CHAPTER 5

DEDICATED INVENTIONS[1]

With the exception of unwrought stones, bones, or other natural curiosities, nearly all objects found in Greek sanctuaries could loosely be labelled 'inventions' in that they are the products of human craft. From Herodotus to Pausanias, sanctuaries of the ancient Greek world overflowed with extraordinary objects made of gold, silver, and bronze such as weapons, statues, cauldrons, and tripods.[2] These are also the kinds of objects recorded with the highest priority in temple inventories though in reality, the archaeological record confirms that ancient temples contained all sorts of 'mundane' dedications too. The aim of Part II is to uncover what ingenuity 'does' in the reciprocal *charis* relationship that organised religious acts, and especially dedication, in ancient Greece.[3] In this, I seek to ascertain not what was at stake when dedicating something expensive, but what we can infer theologically when dedicating something mechanically ingenious.[4] While colossal offerings, and those of rare and intricately worked materials such as gold and ivory, could also be the objects displaying the most technologically sophisticated craftsmanship, a focus on these precious objects risks skewing the historical question underpinning my investigation by introducing muddying issues of wealth. The divide between expense and ingenuity is evidently not clear-cut, but in the subsequent discussion I try to isolate examples which

[1] The phrase is from Fraser 1972, 413, who uses it in the context of Ptolemaic Alexandria. I was taken by the idea behind the phrase, however, and have thus adopted and expanded it vastly (possibly beyond what would have appealed to Fraser).

[2] Taking Delphi as an example: Hdt. 1.14, 1.25, 1.50–1, 8.27, 8.122, 9.81; Paus. 10.9–17.1. Compare the sanctuary's most famous bronze statue to have survived, the Delphi Charioteer.

[3] On *charis* in ancient Greek religion, see especially Parker 1998.

[4] For discussion on the expense of a sacrifice see Van Straten 1981, 68–9. For an analysis of gold and precious dedications, their value, and their meaning, see Linders 1987.

involve an element of the mechanical as a clear feature of the dedication, regardless of the expense involved, in order to better pinpoint the value of ingenuity in (literally) forging connection with the divine. There is a difference too between dedicating a symbolic embodiment of technical or mechanical expertise – a lyre, a nail, a votive tablet with a representation of technical profession, for example – and dedicating something that has been enhanced by *mēchanēma* 'mechanical contrivance' such as self-rotating wheels, pneumatically enhanced vessels, wheeled tripods, or hinged figurines, the case studies presented here.

Hellenistic Epigrams and Technical Manuals

Hellenistic epigrams and mechanical manuals are two types of texts concerned with objects, words, and the constructive power of both.[5] Epigrams are imaginative, and revel in their own use of poetic language to enhance the allure of the objects to which they are (or once were, or are imagined to be) attached. Technical manuals are theoretical and seek, through precise prose, to present objects via their constituent components of construction put together according to the scientific principles therein. Both expect and incite a cognitive, emotional, even somatic reaction to the objects they describe – both, therefore, should be considered ekphrastic – but while epigrams typically harness the ambiguities of poetics to their advantage in order to dictate affect, technical manuals aim to disambiguate, placing mechanical knowledge front and centre to create epistemological advantage for their author and reader.[6] In Gellian terms, when put side by side, epigrams and manuals, respectively, capture for the modern reader the enchantment of technology and the technology of enchantment.[7] Most interestingly for present purposes,

[5] Caution must of course be exercised when attempting strict delineations between ancient genres. Indeed, a corollary to the broader argument presented is to prove the fluidity of genre and the broader infiltration of technical knowledge into culture (and vice versa), rather than anything to the contrary.

[6] Technical texts as ekphrastic, see Roby 2016a. The application of 'ekphrasis' to epigrams is not universally accepted on which see Zanker 2004, 184–5, with defences of the term in Elsner 2002, 9–13; Squire 2009, 139–46; 2010a, 59n15; 2010b, 77.

[7] For an explanation of Gell's theory, see pages 17–21.

both text types have an interest in objects dedicated to the gods and thus by unpacking how these two genres work separately and in conversation, we are able to uncover intriguing histories about object agency, ingenuity, and religious dedication in the Hellenistic world.

Wheels, Worshippers, and *Ilinx*

The oldest surviving text on mechanics attests to the use of technology to enhance objects placed in temples. The *Mechanica*, as we have seen, forms part of the Peripatetic corpus and can probably be ascribed to his school in the opening decades of the third century. The treatise presents and explains various mechanical contradictions manifest in everyday life. Physical principles and mechanical systems are elucidated through practical examples based around recognisable conundrums. Questions range from 'why is a moving object easier to move than an object at rest?' and 'how do pulleys pull great weights?' to 'why are pebbles at the seashore rounded?' and 'why is it necessary in order to stand up to first make an acute angle between calf and thigh, and between thigh and torso?'.[8]

Before setting out the 'Problems' proper, the text offers a short introduction in which the properties of the circle are described, with a focus on the fascination that these properties provoke. According to the *Mechanica*, the circle is the source of all mechanical advantage (the origin of the balance and the lever on which the pulley, wheel, and axle and cogwheel then depend), and as a result it is the first of all *thaumata*, 'marvels'.[9] The circle is something marvellous (*thaumastos*) that creates things even more marvellous (*thaumasiōteros*) by the fact that it combines the most marvellous (*thaumasiōtatos*) quality of the union of opposites (ἐκ μὲν γὰρ θαυμασιωτέρου συμβαίνειν τι θαυμαστὸν οὐδὲν ἄτοπον, θαυμασιώτατον δὲ τὸ τἀναντία γίνεσθαι μετ' ἀλλήλων.).[10] The categories of opposites that the circle combines are: moving and stationary (i.e. the centre point remains stationary while the circumference rotates), and thus, relatedly, slower and faster motion

[8] Arist. *Mech*. problems 31, 9, 15, and 30, respectively.
[9] Arist. *Mech*. 847b–848a. 'οὐδὲν ἄτοπον τὸ πάντων εἶναι τῶν θαυμάτων αὐτὸν ἀρχήν.'
[10] Arist. *Mech*. 847b.

(if one considers the trajectories of different points on the radius), as well as forward and backward motion. This final observation leads the author to describe rotating wheels placed in temples.

In the explanation of the temple wheels, the mechanician's privileged knowledge and practical skills are put to use to elucidate the constructs of a seemingly inexplicable *thauma* harnessed specifically for religious effect:

διὰ δὲ τὸ τὰς ἐναντίας κινήσεις ἅμα κινεῖσθαι τὸν κύκλον, καὶ τὸ μὲν ἕτερον τῆς διαμέτρου τῶν ἄκρων, ἐφ' οὗ τὸ Α, εἰς τοὔμπροσθεν κινεῖσθαι, θάτερον δέ, ἐφ' οὗ τὸ Β, εἰς τοὔπισθεν, κατασκευάζουσί τινες ὥστ' ἀπὸ μιᾶς κινήσεως πολλοὺς ὑπεναντίους ἅμα κινεῖσθαι κύκλους, ὥσπερ οὓς ἀνατιθέασιν ἐν τοῖς ἱεροῖς ποιήσαντες τροχίσκους χαλκοῦς τε καὶ σιδηροῦς. ... ταύτην οὖν λαβόντες ὑπάρχουσαν ἐν τῷ κύκλῳ τὴν φύσιν οἱ δημιουργοὶ κατασκευάζουσιν ὄργανον κρύπτοντες τὴν ἀρχήν, ὅπως ᾖ τοῦ μηχανήματος φανερὸν μόνον τὸ θαυμαστόν, τὸ δ' αἴτιον ἄδηλον.

Because of the fact that opposed motions simultaneously put the circle in motion i.e. one end of the diameter A moving forwards and the other end B moving backwards [see Figure 5.1a], some have set up a construction so that from one movement, many circles move in opposite directions at the same time [see Figure 5.1b], just like they dedicate in temples, having made the little wheels out of bronze and steel. ... So making use of this property inherent in the circle, craftsmen make an instrument concealing the original circle, so that only the marvel of the mechanical device is apparent, while its cause is invisible.[11]

It would be disingenuous to present the *Mechanica* as a text interested in describing objects which might find a place in

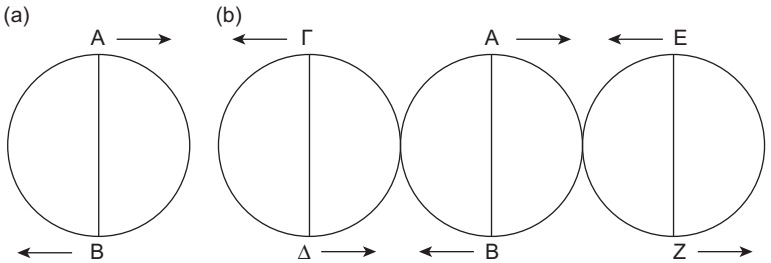

Figure 5.1 Rotating wheels as described in the Peripatetic *Mechanica* (a) single (b) multiple.

[11] Arist. *Mech*. problem 1 (848a.19–37).

a temple. On the contrary, the marvel of circular motion is what leads the author, utterly incidentally, to describe these wheels. Moreover, even in those technical texts where a number of objects are described for the purpose of religious dedication, their style remains frustratingly laconic, above all in relating aesthetics and context. Fortunately for us, however, the *Mechanica* is relatively forthcoming with details of the location, material, size, use, and effect of the self-rotating wheels. We learn that these wheels were small, dedicated in temples, and made of bronze and steel. Still, the precise ritual in which the wheels were involved, the deity to whom they were dedicated, and the intention behind their rotation are all elements which remain unknown from this text alone.

The later pneumatic texts of Philo of Byzantium and Hero of Alexandria describe comparable wheels, which help not so much to fill gaps in the *Mechanica* account, but to gain a broader picture of the phenomenon at hand. Philo of Byzantium (*c*.280–220 BCE) wrote a compendium on a variety of mechanical subjects in nine books entitled *Mēchanikē Syntaxis*. Of this Hellenistic work, only the fourth book (*Belopoeica*) and parts of the seventh (*Parasceuastica*) and eighth (*Poliorcetica*) are preserved in Greek, while book five (*Pneumatica*) is preserved in medieval Arabic with a partial Latin translation. In this latter book, the installation of a bronze, hydraulic, self-rotating, and whistling wheel for ablution and purification 'placed in the vicinity of a mosque or a temple' is described (Figure 5.2).[12] It is also reported that 'the ancients used many wheels of this kind'. Whether this was an authentic comment by Philo, pertaining to religious custom prior to the third century BCE, or whether it is a later interpolation by the medieval Arabic translator as with the mosque, we cannot be sure, but both cases would, albeit in their own way, imply that wheels of this sort were more common in Greek religious contexts than has hitherto been acknowledged. The wheels also offer obvious parallels with other religious traditions, notably with Buddhist mantra wheels, or 'prayer machines' as they were called by early nineteenth-century Protestant

[12] Philo *Pneum*. 63. The mosque clearly and fascinatingly is a later interpolation to the Arabic text. I am following Carra de Vaux's 1902 French translation, translating into English. Other pneumatic devices specified for ablution are described at Philo *Pneum*. 35, 36.

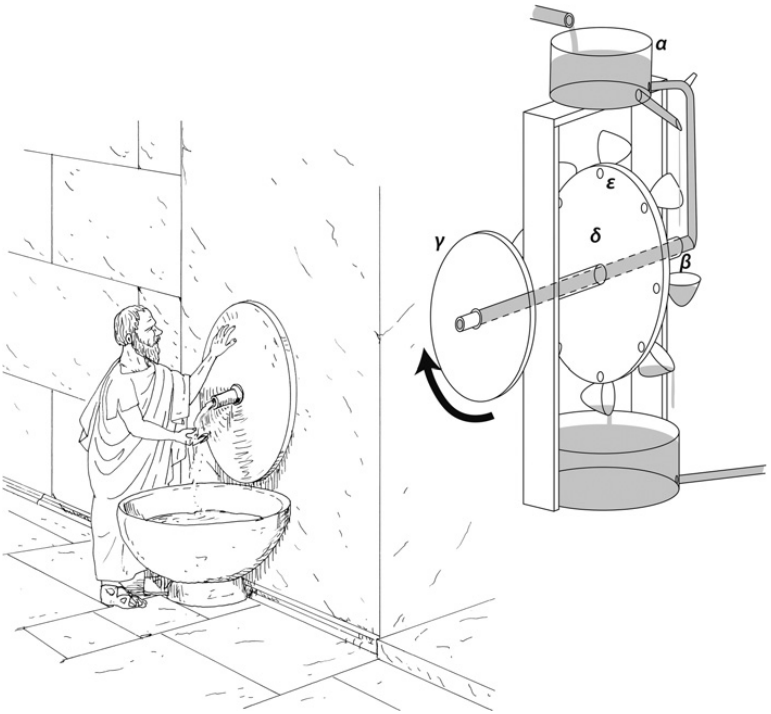

Figure 5.2 Artistic reconstruction of a self-rotating wheel for purification used in temples after Philo, *Pneum*. 63. (Image Y. Nakas.)

missionaries.[13] Comparison both helps to unearth some interesting points of similarity through the use of parallel religious technologies in vastly different religious contexts, and serves to elucidate what was particularly enchanting about the *ilinx* provoked in the Greek case and how it related specifically to aspects of Greek theology.

Buddhist prayer wheels, especially common in Tibet, come in various forms.[14] The handheld kind are made of a cylinder of wood or metal that revolves on an axis and contains within it many copies of thin paper with written mantras used in prayer. There also exist larger pillared versions erected at temple sites

[13] On which see Blanton 2016.
[14] On their use in Japanese Buddhism, see Rambelli 2016.

which can be turned by hand, wind, water, or fire. The pneumatic link is already a curious parallel to note, and, as with Philo's purificatory wheel, the prayer wheel in the Buddhist tradition is innately linked to purification of the individual as well as of the place where it is installed. Both handheld and temple 'mantra mills' function according to the idea that with a single rotation, hundreds (or even thousands or millions) of Buddhist mantras were sent out into the world. Thus, part of the purpose of the Buddhist prayer wheel is replication and accumulation of religious energy (*karma*), and the technology here amplifies the noise of the message by sending out an exponentially greater number of mantras through a single gesture. At the same time, by allowing those who are illiterate to participate in 'reading' the sutra, Buddhist prayer wheels also transmute the signal and in doing so, extend its reach and boost its efficacy. In this, mantra mills help to create religious community by propagating the *dharma*, by introducing and perpetuating motion throughout the worshipping group, and by leading pilgrims collectively around the temple complex in the case of the pillared wheels.

There is little doubt that the technology of the prayer wheel in the Buddhist tradition creates theological community, and the comparison thus raises the question of collective worship in the Greek context too. A crucial difference, however, is the now well-rehearsed fact that ancient Greek religion had no creed or doctrine. Thus, if religious community is formed thanks to the religious technology of the rotating wheel in the Greek case, it is not on the same grounds. Rather than spreading a shared religious message, Greek wheels might be said to generate religious community by manufacturing a sense of the miraculous which offered a common basis for worshippers to confirm divine presence. Buddhist prayer wheels always go from stationary to spinning, aiming towards a state of perpetual rotation. There is no such consistency in the Greek examples. Mechanical texts in fact attest that there were multiple ways for the confirmation of divine presence to take place through the use of wheels in temple contexts. The Buddhist case relates to a theology of equilibrium and eternal harmony: the Buddha is said to have set the 'wheel of *dharma*' in motion when he delivered his first sermon. The Greek case, I suggest,

has more to do with the awe-inspiring potential of the circle that we have seen explained in *Mechanica*, and the temporarily discombobulating power of *ilinx* that is subsequently invoked.

