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Suspending Disbelief:

Magnetic and Miraculous Levitation from Antiquity to the Middle Ages

Abstract:

Static levitation is a form of marvel with metaphysical implications whose long history has not previously been charted. First, Pliny the Elder reports an architect's plan to suspend an iron statue using magnetism, and the later compiler Ampelius mentions a similar-sounding wonder in Syria. When the Serapeum at Alexandria was destroyed, and for many centuries afterwards, chroniclers wrote that an iron Helios had hung magnetically inside. In the Middle Ages, reports of such false miracles multiplied, appearing in Muslim accounts of Christian and Hindu idolatry, as well as Christian descriptions of the tomb of Muhammad. A Christian levitation miracle involving saints' relics also emerged. Yet magnetic suspension could be represented as miraculous in itself, representing lost higher knowledge, as in the latest and easternmost tradition concerning Konark's ruined temple. The levitating monument, first found in classical antiquity, has undergone many cultural and epistemological changes in its long and varied history.

1. INTRODUCTION

Although recent scholarship has extensively explored the rich history of marvels

and miracles,¹ suspended objects have never been systematically studied. The following discussion pursues the theme of magnetic and miraculous suspension through European (and Asian) history from classical antiquity to modern times, revealing a continuous tension between secular and sacred physics. For the first time, this article assembles the diverse historical sources on levitating objects from antiquity onward (some widely acknowledged, others barely noted within their own disciplinary partitions), proposing new interpretations of each.² This requires a loosely chronological approach which, at the risk of seeming naïve, will reveal crucial connections and developments from the Hellenistic period to the modern era. The result is a strange new sidelight on scientific, religious, and even political developments across Europe and beyond.

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¹ The bibliography on curiosity, wonder, and marvels in history is large and growing, though Daston and Park 1998 remains key. See e.g. Hardie 2009 on antiquity (specifically Augustan Rome, thus excluding magnetism); Kesneth 1991 on the Renaissance; Evans and Marr 2006 on the Renaissance and Enlightenment.

² For example, no two of the following have been connected in previous scholarship: Ampelius' statue at Magnesia, Aristotle's coffin in Sicily, the Mercury at Trier, the Cypriot cross, Dulaf's golden temple, Illtud's Welsh altar, the "Monastery of the Idol," the elephant at Khambhat.

The properties of magnets have intrigued intellectuals and entertained ordinary people since the early classical period,³ though static suspension and many other ideas about magnetism have little dependence on observed phenomena. Demonstrations in antiquity of magnets' power to attract ferrous substances—typically, suspending iron rings in a chain, or covertly moving iron from beneath a surface of some other metal—provoked amazement and curiosity.⁴ Medical uses of magnets are recorded from the second century AD and magical ones from around the fourth century (their preternatural ability to move objects without contact resembled the occult powers of spells, which is why a demonstration alarmed Augustine).⁵ Beyond these limited uses magnetism held

³ On magnets in ancient science, see Fritzsche 1902, Rommel 1927, Radl 1988, Wallace 1996. Relevant passages include Pl. *Ion* 533d; Ar. *De Anima* 405a19 (on Thales); Theophr. *On Stones* 5.29; Posidippus *Lithica* 12 Austin and Bastianini; Lucr. 6.910-16, 1042-47. Pliny draws his classification of five “Magnesian stones” (two non-magnetic) from Sotacus, a third-century writer on minerals, and his account of how “Magnes” the shepherd discovered magnets from the second-century author Nicander (*HN* 36.127-28).

⁴ Rings: Plato *Ion* 533d, Lucr. 6.910-16, Plin. *HN* 34.147; iron moved from below: Lucr. 6.1043-47, Aug. *Civ. D.* 21.4. Initiates into the cult of the Great Gods of Samothrace received iron finger-rings, presumably for ritual use involving magnetism: see Blakely 2012.

⁵ Aug. *Civ. D.* 21.4. On medical applications, e.g. Dioscorides, *De Materia Medica* 5.130; Galen, *De facultatibus* (magnetite is astringent, like haematite), *De simplicibus medicina* (magnetite is purgative); see Rommel 1927: col. 483-84. In late antiquity, magical applications appear: magnets were placed inside figurines, seemingly to give

little more than curiosity value, lacking mechanical applications.⁶ Yet it is crucial to bear in mind that although magnetic suspension rarely has a specific maker, magical marvels are invariably crafted by scholars, not mere zealots. They give additional proof that magic was compatible with science and technology in medieval thought.⁷

Importantly, although sources from the first to sixth centuries AD mention magnetic repulsion, it was not understood until the twelfth century that magnets have

them agency (*PGM* IV.1807-10, 3142); an inscribed magnet prevents conception (*PGM* XXIIa.11-12); and a magnet placed under a sleeping woman diagnoses her chastity (if faithful she will cleave to her husband, or otherwise be ejected: *Lithica* 306-37). Some authors use the analogy of magnetism to explain sympathetic magic (Plin. *HN* 34.42, Gal. *Peri Phusikon Dunameon* 1.14.44-54).

⁶ The only documented mechanical use of magnetism is an expensive toy described by Claudian that plays out a simple mythological scene, like some of Hero of Alexandria's automata: inside a golden shrine, an iron Mars slowly approaches a magnetic Venus until he suddenly flies forward and they embrace (*Carm. min.* 29.22-51): see Wallace 1996: 181, Cristante 2001-2002. Some (e.g. James and Thorpe 1995: 154, McKeown 2013: 198) claim that Claudian describes a real temple, but whatever his own religious standpoint (see Vanderspoel 1986), he would not celebrate a pagan ritual in verse at a Christian court. Claudian came from Alexandria, like Hero the inventor.

⁷ On magic and science, see Sherwood 1947, Eamon 1983, Hansen 1986, Truitt 2004. On artificial marvels, see Daston and Park 1998: 88-108. On how the aesthetics of the marvelous relate to artistic theory and practice, see Mirollo 1991.

poles and can therefore both attract and repel.⁸ Yet they inspired fantasies involving colossal invisible forces. One is the magnetic mountain that wrecks ships made with iron nails. This appears in the geographical content of Pliny and Ptolemy, but also across Asia as far as China, as well as in Arabic and European folktales.⁹ The epic poet Silius Italicus says that the Aethiopians used their abundant magnets to extract iron ore without touching it.¹⁰ A millennium later, the *Roman d'Eneas* endows Carthage with magnet-topped battlements for trapping iron-clad attackers like flypaper.¹¹ Such fantasies may legitimately be called science fiction.

