

CHAPTER 5

DAEDALUS AND THE LIVING STATUES

AFTER HIS SAFE arrival in King Cocalus's court, Daedalus's mythic biography continued as he resumed his role as an architect, artist, and engineer in Sicily. According to ancient local traditions, Daedalus designed an impregnable acropolis for Cocalus at Acragas (founded in about 582 BC, now Agrigento). The summit could be reached only by a narrow, circuitous passageway, an echo of the Labyrinth in Crete. So ingenious was the plan that the fortress could be defended by just three or four men. Temples to Apollo at Cumae and Capua were also ascribed to Daedalus, among numerous other architectural works scattered across the Mediterranean from Egypt to Libya.

Daedalus also spent time in Sardinia during his flight from Crete. The mysterious stone towers, the *nuraghe* of the Nuragic era (tenth to eighth century BC) dotting the island of Sardinia, were thought to be of his design. Sardinia is also the home of the enigmatic Nuragic stone giants of Mont'e Prama (chapter 1, fig. 1.8), which scholars compare to so-called Daedalic-style statues on Crete made in the seventh century BC. Archaeologists point out that advanced tools, surprising for an archaic culture, were used to carve the stone giants of Sardinia. This might help to explain why Daedalus was linked to the island. The statues show evidence of the use of sophisticated metal implements such as stone chisels with different sized blades, hand scrapers, the drypoint stylus, and grooved tooth chisels (which were not introduced in Greece until after the sixth century BC). As mentioned in chapter 1, the striking robot-like faces of the statues follow a “T-scheme” with pronounced brows and nose over eyes rendered with two concentric circles and a slit mouth. Making those

perfect concentric circles required technological skill using a compass—and, indeed, archaeologists have discovered Nuragic drills and a complex iron compass on Sardinia.¹



For King Cocalus in Sicily, Daedalus devised a cantilevered platform for the Temple of Aphrodite on a precipice at Mount Eryx. To honor the goddess of love, Daedalus was said to have created a gilded ram whose horns, hooves, and woolly body were “so perfect that it would be taken as an actual ram.” The celebrated Bronze Ram of Syracuse, one of a pair from the palace of the tyrant Agathocles of Sicily (chapter 9), gives an idea of what the ram ascribed to Daedalus might have looked like (fig. 5.1, plate 6). Another marvel among the rich treasures in the Temple of Aphrodite at Mount Eryx was a perfect honeycomb made of gold.² Both objects were of such splendid artistry that they were naturally attributed to Daedalus.

The imitation golden honeycomb was an amazing artifact. How could a human craftsman capture all the details, texture, and geometry of such a fragile, ephemeral natural object in permanent metallic form?

The British artist Michael Ayrton (1921–75) was devoted to re-creating some of the legendary wonders attributed to Daedalus. Working with a goldsmith, Ayrton demonstrated that the fabrication of a delicate golden honeycomb—although laborious and requiring great skill—was “a far less miraculous achievement to a metal worker than to an historian.” Historians, he noted, tend to underestimate the ingenuity and technological expertise of ancient artisans.³

The lost-wax technique of casting metals, described in chapter 1, could employ as the core a natural object, such as a pinecone or shell, allowing an artist to replicate the object with incredibly precise details. Ancient Egyptian goldsmiths first perfected the painstaking process. We know that Egypt carried out lively trade with Minoan Crete, so Greek craftsmen might well have learned the technique at an early date. As Pliny (33.2.4–5) remarked in his discussions of intricate gold-working skills, “Man has learned to challenge nature!” In *The Maze Maker*, Ayrton’s remarkable novel channeling the mythic inventor, he describes the casting process of the honeycomb, as narrated by Daedalus. Being made of beeswax itself, the honeycomb serves as its own wax model in



FIG. 5.1 (PLATE 6). Realistic bronze ram. Was the sculptor of this life-size ram inspired by the story of Daedalus's true-to-life ram dedicated to Aphrodite in the time of King Cocalus? Bronze Ram of Syracuse, Sicily, third century BC, Museo Archeologico, Palermo, Scala / Art Resource, NY.

the complex lost-wax process. First he found a real piece of undamaged honeycomb and carefully uncapped each hexagonal cell and drained the honey. Next the honeycomb was meticulously coated with a fine clay slip. To the side of the clay-covered comb, he attached "a tiny pouring cup and thin 'runners' of wax" as vents. Then the object was placed in a kiln until the waxy honeycomb burned away, leaving its exact