Philo's rotating wheel for purification introduced earlier is different to the multiple wheels described in the Peripatetic text in that the former consists of a single miniature water wheel in constant motion which momentarily stops turning following the worshipper's interaction:[15]

> Upon entering a temple, [the ancient worshippers] sprinkled their clothes with water which was carried by this wheel, then they moved [the wheel] with their hands because they believed that by touching the bronze, they were purified. And the wheel turned with regular rotation, continuously, and whistled: this is what marked it out to those entering the temple. It stopped when one touched it with their hand, and, upon releasing it once more, it started its movement and turned as before.[16]

Though not specified in the text, this kind of rotating wheel would need a source of running water: a central component mentioned in a number of Philo's other pneumatic inventions.[17] Philo explains that the water carried by this wheel was sprinkled onto the clothes of the worshipper who proceeded to touch the wheel for purification. The regular rotation and whistling which accompanied the motion served, according to the author, to mark out the presence of the object in the temple. Tantalised by the constant motion, and quite literally called forth by the marvellous object, the worshiper first dips their fingers into the water and then brings the hard, rotating bronze to a momentary halt. The marvel of circular motion unites the Peripatetic and Philonian examples, certainly, but the involvement of the human body is inverted. In the former, the worshipper *introduces* motion and the chain reaction of the multiple wheels pressed together and consequential dynamism is felt to extend beyond the worshipper's body into

[15] Philo is, it appears, the earliest source which attests to the existence of the water mill (Philo *Pneum*. 61, 65), but it was probably invented in Egypt almost a century earlier. On evidence for the water mill, dating, and role in history of science debates, see Wikander 2008, 141–52; Wilson 2008, 350–7.

[16] Philo *Pneum*. 63.

[17] For example, see Philo *Pneum*. 59, where the device should be 'close to a spring or running water from a cave or a steep location', though the temple is preferred as 'it is safer'. Compare Philo *Pneum*. 60, 61.

inanimate matter. This works more or less in accordance with the haptic theology of the Buddhist wheels where touch also aims at the 'production' of something. In the Philonian case, however, the worshipper temporarily *interrupts* motion – and accompanying sound – marking out their intervention (as well as subsequent integration) into a different kind of space.

Hero of Alexandria describes two comparable designs in his text on pneumatics. The first invention opens with the remark that in the porticoes of Egyptian temples bronze wheels were supposedly placed which were spun upon entrance by worshippers 'in the belief that bronze purifies' (διὰ τὸ δοκεῖν τὸν χαλκὸν ἁγνίζειν),[18] and that beside these wheels were utensils with which worshippers could sprinkle themselves with lustral water (*perirrantēria*) (Figure 5.3).[19] These twin observations on ritual practice lead Hero to devise a wheel which releases lustral water when rotated. Hidden in the entrance of the temple was a vessel of water to the base of which were attached two perforated tubes, one inside the other. A wheel was attached to the front end of the tubes so that in spinning the wheel, worshippers would unknowingly align the perforations, thus letting water pass from the vessel into the tube and out of the main hole.[20] Hero's lustral wheel essentially combines the ritual acts of the Philonian wheel but follows the Peripatetic model, where the worshipper instigates the action. Both Hero's and Philo's inventions could conceivably be read in terms of ritual economics, collapsing two ritual moments together in a single object. Beyond pragmatics, however, these inventions and the intention behind them also tell a theological story: interacting in ritual is, at its base level, a way to transition from secular to sacred. In the Heronian case, for example, the unexpected sprinkling of water would act as an affirmation that this transition has been successfully accomplished, while with the Philonian wheel, it is the re-establishment of sound and motion which affirms divine presence to the worshipper. In the case of the

[18] The apparent purificatory quality of bronze is no clearer in this text than in Philo's, though see Parker 1983, 228n118. On the Egyptian context compare Plutarch, *Vit. Num*. 69.

[19] Hero *Pneum*. I.XXXII Schmidt = 31 Woodcroft.

[20] Incidentally, this is not the only device that releases lustral water as Hero also describes a libation vessel (*spondeion*) which works upon the insertion of a coin: Hero *Pneum*. I. XXI Schmidt = 21 Woodcroft.

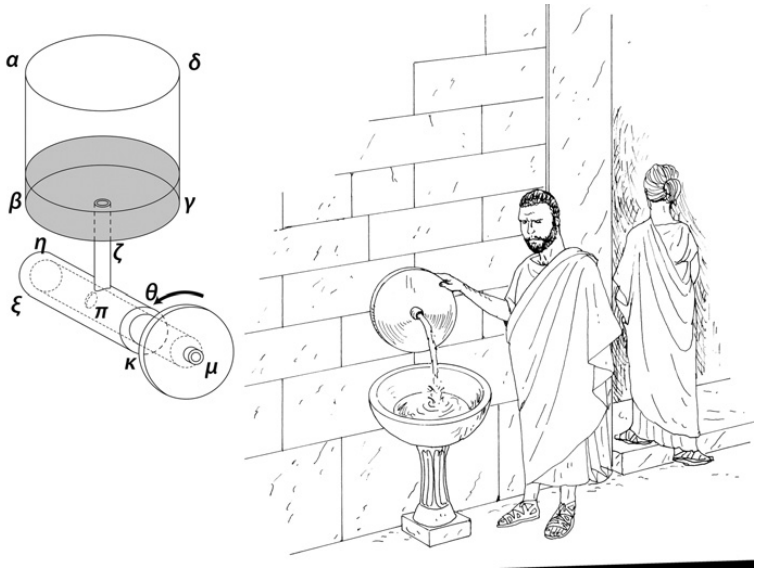

Figure 5.3 Artist reconstruction of wheels placed in temple porticoes after Hero *Pneum*. I.XXXII Schmidt = 31 Woodcroft. (Image Y. Nakas.)

Buddhist mantra mills, the theological work of the temple wheel as 'religious machine', and specifically in the human input of the energy into the spinning, is based on unidirectionality: *from* human action *to* the accumulation of good *karma*. In the Greek cases, the theological work happens in the effect, where the spinning or halting is *confirmatory* of the divine, a two-way channel capable of sending a signal back into the human realm.

Hero's second invention which helps to exemplify themes relevant to the current discussion is called an *hagnistērion*, slightly obscure 'instrument of purification'. It consists of a *thēsauros* ('sacred offertory box') equipped with a single bronze wheel which worshippers were accustomed to spin upon entering a temple (Figure 5.4).[21] Hero's construction aims, he tells us, for this spinning to set off the sound of a black-cap warbler singing and rotating from the top of the device. If the wheel is still, he adds somewhat redundantly, the

[21] Hero *Pneum*. II.XXXII Schmidt = 68 Woodcroft.

warbler will neither make a sound nor rotate. Again, the worshipper's ritual interaction with the object instigates the miracle and confirms divine presence, this time by transferring somatic energy into both a visual and auditory marvel that imitates the natural world in an overtly artificial manner. The technological animation of the little bird relies, paradoxically, on the worshipper's human body transferring force into and thus channelling itself through a pneumatic invention to confirm the ephemeral divine. The circle's essence which 'combines opposites' makes it particularly suited to manufacturing miraculous effect across these ontological boundaries.

Temple wheels are not the only time that *ilinx* and religion come into close contact in the Greek tradition. Spinning tops were common votive offerings to the gods and instead of labelling these simply as 'toys' whose dedication signalled a 'rite of passage' (*vel sim*.) out of childhood, it is perhaps worth stressing the way their spinning captured a sense of the marvellous as described in the *Mechanica* with the acknowledgement that this was clearly harnessed in other religious contexts too. After all, among the toys that were able to distract infant Dionysus – toys which subsequently become *symbola* of the god in Mystery contexts – were the *rhombos* 'bull-roarer' which whirled around on the end of a string and the *kōnos* 'spinning top', as well as *sphairai* 'balls' and golden apples, both of which could also roll or spin.[22]

Some conclusions can be drawn from the discussion thus far. First, that circular motion invoked a sense of marvel in the ancient Greek mind not because of its ability to perpetuate divine energy as in the Buddhist tradition, but due to the wonderful and dizzying effects of spinning which confirmed divine involvement in the human realm. Less specifically, and this will be expanded upon in the following sections, there existed such a category as the 'pneumatic miracle' which worked to invoke the supernatural in temple contexts in the Hellenistic world. Lastly, and perhaps most importantly, there was no single model for how these objects would have used their pneumatic properties to affect the viewer-worshipper.

[22] Not to mention the mirror, which fits neatly with the argument made on pages 113–16. For more on the toys of Dionysus, see Levaniouk 2007. Dasen 2016, 5–7 looks at spinning tops in vase iconography, pointing out the way that *ilinx* is used both in contexts of play, divination, and dizzying love.

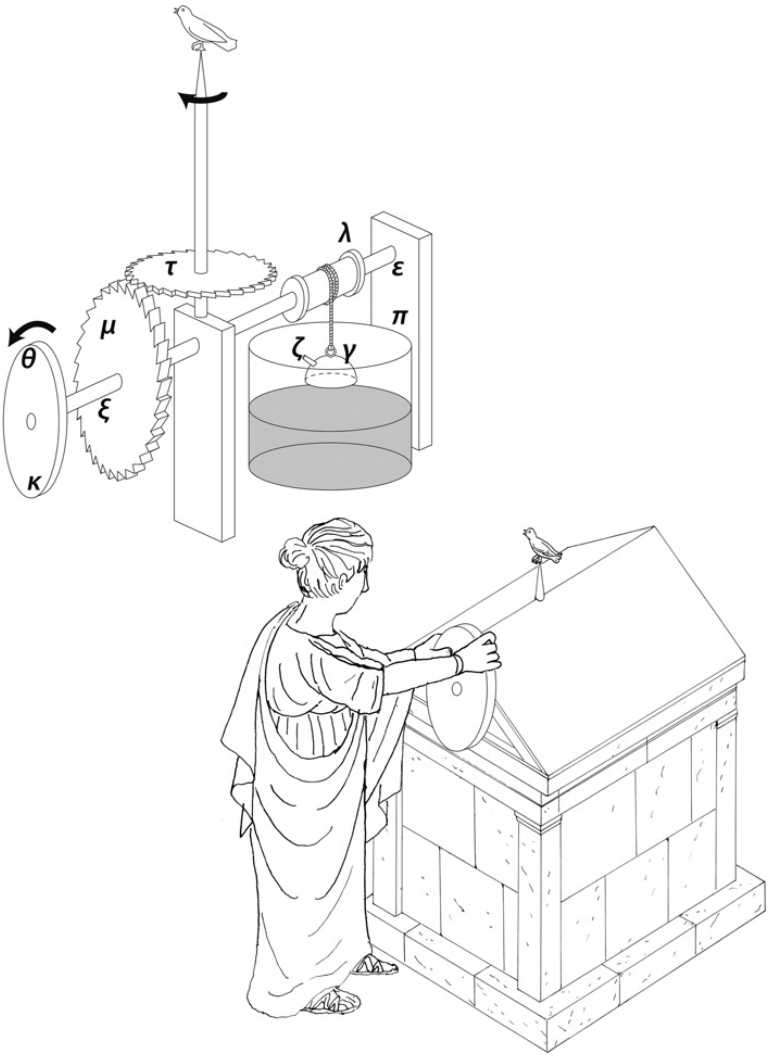

Figure 5.4 Artist reconstruction of a wheel for use in temples which sets off the singing of a little bird after Hero *Pneum*. II.XXXII Schmidt = 68 Woodcroft. (Image Y. Nakas.)

Rather, authors were creative in how they used mechanical knowledge to achieve the ultimate goal of manifesting divine aura. The Peripatetic example capitalises on the capacity of multiple wheels pressed together creating counter-intuitive, simultaneous motion; Philo's invention harnesses the waterwheel's ability to produce constant sound and motion; Hero's models use pneumatic ingenuity to create the element of surprise, a key component of experiencing mechanical *thauma*, as we shall see presently.

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While the texts of Philo and Hero proved vital in placing the objects described in the Peripatetic text into a wider cultural matrix, and the comparisons with the Buddhist tradition helped to pinpoint what was unique about the Greek use of the wheel in etic terms, evidence from the *Mechanica* offers a detailed explanation of what is at stake in viewing the *thauma* from an emic point of view. As the analysis so far has foreshadowed, the author specifies that the movement of these temple wheels is inexplicable (one source of energy animates multiple objects), counter-intuitive (they rotate in opposite ways),[23] and simultaneous (they all turn at once). In addition to the purificatory nature of the bronze conditioning the worshipper's response to these objects, the wheels are considered marvellous for the way in which their mechanical component – essentially a simple series of (cog)wheels pressed hard together[24] – enhances the object's incomprehensibility:

ταύτην οὖν λαβόντες ὑπάρχουσαν ἐν τῷ κύκλῳ τὴν φύσιν οἱ δημιουργοὶ κατασκευάζουσιν ὄργανον κρύπτοντες τὴν ἀρχήν, ὅπως ᾖ τοῦ μηχανήματος φανερὸν μόνον τὸ θαυμαστόν, τὸ δ' αἴτιον ἄδηλον.

So making use of this property inherent in the circle, craftsmen make an instrument concealing the original circle, so that only the marvel of the mechanical device is apparent, while its cause is invisible.[25]

[23] And potentially at differing speeds if the wheels were of different sizes, though this is not mentioned in the text.

[24] I do not wish to enter here into discussion on the invention of the cogwheel. I limit myself to observing that though the *Mechanica* does not speak of cogwheels in this context, without them the transmission of movement would not work as well. Of course, the author's point here is how marvellous circles are, so mentioning the cog mechanism detracts from that. I thank Geoffrey Lloyd for this observation.

[25] Aristotle, *Mech*. 848a.34–7.

Thanks to the cryptic power of the *dēmiourgos*' knowledge applied to the manufacture of this *organon*, the *thauma* is visible, the *archē* hidden, the *aition* unknown. The choice of language here perhaps deserves to be gently pressed given that determining exactly what constituted the *archē* of life was contested among early Milesian philosophers. If nothing else, the language puts mechanical texts into an active intellectual discourse of philosophical thinkers not just on 'wonder-making', as explained by Karin Tybjerg, but also on the origins of the cosmos.[26] The *Mechanica* makes a point of elevating the mechanic to a privileged position: someone who understands the *archē* of miraculous movement, deliberately demystifying the workings of the wondrous. Herein lies an important distinction between the mechanic and the spectator-worshipper. Since 'only the marvel of the mechanical device is visible' ('τοῦ μηχανήματος φανερὸν μόνον τὸ θαυμαστόν'), the worshipper is left to revel in the manifest presence of the divine force within the temple which the mechanics have engendered. At the same time, the text raises (and leaves open) the question of whether the *thauma* effect wears off with time or with familiarity, an issue which we will see return in full force in Part III. This perhaps helps to explain, however, why the Greek models, unlike the Buddhist wheels, offer a variety of different ways to provoke a miracle based on *ilinx*.