With a sufficiently cross-disciplinary perspective, we can reconstruct a long history for the grandest of magnetism fantasies: an apparatus for permanently suspending an object in mid-air. Accounts of full-size monumental examples recur from classical

⁸ On magnetic repulsion see Wallace 1996: 184-85, with citations. Tellingly, when Posidippus describes a stone that both attracts and repels iron he only *compares* it to a magnet, insofar as it attracts (Bing 2005: 264-65). Knowledge of the compass is first attested in Europe by Guiot of Provins (1180) and Alexander Neckam (c. 1190); Peter Peregrinus of Maricourt published the first extended treatise in 1269. The earliest known description is Chinese (Shen Kuo, *Dream Pool Essays*, AD 1088).

⁹ Tuczay 2005: 273-74, with citations; see also Lecouteux 1984, 1999; Marzolph and van Leeuwen 2004. The legendary Virgil visits a magnetic mountain in the *Wartburgkrieg* (c. 1287), *Reinfried von Braunschweig* (c. 1300), and later sources.

¹⁰ *solis honor ille, metallo / intactum chalybem vicino ducere saxo* (Sil. *Pun.* 3.265-67).

Ore processing, rather than mining, is probably meant.

¹¹ Anon. *Roman d'Eneas* 427-40.

antiquity to the late medieval period. Whether authors portray levitation as mechanical, magical, or something in between,¹² they never deny its possibility. In reality Earnshaw's Theorem of 1839, stating that stable levitation against gravity using only ferromagnetic materials cannot work on any scale, stands uncontested. Nonetheless, we have culturally and geographically diverse accounts of levitating monuments from the first century AD to the late Middle Ages and beyond. I propose that these deserve recognition as a genre of architectural fantasy that offers new insights into the history of science, as well as the history of interaction between religious cultures.

Magnetic levitation endows inert matter with spectacular properties, inviting comparison with divine miracles and magic. It also shares features with real and imaginary automata, though this is somewhat paradoxical, since the inert matter is spectacular precisely because it does *not* move: unlike the other magnetic fantasies mentioned above, levitation never involves traction. (Accordingly, I shall use the terms "levitation" and "suspension" interchangeably.) It is sometimes regarded positively, as an open demonstration of engineering and artistic skill, but more often negatively, as a secret trick for faking a divine miracle.

As object of wonder, the suspended monument embodies potentiality: not only in the obvious sense that what went up has not (yet) come down, but in other senses too. As an architectural installation or localized miracle it is by definition non-portable and cannot, like most artificial wonders or holy relics, be brought from the periphery to the center of scholarly, religious, or popular experience. As physics, static levitation is

¹² From antiquity to the Middle Ages, some discourses on magnetism (e.g., *mageia*, Hermeticism, alchemy) resist the modern distinction between natural and supernatural.

theorized but unrealized: it never appears in treatises upon magnets or architecture, nor even descriptions of magnets in lapidaries, and nobody proposes to recreate it. As miracle, meanwhile, static levitation becomes evidence of God's power in nature, and even a test of spiritual intelligence.¹³ In the Middle Ages, reports of magnetism proliferate and the miraculous version emerges. Perhaps the iconoclasm controversies partly account for this, since the suspended monument proves capable of oscillating between fraud and miracle more easily than any other legendary object.

2. ALEXANDRIA: THE POTENTIAL ARSINOE AND THE FALLEN HELIOS

Our earliest reference to a magnetic monument (and likewise, elsewhere, to a magnetic mountain) is a report in Pliny the Elder that has resisted interpretation, despite nuanced treatments of his larger intellectual project.¹⁴ He mentions a design by “the

¹³ “Some Christian writers...saw skepticism concerning wonders as the hallmark of the narrow-minded and suspicious peasant” (Daston and Park 1998: 62); cf. Eamon 1983: 195, Bynum 2011 *passim*. The comeuppance of such a peasant in Lifris' *Life of Cadoc* is discussed below.

¹⁴ See e.g. Healy 1999: 158, Carne 2013: 108. On artificial wonders in Pliny, see Isager 1991 and Beagon 2011, neither of whom mention the present passage.

architectus Timochares,” for a temple in which an iron cult statue of Ptolemy II’s late sister-wife Arsinoe would be suspended in the air:¹⁵

Using magnetic stone (*Magnete lapide*), the architect Timochares had begun to vault a temple (*templum concamarare*) to Arsinoe at Alexandria, so that the iron statue in it would seem to hang in the air (*pendere in aëre videretur*). This was interrupted by his own death and by that of King Ptolemy, who had commissioned it for his own sister.

Pliny’s *videretur* (“would seem”) means only that magnetism would create a lifelike impression of flight. It is unclear whether he envisages contactless “true levitation,” or “pseudo-levitation” in which magnetic attraction pulls against a physical tether. Although neither could work, the latter might have seemed more feasible, since it can be achieved using a scale model. Ptolemy II could access fabulous quantities of precious metal and stone, and without any means of measuring magnetic field strength, “Timochares” could have miscalculated the properties of magnetite.¹⁶ It is not impossible that “Timochares” planned to achieve true levitation. Vitruvius credits a near-contemporary “Dinocrates” with an equally astonishing plan to sculpt Mount Athos into a

¹⁵ Plin. *HN* 34.148. The death of Ptolemy II, the alleged date of the project, was in 246 BC.

¹⁶ Even with today’s artificial supermagnets, thousands of times more powerful, such a monument would require precision engineering and impractically large quantities of metal to achieve suspension across even a few inches of air.