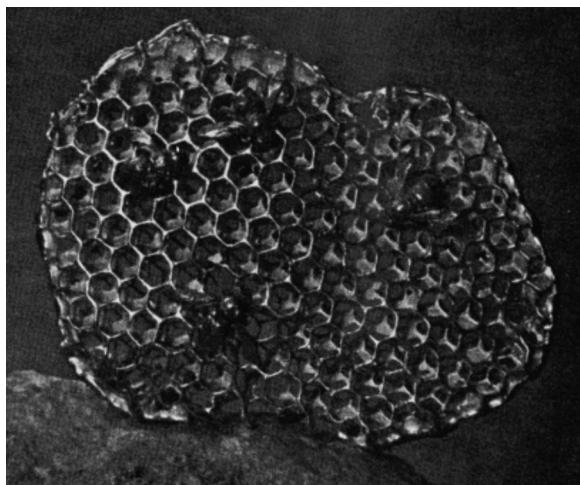


FIG. 5.2. Golden honeycomb cast from real honeycomb.

impression in a mold to be filled with molten gold. A perfect golden replica of a real honeycomb was the result.⁴

The structural strength of honeycombs created by “builder” bees was admired by architects in antiquity. For example, in the sixth and fifth centuries BC, marble blocks of temples on Delos and other Aegean islands were carved to resemble massive honeycombs. It is possible that at some point a metal cast of a honeycomb, like the one in the temple at Mount Eryx, might have played a role in inspiring the sophisticated use of hexagonal “honeycomb” cylinders in the construction of stone buildings. The first written mention of this architectural innovation can be traced to mathematical writings of the second century BC. In about 30 BC, the ancient Roman scholar Varro described the so-called honeycomb conjecture, suggesting that the hexagon shape was the most geometrically efficient for compact volume and strength. More than two millennia later, in 1999, Varro’s theory was mathematically proven by Thomas C. Hales.⁵



Daedalus’s projects for King Cocalus also included innovative waterworks, a network of rejuvenating steam baths. The legend of Daedalus’s thermal “spa” is associated with the volcanic thermal springs at Sciacca,

near Selinus in western Sicily. Visitors today can still make out the ancient ruins of bathing grottoes that were cleverly constructed to take advantage of the natural hot sulfur springs issuing from the hillside.⁶

The storied career of Daedalus in Sicily was not without drama. King Minos of Crete, as mentioned earlier, was obsessed with avenging the death of the Minotaur. Traveling across the Mediterranean seeking Daedalus, Minos contrived a puzzle to flush out his quarry. The king carried a large spiral seashell with him, offering a fabulous reward to anyone who could string a thread through its convoluted chambers—an obvious allusion to the trick of escaping the great Labyrinth complex built by Daedalus.

When Minos finally arrived in Sicily, he showed the shell to King Cocalus. In hope of winning the reward, Cocalus secretly took the shell to Daedalus. Daedalus placed a drop of honey at the mouth of the shell and drilled a tiny hole at the top. Then he glued a slender thread to an ant and placed the tiny creature in the hole. The ant wound her way through the spirals and emerged with the thread at the mouth of the shell to get the honey. When Cocalus returned the threaded shell to Minos, the king immediately demanded that Cocalus surrender Daedalus, the only person clever enough to solve the puzzle.⁷

Caught out, Cocalus pretends to agree to turn over Daedalus. But first he invites Minos to enjoy a refreshing dip in his highly esteemed hot vapor baths. His guest is attended by the royal princesses, Cocalus's daughters. Readers who recall what happened to men who bathed in rejuvenating hot baths invented by Medea will sense an ominous pattern. Indeed, while soaking in the grotto, Minos is murdered by Cocalus's daughters and Daedalus. They scald Minos with boiling water from the hot springs at Sciacca, an act reminiscent of the fate of King Pelias at the hands of his own daughters and Medea in chapter 2.

The story of Daedalus's sojourn in Sicily and his murder of Minos was told by numerous ancient authors, including Sophocles in his lost play *The Camicians* and Aristophanes in the lost comedy *Cocalus*.⁸ The Athenian audiences were quite charmed by Daedalus. According to Athenian lore, after the death of Minos, Daedalus's long, picaresque life continued into its next chapter—in Athens.



As their city grew in prominence, the ambitious Athenians saw a way to enhance their reputation by appropriating Daedalus as their very own star inventor. Legends arose linking Daedalus to Athens. By the fifth century BC, Daedalus had acquired Athenian roots and was said to have created an array of tools, among them the augur, axe, and plumb line. A stylish folding chair was displayed in Athens as his innovation. Daedalus was also given an extensive family tree in Athens. According to the Athenians, the craftsman accepted his sister's young son as his apprentice. His nephew's name, curiously enough, was Talos of Athens.

The Athenian story about this Talos was worthy of a classical tragedy. Young Talos was reputed to be as gifted as his uncle Daedalus. Talos of Athens thought up several brilliant inventions: the potter's wheel, the drawing compass, and other cunning implements. Naturally, the elder Daedalus grew resentful of the young apprentice's accomplishments. The last straw was Talos's invention of a serrated saw. On a jaunt in the countryside, the youth had come across a snake jaw. Playing around with it, he noticed that the row of small jagged teeth cut easily through a stick. Talos created a new iron tool modeled on the snake's teeth. In the Agora, people gathered around to see Talos showing off how well his new tool sawed wood.