For the Peripatetic author, the power of mechanics lies in its ability to confound and to exceed the limits of human understanding. This speaks to Gell's enchantment of technology quite explicitly as the viewer comes under the spell of the 'coming into being' of the object, failing to understand quite how it works.[27] Yet there is a point at which understanding no longer matters, for even a mechanic is sometimes a spectator. As Berryman points out of the present-day 'mechanical philosopher', the mechanician may also, despite technical knowledge, attribute some of the wonder he has created to divinely inspired *technē*.[28] At the heart of the construction of the machine is the unfathomable and the marvellous which work to

[26] On which there is much more to be said. See, for example, Tybjerg 2000, 2003.
[27] Gell 1992.
[28] Berryman 2003, 349. Compare Bolter and Grusin's remark that 'immediacy may mean one thing to theorists, another to practicing artists or designers, and a third to viewers' (1999, 20).

endow the object with an agency over its viewers. In the same way that an irregularity in nature or the natural order is often considered in ancient Greece to be the divine manifesting itself, animation of the non-human – particularly in religious contexts such as the temple or the festival – evokes supernatural presence.[29] The unique characteristic of the technological *thauma* is that it will always also be an invocation: the technology of enchantment has as its reflex condition the enchantment of technology.

As we have seen in the introduction, the *Mechanica* opens with an extensive discussion of nature and *technē*, and places *thauma* and *mēchanē* within the matrix.[30] It is worth re-examining this passage in light of the present discussion on wonder:

θαυμάζεται τῶν μὲν κατὰ φύσιν συμβαινόντων, ὅσων ἀγνοεῖται τὸ αἴτιον, τῶν δὲ παρὰ φύσιν, ὅσα γίνεται διὰ τέχνην πρὸς τὸ συμφέρον τοῖς ἀνθρώποις . . . ὅταν οὖν δέῃ τι παρὰ φύσιν πρᾶξαι, διὰ τὸ χαλεπὸν ἀπορίαν παρέχει καὶ δεῖται τέχνης. διὸ καὶ καλοῦμεν τῆς τέχνης τὸ πρὸς τὰς τοιαύτας ἀπορίας βοηθοῦν μέρος μηχανήν.

One marvels at things which happen according to nature insofar as the cause is unknown, and at things which happen contrary to nature,[31] achieved through *technē* for the benefit of humanity. . . . When, then, we have to produce an effect contrary to nature, we are at a loss, because of the difficulty, and require skill (*technē*). Therefore we call that part of skill which assists such difficulties, a *mēchanē*.[32]

This is a very clear statement not just of the coexistence but of the interdependence of mechanics and wonder. According to this text, at least, the tantalising gap that exists between the natural and technical can be bridged by a specific part of *technē* termed mechanics.[33] The *mēchanē* as object is something which rescues the viewer from the state of *aporia* caused by the disjunct between

[29] On wonder in Herodotus and the divine manifesting itself through irregularities in nature, see Munson 2001. Compare Harrison 2000, 92–101.

[30] See pages 10–12.

[31] I retain this traditional translation of *para physin* for convenience but note discussion on pages 10–16.

[32] Arist. *Mech*. 847a11–13; 16–19. For similar statements in the pneumatic context see Hero *Pneum*. pr.17 (αἱ δὲ ἐκπληκτικόν τινα θαυμασμὸν ἐπιδεικνύμεναι.), pr.346–7 (ποικίλας καὶ θαυμασίας κινήσεις.); pr.74, 81–2, 97–8, 196–7, 241, 267, 327, 343 (vacuums as inherently *para physin* and artificially produced) compare I.I Schmidt = 1 Woodcroft, I.II Schmidt = 2 Woodcroft, I.X Schmidt = 9 Woodcroft, II.XIII Schmidt = 52 Woodcroft (reiterated in the context of specific constructions). Compare Philo *Pneum*. 3. In automata-making see Hero *Aut*. 1.1, 7–8.

[33] Compare Arist. *Mech*. 847a23–4.

the natural and the man-made. This is what makes it such a useful tool in solving the problem of divine presence in the human realm. The Peripatetic text urges the reader to move beyond a simple binary between *technē* and *physis* by placing mechanical objects right at the centre of that otherwise cognitively difficult juncture.

Returning to the use of wheels in temples, and by tempering the rationalising and anthropocentric aspects of Gell's theory as well as considering contemporaneous approaches to mechanical wonder, we are able to offer one last reflection on how these wheels worked to create a sense of the divine. A recurring feature in the description of the wheels is the worshipper's haptic connection to the bronze. The worshipper's initial intervention gives life force to the object which is subsequently absorbed – through the help of the mechanical – within the object to propagate movement, produce sound, distribute holy water, in short, to manifest the miraculous. The very essence of the *thauma* of the wheels, then, lies in the carefully engineered combination of material, status as a technical object, and existence as an embodied object. The human subject does not stand in opposition to the manufactured object, but the body's energy becomes entangled within its very workings, producing miracles which create a sense of divine aura. We might then take this one step further to consider how the 'assemblage' of human worshipper and the sanctuary apparatus thereby generated seems to suggest a broader context of pilgrimage in which such encounters must have taken place.[34] Unlike the *deus ex machina* – a mechanical prosthesis for the actor embodying a god but which remains firmly out of reach of the spectator – here the worshipper is drawn in and obliged to interact with the technical in a search for religious purification that is inherently linked to object and to place. Contact with the bronze mechanical wheels creates the miraculous movement and provokes the epiphanic presence of the supernatural which presumably was available at a select number of religious sites. Decentring the human, we see how the wheel itself forces the human worshipper to undergo the sacred act of purification, making it both instigator of religious action and, thanks to the mechanics,

[34] On ancient pilgrimage, the complexities of the term in the Graeco-Roman and early Christian contexts, as well as a working taxonomy, see Elsner and Rutherford 2005. For more on pilgrimage as it pertains to the current topic, see pages 148–50.

confirmation of religious presence. The material, functional, and embodied qualities of the mechanical wheels work with the enchantment of technology to create a divine aura.

Trumpeting *Rhyt*a

The discussion in the preceding section has demonstrated how technical texts encode objects in a specific way, and their (more or less detailed) instructions of construction which privilege the mechanician's knowledge help us to understand the agency ascribed to the objects beyond the pages of the manuals. Scholars working on ancient technology have, in the past twenty or so years, become more interested in demonstrating the ways that technical knowledge was wrapped up in all sorts of forms and literary genres.[35] By observing technical content through a new materialist lens, I seek to extend the approach of scholars who look at science and technology in its cultural and material context.[36] I turn now to Hellenistic dedicatory epigram and the way that the mechanical is thematised there to continue the exploration of how dedicated inventions might have worked to create and sustain a sense of the sacred.[37]

This section centres itself around the ways that Hellenistic mechanics has informed epigrammatic poetics in two dedicatory poems: one by Hedylus and the other from the 'new' Posidippus epigrams. A third poem, Callimachus' Nautilus epigram, offers a useful entry point into various issues pertinent to the discussion:

[35] For example, see Asper 2009, 2013; Taub and Doody 2009; Doody et al. 2012; Roby 2016a; Formisano and Van der Eijk 2017; Taub 2017.

[36] Netz 1999, 2002, 2004, 2009 (especially chapter 4), 2020; Cuomo 2001, 2002, 2007, 2011; Tuplin and Rihll 2002; Roby 2014, 2016b, 2018, 2019; Berrey 2017. Much of their work relies on the way paved and the questions posed by Geoffrey Lloyd, especially 1979, 1983, 1987, 1991, 2006, 2009.

[37] This merely scratches the surfaces of a much larger topic concerning the infiltration, influence, and manipulation of scientific and technical knowledge in Hellenistic epigram, dedicatory and otherwise. On Posidippus between epigram and *technai*, see Netz (2009) 190–2; on Posidippus' *Lithika* and its links to mineralogy, see Smith (2004). Book 14 of the Greek anthology compiles mathematical problem-poems alongside oracle riddles, on which see Taub 2017, 39–47. On poetry and numbers more generally, with plenty to say on epigram, see Leventhal 2022.

Κόγχος ἐγώ,Ζεφυρῖτι, πάλαι τέρας· ἀλλὰ σὺ νῦν με,
Κύπρι, Σεληναίης ἄνθεμα πρῶτον ἔχεις,
ναυτίλος ὃς πελάγεσσιν ἐπέπλεον, εἰ μὲν ἀῆται,
τείνας οἰκείων λαῖφος ἀπὸ προτόνων,
εἰ δὲ γαληναίη, λιπαρὴ θεός, οὖλος ἐρέσσων
ποσσὶν †ἵν' ὡσπ† ἔργῳ τοὔνομα συμφέρεται,
ἔστ' ἔπεσον παρὰ θῖνας Ἰουλίδας, ὄφρα γένωμαι
σοὶ τὸ περίσκεπτον παίγνιον, Ἀρσινόη,
μηδέ μοι ἐν θαλάμῃσιν ἔθ' ὡς πάρος (εἰμὶ γὰρ ἄπνους)
τίκτηται νοτερῆς ὤεον ἁλκυόνος.
Κλεινίου ἀλλὰ θυγατρὶ δίδου χάριν· οἶδε γὰρ ἐσθλά
ῥέζειν καὶ Σμύρνης ἐστὶν ἀπ' Αἰολίδος.

I am a shell, Lady of Zephyrium, a very ancient one. But you now have me, Cypris, the first dedication of Selenaea, a nautilus, who sailed the seas. If there is wind, I stretch the sail on my own forestays, and if there is Calm, the gentle goddess, I sail ahead, rowing swiftly with my feet – my name suits my work – until I fell by the shores of Iulis, so that I could be a much admired toy for you, Arsinoe. Nor in my chambers as before (for I am airtight) will the sea-dwelling halcyon lay its egg. But give favor to the daughter of Clinias, for she knows how to act nobly and is from Aeolian Smyrna.[38]

Kathryn Gutzwiller has shown the complex ways in which scientific knowledge is used as the basis for cultural truths that inform poetic voice in this poem.[39] The reworking of (pseudo)scientific information – presented in Aristotle's *Historia Animalium*, for example – does not inhibit the poetics of the poem, but instead creates space for metaphor. To this I would add the way that Callimachus' Nautilus epigram captures the important overlaps between religion and play – in this case specifically between dedication and toys – and places science in the picture too.

The poem ventriloquises a nautilus shell that has been dedicated to Aphrodite-Arsinoe, describing both its past life at sea as well as its new-found status as *paignion* 'plaything' of the goddess.[40] Gutzwiller's analysis demonstrates the way that Callimachus manipulates the complexity of the symbol of the shell through

[38] Ath. 7.318b–c = 5 Pf. = XIV Gow-Page, *HE* = LX Sens.
[39] Gutzwiller 1992. See too Sens 2020, 141–4.
[40] On the semantic range of *paignion*, particularly its ability to delight which prompts clear parallels with dedication as an *agalma* to the gods, see Kidd 2019, 102–5. On the link between mechanics, dedication, and ruler cult see Chapter 6 on processional automata, especially pages 200–3.

ambiguity in gender (between sailor and womb), combination of its public and private significance (where Aphrodite offers general protection of those at sea, and personal assistance to navigate the potentially tumultuous waters of marriage), as well as through the paradox of the lifelessness of shell contrasted with the fertility of the dedicant. But even without delving into the realm of the symbolic, the poem triangulates the very existence of the Nautilus shell between various cultural registers: the scientific, the playful, and the religious. Not only does this speak to archaeological votive evidence where objects are both purpose-built and repurposed for votive occasion,[41] but it also helps in offering a paradigm through which we should perceive the polyvalence of dedicatory objects. There is a dialectic – and one not lost on ancient worshippers themselves as the Nautilus epigram exemplifies – between the object's past life and its new-found life as a dedication. This is an issue that will arise again when looking at the religious use of articulated figurines or 'dolls'.[42] What unites votive objects on the 'receiving' end is their status as *agalmata* intended to delight the divine, making them pleasure objects, or 'toys', of the gods. Seen in this light, it makes sense that mechanics should be used to enhance the delightful, surprising, mimetic, agonistic qualities of dedicatory objects – all qualities that define play and playthings too.

Hedylus, who lived in Alexandria during the reign of Ptolemy II Philadelphus, composed a variety of epigrams, mostly to do with food and drink, twelve of which are preserved for us. In one of these, Hedylus describes an offering of a trumpeting *rhyton*, 'drinking horn', dedicated at the temple of the deified queen Arsinoe Philadelphus in the form of the Egyptian god Bes:

> ζωροπόται, καὶ τοῦτο φιλοζεφύρου κατὰ νηὸν
> τὸ ῥυτὸν εὐδίης δεῦτ' ἴδετ' Ἀρσινόης,
> ὀρχηστὴν Βησᾶν Αἰγύπτιον ὃς λιγὺν ἦχον
> σαλπίζει κρουνοῦ πρὸς ῥύσιν οἰγομένου,
> οὐ πολέμου σύνθημα, διὰ χρυσέου δὲ γέγωνεν
> κώδωνος κώμου σύνθεμα καὶ θαλίης.

[41] These are Snodgrass' categories of 'raw' and 'converted' dedications: Snodgrass 1989–90.
[42] See pages 167–84.

Νεῖλος ὁκοῖον ἄναξ μύσταις φίλον ἱεραγωγοῖς
εὗρε μέλος θείων πάτριον ἐξ ὑδάτων
ἀλλὰ Κτησιβίου σοφὸν εὕρεμα τίετε τοῦτο,
δεῦτε, νέοι, νηῷ τῷδε παρ᾽ Ἀρσινόης.

Big drinkers, come and behold this rhyton in the temple of fair Arsinoe, lover of the West Wind: the Egyptian dancer Bes who trumpets forth a shrill sound when the spout is opened in response to the flow. No signal for war, but through the golden bell sounds a signal for revelling and festivity, just as the lord Nile invented the beloved ancestral song from divine waters for the gift-bearing initiates. Revere this clever invention of Ctesibius, young men, come here by this temple of Arsinoe.[43]

Religious revelry and awe are here intertwined with pneumatic knowledge and engineering capabilities. The poem opens by addressing the young men present as drinkers of neat wine (*zōropotai*) which, given good Greek sympotic conduct in antiquity, implies that they were heavy drinkers.[44] Furthermore, the *rhyton* was associated with the East and particularly with Scythians and their 'barbaric' drinking habits. The initial exhortation might thus have set up the viewing of this 'marvellous' vessel as nothing more than the result of an inebriated condition, but the poem makes very sure to demystify the workings of the miracle for its audience. Critically, this is not in order to reduce the enchantment of the object but, on the contrary, so that they might revere it in the temple properly as it deserves. When the liquid runs through the cup, the horn is activated and the object mimics the narrative of the gushing flow of the divine Nile and the associated 'discovery' of sacred song. The pneumatic description of how this is achieved is, in fact, unnecessarily laboured in the epigram, so that while the author might have relied on the power of poetics on the human imagination, the Bes *rhyton* trumpets forth 'when the spout is opened in response to the flow' (κρουνοῦ πρὸς ῥύσιν οἰγομένου). Breaking the poetic conceit, the genitive absolute explicitly brings pneumatics in as an explanatory framework for what the spectator-worshipper has just experienced. What makes this votive *rhyton* stand out from its 'ordinary' counterparts is its capacity to make a trumpeting sound

[43] Ath. 11.497d–e = IV Gow-Page, *HE* = LXVIII Sens. Translation is my own.
[44] On Hedylus' 'Dionysiac poetics' in this poem (and in contrast to Callimachus' sobriety), see Sens 2015.

uncharacteristic of such an object, and it is precisely thanks to the pneumatic trick that the object assimilates itself more closely with its religious purpose.