Rushmore-like statue, holding a city in its left hand and pouring a river from a dish in its right.¹⁷ Alexander the Great rejected this proposal and built Alexandria instead because Athos provided no arable land, Vitruvius says. Other, completed Ptolemaic projects combined innovation and artistry with engineering on an unprecedented scale, including the largest tower, automaton, and galley ever designed.¹⁸ Magnets were relatively rare and hence semi-precious despite their dull appearance,¹⁹ which may have encouraged artisans to consider their uses as architectural ornaments. Importantly, *architectus* often means simply “inventor” and an Arsinoeion did exist at Alexandria, so Pliny’s term *concamarare* probably means adding magnetite to the existing temple, not constructing something anew. Such a plan might have won Ptolemaic sponsorship; later readers certainly found it plausible, since Ausonius in the fourth century AD reports it as completed.²⁰ A temple suspending a statue using magnets would suit the contemporary

¹⁷ Vitruv. 2. *praef.* 2. On the programmatic implications of this anecdote, and a discussion of the uncertainty over the architect’s name, see McEwen 2003: 91-102.

¹⁸ The Pharos: Adler 1901, Thiersch 1909, Picard 1952; the Nysa statue in Ptolemy II’s coronation parade: Athen. *Deipn.* 5.198-99; the “Forty”: Plut. *Demetr.* 43.4-5, Athen. *Deipn.* 5.203e-204b.

¹⁹ Theophrastus calls them rare (*De Lapidibus* 5.29). The belief that rubbing magnets with garlic destroyed their power (Lehoux 2003) might be indirect proof of their value if nobody thought the easy test worth the risk, as with goat’s-blood breaking diamonds (Plin. *HN* 20.2) or vinegar dissolving pearls (Hor. *Sat.* 2.3.239-42, Plin. *HN* 9.59, Suet. *Cal.* 37).

²⁰ Auson. *Mos.* 314-17.

taste for creative engineering, as did another high-tech memorial to Arsinoe, the musical drinking-horn made by Ctesibius.²¹

The idea of a levitating statue could also reflect the Alexandrian milieu in more subtle ways, having potential links with motifs in Egyptian religious art, as well as recent developments in Greek physics. The Egyptians pictured the heavens as a curved ceiling (or even, in the Pyramid Texts, an iron slab supported on four columns),²² and spangled their own ceilings with stars.²³ Egyptian tradition also represented pharaohs ascending to heaven after death, and likewise Callimachus describes Arsinoe being taken up by the Dioscuri to become the Pole Star,²⁴ which stands at the center of the turning sky. The “lock of Berenice” narrative a generation later shows how astronomy could contribute to Ptolemaic self-fashioning. All this lends credence to Deonna’s suggestion that the

²¹ Ctesibius’ cornucopia is known only through an epigram by Hedylus (Athen. *Deipn.* 11.497d-e).

²² On the image of heaven as vault, see Couprie 2011: 1-13. As iron slab in the Pyramid Texts, see Budge 1904: 1.156-57. Homer’s heaven is iron (*Od.* 15.329, 17.565) or bronze (*Il.* 17.425, *Od.* 3.2) and supported by pillars (*Od.* 1.52-54).

²³ Constructed vaults only rarely appear before the Ptolemies, but excavated chambers frequently had curved ceilings. Whether flat or curved, they were commonly decorated with the starry goddess Nut and other sky symbols. On the use of the star-spangled canopy (“uraniskos”) in Greek cults of celestial deities, see Crane 1952; in later art, see Lehmann 1945, Swift and Alwis 2010.

²⁴ Callimachus fr. 228 Pfeiffer, with scholion. On Arsinoe as Pole Star, see Green 2004: 248. The Mendes Stele records that Arsinoe “ascended to heaven.”

planned monument represented Arsinoe's catasterism.²⁵ If the vault depicted the sky, Pliny's otherwise unknown "Timochares" may be a misspelling of Timocharis, a contemporary Alexandrian astronomer whose achievements involved tracking and mapping the constellations.²⁶ If he proposed to decorate the vaulted ceiling over Arsinoe with an accurate star-map, an ekphrastic epigrammatist might easily describe this as placing the catasterized *thea philadelphus* "in the sky," a phrase open to misconstruction by later readers.²⁷

Third-century Alexandria was also a likely context for thought experiments about bodies suspended between countervailing forces, for philosophers and engineers alike. Both Chrysippus and Archimedes would be active in the decades after Arsinoe died, circa 270 BC,²⁸ and Ptolemy himself had been tutored by Strato of Lampsacus, a specialist in cosmology.²⁹ The Stoics had recently developed a new explanation for the earth's poise

²⁵ Deonna 1914: 106.

²⁶ On the confusion over Timocharis and related names, see Fabricius, *Pauly-Wissowa Realencyclopädie* s.v. "Deinochares." Pliny's reference to Ptolemy Philadelphus' death implies that "Timochares" died around 246 BC.

²⁷ Unfortunately translation from Latin to Greek is highly unlikely, so we cannot explain the whole concept of magnetic levitation as a translation error involving some lost epigram whereby Arsinoe or the ceiling went from *sīdērĕa* "celestial, star-spangled" to σιδήρεα "made of iron" (cf. σιδηρῆτις "magnet": Philod. *Sign.* 9, Strab.15.1.38).

²⁸ Timocharis is thought to have lived c. 320-260 BC, Archimedes c. 287-212, Chrysippus c. 279-206.

²⁹ Diog. Laert. 5.3.1.

at the center of the cosmos (besides its own symmetry): the dynamic force of *pneuma* acting equally upon it from all directions.³⁰ Sambursky points out that the term *isobares*, “equal weight,” used by Chrysippus also appears in proposition 1.3 of Archimedes’ *On Floating Bodies*, which states that a solid immersed in fluid of equivalent volume neither sinks nor rises.³¹ Suggestively, our late antique source for Chrysippus’ terminology replaces push with pull, comparing the static earth to an object pulled by cords in all directions with equal force.³² Perhaps a Hellenistic author imagined a magnet-clad arch as a thought experiment, illustrating either a principle of hydrostatics or the Stoic cosmos, which generated an urban myth for paradoxographers and ultimately Pliny. These are only speculations, but it is tempting to derive “Timochares” and his magnetism from known facts about the cultural climate of Ptolemaic Alexandria.