In a fit of envy Daedalus murdered his nephew. After pushing him off the Acropolis, Daedalus was discovered secretly burying the body. Athens grieved the loss of their brilliant young inventor: Talos's grave, on the south slope of the Acropolis, was still honored when Pausanias (1.21.4) visited it in the second century AD. According to their myth, the Athenians put Daedalus on trial for murder, and the Council of the Areopagus found him guilty. Daedalus fled Attica and sailed to Crete—where, so the Athenians claimed, he found work with King Minos. According to the new Athenian chronology, this was when Daedalus began his Cretan adventures (described in chapter 4).⁹



In antiquity, Daedalus's illustrious reputation revolved around his ability to replicate life with staggering authenticity. His specialty was statuary so true to life that the figures were believed to be capable of movement. As noted, the word *daedala* came to describe “Daedalic” wonders, statues and marvelous images so realistic they seemed beyond the scope of

human manufacture, apparently wrought by superhuman skills. The list of statues attributed to Daedalus is very long. Besides the ram mentioned above, examples include a pair of tin and brass statues of himself and Icarus on the Electridae islands in the Adriatic; an Artemis at Monogissa, Caria (Asia Minor); a self-portrait statue in the Temple of Hephaestus in Memphis, Egypt; realistic lions and dolphins for an altar on the coast of Libya; and Heracles statues in Thebes and Corinth.¹⁰

According to a tale recorded by Apollodorus (*Library* 2.6.3), Heracles himself was fooled by Daedalus's spitting-image portrait of Heracles. One night, Heracles unexpectedly came upon the imposing statue in a portico. So startled was the mighty hero that he instantly grabbed a stone and hurled it at the "intruder."

The Athenian playwrights famously drew on ancient traditions and inserted original revisions in their dramas about mythological events and characters. Daedalus's myth was no exception. Daedalus's so-called living statues were featured in numerous Athenian plays, now known only from fragments quoted by other authors. We know that Sophocles and Aristophanes each wrote a play called *Daedalus*. In both plays, characters claim that Daedalus's animated statues must be bound in place or they will escape. In Euripides's extant play *Hecuba* (ca. 420 BC) Daedalus's automata are compared to those made by the god Hephaestus, and his comedy *Eurystheus* also refers to *daedalic* animated statues. A comic play by Cratinus (*Thracian Women*, ca. 430 BC) jokes that a bronze statue that runs away was made by Daedalus, and a fourth-century BC comedy by Philippus features a wooden statue carved by Daedalus that can speak and walk. The theme of runaway statues became a popular Athenian joke, taken up by Socrates (chapter 7). Artists employed the theme too. A unique scene of artisans making a horse statue so lifelike that it is chained by the leg was engraved on an Etruscan bronze mirror (discussed in chapter 7, fig. 7.7, plate 8). A group of archaic black-figure vase painters (sixth–fifth century BC) illustrated statues of men and animals on buildings coming to life and escaping their architectural frames.¹¹



Modern scholars have often noted that the figure of Daedalus might originally have been an earthbound human double of the inventor god