That the pneumatic explanation forms part of what is an overtly festive epigram is telling, thematising the ludic once again alongside religious technologies. This *rhyton* sounded not to announce battle but to indicate merriment and festivity (κώμου σύνθεμα καὶ θαλίης) – vocabulary characteristic of the joy of festivals and of the revel involved in festival processions in particular. On the most superficial level, technical knowledge and religious celebration are here tied up in a way that has yet to be explored in scholarship. We will see in Chapter 6 how festival processions in the Hellenistic period made particularly avid use of this connection and politicised it. That the sound of the *rhyton* was 'no signal for war' refers to the trumpet's use in military contexts, but also alludes to the mechanician's role in devising machines of war, and thus serves both as an assurance that, in this context, technical knowledge was meant for playful ingenuity and religious zeal, and as a reminder of the presence of the mechanician's involvement in the object's existence. Pressing the full semantic range of the verb in his imperative *tiete*, the poem asks listeners to observe the cup in order both to revere it as a religious object, and simultaneously to judge its material value as a clever toy.[45] The existence of this *rhyton* as votive offering, object of play, and pneumatic invention – and the modes of viewing that the object consequently engenders – are forcibly and deliberately intertwined. This speaks quite directly to the multivalent poetics of Callimachus' Nautilus epigram, but the focus here is explicitly on *mechanical* knowledge, rather than the natural sciences that inform viewership in the Nautilus poem. Hedylus' epigram helps to characterise ancient religion as lively rather than sombre, and, in the process, sheds light on the way that invented dedications, in Hellenistic Alexandria at least, functioned theologically thanks to their status both as a dedication and as an invention.

[45] LSJ s.v. τίω I. honour, revere II. rate, value.

The Bes *rhyton* reproduces for the initiates (*mystai*, another loaded religious term) the ancestral song from divine water which the personified Nile is said to have 'invented' (*heure*). This might be seen to play into the river's ancient relationship with technical expertise especially as it relates to irrigation. It may be a reference to Bes' trumpet mimicking the sound of water rushing into a Nilometer, a device used to measure the height of the river in flooding periods.[46] Even given these associations between the Nile and the technical, the verb is rather striking – one might expect the Nile 'to command' or 'to engender', not necessarily 'to invent'. The choice of vocabulary serves equate the Lord Nile and the named engineer Ctesibius, consequently elevating the human and his clever invention (*sophon heurema*).[47] Pneumatic advantage allows for religious advantage, not only because it is through his knowledge that the engineer is able to create a votive dedication for the divine Arsinoe at all, but also because the pneumatic trick enables the dedication to mimic the noise of the great Nile, and to contain and pour forth divine song. Just as we saw with the temple wheels, nature, *technē* and the sacred are intertwined in complex, mutually reinforcing ways and this was not something which was contained only to 'philosophical' or 'technical' texts. Authors of epigram too were clearly conscious of and incorporating the same entanglements into their work. This helps to destabilise any firm boundaries not only between (what we classify as) different *literary* genres, but also in the ways that cultural understandings of material objects seeped into and impacted texts.

The Bes *rhyton* was pneumatically devised and then religiously dedicated. According to the epigram, however, it was not meant simply to sit in the temple but invited a moment (repeated moments?) of embodied interaction between deity, object and worshipper. It was a hyper-sensorial, one might even suggest

[46] See Sens 2015, 44–5 with further references.

[47] Hedylus here effaces his own identity for that of the engineer. There are parallels with the craftsman so often mentioned in Posidippus' *Lithika*, on which see Elsner 2014. In a different vein, compare the veneration of Ctesibius here with the description of Archimedes as superhuman thanks to the efficiency of his siege engines as per Plut. *Vit. Marc*. 17.

synaesthetic, votive. The feel of the curved horn in the hand brought the smell of the wine closer; the touch of the rim of the horn on the lips joined with the rush and gurgle of the liquid down into the throat; the taste of the wine intermingled with the piercing sound of the horn which the intake released; the unexpected trumpeting prompted the worshipper both to revel and to revere. Fashioned by the human hand and passed into the hand of the worshipper-dedicator, the non-human horn then performs and provokes intention of its own. As in the case of the wheels, we see the way that technical knowledge served to create and sustain religious aura associated with dedication and that, further, the human (be it inventor/dedicator/worshipper) becomes decentred by the *rhyton*'s own agency once the object has been dedicated.

The dedicated invention captured for us in Hedylus' epigram finds various counterparts in Hero of Alexandria's treatise on pneumatics. There are three drinking horns described in Hero's *Pneumatica*, all of which perform a 'miracle' of some kind. Two of the *rhyta* unpredictably (for the user) dispense either water or wine;[48] another has a bent siphon inserted within it so that the *thauma* lies in the liquid being carried upward *para physin*.[49] Elsewhere, Hero explains what is essentially the principle behind the Bes *rhyton*: that (flowing) liquid can displace air which, when forced through a mouthpiece and bell, can make a trumpeting sound.[50] He later embeds this principle not within a *rhyton* but within a *lagynos*, a particularly Hellenistic pitcher with a narrow neck, the very same vessel being carried by the so-called Drunken Hag sculpture.[51] These are the sorts of cultural cues we can only pick up when the materiality of the objects described in technical literature are taken seriously, a methodological approach which, I contend, helps us to understand and give life to these underappreciated texts.

In composing the *Pneumatica*, Hero was writing in an established tradition where certain wondrous items described had become 'old

[48] Hero *Pneum*. I.XVIII Schmidt = 18 Woodcroft, II.XXVIII Schmidt = 64 Woodcroft.
[49] Hero *Pneum*. II.XIII Schmidt = 52 Woodcroft. Compare Philo *Pneum*. 16.
[50] Hero *Pneum*. I.XVI Schmidt = 16 Woodcroft.
[51] Hero *Pneum*. II.XXVI Schmidt = 62 Woodcroft. See Kehrberg 2004 especially 300n6 on the *lagynos* and particularly its link to Ptolemaic sympotic culture and the so-called *lagynophoria*.

tricks' by the first century CE. Hero alludes to this fact in the introduction to his work, where he says that he will first bring into good order what has been handed down to him by former writers (τὰ παραδοθέντα ὑπὸ τῶν ἀρχαίων εἰς τάξιν ἀγαγεῖν) and from there add to it his own discoveries (ἃ ἡμεῖς δὲ προσευρήκαμεν).[52] It is unfortunate for the history of pneumatics that Hero does not make clear what is new and what is old material once he begins describing the objects and explaining their respective pneumatic properties. We can deduce, however, that just as Philo's work formed a model for Hero's *On Automata*, so Ctesibius' pneumatic creations, on the evidence of Hedylus, were incorporated into Hero's repertoire too, or rephrased to draw a wider cultural picture beyond a few 'genius' figures, we see how the types of drinking horns made around the turn of the third century remained popular enough to be preserved and remodelled three centuries later. This presumably reveals a wider trend of dedicating technologically enhanced wonders in Hellenistic Alexandria, and though it is difficult to estimate the *quantity* of similar objects that would have been dedicated, we have come some way in understanding the *quality* of the technological *thauma* which dedicated inventions embody.

One final piece of evidence brings together both the quality of technological *thauma*, and the quantity, not of objects, but of potential viewer-worshippers. This picks up from a different angle the relation between technological marvel and religious community presented in the discussion on wheels and worshippers. While we may never know how many dedicated inventions existed in Graeco-Roman antiquity, we may have a way into knowing how popular technological *thauma* was judging by its capacity to incite religious tourism. The Colossus of Memnon and its twin statue were originally part of the fifteenth-century BCE temple of Amenhotep III. Over time, possibly due to an earthquake, possibly due to an attack by Cambyses' troops, the statue broke and from the top of the exposed torso a sound was heard every day at sunrise. The statue and its sonic *thauma* are described, in detail or in passing, with respect, curiosity or incredulity, by a number of ancient sources from

[52] Hero *Pneum*. pr.5–7. Philo *Pneum*. 1 makes a similar claim.

Strabo and Pliny to Pausanias, Lucian and Philostratus.[53] Individual literary agendas aside, the auditory nature of the marvel is consistent in all the descriptions but the type of sound changes between them: melodic, percussive, a creak, or a human voice. Memnon's sonic epiphany was in fact likely caused by the warmth of the sun heating the statue base and causing the cooler air in the inner compartments to be pushed out, accompanied by a droning sound. The same principle is at work in one of Hero's pneumatic inventions. There, when a globe filled with water and fitted with a bent siphon is struck by sunlight, the heat also drives liquid upward and outward, turning the sphere into an autonomous fountain.[54] The Memnon Colossus is not too far removed from another of Hero's devices, a self-playing organ which relies on wind power to produce flute sounds through pipes.[55] The Colossus of Memnon differs to the Heronian objects, and to the other pieces of evidence examined in this book, because it is an unintentional technology. It is only because the statue broke that this auditory marvel can be heard and as such, the Colossus of Memnon has a different relation to nature and artifice, *physis* and *technē*. Intentionally or not, however, our evidence when taken together points to a category of the miraculous in the ancient mind where science and religion worked together rather than being at odds. What we are able to discern from the Memnon Colossus is that, at least by the Imperial period, technological marvels could draw a crowd.

Uniquely, the Memnon colossus survives to this day along with the inscriptions left by hundreds of visitors.[56] The inscriptions reveal that by the time of Hadrian, the site was popular among religious pilgrims as well as Roman soldiers, emperors, and high-ranking administrators who may have been visiting the site less out of religious persuasion and more out of curiosity. If it

[53] Strabo 17.1.46; Paus 1.42; Tac. *Ann*. 2.61 ; Plin. *HN* 36.58; Luc. *Toxaris* 27; Luc. *Philops*. 33; Philostr. *VA* 6.4; Philostr. *Imag*. 1.7.15–25; Callistr. *Ekphr*. 9. On the Memnon Colossus, see Bowerstock 1984; Bravi 2007; Platt 2011, 299–312; Rutherford 2013, 152–5; Rosenmeyer 2018.

[54] Hero *Pneum*. II.XIII Schmidt = Woodcroft 47.

[55] Hero *Pneum*. I.XLIII Schmidt = Woodcroft 77. Incidentally, in its modern reception, Memnon was reimagined as a hero with an Aeolic harp, for which see Rosenmeyer 2018, 186–98.

[56] Rosenmeyer 2018, appendix 2 offers full text and translation of the inscriptions.

remains difficult to ascertain any notion of the historical number of visitors to the temples that held dedicated inventions (whether described in technical manuals or epigram), the Colossus at Memnon offers, for a similar but not identical kind of object, one kind of answer. The religious fervour that surrounds the cult of Glykon and its mechanical image as described in Lucian's *Alexander* provides another kind of answer. That text will be dealt with much more fully in Part III, but suffice it to note here that Alexander is depicted as being in the business of religious tourism as a vendor, and the prophesising techno-snakehead is portrayed as a reason to travel to Abonoteichos-Ionopolis from surrounding regions, as well as from Italy.[57] The inscriptions left on the Colossus of Memnon not only give an idea of the popularity of the site, then, but they also offer a perspective into the idea of experiencing a technological miracle. The visitors, like the ancient authors whose descriptions survive, struggled to define the nature of the sound, most often, however, believing that they were hearing the voice of the god.[58] As we might predict, the language of *thauma* is common in the descriptions which otherwise place varying levels of importance on the sun's rays, the statue's stone, and the divine voice, and how these work together to create the miracle.

Zoomorphic Narratives

Hedylus' epigram, we noted, overtly describes the scientific principles at work in the Bes *rhyton* and how this induces a religious response in the viewer-worshiper. We now turn to a more enigmatic example of an 'invented dedication' preserved in Hellenistic epigram to see how it might function in tradition with technical texts and technical knowledge, and how this in turn endowed religious agency upon the dedication. The section known as the *Anathematika* of the so-called New Posidippus papyrus, attributed to the third century BCE, consists of six epigrams which describe

[57] Luc. *Alex*. 2 ('The whole of the Roman empire'); 15 (Paphlagonia); 18 (Bithynia, Galatia, and Thrace); 30 (Ionia, Cilicia, Paphlagonia, Galatia, and Italy).
[58] Rosenmeyer 2018, 19.

dedications.[59] One of these dedications is a sacred vessel (*thēsauros*) in the shape of a wolf's mouth into which the dedicant is urged to place a deposit:

ἔμβαλε τῆι Λητοῖ κατ' ἐμὸν στόμα, μηδὲ φοβηθῆις
δοῦναι παρθήκην εἰ λύκος ὢν ἔχανον·
θησαυρ[όν μ'] ἀνέθ[ηκε] Λύ[κος,] σὺ δὲ [τῆς ἰε]ρείης
πεύθεο [. . ..]ηκ[. . .. .]ε Λυ[κ-]

Place your deposit in my mouth for Leto, don't be afraid
to give if, being a wolf, I gape;
Lykos dedicated me as a treasure, but you . . .
ask . . .[60]

A *thēsauros*, we will recall, also formed part of one of Hero's dedicated inventions.[61] This strengthens the earlier suggestion that we should make more of the vessels chosen by technical authors to demonstrate mechanical principles given how these objects have contextual and material connotations which enrich our understanding of the cultural life of the objects, and the texts within which they are embedded. It also suggests that the cultural coherence of the objects constructed were as important as the technical principles demonstrated, and that these were not 'armchair inventions' as certain scholars have suggested in the past.[62]

In Hero's invention, the *thēsauros* is but one element in the composite construction of the *hagnistērion*, where it is the rotating wheel, and subsequent miracle of the singing, rotating bird which take centre stage. The focus is different in the Posidippus epigram, where the vocabulary of a *thēsauros* allows the author to allude to the votive's existence both as a treasure itself (a precious dedication) and

[59] On the Milan Papyrus (P. Mil. Vogl. VIII 309) see Bastianini and Gallazzi 2001; Austin and Bastianini 2002 (translations into Italian and English); Acosta-Hughes, Kosmetatou, and Baumbach 2004; Gutzwiller 2005; Durbec 2014 (French translation); Seidensticker, Stähli, and Wessels 2015; Acosta-Hughes, Kosmetatou, Cuypers, and Angiò 2016 offer an English translation and up-to-date repertory of textual conjectures online.

[60] Posidipp. AB 40 (VI 38–39–VII 1–2). Transl. E Kosmetatou.

[61] Hero *Pneum*. II.XXXII Schmidt = 68 Woodcroft and page 134. Lelli 2005, 108 gives examples of dedications of *thēsauroi* in the Hellenistic period recorded through epigraphic evidence but these tend to be discussed as 'treasuries'.

