1971. Heron of Alexandria acknowledged that some of his automata mechanisms were related to catapults; Ruffell 2015–16.
3. On links between ruthless tyrants and devices, see Amedick 1998, 498.
4. D’Angour 1999, 25; a jocular article juxtaposing historical evidence for human flight with representations in ancient comedy and fiction.
5. Sappho’s supposed suicide at the Leucadian cliff was first suggested in the late fourth century BC by the comic playwright Menander (frag. 258 K).
6. *Book of Sui* (AD 636), Needham and Wang 1965, 587; *Zizhi Tongjian* 167 (AD 1044) in abridgment by Ronan 1994, 285. *History of the Northern Dynasties* 19. James and Thorpe 1994, 104–7 on man-bearing kites and parachutes. Yuan Hangtong survived but was executed.
7. Lucian *Phalaris*. Phalaris’s reputation for cruelty: Aristotle *Politics* 5.10; *Rhetoric* 2.20. Pindar *Pythian* 1; Polyaeus *Stratagems* 5.1; Polybius 12.25. Kang 2011, 94–95. Phalaris’s sadism was exaggerated by the early Christian writer Tatian, b. AD 120, who claimed that Phalaris devoured infants (*Address to the Greeks* 34).
8. Diodorus Siculus 9.18–19. Plutarch *Moralia* 315. Lucian *Phalaris*.
9. Plutarch *Moralia* 315c–d, 39, citing Callimachus *Aetia* (fourth century BC, known only from fragments, and Aristeides of Miletus’s *Italian History* book 4 (lost). See also Stobaeus *Florilegium*, fifth century AD. Arruntius’s bronze horse recalls some descriptions of the Trojan Horse, hollow with an opening in the side.
10. Diodorus Siculus 9.18–19 and 13.90.3–5; Cicero *Against Verres* 4.33 and *Tusculan Disputations* 2.7; 5.26, 5.31–33 (death of Phalaris), 2.28
11. *Consularia Caesaraugustana*, the chronicle of Zaragoza, *Victoris Tunnunnensis Chronicon*, ed. Hartmann, Victor 74a, 75a, p. 23, commentary pp. 100–101. For sadistic public displays of roasting birds and animals alive in China, Tang dynasty, for the pleasure of Empress Wu Zetian, see Benn 2004, 130.

12. Berryman (2009, 29–30) includes the Brazen Bull in the “homunculus”-driven variety of artifices in her classification system. For Indian automata worked by people inside, Cohen 2002, 69.
13. Faraone 1992, 21. Blakely 2006, 16, 215–23. The Antikythera device is in the National Archaeological Museum, Athens. Iverson 2017.
14. Faraone 1992, 21, 26. Timaeus in scholia to Pindar *Olympian* 7.160.
15. A drawing of the stentorophonic tube is preserved in the Vatican Museums; see Kotsanas 2014, 83. Stoneman 2008, 121, Aristotle tells Alexander about the “pneumatic horn of Yayastayus,” the Horn of Themistius, a “war organ” believed to have been invented ca. AD 800–1100, perhaps powered by pneumatics or hydraulics.
16. Musical automata: Zielinski and Weibel 2015, 49–99. Pollitt 1990, 89.
17. Cohen 1966, 21–22 and n20; other speaking statues, 18–24. Chapuis and Droz 1958, 23–24.
18. Cohen 1966, 15–16. Philostratus *Life of Apollonius of Tyana* 6.4; *Imagines* 1.7. “The Sounding Statue of Memnon” 1850.
19. Cohen 1966, 24; McKeown 2013, 199; LaGrandeur 2013, 22. Himerius *Orations* 8.5 and 62.1.
20. Oleson 2009, 785–97 for Greek and Roman automata. Poulsen 1945; Felton 2001, 82–83.
21. Frood 2003; Keyser 1993, for experiments, diagrams, and photos. The theory that the batteries were used to electroplate silver has been discarded. Thanks to Sam Crow for pointing out that if thin wires once existed, they may have corroded away.