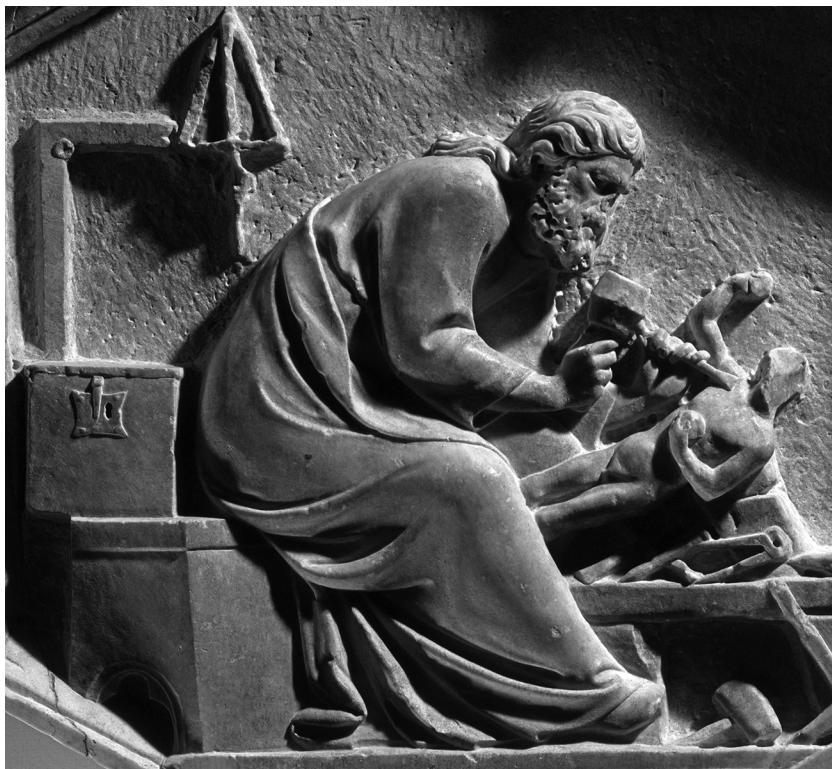


FIG. 5.3. The sculptor Phidias making a nude statue, by Andrea Pisano, fourteenth century, Museo dell'Opera del Duomo, Florence, Alfredo Dagli Orti / Art Resource, NY.

Hephaestus. Indeed, the Athenians gave Daedalus a genealogy that made him a descendant of Hephaestus, who was revered alongside the goddess Athena in Athens.¹² A district of Athens came to be named for Daedalus, populated by craftsmen who saw him as their patron and claimed to be his descendants. Socrates, whose father was a stonemason, twice refers to Daedalus as his ancestor.

Socrates also mentions Daedalus in some of his metaphors in Plato's philosophical dialogues. In two instances, for example, Socrates likens vacillating arguments to Daedalus's celebrated moving statues (Plato *Alcibiades* 121a; *Euthyphro* 11c–e). In another passage, Plato's Socrates compares people's fleeting opinions unmoored from reason to Daedalus's animated statues. If one's thoughts or opinions are to be of any value, maintains Socrates, then they—like Daedalus's automata—must

be tethered to a plinth, or else they will escape, like runaway slaves (*Meno* 97d–98a).¹³

The ancient Greek comparison of automata to slaves remains a concept with a moral significance in modernity. In antiquity, Greek and Roman masters were held responsible for the behavior of their slaves. Today, prescient philosophers of Artificial Intelligence and robotics ethics maintain that it is imperative that AI and robots be considered tools and property—essentially slaves—and that makers must be held responsible for their programming and behavior.¹⁴

In about 350 BC, Aristotle discussed automata, puppets, and toys set in motion by artisans' practical *techne* (strings, weights, springs, wheels, and other forms of stored, temporary energy) and their similitude to animal locomotion in his natural history treatises (e.g., *Movements of Animals* 701b; *Generation of Animals* 734b). In a curious passage in *Movements of Animals*, Aristotle, referring to semen as the liquid that “animates” an embryo, draws an analogy to the way “sculptors create statues and automata” that contain latent or potential power akin to wound-up clockwork. Aristotle's discussions allude to legendary animated statues like those associated with Daedalus, but it is also possible that Aristotle had in mind real self-moving machines, “mechanical dolls of some kind” made by contemporary inventors (chapter 9). Notably, Aristotle remarks that “an artifact might imitate” a living thing, and he defines an automaton as “a kind of puppet with the ability to move by itself.”¹⁵

In the *Politics* (1.4, discussed more fully in chapter 7), Aristotle clearly speaks of self-moving statues like those made by Hephaestus and Daedalus. In a complicated passage in *On the Soul* (*De Anima* 1.3.406b), Aristotle specifically mentions Daedalus's self-moving sculptures. The statues come up in his discussion of the atomism theory of the fifth-century BC natural philosopher Democritus (b. ca. 460 BC). Democritus's sixty-some treatises have not survived, but from *testimonia* in other works, we know that he based his theory of living beings and their motion on the existence of minuscule, indestructible, invisible “atoms jostling back and forth.” In his comments about Democritus's theory—that ceaselessly moving spherical atoms initiate movement—Aristotle refers to the claim made by his contemporary, the Athenian comic playwright Philippus (mentioned above), that the secret of a famous moving statue of Aphrodite was that Daedalus had poured mercury into the hollow figure. Aristotle's point

is to compare Democritus's atomism theory to the way balls of mercury naturally move to draw together.¹⁶

In fact, the shifting weight of mercury flowing to the end of a tilted tube with enough force to change the center of gravity was used to animate self-moving toys in medieval and early modern times. The engineer Heron of Alexandria (first century BC) designed self-opening doors for temples using boiling water and pulleys, and he stated that others used an alternative system based on heated mercury. It is not implausible that mercury could have been used in antiquity to animate devices. The idea that the little-understood metallic fluid called "quicksilver" or "living" mercury could impart mobility to a statue also appears in ancient Indian texts about automatically moving machines. For example, a light wooden model of a giant bird "flew by the energy generated from vats of boiling mercury," and mercury was the key substance to power a sort of perpetual-motion machine.¹⁷