[62] Wikander 2008, 789; Wilson 2008, 361.

as an object for treasure (with a gaping mouth for donation). In the Bes *rhyton*, Hedylus uses technical description to create a dual – and co-constituted – appreciation of the object as pneumatic and religious marvel. Here, the dedication also has a dual function thanks to its existence as treasure and treasure box: open mouthed, it voices the epigram and obliges the worshipper – with some trepidation – to approach and donate.[63] The triple play on the word *lykos* takes on an important role in the epigram's ludic polyvalence. It begins by describing the object itself, which takes the shape of a *lykos* (wolf) and links the object through its zoomorphic shape to the (original?) dedicant whose name, it seems, was Lykos. The proverb of disappointed hope (λύκος ἔχανεν) then works with the repeated imperatives (ἔμβαλε … μηδὲ φοβηθῆις … πεύθεο) as an appeal to the current dedicant-viewer-reader-worshipper not to let the wolf stand with its mouth open in vain, but to engage with the dedicatory object.[64] The object, thanks to the epigram's clever language, has a function and connection with the divine both in the past and in the present. It is an object that has been religious dedicated by Lykos and the epigram endlessly re-performs that initial religious act while simultaneously reanimating the object in its current votive function every time a subsequent worshipper is convinced to place an offering in the wolf's gaping mouth. The epigram's last line, though fragmentary, seems to suggest that in doing so, the donation will offer the worshipper a ticket to an oracular consultation with the god and thus the 'dedication-cum-money box' works as an ever-present gatekeeper to epiphanic intervention.

Whether or not this sort of object (or indeed any dedication described in epigram) existed, we will never know. Regardless, the epigram tells a story about object agency in religious contexts: that the purpose of religious dedication was for the votive offering to participate in mnemonic re-performance, and that the gods received votive offerings in this highly interactive way. At most, we can imagine a category of objects which were purposefully

[63] Obbink 2004, 17 suggests the dedication would have been a coin which would speak quite directly to Hero's 'coin-slot machine', incidentally also a *thēsauros* (Hero *Pneum*. I.XXI Schmidt = 21 Woodcroft).

[64] On imperatives in Hellenistic text and epigram as a way 'to ekphrastically engage the reader in a process of visualisation', see Roby 2016, 77–8.

built in order to bring to life this imaginative intention, which is what contemporary technical texts also purposefully describe.

The *lykos* votive works in a less overtly technical way than the Bes *rhyton*, but it still raises a number of relevant issues. First, it continues to reconfigure the types of objects we conceive of as dedications in Greek temples, perhaps especially in the Hellenistic period. Second, it re-emphasises the point initially raised by the Nautilus epigram and followed through in the Hedylus epigram that objects of dedication are by their nature polyvalent, existing always at least as manufactured and religious objects and that these statuses did not stand in opposition to each other, but worked in harmony to create divine aura.[65] Lastly, the zoomorphic shape of the speaking *lykos* votive and the lifelikeness this engenders finds parallels with animal figurines described in technical manuals.[66]

Zoomorphic inventions are common in pneumatic texts, playing, in their own ways, with ideas of mimesis recurring in epigram focusing around ideas of the living and breathing object.[67] The clean sound of air, or the gurgle of water and air, pushed through a small pipe offered technical writers almost endless opportunities for auditory marvels which are encased in animal bodies to 'animate' them in some way.[68] The inventions described tend to capitalise on the running water that the temple context offered, and then devised ways to 'randomise' the sounds of the animals, especially birds (Figure 5.5). Mammal figurines were also constructed with a siphon hidden within them so as to appear to be drinking water 'with thirst'.[69] These pneumatic inventions are notoriously difficult to contextualise and even those where a temple setting is explicitly stated push to its limit what we can consider a religious dedication.

[65] More generally on the idea that *technē* and religiosity should not be regarded as mutually contradictory in the Hellenistic period, see Platt 2010.

[66] On the real/make-believe dichotomy in pneumatically animated scenes, see Bur 2022.

[67] On mimetic verisimilitude in epigrams on artworks, see Squire 2010b, 86–8. For epigram's poetic-pictorial plays on the language of *technē* (as both visual and verbal craftsmanship), see Squire 2011, chapter 5.

[68] Philo *Pneum*. 58, 60, 61, 62, 63; Hero *Pneum*. I.XV–XVI Schmidt = 14–16 Woodcroft, II.IV Schmidt = 43 Woodcroft; II.V Schmidt = 44 Woodcroft, XXXII Schmidt = 68 Woodcroft.

[69] Philo *Pneum*. 33, 34, 59 ('as if it were thirsty'); Hero *Pneum*. I.XXIX Schmidt = 28 Woodcroft ('to give the appearance of thirst'), I.XXX Schmidt = 29 Woodcroft, I.XXXI Schmidt = 30 Woodcroft, XXXVI–XXXVII Schmidt = 78 Woodcroft.

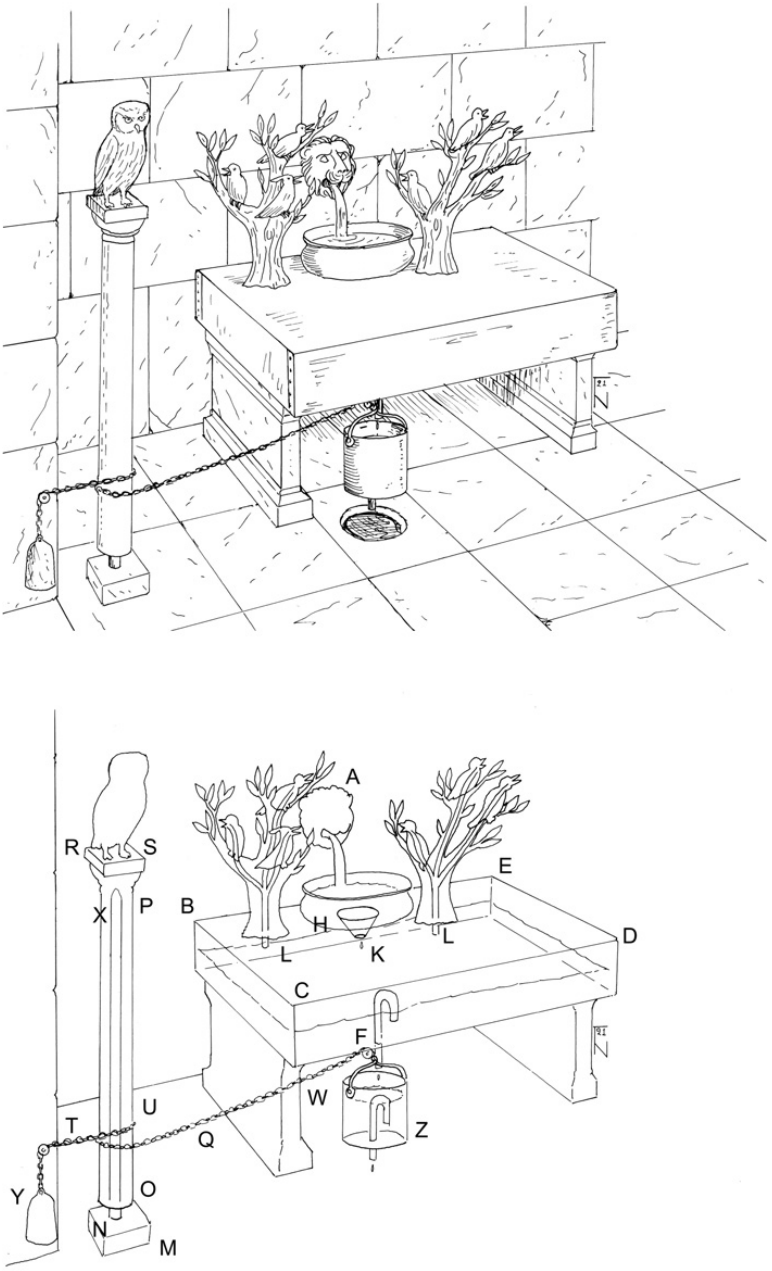

Figure 5.5 Owl and bird display described in Hero *Pneum*. I.XVI Schmidt = 15 Woodcroft. (Image Y. Nakas, copyright T. Bur.)

They do, however, encourage us to contemplate the broader ways that pneumatics and mechanics – as well as catoptrics and mathematical probability as discussed earlier – were used in order to create a general sense of divine aura in sacred settings through animation of the inanimate. In this case, the animal figurines, termed *zōa*, create an ontological 'mid ground' not only in the sense that animals are often used as a category to define and navigate the very categories of humans and gods,[70] but also thanks to the status of the *zōon* as both 'living animal' and 'image'. Pneumatics – or the science of *pneuma*, 'breath' if we are to be very literal about it – is used to exhibit this ontological instability quite overtly and, at least in certain cases, this pneumatic performance unfolded in sacred contexts.

The inventions described in technical manuals and the curiosities captured in dedicatory epigram reveal for us some of the ways in which ingenuity functioned in the context of religious dedication. To see these objects as 'advertisements of scientific achievements' of the Hellenistic period is to miss half the point.[71] Scientific knowledge was not lauded for its own sake, it did not mystify the uneducated masses or render atheist the educated few; rather, it endowed the objects with characteristics which provoked a non-human agency understood through the framework of supernatural involvement in the human world. This, I suggest, is the essence of the technological marvel.

Tripods and Hephaistos

Temples in antiquity were treasure troves of a wide variety of objects, some shiny, some matte; some colossal, some miniature; some simple, some intricate. When it came to depositing votive dedications to the gods, ancient worshippers evidently had many choices influenced by many factors: the deity receiving the dedication, for example, the occasion or intended outcome, the location and nature of the sanctuary, the means and gender of the dedicant, to name but a few. With the help of technical manuals

[70] On animals in ancient Greek religion, see the contributions in Kindt 2020.

[71] Fraser 1972, 413; compare Schürmann 1991 249–51; see Devecka 2013 on automata and Hellenistic kings.

and epigrams we have so far formed an idea of where technology and ingenuity might fit within the matrix of choices, and we have seen that the technical component of a dedication, at least in the Hellenistic period, was not hidden, but on the contrary worked productively to manufacture the marvellous and thus to enhance the object's potential to create numinosity. In what follows, we turn to the material record, examining traces of technically enhanced dedications in practice and using this evidence to ask what it might add to an historical picture of the phenomenon at hand. Two examples will be explored: wheeled tripods and articulated figurines. Both categories of votive object show different ways in which the mechanical worked to create divine presence and expand our understanding of the vocabulary of mechanical epiphany in ancient Greek religion. Both examples also stretch far further back chronologically than the discussion has done so far and serve to unearth a kind of prehistory of the interaction between mechanical *technē* and the sacred.

Tripods are one of the most common and oldest recorded gifts to the gods.[72] In certain cases, they were dedicated after having had a life as instruments for cooking or as prizes for athletic victory; in others, they were constructed with the sole purpose of dedication, in miniature or monumental size, for example.[73] Their symbolic significance as votives – or, perhaps we should be looking for the range in their symbolic meaning – remains difficult to interpret.[74] What we can tell from the material record is that tripods were not just more or less ornamented, they were also more or less ingenious, and tripods with wheels attached to the legs appear surprisingly early in the archaeological record.[75]

From the temple to Dictaean Zeus at the Cretan site of Palaikastro, and dated between the seventh and fifth centuries BCE, for example, the bottom of a tripod leg with a square shaft

[72] See ThesCRA I.2d.ii.F.5 on tripods and cauldrons as dedications. Tripods are also abundant in the Delian inventories; see Hamilton 2000 s.v. *tripod* in the index. See Benton 1934/5b on the evolution of the tripod-lebes from circa 1000 to 700 BCE.

[73] Again see Snodgrass 1989–90 on 'raw' and 'converted' dedications. Compare page 143.

[74] For some hypotheses see Papalexandrou 2005.

[75] Although not quite a tripod, a very elaborate rectangular, Mycenaean bronze cauldron stand was excavated at Larnaka in Cyprus and is now in the Berlin Museum 8947. Compare Lamb 1929 pl. XIIa; Casson 1937, 55–6.

was found together with a wheel that fits within the shaft.[76] Even earlier, dated to the eighth century BCE, a wheeled tripod was excavated at the Polis Cave in northern Ithaca with at least thirteen other elaborate but non-wheeled tripods.[77] Scholars have been quick to note the way that this group of tripods from the Polis Cave speaks to Odysseus' Homeric arrival at Ithaca.[78] While specific connections to the *Odyssey*, and the relation of the archaeological site with hero worship, are of less relevance to us, the Homeric tradition does throw broader cultural light on the phenomenon at hand and helps us to understand why wheeled tripods deserve to be considered as objects which manifest divine presence precisely thanks to their mechanised aspect. The tripods also allow us to engage in the conversation on the 'mechanistic conception' in antiquity and to ask diachronic questions about our source material.

Dedicated either to the Nymphs or to Odysseus himself, the wheeled tripod of the Polis Cave would have measured almost a metre in height and had a wheel at the base of each of its three legs, set in parallel and thus running on a single axis.[79] Though this would have made manoeuvring a full cauldron slightly tricky, the twist in the extant leg fragment indicates that the wheels were not just decorative, but that the tripod had been used prior to dedication. By their very presence, the wheels on this large, bronze tripod implied a potential for movement – a *possibility* for animation of the inanimate even if never enacted before the worshipper[80] – which would have rendered the object unique in comparison to its non-wheeled counterparts. Some contemporary, eighth-century

[76] Bosanquet et al. 1904–5, 307; Benton 1934/5b 88 with plate 19n4 (wheel) and plate 20n5 (shaft); Benton 1940, 52. A large pair of wheels with pole attached was found in Cyprus but evidence for reconstruction is ambiguous and it could have formed part of a chariot as much as a tripod. The tripod wheels found in Lucera, Italy, are even more chariot-like. See Benton 1934/5b 120 with further references.

[77] Benton 1934/5a especially 58–9; pls 11, 14, 15; figs 9, 15. For update on dating see Waterhouse 1996, especially 310–12.

[78] *Od* 13.13–14, 96–112, 216–17. This started with Schliemann, but the more recent debate is most interesting from Antonaccio 1995, 152–5 (who argues that Odyssean association with caves was a Hellenistic phenomenon); Waterhouse 1996; Malkin 1998, 94–119 (who argues that the correct approach is neither to look for the real Odysseus nor to reduce the Odyssey to an *aition* but rather to see it in terms of life being articulated through art, of ritual following myth); Boardman 2002, 67–70; and Papalexandrou 2005, 22–3.

[79] Reconstruction in Benton 1934/5a, figure 15.

[80] Compare the discussion of the hinge on pages 180–84.

tripod legs from Delphi and Perachora have wheels as decorative motifs on the legs, possibly playing into this tradition of the animated tripod.[81] Further, however, the 'real' wheels attached to the legs of the Polis tripod would have served to associate it specifically with the known mythic tradition of self-animated tripods made by the god Hephaistos, the earliest known mention of which is in book 18 of the *Iliad*.[82]

The self-animated, wheeled tripods appear in the Homeric epic at the point when Thetis goes to ask Hephaistos to make armour for Achilles:

> τὸν δ' εὗρ' ἱδρώοντα ἑλισσόμενον περὶ φύσας
> σπεύδοντα· τρίποδας γὰρ ἐείκοσι πάντας ἔτευχεν
> ἑστάμεναι περὶ τοῖχον ἐϋσταθέος μεγάροιο,
> χρύσεα δέ σφ' ὑπὸ κύκλα ἑκάστῳ πυθμένι θῆκεν,
> ὄφρά οἱ αὐτόματοι θεῖον δυσαίατ' ἀγῶνα
> ἠδ' αὖτις πρὸς δῶμα νεοίατο θαῦμα ἰδέσθαι.
> οἳ δ' ἤτοι τόσσον μὲν ἔχον τέλος, οὔατα δ' οὔ πω
> δαιδάλεα προσέκειτο· τά ῥ' ἤρτυε, κόπτε δὲ δεσμούς.