In some ways, Pliny establishes norms for later descriptions of magnetic levitation, but in others he is unique. His description is the last to mention a *potential* monument. It is also among the minority that specify a designer and date of construction,

³⁰ Sambursky 1959: 109.

³¹ Sambursky 1959: 111. Archimedes himself was reportedly an astronomer’s son and owned two orreries (probably heliocentric, cf. his *Sand-reckoner*): see Jaeger 2008.

³² Achilles *Isagoge* 4 = von Arnim *VSF* 2.555, probably third century AD (Sambursky 1959: 109). Independently, in the early twelfth century, Bruno of Segni directly compares the earth’s suspension (by God) with that of a magnetic statue (*Sententiae* 3 = *PL* 165.983d).

and the only to do so without scorn.³³ Pliny's brevity led to centuries of uncertainty about how static levitation should work. Yet several features become near-universal: all later accounts describe true (contactless) levitation, not pseudo (tethered). Generally, the suspended object is not a magnet,³⁴ and just as Pliny's reference to a vault (*concamarare*) implies multiple magnets holding the object at a focal point, most later sources mention a vault or dome, despite one-magnet, two-magnet, and four-magnet configurations. Finally, virtually every magnetic monument is, like Pliny's, portrayed as one of a kind.³⁵ This makes the levitating artifact the sole remnant of a lost skill, suspended in time as well as space; since relics represent loss of another kind, Christian levitation-miracles supply equally evocative remnants.

After Pliny we turn to late antiquity, when faith comes to the fore and the longest and most coherent tradition about magnetic levitation begins, based on the historic temple of Serapis at Alexandria. It has an obvious link to the "Timochares" tale, being set in the same city. The Serapeum complex, built by Ptolemy III, was thoroughly destroyed by Christians around AD 391 following the Theodosian decrees. After this event, numerous historians report that an iron image of Helios had been suspended within using magnetism. They mention it after describing the Serapis cult-statue, a dazzling colossus of multiple precious stones and metals. Both descriptions imbue the ruined site of

³³ The exceptions (discussed below) are Gehazi's and Jeroboam's idols, Yablunus' "Monastery of the Idol," and the mausoleum of "Magus" of Muhammad in Embrico.

³⁴ The unique exception is the idol ascribed to Gehazi in the Talmud.

³⁵ Gehazi's idol is again exceptional, being compared to those of Jeroboam.

worship with sinful exoticism. This combination recurs in much later tales of similar wonders, gratifying the imagination while sharpening the moral lesson of righteous destruction.. The earliest account appears in Tyrannius Rufinus, who specifies only a single magnet:³⁶

There was also another kind of deception, namely the following: the magnet is known to be of such a nature that it seizes upon and attracts iron. A craftsman (*artifex*) had with very skilful hand fashioned an iron image of the Sun (*signum Solis*) for this very purpose, so that the stone—we have said that it has the property of attracting iron—was fixed in the ceiling-coffers above (*in laquearibus fixus*). When the image had been placed precisely under the ray and balanced (*sub ipso radio ad libram*), and by force of nature the stone attracted the iron, the image seemed to the people to have risen up and be hanging in the air (*in aëre pendere*). And in case this was betrayed by a sudden fall, the treacherous ministers used to say, “The Sun has risen, so that bidding farewell to Serapis, he may go off to his own place.”

Rufinus’ description is evidently fantastical, but the circumstantial details make it sound as if some mechanical trick were indeed used. Schwartz has plausibly suggested that Rufinus transposed this and other elements from the earlier destruction of the moon-god Sîn at Carrhae (the medieval “Harran,” discussed below).³⁷ Christopher Jones recently

³⁶ Rufinus *Ecclesiastical History* 2.23.

³⁷ Schwartz 1966. Polański 1998: 122-28 contests certain aspects.

offered new reasons to identify this with a temple that contained “secret devices of the ceiling” and many iron statues.³⁸ In any case, Ptolemaic Alexandria had been home to the inventors Ctesibius, Philo, and later Hero, who recorded how to create apparently supernatural effects such as self-opening temple doors.³⁹ Rufinus may represent a repurposed version of Pliny’s “Timochares” anecdote, but in any case, Christian authors for centuries to come treated the Sun-image as an important detail of the Serapeum’s destruction. For Pliny (and Ampelius, as we shall soon see) the magnetic monument was an end in itself, edifying and entertaining, resembling his larger distillation of world knowledge. Rufinus gave it much deeper implications as an instrument with a purpose, like most artificial wonders whether magical or technological. For the Christian chroniclers it was a faith-machine, generating false belief until its magnetic workings were physically or intellectually exposed. Conversely, we shall find that in some accounts of levitation in the second millennium (both Christian and non-Christian), the magnetic workings are themselves the belief-sustaining miracle. This reflects the view prevailing in

³⁸ Jones 2013; Libanius *Or.* 30.44-45. If so, Theodoret’s claim that a female corpse—disemboweled for omens by the occultist Julian—was found inside the Carrhae temple “suspended by the hair” (ἐκ τῶν τριχῶν ἠωρημένον, *Church History* 3.21 = *PG* 82.1119) might well derive from magnetic suspension: decades earlier, Ausonius described Arsinoe’s statue as magnetically suspended “by its iron-clad hair” (*affictamque trahit ferrato crine puellam*, *Mosella* 317).

³⁹ Hero *Pneumatica* 1.17, 38-39. It may also be relevant that Manetho, a Ptolemaic authority on the Serapis cult, dubbed magnetite “the bone of Horus”—often identified as the sun-god—and iron “the bone of Typhon” (Plut. *De Is. et Os.* 62).

High Middle Age Christendom that the supernatural or inexplicable is evidence of God's power in nature.⁴⁰ Indeed, as I shall demonstrate later, magnetism would directly inspire a Christian relic-powered form of miracle.