According to a brief poem by Pindar (*Olympian 7.50–54*, written in 464 BC), a group of legendary animated statues with similarities to works by Daedalus were located in Rhodes. "All along the avenues," wrote Pindar, stood works of exalted art so gloriously crafted that they seem to "breathe and move." An ancient scholiast's commentary on the poem calls the statues "moving things with a soul or life spark." In this case, the maker was not said to have been Daedalus or Hephaestus, but the Telchines, blacksmith wizards of magical metallurgical lore, fabled to be the original inhabitants of Crete and Rhodes. The Telchines carried out activities similar to those of Hephaestus, but on a smaller scale, forging weapons and baubles for the gods. The powers of the statues of Rhodes recall the bronze guardians defending harbors and borders, the function of the mythic Talos of Crete and the historical Colossus of Rhodes (chapter 1).¹⁸

The legendary "living statues" attributed to Daedalus are of great interest as examples of imaginary and genuine "artificial life" described by classical writers. Many claimed that *daedala*, life-mimicking sculptures, could move their eyes and make sounds, lift their arms, and take steps forward. At the same time, however, controversy arose over the nature of "living statues." Could Daedalus's statues really move on their own? Or

was their movement illusory? Numerous ancient Greek accounts refer to wood, metal, and marble statues that could move their heads, eyes, or limbs, perspire, weep, bleed, and make sounds. The archaic idea that statues, especially of divinities, possessed agency has a deep history, long before the fifth and fourth centuries BC when artists began to create exceptionally lifelike figures and historical inventors began to design self-moving devices (chapter 9). It was possible to make statues with parts and hidden or internal mechanisms capable of movement, such as nodding, moving inset eyes, raising arms, opening temple doors, and so on. Hollow statues with cavities and tubes allowed priests to ventriloquize their voices, and Plutarch, Cicero, Dio Cassius, Lucian, and others discuss ways to cause a statue appear to shed tears, sweat, or bleed.¹⁹

Some writers, such as Diodorus Siculus (4.76), maintained that Daedalus must have “towered above all others in building arts, metal and stone work,” and crafted “statues so like their living models that people felt that they were somehow endowed with life.” Others proposed that Daedalus was the first sculptor to depict the walking pose in art. “This is the workshop of Daedalus,” wrote Philostratus (*Imagines* 1.16); “all around are statues, some with forms blocked out, others in a quite complete state in that they are already stepping forward and give promise of walking about. Before the time of Daedalus, the art of making statues had not yet conceived such a thing.”²⁰ On the other hand, writing in the same era (third century AD), Callistratus (*Ekphrasis* 8) described fourteen well-known bronze and marble sculptures, and he attributed the motion of Daedalus’s statues to some sort of “mechanical” workings (*mechanai*).

Whether or not statues made by the mythic inventor Daedalus could actually move is moot. What matters is how they were described and envisioned in antiquity. Some historians and philosophers of science argue that myths about Talos and other literary accounts of “living statues” cannot be taken as evidence that people “imagined the building of mechanical automata” in antiquity—because mechanical conceptions cannot be envisioned before the technology actually exists. Berryman’s study of mechanics in ancient Greek thought takes a literalist view of imagination and innovation: “We should not expect people to be able to *imagine* what devices can actually achieve without practical experience.” In this admittedly “tautological” view, no one in antiquity could have “*imagined*” such inventions “unless they were informed by experience with technology”

to compare them to. In other words, there must have already been some “technology available” before anyone could have conceived of the techniques or tools that might achieve the results described in the myths.²¹

There are of course tensions and gaps between imagination and actuality, representation and reality. Yet it seems obvious that the long history of human innovation relies on the ability to imagine or contemplate unheard-of technologies beyond what already exists or is possible. Indeed, the ancient Greeks are generally acknowledged as innovators in culture, literature, politics, philosophy, the arts, warfare, and science; they embraced creativity, novelty, and imagination. Instead of assuming that changes, improved techniques, and new technologies somehow simply *happen*, ex nihilo, the Greeks saw dreams, ambition, inspiration, resourcefulness, skill, effort, competition, and ingenuity as the essential drivers of change and invention in all fields of endeavor. They could, in literature and art, imagine all manner of things that “could happen.” Not all creativity is based on technological precedent or material resources. It is because of surprising ideas and “novelty in the ancient Greek imagination and experience” that “saliently different” concepts and innovations “emerge into being,” remarks Armand D’Angour in *The Greeks and the New*. Moreover, imagining technologies that do not yet exist has always been the wellspring of the genre of speculative fiction that we call “science fiction” today, which modern Greek and Latin scholars have traced back to classical antiquity. “Where science fiction leads, philosophers and inventors soon follow.”²²