She found him sweating, whirling about his bellows, hastening. For he was building tripods, twenty in all, to stand around the walls of the well-built hall, and he put golden wheels beneath the base of each so that they might automatically make their way to the divine assembly for him and go back again to his house, a wonder to behold. And truly so greatly were they being brought to completion, the handles were not yet cunningly placed on. These he was making ready, and was forging the bindings.[83]

Animated and controlled by divine will, Hephaistos' tripods did not need the mechanical advantage that wheels offered: the divine craftsman could presumably have made the tripods meander over to the divine assembly regardless of how they were constructed. Yet in Homer's description the tripods explicitly possess wheels (*kykla*) which first enable the movement to the assembly and back again, and, subsequently, provoke wonder (*thauma idesthai*).[84] For all that

[81] Benton 1934/5b 89 with plate 24 no. 2.
[82] Benton 1934/5a noted this connection long ago in her archaeological report of the Polis Cave 1934/5, 53. On animation and Hephaistos' tripods (and other objects in book 18), see Steiner 2021, 25–75; 2024.
[83] Hom. *Il.* 18.372–9.
[84] On this phrase see Prier 1989; Neer 2010, 2018. On thauma from Homer to the Hellenistic world, see Lightfoot 2021.

Hephaistos' tripods are products of divine *technē*, the text makes clear that they are also the outcome of hard work, sweat, and functional construction: alongside the golden wheels, Hephaistos will also attach handles properly secured by bindings. Human and divine *technē*, are not, then, differentiated by manufacturing technique.[85] There might be a difference in quality or skill – possibly also one of superior knowledge in design – but not one of production. This is important because it keeps divine and human *technē* at a bridgeable distance. Since Prometheus first handed mankind the tools to build this bridge (πᾶσαι τέχναι βροτοῖσιν ἐκ Προμηθέως),[86] technology in the ancient mind was always Promethean, and thus divine, and, because of Prometheus, human. This is the fundamental paradox that *Prometheus Bound* stages and it is to that play that we now turn in order to enrich further our understanding of the early connection between *technē* and the divine in emic terms.

Prometheus, *Technē*, and *Mēchan*ē

In the Hesiodic tradition Prometheus is by no means the complex protagonist that he will become in *Prometheus Bound*. Both in the *Theogony* and in *Works and Days*, the focus is on Prometheus' foolish transgression of giving fire to mortals and, above all, on his due punishment by the mightier force of Zeus.[87] The author of *Prometheus Bound* both re-characterises Prometheus' relationship with Zeus and vastly expands the role of Prometheus as champion of the human race, placing the transfer of a long list of *technai* from divine prerogative to immortal ability at the core of this transgressive relationship.[88] For the purposes of the current discussion, *Prometheus Bound* is most useful for showing two things. First, the tragedy writes a history of technology as one that is, from its inception, both inherently human and divine. Second, it presents the figure of Prometheus as a technophile and theomach who

[85] Compare Brouillet 2016, who shows that the relationship between men and gods in Homeric epic is one generally characterised not by distance but by shared experiences.
[86] Aesch. *PV* 506. [87] Hes. *Theog*. 521–616; *Op*. 42–89.
[88] Prometheus is absent in the literary tradition from Hesiod to the fifth century but popular in archaic art. For the authenticity of the Aeschylean authorship, see Griffith 1977; Sommerstein 2010, 228–32; Ruffell 2012, 13–19.

goes up against Zeus with at least some chance for success. The latter will be picked up in Chapter 8, which considers the role of technology in theomachy. We turn for now to unpacking the critical role of *technē*, and *mēchanica* as part of this, in the relationship between mortal and divine as it features in the fifth-century *Prometheus Bound*.

The tragedy deployed a unique stage arrangement and exactly how the typical elements (*skēnē*, *theologeion*, *mēchanē*, *ekkyklēma*) worked together remains most uncertain.[89] It is highly likely that for almost the entire duration of the play, Prometheus was somehow tied up against a surface meant to represent a cliff face, and that the protagonist thus observed the action of the play from a completely static, bound position. The tragedy ends by Prometheus being swallowed by the 'rock' to which he is attached.[90] There are then two other moments in *Prometheus Bound* where stage machinery could have been used: the first choral entrance which sees the Oceanids apparently aloft in a winged chariot (135 f.), and Oceanus' entrance, which is described as upon some winged creature (284 f.). In what follows I am not going to assume that either used the *mēchanē* so as not to risk a circular argument. Instead, I hope that the case is strong enough on its own, relying simply on the far less contested staging of Prometheus himself. I leave it to the reader to decide whether they are persuaded by my interpretation and, if so, I suggest that it would only be further strengthened through the additional use of the *mēchanē* in the play.

Prometheus Bound begins with Kratos and Hephaistos leading Prometheus to be brutally affixed to the rock face. Kratos' opening speech swiftly establishes context:

> Χθονὸς μὲν εἰς τήλουρον ἥκομεν πέδον,
> Σκύθην ἐς οἶμον, ἄβροτον εἰς ἐρημίαν.
> Ἥφαιστε, σοὶ δὲ χρὴ μέλειν ἐπιστολὰς ἃς

[89] On staging of the play see Griffith 1977, 143–4; 1982, 109–10; Davidson 1994; Mastronarde 1990, 266; Rehm 2002, 156–67; Sommerstein 2010, 221–4; Ruffell 2012, 80–96.

[90] Sommerstein 2010, 223 convincingly suggests a board in front of the main *skēnē* doors, which then collapses backward and is dragged inside by stagehands.

σοι πατὴρ ἐφεῖτο, τόνδε πρὸς πέτραις
ὑψηλοκρήμνοις τὸν λεωργὸν ὀχμάσαι
ἀδαμαντίνων δεσμῶν ἐν ἀρρήκτοις πέδαις.
τὸ σὸν γὰρ ἄνθος, παντέχνου πυρὸς σέλας,
θνητοῖσι κλέψας ὤπασεν· τοιᾶσδέ τοι
ἁμαρτίας σφε δεῖ θεοῖς δοῦναι δίκην,
ὡς ἂν διδαχθῇ τὴν Διὸς τυραννίδα
στέργειν, φιλανθρώπου δὲ παύεσθαι τρόπου.

We have reached the land at the furthest bounds of earth, the Scythian marches, a wilderness where no mortals live. Hephaistos, you must attend to the instructions the Father has laid upon you, to bind this criminal to the high rocky cliffs in the unbreakable fetters of adamantine bonds; for it was your glory, the gleam of fire that makes all skills attainable, that he stole and gave to mortals. For such an offence he must assuredly pay his penalty to the gods, to teach him that he must accept the autocracy of Zeus and abandon his human-loving ways.[91]

In an utterly inhospitable land, Hephaistos has been tasked, on Zeus' orders, with tying up Prometheus as punishment for the latter's theft of fire from him. *Anthos* and *selas* work together in connoting brightness to link what was Hephaistos' most glorious possession to the literal spark of fire as ultimate assistant to all *technē*: the *pantechnos*. Introduced in the opening lines of the play, this idea is re-emphasised at various other points so that we come to understand that, contrary to the Hesiodic tradition, Prometheus' wrongdoing does not stop at the theft of fire but has further repercussions in enabling other *technai* to develop. As it is described elsewhere in the play, fire is a great resource (*megas poros*) that enables subsequent human knowledge in a variety of fields by being the teacher of every *technē*.[92] In giving fire to humans, Prometheus was made into the ultimate *philanthropos*[93] to the extent that, as in Hesiod, it pitches him as a theomach against Zeus and the gods. As a penalty, and again in line with the Hesiodic myth, Prometheus is to be tied with unbreakable fetters to the rocky cliffs of this desolate land. If the images of Prometheus nailed to a rock and left to grill under the hot sun were not brutal enough, we understand the intended violence of the action through Kratos and Bia, Might and Strength personified, who are sent by Zeus to ensure that Hephaistos

[91] Aesch. *PV* 1–11. [92] Aesch. *PV* 110–11; compare 254, 477.
[93] Compare Aesch. *PV* 28, 123, 513.

duly undertakes this task he so resents having been assigned.[94] There is huge emphasis in the opening scene of the play on Hephaistos physically tying up Prometheus, with Kratos watching over for quality control. The audience is walked and talked through every nail and wedge in the binding process used to secure Prometheus' arms, armpits, chest, and legs tightly.[95] Hephaistos works just as hard to firmly hammer the fetters into the rock as he does in his workshop in the *Iliad* to make the self-animated tripods.

The precise definition of *technē* undergoes further elaboration in the stichomythia between Hephaistos and Kratos when the former is bemoaning the task he has been set by Zeus. The dialogue allows for related terms to be defined against each other:

Ηφ. ὦ πολλὰ μισηθεῖσα χειρωναξία.
Κρ. τί νιν στυγεῖς; πόνων γὰρ ὡς ἁπλῶι λόγωι
τῶν νῦν παρόντων οὐδὲν αἰτία τέχνη.

H: Oh, how I hate handicraft!
K: Why do you hate it? Quite simply, *technē* is in no way responsible for the present struggles.[96]

Hephaistos' use of *cheirōnaxia*, with its etymological links with the hands, emphasises the physicality of the work not, for example, the knowledge or the specialist skill which Kratos' *technē* instead picks up. Hephaistos is being very literal about the fact that he resents having to tie up a friend and kinsman.[97] Kratos' answer takes the opportunity to make an abstract comment about the fact that *technē* itself has no moral value and that this is instead determined by the use to which it is put. This looks to the tension between theoretical *technē* and its practical 'banausic' applications as it appears more widely in ancient Greek cultural discourse.

It has now been long shown (though not necessarily long recognised) that this is not a true dichotomy when it comes to Greek cultural uses of technology. On the one hand, there was plenty of manual, technical activity in Classical antiquity whose

[94] Aesch. *PV* 12–35. [95] Aesch. *PV* 44–81. [96] Aesch. *PV* 45–7.
[97] Aesch. *PV* 39.

development, knowledge transfer, and innovation trajectory disprove the assumptions of 'blocage' theorists who saw the Classical world as technologically stagnant.[98] On the other hand, the theoretical conversation around the value of *technē* was far more nuanced than the philosophical distinctions between abstract theory and actual practice.[99] This comment in *Prometheus Bound* points precisely to the cultural problematics in explaining the origin of *technē* and the uneasy relation between its usefulness and moral ambiguity.[100] According to the play, this is not 'just' a human problem but is something that emerges from the earliest chapters in technology's history. Part of the inherent predicament behind what Prometheus has done is that he has given humans a divine privilege and it is precisely through this sharing that he bridges the gap between human and divine. Prometheus has 'robbed the gods of their prerogatives (*gera*) and handed them over to humans'[101] but the inherent complexities in how to put *technē* to use, in what contexts, and to what ends, are not issues which evolved after the transaction but are questions that pertain to technology as a divine tool too. Even Hephaistos, we see, is compelled to put his divine *technē* to distasteful use.

If these are general comments on *technē*, what use is *Prometheus Bound* for understanding the precise relationship between humans, gods, and *mēchanica*? The answer lies in the way that the play links *mēchanai* as 'stratagems' to *mēchanai* as physical mechanical devices. To get at this, we need to consider the meta-theatrical dimension of the use of *mēchanē*/*mēchanēma* vocabulary in the play which self-referentially points out the way that Prometheus himself is ingeniously tied up thanks to a literal and metaphorical *mēchanē*. Kratos first hints at this early by telling Hephaistos to secure Prometheus well since 'he's very clever at discovering ways out of impossible situations' (δεινὸς γὰρ εὑρεῖν κἀξ ἀμηχάνων πόρον), linking without doubt the physical binding and Prometheus' reputation as a devious

[98] The early articles of Greene (1990, 2000) were especially important in bringing archaeological evidence into these discussions.
[99] Especially see Cuomo 2007, chapter 1 on the definition of *technē* in Classical Athens.
[100] Compare Soph. *Ant*. 365–7. [101] Aesch. *PV* 82–3; compare 228–33.

trickster.[102] Since he is in fact tied so firmly, however, Prometheus will need to look elsewhere for help to free himself according to Kratos' parting sneer:

> ἐνταῦθά νυν ὕβριζε καὶ θεῶν γέρα
> συλῶν ἐφημέροισι προστίθει. τί σοι
> οἷοί τε θνητοὶ τῶνδ' ἀπαντλῆσαι πόνων;
> ψευδωνύμως σε δαίμονες Προμηθέα
> καλοῦσιν· αὐτὸν γάρ σε δεῖ προμηθέως,
> ὅτῳ τρόπῳ τῆσδ' ἐκκυλισθήσῃ τέχνης.

There now, practise your impudence here, robbing the gods of their prerogatives and handing them over to beings who live for a day. How are mortals going to be able to bail you out of these sufferings? The gods are wrong to call you Prometheus, 'the Forethinker'; you now need someone to exercise forethought for you as to how you're going to be extricated from this piece of craft.[103]

There is hardly a doubt that this should be taken metatheatrically, on the one hand pointing to the poetic *technē* that recasts Prometheus in a different light to the Hesiodic tradition, and, on the other hand pointing out the very stage machinery that is somehow pinning him in a crucifix for the audience to see. The use of *ekkylindō* is carefully chosen to invoke the rolling capacity of the *ekkyklēma*, an iconic piece of fifth-century stage machinery. The premise of *Prometheus Bound*, then, is how Prometheus will find his way out of his current plight which has been thrust upon him both by the new story the playwright has invented and by the physical *mēchanai* that hold him in place. Poetics and mechanics are the two *technai* that Prometheus needs to extricate himself from, and there could be no place better suited than the tragic stage to watch this unfold.

In a famous pair of speeches, Prometheus explains in full the different *technai* that he gave to mortals which range from using their senses (i.e. aesthesis and philosophy) to architecture, meteorology and astronomy, mathematics and poetry, husbandry, nautical engineering, medicine, divination, and mineralogy.[104] He ends by pointing out the irony of his current situation: he invented all these *mēchanēmata* for humans, and yet he is currently stuck

[102] Aesch. *PV* 59. [103] Aesch. *PV* 82–8. [104] Aesch. *PV* 447–68, 476–506.

without means to free himself (τοιαῦτα μηχανήματ᾽ ἐξευρὼν τάλας βροτοῖσιν αὐτὸς οὐκ ἔχω σόφισμ᾽ ὅτῳτῆς νῦν παρούσης πημονῆς ἀπαλλαγῶ).[105] Mechanics are, in fact, a *technē* that can and will bring mortals and divine (back) into contact, as prophecy does too. At the same time as the rocky cliff is engulfing Prometheus, the stage machinery is presumably lowered 'releasing' Prometheus from his position of torture. The abrupt climax of the ending demonstrates in one swift manoeuvres, Zeus' divine will in enacting the cataclysm, the power of *mēchanē* in facilitating such, and Prometheus' human allies 'unbinding' him thanks to *mēchanica*.