Repeated mentions of the Serapeum Helios throughout the Middle Ages, with occasional changes, shed light on how magnetic levitation was thought to work. Probably the most widely read report after Pliny's appears in Augustine's *City of God*. It was written soon after 410, only postdating Rufinus' history by a few years, yet several details are different. Augustine passingly describes magnetic levitation as a false miracle achieved "in a certain temple" (*in quodam templo*):⁴¹

The marvels that they call "contrivances" (*mirifica, quae μηχανήματα appellant*), made by human skill through manipulating God's creation, are so many and so great that those who don't know better think them divine. So it happened that in a certain temple, where magnets were placed in the ground and the vault in proportion to their size [*in solo et camera proportione magnitudinis positis*], an iron statue was suspended in mid-air between the two stones. To those unaware of what was above and below, it hung as if by divine power.

⁴⁰ See Bynum 2011, whose discussion on the materiality of saints' bodies may in some respects be extended to physical matter in general. On the cult of relics in eastern Christendom, see recently Hahn and Klein 2015.

⁴¹ Augustine *Civ. D.* 21.6. Isid. *Orig.* 16.4 merely repeats Augustine and Pliny.

Augustine goes on to say that supposed miracles such as this levitating statue—his use of the Greek μηχανήματα collectively secularizes non-Christian *mirifica*—are not proofs of divine power but simple tricks using either mechanisms or magic. Although he almost certainly means the Helios statue at Alexandria, he specifies magnets both above and below it, contradicting Rufinus. This alternative guess at the workings of magnetic suspension is also impossible,⁴² but marginally more plausible than one magnet pulling against gravity. Perhaps a shared source had envisaged the multiple-magnet, focal-point model and Augustine’s version is more faithful than Rufinus’. In the second quarter of the fifth century, Augustine’s student Quodvultdeus repeats Rufinus’ one-magnet configuration but seems to derive his account from an independent source. He does not name the statue but calls it a *quadriga* (four-horse chariot); Helios was usually represented driving a *quadriga*. The tale of its destruction has also become dramatized:⁴³

At Alexandria in the temple of Serapis this was offered as “proof” of a spirit (*hoc argumentum daemonis fuit*): an iron chariot with no plinth to support it and no hooks attaching it to the walls, hanging in the air (*in aëre pendens*). It stunned everyone and, to mortal eyes, seemed to display divine assistance, although in fact a magnet attached to the vault in that spot (*eo loco camerae affixus*), which kept the iron joined to it and hanging, was holding up the

⁴² Even if the poles were aligned, gravity and air currents would instantly dislodge the statue.

⁴³ Quodvultdeus *De promissionibus et praedictionibus dei* 38 = PL 51 834c (attributed there to Prosper of Aquitaine, but see e.g. Radl 1988).

entire assemblage (*totam illam machinam sustentabat*). Accordingly, when one inspired servant of God had figured this out (*id intellexisset*), he sneaked the magnet away (*subtraxit*) from the vault and instantly the whole display collapsed and broke apart. This showed that it was not divine, as a mortal man had proved (*firmaverit*).

In *Quodvultdeus*, the single magnet is small and portable enough for an iconoclast to remove without detection, essentially a magic talisman whose spell breaks when it is removed from its place of concealment. *Quodvultdeus* also mentions the vault, like Augustine, whereas Rufinus has the magnet embedded in the coffers of the ceiling. Two ninth-century texts show further changes. Haymo of Halberstadt faithfully reproduces Rufinus' account but adds that the statue is huge, gilded, and suspended between two magnets (Augustine-style).⁴⁴ Conversely, Haymo's Byzantine near-contemporary George the Monk describes the "statue of wickedness" (εἶδος...κακουργίας) as hanging from one magnet in the coffers (Rufinus-style). In George the iron is far more hidden, and the magnet's strength is more enormous, since the statue is now bronze with iron merely nailed inside its head. The *Suda* quotes George's description verbatim in the tenth

⁴⁴ *lapidibus magnetibus in solo et camera...simulacrum ferreum deauratum mirae magnitudinis* (*Epitome of the Sacred History* 8 = *PL* 118.873c). Bruno of Segni follows this description closely (*Sententiae* 3 = *PL* 165.983d).

century, and Cedrenus paraphrases it closely in the eleventh.⁴⁵ Only in the early twelfth (AD 1118) does Michael Glycas introduce a new variation:⁴⁶

In that temple there was a statue that hung irresistibly aloft; for pieces of iron were fastened around it—the statue, of course—in a circle, and magnets fastened directly opposite them, and it was suspended between the floor and the roof. For being drawn equally from four directions, and not leaning anywhere, it was forced to hang in mid-air.

Although we know little about the sources for these historical notices of the Serapeum Helios, they clearly vary according to how the properties of magnets are imagined.⁴⁷ In retrospect, based on this later consensus that magnetic forces are hugely stable and powerful, the ambition ascribed to “Timochares” could well be true. Our sources disagree on how the Helios was suspended: Rufinus claims that it hung from a magnet above, as if on an invisible chain, whereas Augustine’s statue, probably the same one, is the first to have magnets pulling up and down simultaneously. (Even for someone who believed in stable suspension from one magnet, the second would serve to prevent the object from

⁴⁵ George the Monk *Chronicon* 2.584.18-2.585.6; Suda s.v. Μαγνητης; Cedrenus *Compendium Historiarum* 325b Niebuhr = PG 121.620.

⁴⁶ Michael Glycas *Chronicle* 4.257 = PG 158.433.

⁴⁷ Descriptions of magnetic monuments seem unconcerned with the brief remarks on magnetism by classical philosophers (see Radl 1988), which concern only the nature of the force, not the factors affecting its strength or the effects of competing forces.

swinging.) Finally, Quodvultdeus' magnet is a small, removable talisman, which completes the transformation of the levitating statue: a putative engineering challenge in the Hellenistic age, with the properties of magnets on show, becomes a magic-based religious fraud in late antiquity, with the properties of magnets kept secret. As we shall see, later medieval accounts transfer the false miracle from paganism to other religions.