The animated figures and artificial human enhancements made with prodigious creativity and expertise using familiar materials, tools, and technology to achieve amazing results, as described in classical traditions, are not *literal* prototypes of modern, full-fledged robots and other forms of man-made life. As noted earlier, their internal workings are inscrutable, expressed in mythic language, rendering them “black boxes.” But they are significant to us because the accounts show that people in antiquity *could* imagine artificial life and speculate on its possible realization through some ingenious, sublime *biotechnē* not yet known or understood. The myths express the idea that there might be discoverable practical ways to achieve synthetic nature in the forms of humans or animals; that perhaps there were ways to create artificial life outside or beyond mere magic or fiat.²³



A striking aspect of the stories of “living statues” is that ancient philosophers, poets, and playwrights tell us that contemporary images and sculptures of startling realism called up conflicting strong emotions in the viewers.²⁴ By the fifth century BC, Greek sculptors were achieving extraordinary levels of anatomical verisimilitude, with exceedingly minute details of veins and musculature and a variety of facial expressions. Sculptors began to depict naturalistic, fluid poses that had been impossible before innovations in artistic technology. And keep in mind that both marble and bronze statues were realistically painted. A host of eminent artists’ works were described by Pliny.²⁵ Among his examples of sculptures of “miraculous excellence and absolute truth to life” was a bronze dog licking its wound—a statue so valuable that it could not be insured for loss but had bodyguards charged to defend it with their lives. Pliny also singled out Pythagoras of Rhegium (fifth century BC), who was renowned for his muscle-bound marble athletes with visible tendons and veins. The festering ulcer on the leg of his Lame Man caused viewers to wince with sympathetic pain. The paunchy and balding



FIG. 5.4. Athena visiting the workshop of a sculptor (Epeius?) making a realistic horse statue (Trojan Horse?). Attic red-figure kylix, by the Foundry Painter, about 480 BC, Staatliche Antikensammlungen and Glyptothek Munich, photographer Renate Kühling.

portrait statues made by the Athenian sculptor Demetrius of Alopece (ca. 400–360 BC) were so “lifelike that they were unflattering.”²⁶ People even developed the desire to have sex with erotically compelling statues (see chapter 6).

Meanwhile, painting masterpieces began to feature astonishing depth and perspective. Compelling three-dimensional effects made hands and objects appear to project from the surface. Examples from the fourth century BC, described by Pliny in his *Natural History*, include Aristides of Thebes who painted emotions so skillfully, and Apelles, whose life-size pictures of energetic horses elicited neighs from live horses. Several ancient writers praised the works of Theon of Samos, who specialized in “imaginary visions that they call *phantasias*,” vivid paintings accompanied by 3-D and theatrical effects of sounds, music, and lights to give realistic “sense-surround” impressions. Another great Greek artist was Parrhasius, whose incredibly lifelike portraits of athletes appeared to pant and sweat. For his vivid painting of Prometheus ravaged by the Eagle of Zeus, it was whispered that Parrhasius must have tortured a slave to death as his model. The paintings of Zeuxis, Parrhasius’s rival, were examples of unprecedented illusionism. These and other artists competed with each other to produce astounding trompe l’oeil paintings and objects, such as luscious-looking bunches of grapes that deceived birds into trying to peck them.²⁷

As we will see in chapter 9, by the Hellenistic era a number of artisans were designing and making real mechanical models of humans and animals, such as serving maids, whistling birds, moving serpents, drinking horses, and so on. Marvels of artificial life only imagined in the ancient myths were being realized in engineering plans and inventors’ workshops.

As artist Michael Ayrton noted, modern historians tend to undervalue the role of technical ingenuity in ancient artworks. In his survey of realistic artworks, Pliny explained how bronze sculptors made lifelike plaster (and wax) casts of living people, a technique that enhanced the realism of portraits. Physical evidence for the use of plaster and wax casts of real people’s bodies to make phenomenal, true-to-life bronze sculptures has come to light in some magnificent statues of the fifth century BC. These unexpected discoveries of artistic technology shocked the modern art world; we had been accustomed to assuming that classical sculptors possessed inimitable, awesome virtuosity in achieving such realism in