22. Brunschwig and Lloyd 2000, Archytas: 393, 401, 403, 406, 926–27, 932–33; ancient mechanics: 487–94. Keyser and Irby-Massie 2008, 161–62; D’Angour 2003, 108, 127–28, 180–82.
23. Chirping bird devices: Kotsanas 2014, 51 and 69. Sources for Archytas: Aristotle *Politics* 8.6.1340b25–30; Horace *Odes* 1.28; D’Angour 2003, 180–82; Plutarch *Marcellus* 14.5–6. Diogenes Laertius 8.83; Aulus Gellius *Attic Nights* 10.12.9–10; Vitruvius *On Architecture* 1.1.17; 7.14. Berryman 2009, 58 and n14, 95 n159 (Aristotle and Archytas); 87–96, Berryman speculates that the “dove” was a nickname for a catapult or projectile, but neither would account for the “current of air and weights” said to propel the flying device. Aulus Gellius’s source, Favorinus, a philosopher and historian who was also a friend of Plutarch, wrote nearly thirty works, most known from fragments.
24. See Brunschwig and Lloyd 2000, 933; D’Angour 2003, 181. Huffman 2003, 82–83, 570–78 (dove); for a working aerodynamic replica of Archytas’s Dove using a pig’s bladder and compressed air or steam, see Kotsanas 2014, 145. The Dove is placed in the category of “mythic self-moving devices of human creation” by Kang 2011, 16–18.
25. Aristotle *Politics* 5.6.1340b26; Huffman 2003, 303–7 (clapper).
26. Plutarch *Demetrius*; Diogenes Laertius 1925b78.

27. Demochares's history of his times is lost but quoted by Polybius 12.13. D'Angour 2011, 164. Berryman 2009, 29–30.
28. Koetsier and Kerle 2015, fig. 2a and b. The Giant Snail and problems with Rehm's theory, see Ian Ruffell's University of Glasgow blog post "Riding the Snail," March 31, 2016, <http://classics.academicblogs.co.uk/riding-the-snail/>.
29. Snails in Greek folklore, Hesiod *Works and Days* 571; Plautus *Poen.* 531; Plutarch *Moralia* 525e. Donkeys (asses): Homer *Iliad* 11.558; Simonides 7.43–49; Plautus *Asinaria*; Apuleius *Golden Ass*; etc.
30. Diodorus Siculus frag. 27.1.
31. Polybius 13.6–8; Apega 18.17; also 4.81, 16.13, 21.11. Sage 1935. Pomeroy (2002, 89–90 and n51) accepts authenticity of account, 152.
32. Aristotle *Constitution of Athens*, describes the *kleroterion*; for a surviving example, Dow 1937. Demetrius and Mithradates's attempt to surpass him in 88 BC, Mayor 2010, 179–83. Ancient military technology: Aeneas Tacticus; Philo of Byzantium; Berryman 2009, 70–71; Cuomo 2007; Hodges 1970, 145–53, 183–84; Marsden 1971. Archimedes, Plutarch *Marcellus* 14–18; Brunschwig and Lloyd 2000, 544–53; Keyser and Irby-Massie 2008, 125–28.
33. Mayor 2010, 182, 291–92, 193–94. Kotsanas 2014, *deus ex machina* model, 101.
34. Koetsier and Kerle 2015.
35. Keyser 2016 on the date of the Grand Procession, marriage to Arsinoe II, and the reliability of Callixenus's account, based on *Accounts of the Penteterides*.