The variations between arrangements of magnets tell us much about contemporary theories of magnetism. In Rufinus and Quodvultdeus, magnets hold objects at fixed lengths by pulling against gravity, whereas in most sources, two or more magnets pull simultaneously. However, in most accounts, magnetically suspended objects cannot be dislodged by force, and only move when the magnet is extracted.⁴⁸ It is doubtful that the invisible forces in magnetic monuments were ever imagined as “elastic,” i.e. as varying by distance, since as we shall see in later sources, multiple magnets emphatically prevent the suspended object from any movement. Carefully positioned magnets are consistently pictured as generating unbreakable chains, not fields, which is why the suspended object's shape and weight hardly matter. Rufinus' remark that the Serapeum priests were afraid of the statue falling is not based, as one might expect, on the fear that it might easily shift from its exact position. Rufinus' priests are only as afraid as they would be for any statue hanging from a chain.

⁴⁸ The coffin of St. Paulinus is an interesting case: it no longer levitates because some unbelievers wickedly pushed it to the ground (*post multos annos a quibusdam infidelibus depressum subsedit*, *Gesta Treverorum* 43 = *PL* 154.1164). However, it was suspended by God rather than by magnets (see discussion below), so it is not an exception to the rule.

3. INVISIBLE BONDS AS BASIS FOR CHRISTIAN MIRACLES

Invisible suspension reappears in the fourth and fifth centuries in the form of Christian miracles, which do not involve magnets, but deserve discussion as they reinforce the “invisible chains” hypothesis by imitating suspension by ropes. One example appears in Rufinus’ narrative of how an unnamed woman, later identified with St. Nina, converted the Caucasian kingdom of Iberia.⁴⁹ The third column of the Iberians’ inaugural church seemed impossible to lift and was abandoned overnight. Next morning they found it hanging perpendicular, one foot above its pedestal, and before the rejoicing crowd it sank into position (the remainder were easily erected). It behaved as if moved by an invisible crane. Likewise, miraculous suspensions of demoniacs during exorcism, first attested in Hilary of Poitiers and three near-contemporaries,⁵⁰ mimic a torture method documented in martyrology.⁵¹ It differs sharply from the voluntary aerobatics of sorcerers

⁴⁹ Tyrannius Rufinus *Historia Ecclesiastica* 1.10 = PL 481c-482c.

⁵⁰ Hilary of Poitiers *Contra Constantium* 8.2-10; Jerome *Vita Hilarionis* 13.6, *Epistles* 108.13; Sulpicius Severus *Dialogi* 3.6.2-4; Paulinus of Nola *Carmen* 23.82-95. Two later Greek examples are divergent: in Palladius a demoniac levitates during exorcism, swells, and emits water (*Historia Lausiaca* 22), and in Sozomen another levitates (without specified Christian agency) and taunts John the Baptist (*Historia Ecclesiastica* 7.24.8).

⁵¹ Wiśniewski (2002: 373-74) makes this point cautiously but convincingly, quoting a sixth-century description of a demoniac shouting confessions while hanging by his

like Simon Magus, who resemble birds (or rather Icarus, whose pride led to a fall).⁵² The four early sources consistently describe demoniacs hanging before saints upside down, specifying that their clothes are supernaturally held upward to cover their nakedness. Decades earlier, Eusebius' description of martyrdoms at Thebais mentioned the "cruel and shameful spectacle" of women indecently suspended by one foot from pulleys (μαγγάνοις τισίν).⁵³ This implies that these miraculous levitations of humans came about because martyrdom was sublimated into exorcism. As saints torture demons into confessing, the demoniac hangs temporarily from invisible ropes, just as metal objects hang more permanently from invisible chains.⁵⁴

elbows over a saint's cinerary urn, like criminals "condemned to flogging on nooses" (*tendiculis iudicum sententia verberari*, Anon. *Vita Patrum Iurensium* 42). Wiśniewski also quotes Augustine comparing the tormented status of demons (physically celestial, spiritually terrestrial) with suspension head-downwards (*Civ. D.* 9.9).

⁵² Anon. *Acts of Peter*; cf. Iamblichus *De mysteriis Aegyptiorum* 3.5.112.3-5. Demons were imagined as native to the air. Gregory of Tours (*Liber Miraculorum* 24 = *PL* 71.735c) combines exorcism with aerobatics: the saint extracts a confession by lifting someone by the feet and dropping him on his head (cf. Constantius of Lyons *Vita Germani* 7.18-37).

⁵³ Eusebius *Historia Ecclesiastica* 8.9. It may be relevant that in Sophronius' seventh-century *Life of Mary of Egypt*, Zosimas clothes Mary's nakedness immediately before her levitation that closely resembles exorcism (*Life* 15 = *PG* 87.3708d).

⁵⁴ The same principle underlies a later class of miracle (attributed to Goar, Aicandrus, Aldhelm, Dunstan, and others) in which saints accidentally cause garments to levitate by

4. SYRIA: NIKE AND BELLEROPHON

Our second-earliest classical source concerning levitation (after Pliny) is frequently overlooked, but will prove very significant. It is a brief notice in a catalogue of the world's wonders from Ampelius' book of facts for boys, probably written in the fourth century AD. Unlike the Arsinoe monument, it is described as real and is located in a different prosperous Hellenic city:⁵⁵

At Magnesia-under-Sipylyus there are four columns. Between these columns is an iron Victory, hanging without any suspension (*pendens sine aliquo vinculo*), bobbing in the air (*in aëre ludens*); but every time there is wind or rain (*quotiens ventus aut pluvia fuerit*), it does not move.

Ampelius does not actually mention magnets, but his ultimate source probably did, since the levitating Nike is both made of iron and located at Magnesia, reputed origin of *Magnesia lapis* or magnetite.⁵⁶ That source was probably a Hellenistic Greek

hanging them on a sunbeam. This is modelled on the use of wooden perches as coatracks: the first recorded example (Waldelbert's expanded *Life of St. Goar*) makes this explicit.

⁵⁵ Ampelius *Liber Memorialis* 8.9.