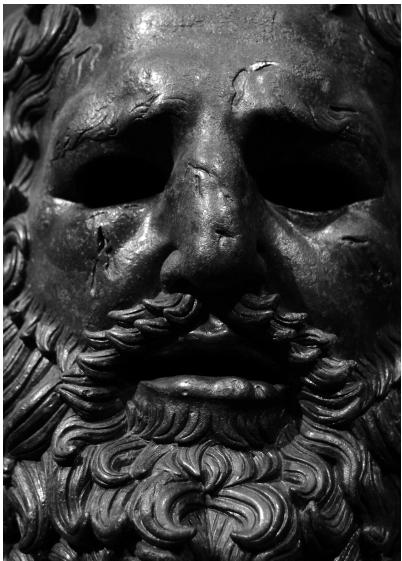


FIG. 5.5 (PLATE 7). Realistic bronze and marble statues. Upper left, face of the Hellenistic bronze Boxer of Quirinal (Terme Boxer). Album / Art Resource, NY. Upper right, beard and mouth with silver teeth, Riace bronze statue A, found in bay of Riace, Calabria, Italy, in 1972, thought to be the work of Myron of Athens, 460–450 BC. Museo Archeologico Nazionale, Reggio Calabria, Erich Lessing / Art Resource, NY. Lower left, marble arm of the Discus Thrower, Roman copy of the classical Greek bronze original by Myron of Athens, 460–450 BC. Museo Nationale Romano, Rome, © Vanni Archive / Art Resource, NY. Lower right, athlete, fourth to second century BC, recovered off the coast of Croatia in 1996, Museum of Apoxyomenos, Mali Losinj, Croatia. Photo by Marie-Lan Nguyen, 2013.

their bronze figures. The technique, detected and explained by Nigel Konstam in 2004, helps explain the stunning mimetic qualities of many bronze statues.²⁸



Mercury, quicksilver, was a substance of mystery in antiquity, as we have seen. Curiosity about mysterious lodestones—magnetite, a naturally occurring magnet that attracts iron—led some ancients to suggest that magnets also possessed a kind of life, a soul or breath or daimon within. The strange, rare mineral—popularly called *ferrum vivum*, “live iron”—had bewitching powers to move and enliven objects made of iron. This led creative thinkers to imagine how the stone’s inexplicable ability to draw or repel iron might be exploited to mystify viewers. What if “living iron” could allow a human replica made of iron to float in midair, to actually levitate and hover effortlessly like the gods, or soaring birds?²⁹

Ptolemy II Philadelphus, the Macedonian Greek king of Egypt (283–246 BC) oversaw many unprecedented engineering feats in Alexandria, including an impressive female automaton (chapter 9). He married his own sister, Queen Arsinoe II, and honored her as a goddess after her death. In 270 BC he decreed that her likeness should grace every temple in Egypt. Pliny reports that the king commissioned a renowned architect to create an especially sublime statue of Arsinoe for a temple in Alexandria. Pliny gives his name as “Timochares,” but he may have meant Dinocrates of Rhodes, the brilliant engineer for Alexander the Great, who designed the city of Alexandria and other wonders. The plans called for constructing a vaulted roof of *magnete lapide*, magnetic stone, over a lifelike statue of Arsinoe, either made of iron or with an iron core. The idea was that the queen would miraculously hover unsupported in midair, symbolizing her ascent to the heavens (Pliny 34.42.147–48). Surviving sculptures of Arsinoe are realistic, sensuous portraits, nude or transparently draped, so one can guess a similarly erotic statue was planned for this temple. But the grand project was never completed, owing to the deaths of the architect and Ptolemy II Philadelphus in 246 BC.

In fact, the design for the perpetually or even momentarily hovering Arsinoe was an impossible dream. In his study of the long history

of “magnetism fantasies” from antiquity to the Middle Ages, Dunstan Lowe shows how the pervasive lore about “floating statues” arose from misunderstandings of the physics of magnets. “In reality,” Lowe points out, Earnshaw’s theorem of 1839 remains uncontested to this day: it states that “stable levitation” of a fixed magnetic object “against gravity using only ferromagnetic materials cannot work on any scale.” The ancient fascination with magnetic power in third-century BC Ptolemaic Egypt is an example of an attempt to imagine and realize an advanced technology millennia before electromagnetic levitation was perfected.³⁰

Yet the vision—the science fiction—of animated statues activated by “live iron” was perpetuated as a kind of “sacred physics” in the ancient world. Over the centuries, numerous reports accumulated, alleging that scores of statues, including likenesses of the Greek-Egyptian god Serapis, the Greek sun god Helios, the mythic Athenian king Cecrops, even a winged Eros/Cupid, really floated in midair, magically suspended or balanced by lodestones. Notably, in the twelfth century AD, a twirling statue of Muhammad, made of gold and silver and presumably iron, was said to have been balanced above a tent by means of four magnets and caused to rotate by fans—an idea that included the concept of rotation, but also impossible. All of these “floating” idols, if they really existed, were supported by other, cleverly hidden means, but they were taken as techno-miracles by viewers and ascribed to ingenious harnessing of magnetism by the learned.³¹