36. Koetsier and Kerle 2015. Athenaeus *Learned Banquet* 11.497d; Keyser and Irby-Massie 2008, 496.
37. Philo, Ctesibius, Heron: Hodges 1970, 180–84. Neither Ctesibius nor Philo of Byzantium receives notice in Minsoo Kang's "historical study of the automaton" as a working object and concept in the European imagination. The unparalleled Nysa automaton is relegated to a footnote, and Demetrius's Great Snail and the deadly Apega "robot" of Sparta are also omitted from Kang's categories of actual mechanical automata of human design in antiquity: Kang 2011, 16–18, 332n66 (Nysa); 1. Sylvia Berryman (2009, 116) briefly mentions the possibility that Ctesibius made the Nysa automaton.
38. Zielinski and Weibel 2015, 20–47; Truitt 2015a, 4, 19; Keyser and Irby-Massie 2008, 684–56.
39. Huffman 2003, 575; Philo *Pneumatics* 40, 42. Diagram of the bird-and-snake assemblage, James and Thorpe 1994, 117. For working models of bronze and wood and explanations of the serving woman, the bird and owl, and the Pan and dragon, see Kotsanas 2014, 51–55.
40. Heron: Woodcroft 1851; Keyser and Irby-Massie 2008, 384–87. Ruffell 2015–16.
41. Working models and explanation of the Heracles-and-dragon mechanism, and the automatic theater, James and Thorpe 1994, 136–38; Kotsanas 2014, 58 and 71–75. Anderson 2012 (the first programmable device is often said to be the Jacquard loom of 1800). Berryman 2009, 30 citing Heron *Automata* 4.4.4. Huffman 2003, 575.

- Kang (2011) includes Heron's works in his third category of actually constructed automata, 16.
42. Ruffell 2015–16; for more 3-D re-creations and explanations of Heron's self-moving artifices, see the Heron of Alexandria/Automaton Project directed by Ian Ruffell and Francesco Grillo at the University of Glasgow. <http://classics.academicblogs.co.uk/heros-automata-first-moves/>.
 43. Medieval Islamic and European automata: Brunschwig and Lloyd 2000, 410, 490–91, 493–94. Zielinski and Weibel 2015, 20–21; James and Thorpe 1994, 138–40; Truitt 2015a, 18–20. By the tenth century, Arabic translations of the automata designs of Greek inventors such as Philo and Heron were adapted in India; Ali 2016, 468. Strong 2004, 132n17.
 44. Needham 1986; 4:156–63 and throughout, on the history of Chinese mechanical engineering and automatic devices. As Forte (1988, 11) points out, not all mechanical innovations in China were transmitted from Europe; some arose from what Needham termed "diffusion stimulus." South-pointing chariot, James and Thorpe 1994, 140–42.
 45. Tang inventions, Benn 2004, 52, 95–96, 108–9, 112, 143–44, 167, 271. Empress Wu Zetian's ambition to outdo Asoka: Strong 2004, 125 and n6 sources. Empress Wu was also called Wu Zhao.
 46. Keay 2011, 69 and n19, citing R. K. Mookerji, in *History and Culture of the Indian People*, 2:28. Mookerji describes the armored war chariot with whirling clubs or blades as like a "tank"; Keay calls it a "robot" swinging a club; others compare the "machine" to a scythed chariot with spinning blades attached to the wheels.
 47. Strong 2004, 124–38. Keay 2011, 78–100; Ali 2016, 481–84.
 48. Strong 2004, 132–38; Pannikar 1984; there are other versions in Cambodian and Thai. Higley 1997, 132–33. Cohen 2002. Zarkadakis 2015, 34. "Drew on a rich store of legends," Ali (2016, 481–84) discusses the legend and the date and sources of the *Lokapannatti*.
 49. Strong 2004, 132–33. In some versions, the engineer is beheaded by the robot assassin sent to kill Asoka, Higley 1997, 132–33, and Pannikar 1984.
 50. Cohen 2002, 73–74. It is assumed that the *Lokapannatti* story was solely influenced by later Byzantine and early medieval automata. For the history of automata and elaborate mechanical wonders, comparable to the fabulous Byzantine "Throne of Solomon," in early medieval India, see Ali 2016, esp. 484 on the circulation of *techne*, and Brett 1954 on the automated Throne of Solomon.