⁵⁶ Ancient sources already show uncertainty over which Magnesia (those in Thessaly, on the Maeander in the province of Syria, and under Mount Sipylyus in the province of Asia)

paradoxography from Alexandria.⁵⁷ Like Eroles, Nikai were commonly portrayed in flight and sometimes used as metal pendants in jewelry: suspending Nike aloft, perhaps using a concealed bracket, would be a reasonable continuation of Greek sculptors' efforts to represent her alighting weightlessly, as in the famous Paionian and Samothracian statues. We hear of a sizeable mechanically suspended Nike statue at Pergamum in the first century BC.⁵⁸ It seems likely that Ampelius' "four columns" means a tetrapylon, since there is at least one Hellenistic parallel for a goddess statue thus installed.⁵⁹

exported magnetite. Its other early names, "Heracleian stone" and "Lydian stone" (Rommel 1927: col. 475), offer little help because there were also several Heracleas. This may be the most overdue application of magnetometry to any ancient enigma.

⁵⁷ von Rohden 1875: 3-29.

⁵⁸ In the theater at Pergamum, which is far north of Magnesia but still within the Hellenistic province of Asia, a suspended Nike was employed to lower a crown onto Mithridates Eupator (Plut. *Sull.* 11). On *nikai* as pendants in jewelry, see *LIMC* s.v. *Nike*.

⁵⁹ At least one tetrapylon in Hellenistic Syria contained a goddess statue, although no exact parallel for a Nike image survives. When Seleucus destroyed the city of Antiochia in the second century BC, he installed a statue of Antiochia's Tyche inside a tetrapylon at Antioch (Malalas 8.201). This is probably the Tyche shown sitting between two pairs of columns on Antiochene coin-issues, especially of the second and third centuries AD (*LIMC* s.v. *Antiocheia*). Other Syrian cities including Anjar, Palmyra, and Aphrodisias gained tetrapyla between the second and fourth centuries AD; Palmyra's tetrakionion could have housed four statues, although none survive. That of Aphrodisias bears reliefs of Nikai and Eroles in flight. An Aphrodite statue in fifth-century Gaza occupied a plinth

Meanwhile, his description of the Nike, which even wobbles (when touched?), matches the model I have established for magnetic forces as invisible chains (especially *sine aliquo vinculo*).⁶⁰

Despite sharing the recurrent assumption that magnets work like chains, Ampelius is best treated separately from the “mainstream” tradition about Alexandria that I have outlined, because he seems to preserve an independent tradition concerning the Near East that surfaces again many centuries later. This late resurgence has two points of contact with Ampelius’ brief notice, one geographic, the other thematic. In the High Middle Ages we hear of a new levitating monument: a giant airborne statue of Bellerophon riding Pegasus. Scholars have traced its evolution from what was probably a genuine monument from classical antiquity into a world wonder.⁶¹ This begins with Cosmas of Maiuma’s eighth-century commentary on Gregory of Nazianzus’ poems.⁶² Gregory alludes to the

at a crossroads, perhaps within another tetrapylon (περὶ τὸ καλούμενον τετράμφοδον...ἐπάνω βωμοῦ λιθίνου, Mark the Deacon *Vita Porphyrii* 59). Classical Magnesia-under-Sipylos (modern Manisa) remains largely unexcavated.

⁶⁰ Pliny describes both a “rocking stone” at Harpasa (*cautes stat horrenda uno digito mobilis, eadem, si toto corpore inpellatur, resistens, HN 2.98, cf. Ap. Rhod. Argon. 1.1304-1308*) and the colossal Zeus at Tarentum, said to revolve on its axis and as resisting force despite yielding *to manual pressure (mirum in eo quod manu, ut ferunt, mobilis ea ratio libramenti est, ut nullis convellatur procellis, HN 34.40)*.

⁶¹ Reinach 1912, Deonna 1914, Rushforth 1919.

⁶² Eckhardt 1949: 80 wrongly derives pseudo-Bede’s levitating Bellerophon from Prosper of Aquitaine (i.e. Quodvultdeus).

Seven Wonders rather obliquely and Cosmas only gets some of them right; for example, he knows that one of the two statues is the Colossus of Rhodes, but seems unaware of the Zeus at Olympia. Perhaps because Cosmas is a native of Damascus in Syria and more familiar with the near East, a different statue comes to mind:⁶³

Ἄγαλμα πάλιν ἐστὶν τὸ ἐν Σμύρνη τοῦ Βελλεροφόντου, ὅπερ ἐστὶν ἐπὶ
ὀχήματος ἐπὶ τὴν θάλασσαν προκύπτων τοῦ τείχους, ὃ τε Πήγασος
ἵππος μικρὸν ὀπισθεν τοῦ ποδὸς κατεχόμενος, πολλάκις μὲν ἠρέμα
σαλευούσης συνεπόμενος χειρός· προωθούμενος δὲ σὺν βίᾳ, μένων πάγιος
καὶ ἀκράδαντος.

The second “statue” is that of Bellerophon in Smyrna, which is on a carriage above the sea pointing out over the wall. Pegasus the horse is attached discreetly behind one hoof, rocking slightly many times when a hand follows along with it, but remaining firm and unshaken when shoved with force.

No such statue is attested elsewhere. I suggest that Gregory or his source wrote “Syria” (Συρία), not “Smyrna” (Σμύρνη), since a likely site for such a statue was Syria’s maritime city of Bargylia, which derived its name from Bargylus, Bellerophon’s friend killed by Pegasus.⁶⁴ Cosmas’ Bellerophon is wondrous because deceptively resilient.⁶⁵

⁶³ Cosmas *Commentarii in sancti Gregorii Nazanzieni carmina* = PG 38.545-46.

⁶⁴ Steph. Byz. s.v. Βαργύλια (quoting Apollonius of Aphrodisias’ *Karika*, c.AD 200). According to Ampelius, Syria’s Mount Bargylus had another wondrously resilient

This probably reminded later readers of magnetic monuments locked in place by invisible chains, especially Ampelius' Nike, which wobbled but stayed put. That would explain why, in the tenth-century *Seven Wonders of the World*, the statue "at Smyrna" is now made of iron and magnetic stones "in the vaults" (*archivolis*) suspend it in equilibrium (*in mensura aequiparata consistit*), even though it weighs around 5000 pounds.