Hand in hand with the meta-theatrical use of *mēchanē* vocabulary is the distinct characterisation of Zeus in *Prometheus Bound*. Part of the uniqueness of the story of the tragedy is Prometheus' knowledge that Zeus will lose his pre-eminence if he chooses a union with Thetis. This creates a very particular dynamic between an unapologetically violent Zeus and an arrogant Prometheus. We hear in the play that as Zeus was apportioning divine privileges, he took no account of mortals and in fact wanted to kill them and create a new race.[106] The Zeus of *Prometheus Bound* is a kind of neo-Zeus who is noted as being unusually harsh because he is new to power.[107] Yet, ultimately, this Zeus who hates ingenious *mēchanai* and is all for ruling through *bia*[108] will learn that, both as stratagems and as machines, *mēchanai* ultimately offer advantages that brute strength cannot.[109] Prometheus predicts a time where the rash autocrat has come to see the benefit of *mēchanai*, presumably the 'kind' of Zeus familiar to a fifth-century audience.

*

The *Iliad* 18 passage featuring the self-animated tripods lies at the heart of conversation on the 'mechanistic conception' in antiquity, a scholarly debate which is largely polarised into two distinct camps: those who interpret this and similar scenes as pure 'magic', and those who instead read this type of evidence as

[105] Aesch. *PV* 469–71. [106] Aesch. *PV* 228–33.
[107] Aesch. *PV* 35; compare 96, 149–50, 310.
[108] Aesch. *PV* 206–8: αἱμύλας δὲ μηχανὰς ἀτιμάσαντες καρτεροῖς φρονήμασινῷοντ᾽ ἀμοχθεὶ πρὸς βίαν τε δεσπόσειν.
[109] This is what Prometheus alludes to at Aesch. *PV* 169–77.

proof of mechanics informing conceptions of the world.[110] The more sophisticated arguments to date are those that in effect combine the two in some sort of diachronic progression, though exactly when the shift from 'irrational', 'magical' viewing to 'rational', 'mechanical' occurred, and how widespread among the population the 'rational' was, is not always consistent.[111] Certain scholars such as Sylvia Berryman, Clara Bosak-Schroeder, and Maria Gerolemou, for example, argue that Hellenistic mechanics were the watershed, while others think that the shift did not occur until later – some, such as Minsoo Kang, arguing for as late as the mid seventeenth century. Yet the world is rarely, if ever, seen in binaries, and the duality set up between 'mechanistic' and 'non-mechanistic' is, I think, inadequate when it comes to describing observations and understandings of the world and its constituent parts. My suggestion is that, as we have seen in the epigrams and technical texts of the Hellenistic period, the two modes of viewing were not mutually exclusive; rather than think in terms of moving from a magical to a mechanical mode of understanding the world, we should see ideas of the mechanical as cultural techniques informing religious visuality from as early as the eighth century BCE.[112] Hephaistos' tripods are able to function as religiously wondrous objects in the human world thanks to their association with the (divine) craftsman *who first put wheels on them*.[113]

Hephaistos' self-animated tripods made a vivid and long-lasting impression on the ancient Greek imagination: Aristotle uses them as examples in a discussion on labour, objects, and enslavement,[114] and much later in the second century CE, Philostratus describes

[110] De Solla Price 1964; Berryman 2003, 2009; Kang 2011; Fragaki 2012; Devecka 2013; Bosak-Schroeder 2016; Mayor 2018; Gerolemou 2022.

[111] In general on the coexistence of magic and rationality, see Lloyd 1979. Compare discussion on pages 21–23.

[112] Steiner 2024 makes a similar case even beyond religious material showing how archaic vases played a significant role in contemporary notions concerning technological animation, and that it was these manufactured goods that informed and even outpaced the literary descriptions of automata-like phenomena in early Greece. On religious visuality see Elsner 1995, 88–158, 2007, 24–48. Compare the comments in Osborne 2011, 205–7.

[113] Compare the reading of Bielfeldt 2014, 23–38.

[114] Aristotle, *Pol*. 1253b.

self-animated Pythian tripods 'advancing like the Homeric ones'.[115] In all cases, however, these are not 'just' magical objects. They are everyday objects which have the capacity to engender a sense of the divine by virtue of their aetiological link with divine *technē*, but which humans have the capacity to construct by virtue of divine and human *technē* sharing a common ground first extended by Prometheus. In the context of dedicated inventions, this helps with the cognitively difficult jump in the worshipper's mind from these *being* Hephaistos' self-moving tripods to their being *just like* Hephaistos' tripods. Either case is wondrous because in either case human and divine *technē* coalesce within this object which now lies before the worshipper's eyes. As scientific knowledge and court culture become entangled through patronage relationships in the Hellenistic period, the human engineer (e.g. Ctesibius, in the case of the Bes *rhyton*) takes on a more visible role in this process, but mechanics and religious wonder were inextricably linked since much earlier in Greek history.

Figurines and Hinges

We turn now to an example from the archaeological record of a type of dedication that is not associated to a specific mythical figure: the articulated or jointed figurine. Unlike wheeled tripods which, for whatever reason, have a short life in the archaeological record, articulated figurines are manufactured from at least the tenth century BCE well into the Roman period. These objects provide a good case study because though they are not necessarily expensive, they are an elaboration on a familiar object of dedication: the static statuette. I use these as an example of a 'technical version' of a figurine, standing beside – and in certain assemblages this should be taken quite literally – their less 'technical' counterparts. I highlight their synchronic existence, therefore, to think laterally across assemblages and do not necessarily at this stage want to make any diachronic suggestions about the articulated figure as a 'proto-automaton'.[116]

Articulated figurines have long been interpreted as children's dolls or toys given predominantly to goddesses (especially

[115] Phil. *VA* 3.27.17–28. [116] I return to this issue on pages 185–6.

Artemis) in association with coming-of-age rituals, or used in the burials of young and adolescent girls.[117] Once thought to be confirmed by a single poem in the *Greek Anthology*, this reading, based on an incorrect emendation of the text, has now been discredited.[118] More recent discussions ascribe a broader significance to articulated figurines, particularly for what Roman versions betray about notions of the female body.[119] An early and eminently sensible discussion by Gladys Davidson and Dorothy Burr Thompson argued for the apotropaic power of the dolls as dancers, and subsequently, Maya Muratov has systematically studied articulated figurines and their meanings.[120] As well as being commonly found in graves, articulated figurines have been found at temples all over the Greek world, at sites sacred to Artemis, but also as dedications to Aphrodite, Athena, Demeter, Amynos, and Apollo.[121]

While it is surely right to move beyond simply ascribing the label of dolls to the figurines as a way to explain (away) their presence in temples as objects related to 'rites of passages', we should not lose sight of the importance of play in ancient Greek religion. Not only are toys of all sorts found as votive dedications across the Greek world, but humans were themselves conceived as playthings of the gods. This is explicitly described in Plato's *Laws* and already in the *Iliad*, for example, we hear of Apollo tearing down the wall of the Achaeans and rendering them his playthings (*athurmata*) with the ease and frivolity of a boy who

[117] Elderkin 1930; Boehn 1966; Manson 1987, 1992; Neils and Oakley 2003; Wünche and Knauss 2004.

[118] See Daux 1973 on *Anth. Pal*. 6.280.

[119] See, for example, Reilly 1997; Dolansky 2012. See Lang-Auinger 2015 on male articulated figurines from Ephesos apparently from a sympotic context.

[120] Muratov 2005, 2019, 2024. The ERC-funded *Locus Ludi* project has also prompted new study on Roman articulated figurines which will be published in due course.

[121] Shrine to the healing god Amynos at Athens (Koerte 1893, 244); Delos, the shrine of Amynos and Acropolis at Athens (Rouse 1902, 249–50); Athenian acropolis late archaic apparently 'more than thirty figurines were parts of dolls' (Brooke 1921, 426–9); 'very popular' in Corinth and a number were found at the sanctuary of Demeter and Kore at Acrocorinth (Stroud 1965, 18; Reilly 1997, 154n10); early-to-mid fifth-century articulated 'dolls' from the sanctuary to Artemis at Brauron (Mitsopoulos-Leon 2009, 14); limbs of articulated 'dolls' from the *adyton* of the archaic sanctuary on Kythnos (Alexandrou et al. 2017, 175–6). On the Egyptian context see Reeves 2015.

stomps on sandcastles at the beach.[122] In this sense, there is thus a certain logic behind dedicating an object representative of the relationship between humans and gods in an act which seeks to forge a connection between the two realms. The fragility of many articulated figurines complicates possible scenarios of play prior to dedication, but this does not stop them having a definitive playful quality. I would like to suggest that in their role as votives, the articulated statuettes' movable parts do not 'just' invoke childish entertainment, but that they are playful objects that do two important things in terms of religious potential.[123] First, they bestow upon the object a capacity to imitate ritual movement in order to please and entertain the god. We will see, in fact, that a uniting feature of otherwise stylistically, geographically, and chronologically disparate ancient articulated figurines is their inclination towards meta-ritualistic poses. Second, they allow for supernatural response through the figurine's capability for animation. Articulated statuettes' playful quality works alongside, not in opposition to, their ability to invoke sacred awe. Verity Platt has explored how naturalism in dedication is a way to make acts of worship present.[124] Focusing instead on the object's technical features which endow it with agency, I suggest that even minimal mechanical ingenuity, as in these figures, should be considered another way in which objects and associated techniques of construction work to invoke the supernatural in ancient Greek votive contexts. Unfortunately, the original archaeological context of 'dolls' – still so called in much scholarship – is not always recorded, but it remains instructive for our purposes to consider groups of articulated figurines from several times and places in the Greek world, which give a sample of the variety and change of form before we try to analyse their power as religious objects.

The early 'bell' type is a good place to start. Far removed from the Classical ideal in form, these curious domed-shaped figurines with dangling legs were most common in eighth-century Boeotia, where a particular Theban workshop seems to have specialised in

[122] Pl. *Leg*. 7.803c and Hom. *Il*. 15 361–6.
[123] On 'dolls' in reliefs actually being anatomical votives, see Reilly 1997.
[124] See Platt 2011, especially 31–50, 114–23; 2018, 145–8. Compare Tanner 2006, 31–40.

Figure 5.6 C8/7 BCE Boeotian bell-type articulated figurine. Louvre CA 263

their construction (Figure 5.6).[125] The Boeotian articulated figurines are of terracotta and have small heads with long necks giving way to a bell-shaped body with stubby, jointed legs hanging loosely from the bottom. As well as their articulated legs – which could have made noise clanging together as they swayed – the figurines all

[125] The fullest treatment of Boeotian 'bell' dolls is Jeammet 2003, who also gives examples of Geometric articulated figurines beyond Boeotia in discussion at 22–5 and in an index at 40–1. Compare Elderkin 1930, 458–60.

have holes in their ears where earrings would have hung, mimicking the motion of the legs and the holes in the tops of their heads from which the figurine would presumably have been suspended for display: a hyperbolic showcase of the potential for movement. They tend to be painted with Geometric designs, sometimes identifiable as sacred iconography. Although the original find-spot of many of these figurines is lost, Violaine Jeammet, who published two beautifully preserved examples now in the Louvre, lays out the possibility that they were used as *pompeia* in the Boeotian Daedala festival,[126] or as part of a ritual in the cult of Artemis Kondylea – so-called due to the 'hanging' of her idols.[127] Ultimately, however, by parallel with a number of similar bell-shaped articulated dolls found between the tenth and seventh centuries BCE in Attica, Skyros, Rhodes, Cyprus and Cos, Jeammet concludes that these Boeotian bell figurines most plausibly formed part of funerary rituals and will have been found in tombs, like many of their counterparts. It is not impossible, I would add, that though ending up in tombs, the figurines had played a previous role in other rituals which also sought connection with the divine. For our purposes it is important merely to note, first, that bell-shaped articulated figurines had a widespread life in Greece from the Proto-Geometric period[128] through to the early Archaic period. Second, it seems clear that articulated bell figurines had a religious life, even if we cannot quite determine the specifics of what this was, and that their ability to create or to sustain a link with the supernatural world – whether in procession, in a sanctuary, or in a funerary context – is not to be doubted.

Though united in their static arms, domed bodies and articulated legs, the category of 'bell dolls' from other parts of the Greek world convey recognisable regional identity (e.g. compare

[126] Jeammet 2003, 20–1. The Daedala is related in Paus. 9.3.2–9. We also get two versions in Plutarch's now fragmentary *Peri tōn en Plataiais Daidalōn* = *FGrH* 388 F 1. For an excellent reconstruction of the Daedala and its phases, see Chaniotis 2002a.

[127] Paus. 8.23.6.

[128] At least nine of these are known: all come from graves of adult women (two inhumations, the other cremations) in Attica, Lefkandi, and on Euboea. Moreover, six out of the nine figurines were found in pairs. All nine belong to the so-called Athenian Incised Ware, which was most probably produced in one or two workshops and, it has been claimed, exclusively for the burial purposes. It has also been observed that these figurines represent the only known instance of fashioning a three-dimensional human figure in Proto-Geometric Athens. I thank Maya Muratov for this note.

Figure 5.7 Mid-late C10 BCE Attic bell-type articulated figurine. From tomb 33. H 8.2 cm. Athens Kerameikos Museum, inv. no. 962. Hellenic Ministry of Culture.

Athenian Figure 5.7). The Cypriot bell types are probably the most distinctive for the way that they adopt a series of telling postures, often imitating ritual acts. One figurine, for example, carries an animal (for dedication or sacrifice?), another plays a flute (Figures 5.8 and 5.9).[129] This meta-ritualistic element of the 'dolls' will prove to be a continuing feature over time and helps us to understand how the joints elicited a sense of divine interaction or presence.

[129] Karageorghis et al. 2004, Cat. 128 and 129.

Figure 5.8 C8/7 BCE Cypriot terracotta figurine, once articulated, holding an animal. From a tomb. H. 16 cm. Metropolitan Museum of Art 74.51.1613. The Cesnola Collection. Purchased by subscription, 1874–6.

As we move into the Classical period, articulated figurines lose the bell shape in their body, but the enthusiasm for the potential of the joint seems grow over time as the figurines gain an extra set of joints at the shoulders, resulting now in four movable limbs (Figure 5.10). Examples of Classical articulated figurines abound from Athens, Corinth, the Crimea, Rhodes, and the Cyrenaica.[130] The sanctuary of Demeter and Kore at Acrocorinth is a particularly good example where articulated votive figurines are prolific and well published from the Classical to Roman periods.[131] Just shy of one thousand articulated figurines were

[130] Elderkin 1930, 460.