 51. Ali 2016, 484.
 52. Greco-Buddhist syncretism, McEvilley 2001; Boardman 2015.
 53. Asoka and Hellenistic rulers, Hinuber 2010, 263 (Megasthenes). Megasthenes *Indica* fragments; Arrian *Indica* 10. Megasthenes and Deimachus were envoys to Mauryan emperor Chandragupta and his son; Dionysius was Ptolemy's envoy to Asoka. See Arrian *Anabasis* 5; Pliny 6.21; Strabo 2.1.9–14; 15.1.12.
 54. Keay 2011, 78–100; McEvilley 2000, esp. 367–70; on Indian technology, 649 and n19. On Asoka's envoys to Hellenistic rulers, Jansari 2011.

55. Legge 1965, 79. Animated Buddhist statues and carts in China, Needham 1986, 159–60, 256–57. On miracle tales of animated Buddhist statues, Wang 2016.
56. Rotating attendants, Needham 1986, 159. Wrathful Vajrapani, Wang 2016, 32 and 27. Daoxuan, Strong 2004, 187–89. Dudbridge 2005. Daoxuan’s sacred technology and descriptions of the utopian Jetavana monastery automata in India, Forte 1988, 38–50 and 92; 49–50, one cannot know whether Daoxuan was describing real automata of India that he had heard or read about, but Empress Wu apparently wished to construct physical replicas of those wonders in her shrines.
57. Hsing and Crowell 2005, esp. 118–23. Greek-Indian influences, Boardman 2015, 130–99; Heracles in Buddhist art, 189, 199, figs 116, 118, 122. Relief panel of Heracles in lion skin with sword: British Museum 1970, 0718.1.
58. Simons 1992, 29–32. Mori 1981 and 2012. Borody 2013. Han 2017.
59. Borody 2013. Thanks to Ruel Macraeg for telling me about *Mazinger Z* and *18 Bronzemen* and thanks to Sage Adrienne Smith for telling me about the ancient robots in *Laputa: Castle in the Sky*. “Whistlefax” robot by Glorbes (B. Ross), Fwoosh Forums November 13, 2007, <http://thefwoosh.com/forum/viewtopic.php?t=12823&start=4380>.
60. Berryman 2009, 28 original italics. D’Angour 2011, 62–63, 108–9, 127, 128–33, 180–81.
61. Zarkadakis 2015, xvii, 305.

EPILOGUE. AWE, DREAD, HOPE: DEEP LEARNING AND ANCIENT STORIES

1. An earlier version of parts of this epilogue appeared in *Aeon*, May 16, 2016. On love/hate responses to AI, Zarkadakis 2015.
2. Microsoft’s Tay and Zo, Kantrowitz 2017; human bias in AI, Bhorat 2017. Tay’s debut and demise: <http://www.telegraph.co.uk/technology/2016/03/24/microsofts-teen-girl-ai-turns-into-a-hitler-loving-sex-robot-wit/>.
3. Raytheon: http://www.raytheon.com/news/feature/artificial_intelligence.html.
4. Hawking quote, Scheherazade: Flood 2016. <http://www.news.gatech.edu/2016/02/12/using-stories-teach-human-values-artificial-agents>. <http://realkm.com/2016/01/25/teaching-ai-to-appreciate-stories/>. Summerville et al. 2017, 9–10. Scheherazade: R. Burton, trans. and intro by A. S. Byatt. *Arabian Nights, One Thousand and One Nights*.
5. Zarkadakis 2015, 27, 305. Leverhulme Centre for the Future of Intelligence “AI Narrative” project, <http://lcfi.ac.uk/projects/ai-narratives/>.
6. “Dawn of RoboHumanity”: Popcorn 2016, 112–13.