Magnetism as a metaphor for sexual attraction turns out to be an ancient concept. The irresistible, mystical coupling of otherwise lifeless stones, magnetite and iron, was observed in antiquity. The phenomenon was “brought to life” in a pair of erotic statues in a racy Latin poem by Claudian (b. ca. AD 370). The mineral *magnete*, magnetite, writes Claudian, is “animated and invigorated by the hardness of iron” and it “languishes without it.” Iron, for its part, is charmed by lodestone’s “warm embrace.” The poem describes two statues in a temple, a Venus carved of magnetite and an iron Mars, standing some distance apart. The goddess of love and the god of war were lustful lovers in Greek myth: Claudian tells how the priests celebrate their divine love with bouquets and songs. As the figures are slowly moved closer together—suddenly Venus and Mars fly into each other’s arms, and it takes effort to pull them apart.³²

Did these magnetically animated statues really exist in Alexandria, or were they figments of the poet's imagination? Claudian was a native of Alexandria, the home of many magnetic fantasies. The action described in the poem is not impossible levitation but realistic magnetic attraction. One can easily imagine that a pair of small figurines, along the lines of modern magnetic toys, could have been created for entertainment in that sophisticated city of technology.



Unprecedented innovations and brilliant techniques in Greek art and in mechanical technology, evoked *sebas*, *thauma*, and *thambos*—awe, wonder, and astonishment—in antiquity. Many writers described how people confronted with true-to-life artificial animals and especially facsimile human beings experienced the “shock of the new,” a sense of surprise and pleasure—but mixed with acute feelings of disorientation, alarm, and terror. These unnerving effects of artistic illusions, vivid imitations of life, animated sculptures of humans and animals, and statues that seem to actually *be* what they portray can be seen as ancient parallels of the Uncanny Valley phenomenon. The Uncanny Valley, a psychological reaction first identified in robotics in 1970, refers to the unease and apprehension that people experience when they encounter eerie, “not quite but very nearly human” replicas or automata. Anxiety rises steeply when the line dividing the inanimate from the animate collapses, especially with anthropomorphic entities, and actual movement or the illusion of movement intensifies negative emotions.³³

A genre of ancient and early medieval oral traditions preserved in Hindu and Buddhist literature describes the wonder mixed with fear evoked by superrealistic android robots (*yantra/yanta* “machine, mechanical device” in Sanskrit and Pali, respectively) made by clever machine-makers (*yantrakaras/yantakaras*). The original dates of the oral tales (versions exist in Sanskrit, Pali, Tibetan, Tocharian, Mongolian, and Chinese) are unknown, but the stories began to be committed to writing in the third to first century BC. One tale tells of a brilliant inventor who visits a foreign king accompanied by a lifelike robot that he introduces to the court as his son. The robot, dressed in elegant robes, has “charming manners and dances most beautifully.” One day, however,

the robot casts flirtatious glances at the queen. The outraged king orders his men to behead the “lascivious young man.” The inventor quickly offers to discipline his “son” himself and removes part of the robot’s shell to reveal the mechanism inside. Astonished and delighted, the king richly rewards the inventor (see chapter 6 for an ancient Chinese version of this tradition).³⁴

The earliest Greek examples of an Uncanny Valley–type response to artificial life occur in Homer’s *Odyssey* (11.609–14). In the Underworld, Odysseus reacts with fear when he encounters hyperrealistic images of wild animal predators and murderers with glaring eyes. Odysseus prays that this fiendish artist will not create any more of these terrifying pictures. Later (19.226–30), Odysseus describes an intricately wrought golden brooch depicting a hunting hound mauling a fawn. Everyone marvels at the “living” vignette of the dog seemingly captured in the very act of seizing and killing the fawn as it gasps out its last breath.³⁵

In two dramatic instances in lost plays of the fifth century BC by Euripides and Aeschylus, old men are frightened out of their wits by Daedalus’s animated statues. In Aeschylus’s *Theoroi*, some satyrs are alarmed by effigies of their own heads nailed to a temple. One satyr cries out that they are so real they lack only voices to come alive. Another satyr exclaims that the replica of her son’s head would send his mother running and shrieking in horror. Such theatrical anecdotes suggest that classical audiences were familiar with artworks of disquieting realism, and, furthermore, they could imagine an extraordinary artisan who might be capable of even more preternatural mimesis than they had personally experienced.³⁶



Daedalus was imagined in antiquity as a brilliant craftsman, a sculptor of artificial life, and innovator of countless clever tools and designs to augment human abilities. In myth, the inventor not only borrowed the pinions of birds in order to fly to freedom; he was believed to have created such lifelike statues that they moved on their own or at least gave the startling appearance of motion. As mentioned earlier, Daedalus and his works sometimes overlap with those of his divine counterparts, Prometheus and Hephaestus. As we’ll see in the next two chapters, many of

the marvels wrought by these two divinities eclipse those of Daedalus. Their artifices are still more splendidly “alive” and some even possess “intelligence.” Yet both Prometheus and Hephaestus were envisioned using the very same tools, methods, and technologies that the mortal Daedalus wielded in his earthly workshop.