[131] Stroud's initial assessment was that dolls were 'very popular'; see Stroud 1965, 18 with an example at plate 9a. Gloria Merker 2000 undertook the mammoth task of publishing the terracotta figurines offered to the goddesses from the Classical to

Figure 5.9 C8/7 BCE Cypriot terracotta figurine, once articulated, of a male flute player. From a tomb. H. 14.9 cm. Metropolitan Museum of Art 74.51.1691. The Cesnola Collection, Purchased by subscription, 1874–6.

deposited during the fifth and fourth centuries BCE at this single site, making 'dolls' by far the most common type of figurine found and dedicated at the sanctuary.[132] Ranging in size from statuettes to miniatures, most, though not all, of the articulated figurines could be suspended by the head, as with the bell types. Most represent young women with faces that show traces of paint, and of the approximately 930 extant torsos, about 810 are naked while the remainder wear a knee-length chiton or peplos. Some of the figurines have offerings in the hands of their articulated arms, and particularly common among these is a type of basket carrying cake known as a *liknon*. Given the high

Roman periods. The publication of the archaic votive figurines is underway by Susan Langdon.

[132] See Merker 2000, 3–4 with full discussion and analysis at 48–58.

Figure 5.10 C5 BCE Corinthian terracotta jointed figurine. Metropolitan Museum of Art 44.11.8. Rogers Fund, 1944.

number of terracotta *likna* votives also found at the site, this strengthens the meta-dedicatory role of the 'dolls' and thus speaks clearly to the earlier Cypriot articulated figurines.[133]

Classical 'dolls' from other sites hold tambourines or cymbals, instruments associated with ritual dancing.[134] Postures of the 'dolls' diversify as some are preserved in a seated position with static legs and mobile arms, though this type is less common in

[133] See Brumfield 1997 on *likna* votives at the Sanctuary of Demeter and Kore at Acrocorinth.
[134] Elderkin 1930, 461–3.

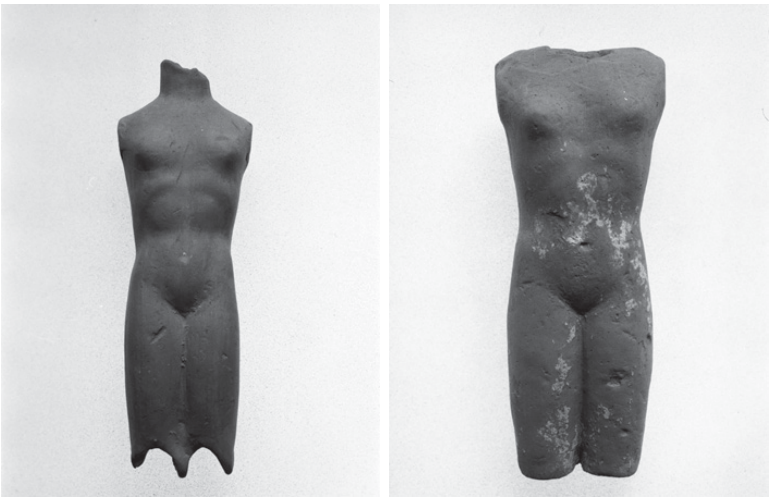

Figure 5.11 Examples of socketed-leg and flanged-leg articulated figurines from Acrocorinth. Adapted from Merker 2000, plate 12.

Corinth than other parts of Greece, such as Athens, for example.[135] Various manufacturing techniques existed to make the dolls and specifically to secure the limbs which hid the hinges to a greater or lesser extent. The assemblage from the Acrocorinth sanctuary preserves socketed-leg and flanged-leg figurines which, until the fourth century, existed side by side (Figure 5.11).[136] It has been suggested that socketed-leg dolls are Attic while flanged-leg dolls are Corinthian,[137] though Merker rightly warns against assigning geographical origins to different methods of attaching limbs. With time, materials used in the fabrication diversify as well, and we get bronze and ivory articulated figurines alongside continued use of terracotta. The oldest Greek example of an articulated ivory 'doll' comes from Taranto in the Hellenistic period and, like its terracotta

[135] Attic dolls: on Pnyx votives see Davidson and Burr Thompson 1943, 108–11 fig. 49 no. 6 (bone doll height 5.4 cm head and limbs missing but holes at the shoulder and at the bottom of the figure for the attachment of arms and legs) and 114–18, figure 53 (articulated limbs); for the Agora see Nicholls 1995, 435–8.

[136] Flanging eventually became the norm in the fourth-century 'dolls'.

[137] Stillwell 1952, 147–8.

Figure 5.12 Late C4/early C3 BCE articulated ivory figurine said to be from Taranto. Metropolitan Museum of Art 11.212.43. Rogers Fund, 1911.

counterparts which continue to be made, carries traces of paint (Figure 5.12).[138]

An interesting group of articulated figurines comes from the Bosporan Kingdom from the late second century BCE to the third century CE. Muratov has recently published some of these articulated figurines and offers a convincing hypothesis of their use in Dionysian, para-theatrical contexts.[139] Depicting only male characters, these once brightly decorated, terracotta figurines had jointed legs as well as large movable phalloi (Figure 5.13). Overwhelmingly

[138] Elderkin 1930, 467–8. [139] Muratov 2019.

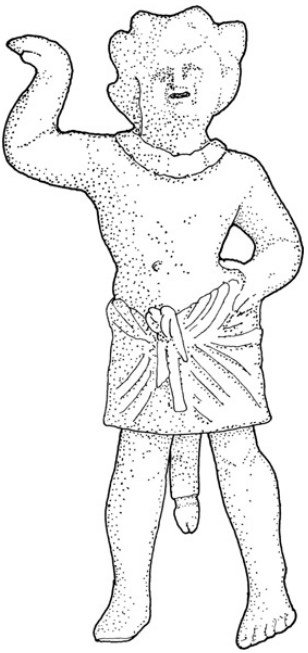

Figure 5.13 Sketch of Bosporan terracotta figurine with articulated legs and phalloi. Moscow State Historical Museum Оп.Б 72/3.
(Image Y. Nakas, copyright T. Bur.)

found in the necropoleis of Bosporan cities, they were also found in temples and sanctuaries. It is tempting to see these figurines as related in some way to the string-drawn *neurospasta* described in Lucian's *On the Syrian Goddess*.[140] There, residing in the temple that the narrator is visiting, little wooden men with large phalloi are made to mount large erect phalloi, and are referred to as Dionysian mystic objects. According to Lucian's text, there seems to be a ritual where worshippers proceeded to imitate the phallus-riding puppets by climbing large phallus-poles.[141] These string-drawn figurines acting as proxies to the human worshippers who themselves then mimetically duplicate the actions of the puppets reimagines, in a Dionysian

[140] Luc. *Syr. D.* 16, 28.
[141] On this ritual, see Csapo 1997. For the text and its historical accuracy, see Lightfoot 2003 with 368–9 on the *neurospasta*.

way, the idea presented earlier in this chapter of worshippers as playthings of the gods, by blurring the boundaries between puppets and puppeteer; human and object; ritual, representations, and re-enactment. These ludic *neurospasta*, the Dionysian para-theatrical Bosporan figurines, as well as the various articulated figurines made to adopt ritualistic poses (dance, music-playing, dedication, procession) are a nice reminder of the way that sacred and festive activities often went hand in hand in ancient Greek religion.

The ritual mimesis described in Lucian's text between articulated figurine and worshipper cannot be historically verified. Yet one subcategory of the Bosporan figurines appears to attest a similar intention. A large number of these statuettes participate in ritual action such as dancing or playing an instrument, or sporting ritual objects including human figurines, possibly effigies of deities (Figure 5.14).[142] In the case of the latter, the worshipper walking in procession carrying or wearing this small, movable figurine, itself armed with an even smaller figurine or effigy, creates a wonderful hall of mirrors effect, visually enacting the constant reflections and refractions between man, god, and object. Once dedicated, the articulated figurine, legs swaying as it hung in the temple, re-enacted over and over again the activities of procession and dedication to the god. Ritual uses of visual (and verbal) *mise en abyme* were common in ancient religion.[143] We have already seen, for example, the staging of epiphanies within the staging of *Orestes*, or the way that the Archinos relief re-performs its own existence as votive tablet to both internal and external audiences.[144] We should add to this the use of articulated figurines in procession where the hinge plays a crucial role in both assimilating and distinguishing ontologies through a metonymic logic that renders present the divine. On the one hand, the articulated figurine stands in for all worshippers and facilitates a connection with the divine through its status as votive object. On the other hand, the hinge as a technology of animation invests the object

[142] Muratov 2019, 424. As well as Figures 5.13 and 5.14, see Moscow State Historical Museum Оп.Б 305/125.
[143] Platt 2010, 207; 2014, 201–7; Platt and Squire 2017, 59–74, 78–81; Elsner 2018 (Roman sarcophagi).
[144] See pages 88–91 and 51–2, respectively.

Figure 5.14 Sketch of Bosporan terracotta figurine with articulated legs carrying an effigy. Moscow State Historical Museum Оп.Б 305/115. (Image Y. Nakas, copyright T. Bur.)

with a power to move autonomously and to be received in the human realm as a reflection of divine will. The meta-performative aspect of large spectacle machinery that came to be used especially in Hellenistic *pompai* will pick up on and expand this theme significantly.[145] We move first to a detailed contemplation of the hinge as a cultural technique of animation.

Given that articulated figurines were popular as votive dedications across a wide breadth of time and space in the Greek world, and that they existed in addition to, not instead of, non-articulated

[145] On which see Chapter 6.

figurines, we must now try to ascertain what would lead a worshipper to dedicate one of these relatively fragile, highly theatrical objects. In other words, what (theological) work do the joints do? Here, I take my cue from Bruno Latour's work on the sociological impact of 'non-humans' that inhabit our world.[146] Latour's sociological theory of (technological) objects complements rather than contradicts Gell's anthropological theory of art and his work on the enchantment of technology. Latour sees technology as anthropomorphic in the sense that it is made by humans, takes the place of or supplements the labour of humans at performing tasks, and controls human minds and relationships. The non-human door, for example, turns an impenetrable space bordered by walls into a room in and out of which humans can resultantly move freely. The technology of the door – we might even say the *mēchanē* of the door – composed simply of a panel to fill space and a hinge to allow opening and closing has been delegated a crucial role as gatekeeper, and human movement and activity are compelled to arrange themselves around it and thanks to it.[147] Entry and exit must be through this single point in space, and human movement requires the momentary delay of pushing or pulling a door. The non-human door, then, has both spatial and temporal impact on its human users, but that is not all. Thanks to its hinge, the door can open and thus feel inviting, or slam shut and invoke a sentiment of rejection in the human user who is typically seen as the 'subject'. The example of the door holds an important lesson on the agency of the most unassuming of technologies which aids in breaking down the presumption that technological objects needed to be the most advance objects that antiquity had to offer in order to engender (numinous) effect.

A Latourian analysis of the joint on the ancient articulated statuette helps in understanding what was at stake when a human worshipper picked out, or commissioned, this object as their votive dedication of choice. Articulated figurines have potential

[146] Latour's 1992 'Where are the Missing Masses? The Sociology of a Few Mundane Artifacts' has greatly shaped my approach in the subsequent discussion.

[147] On the door as cultural technique, see Siegert 2015, 192–205.

for movement and animation which, even when unrealised, is visible in the object's construction, always hinted at by the creases at the joints on the statuette's body and integral to the object's very existence. We might compare Siegert's comment on the way that the door 'shapes the possibility of closure against the backdrop of the possibility of opening and keeps virtually present both possibilities'.[148] The articulated nature of votive 'dolls' means that they are not committed to any single pose and, as a result, a simple gust of wind as they hang from their chosen place in the temple can animate them and suggest that life has been breathed into them by some supernatural power, opening them up to become possible signs of divine approbation or condemnation. When taken in hand, they move in a way that is independent of but directly related to the worshipper's own corporeal existence. The joint in the figurine is, in effect, a technology of animation and, as such, a temporal tool allowing for a connection between human and supernatural both in and beyond the moment of dedication.

There is an illuminating parallel here with early Renaissance devotional polyptychs which use the hinge as a comparable cultural technique. In those apparatuses of religious display, the hinge serves both a practical and symbolic function: to protect the artwork when folded and to create meaningful breaks in the pictorial representation. These two objectives meet in that the hinge in both cases distinguishes sacred from profane whether in regards to context (concealing and revealing) or content (separating and connecting). Just as we saw with the theatrical *mēchanē* in Greek tragedy, hinges open up spaces that are characteristically 'outwards' and 'beyond' and are thus extremely useful to both 'articulate and operationalise the precarious threshold between appearance and vision, the profane and the sacred.'[149] The hinge on the polyptych is a cultural technique harnessed for *revelation* of a divine scene. The hinge on the articulated figurine also reveals, but it reveals an ability for movement, a potential for

[148] Siegert 2015, 194.
[149] See Siegert 2015, 199 and 195–200 for a wonderful discussion of the *Mérode Triptych*.

animation and thus the hinge of both the polyptych and the figurine 'stage' epiphanies and produce 'almost-visions' of the divine.

This idea is also exemplified in Hero of Alexandria's *Pneumatics*, where the engineer designs two ways for temple doors to open automatically.[150] Hero's inventions do not imagine life-size temples but are instead miniature or model temples where the heat of a worshipper burning an offering as part of this small display allows for the doors to open of their own accord. Beginning with the doors of Olympus in the *Iliad* and through to Callimachus' *Hymn to Apollo* (and beyond!) automatic doors have a strong mythic precedent as divine *sēmata*.[151] Hero uses his pneumatic expertise to bring such stories to life through the technology of automation, yet the instigation still lies with the worshipper's ritual action (burning an offering). This is Hero's version of the visual *mise en abyme* that articulated figurines lean into as well. While the figurines work with and respond to the worshipper's body in procession, for example, and the movement enabled by the hinge aids in the almost infinite re-performance of procession and dedication, Hero sets a miniature temple inside a larger temple where every burnt offering reconfirms divine presence thanks to his pneumatic intervention. In other words, hinges as technologies of automation can function in an ancient Greek religious contexts thanks to the inherent principle of call and response that underpins human–divine communication more generally.

Technological animation is the perfect technique both to refer to and to create sacred aura, in that it collapses into a single object both the call and response of the divine. That figurines often hold dedications themselves or engage in other ritual acts, that Hero's inventions are also meta-ritualistic, plays with and plays into this call and response paradigm that technologically enabled epiphany allows. Votive objects were *agalmata*:

[150] Hero *Pneum*. I.XXXVIII Schmidt = Woodcroft 37; Hero *Pneum*., I.XXXIX Schmidt = Woodcroft 38.

[151] Hom. *Il*. 5.749–51, 8.393–5; Call. *Hymn* 2.6–7. Compare A.R. 4.41–2. Xen. *HG* 6.4.7 Pl. Ti. 12.9 with discussion in Bur 2016, 28–32. On doors and automation in ancient literature, see also Wessels 2024.

delightful things meant to adorn, honour, and please the gods. At the same time as being an act of piety, the dedication was also an act of self-display, a cognitive tension that the ancient Greek worshipper had no problem reconciling. The god delights in seeing this unique statuette and is able to express himself or herself back to the worshipper through it. It is an embodiment of human ingenuity made both for and thanks to the very same divine powers that frequently reveal themselves in the human world; it is an object of Promethean technical superiority that both benefits from divine inspiration in its creation and remains resolutely made by mortals; a gift for and from the divine intended to delight, persuade, and give thanks to the gods, as well as an object which – by virtue of its mechanical component and the religious potential contained in its capacity for animation – is able to create an aura of the supernatural.