This Bellerophon is no longer poised to leap from a cliff-top, but airborne within Smyrna. It has apparently merged with Ampelius' levitating Nike; indeed, Magnesia-under-Sipylos was only twenty miles northeast of Smyrna, enjoying sympolity with it. The magnets are fixed in the conventional "vaults," probably meaning vertical suspension; but the non-vertical *hinc et inde* implies horizontal suspension between two or more magnets, for which the only precedent is Ampelius. In the twelfth century, the well-read pilgrim "Master Gregory" attempts to reconcile his reading of the *Seven Wonders* with what he personally saw at Rome. Despite following his source closely,

artwork: a lamp outside a temple of Venus that burned constantly, resisting wind and rain (*quam neque ventus extinguit, nec pluvia aspargit*: Ampelius *Liber Memorialis* 8, cf. Aug. *Civ. D.* 21.6).

⁶⁵ Reinach 1912 and Deonna 1914: 102 believe that this statue somehow oscillated in a socket. I suggest instead that the effect was achieved by embedding a metal armature deep into the base, and Cosmas means that Pegasus wobbled or vibrated when shoved, but was never dislodged.

Gregory relocates the Bellerophon to Rome on the basis of a textual error,⁶⁶ which (since he observed nothing like it there) obliged him to consider it a thing of the past.

Pseudo-Bede's and Gregory's Bellerophons hang between multiple magnets Ampelius-style, not from a single magnet Rufinus-style, nor as a pair above and below Augustine-style. However, Gregory's wording suggests that his occupies the focal point inside a round-topped Roman archway.⁶⁷ It is tempting to see this focal-point arrangement as the reason why levitating statues usually hang within vaults (and as we shall see, domes). It may even be what our earliest sources intended, though descriptions vary over time.

5. NEAR EASTERN IDOL-WORSHIP AND THE TOMBS OF SAINTS

⁶⁶ As Rushforth 1919: 43-44 shrewdly observes, Gregory must have read the *Seven Wonders* (or something similar) not with *in Smyrna civitate*, "in the city of Smyrna," but with the variant *in summa civitate*, "over the top of the City." (I have already suggested that *Smyrna* was itself a corruption of *Syria*.) Meanwhile the name Bellerophon has been corrupted to "Belloforon" and the weight tripled to 15000 Roman *libra* (the lower weight of 5000 is realistic for a full-size iron equestrian statue. Estimating one *libra* at 328.9g makes 5000 *libra* around 1640 kg; the equestrian statue of Marcus Aurelius, which is over-life-size and made of heavier bronze, weighs 1920 kg; Marabelli 1994: 2).

⁶⁷ Magnets exert equal forces "in the arches of the vault" (*in arcus voltura*, Rushforth's emendation of *in arcus involtura*).

During the first millennium AD, the ancient cultures of the Levant—or rather, the reflections of their cultural heirs—yield a handful of allusions to levitation that differ from those in our Greek and Latin sources. The Midrash (c.AD 200) reports among hypotheses about how Gehazi sinned that “Some say he set up a lodestone according to the sin of Jeroboam and made it stand between heaven and earth.”⁶⁸ Jeroboam had erected two golden calves as cult-objects in Bethel and Dan (II Kings viii.3); according to the Babylonian Gemara (c.AD 500), he deployed magnets to hold these in mid-air. Although the mechanical details differ,⁶⁹ these remarks agree with the Serapeum chroniclers (and many later reports of magnetic suspension) that idolaters successfully created false miracles using magnetism. More surprisingly, a theory ascribed elsewhere in the Gemara to the third-century Rabbi Jose ben Hanina involves a sacred usage.⁷⁰ When asked how David could wear the gold Ammonite crown weighing one Babylonian talent (around 30 kg: 2 Samuel xii.30), the Rabbi suggests that a magnetic stone held it above his head.⁷¹

⁶⁸ Tractate Sotah fol. 47a (trans. Robert Travers Herford).

⁶⁹ The first passage is the only known pre-modern description of a magnet itself levitating, instead of suspending other objects. The second passage also differs from Greek and Roman accounts because it neither indicates where the magnets were placed nor suggests that the golden calves contained iron.

⁷⁰ Gemara Avodah Zarah fol. 44a.

⁷¹ This is probably inspired by the suspension of a heavy crown (from a chain inside an arch) over the Sassanian monarch at Ctesiphon: see Erdmann 1951: 114-17.

To these three Talmudic examples we may add an Arabic one. Ibn Wahshiyya's translation of *The Nabatean Agriculture* in the early tenth century AD explains that when Tammuz was murdered, Babylon's statues all assembled in the temple of the Sun to mourn him, whereupon the large golden Sun figure, normally suspended between heaven and earth, came down among them. The date and authorship of *The Nabatean Agriculture* itself is very uncertain, let alone this particular fable, but influences from late antique and medieval Greek agronomic texts (mediated through the context of medieval Iraq) have been detected elsewhere.⁷² This Babylonian Sun-statue could therefore derive partly from the Alexandrian one, even though its levitation is a supernatural miracle with no mention of magnets.⁷³ Meanwhile, it is a golden idol, like Jeroboam's calves, hangs "between heaven and earth," like Gehazi's magnet, and is neutral or positive in character, like David's golden crown. These allusions all envisage non-Jewish peoples suspending golden objects in the air, without mentioning vaults, iron, or extant monuments, but are otherwise heterogeneous. Perhaps Western reports of magnetic suspension influenced some or all of these Semitic reports of levitating gold objects, but indirectly at best. They have no obvious bearing on its recurrent associations with the Near East.

⁷² The relevant passage is reported in Maimonides *Guide for the Perplexed* 29. The *Nabatean Agriculture* and its interpretative problems are discussed in Hämeen-Anttila 2002–2003.

⁷³ Two other tenth-century Muslim writers, describing India, mention a suspended idol and golden temple without mentioning magnetism (Abu Dulaf and Al-Mas'udi, discussed below), though no connection with Ibn Wahshiyya can be made.

After Ibn Wahshiyya, many other Muslim scholars report non-Muslims worshipping levitating objects, in which the relationship between trick and miracle remains close. The first and fullest reference to a levitating tomb of a Christian saint or sage on Sicily comes from Ibn Hawqal in the late tenth century:⁷⁴

The great city of Balarm (Palermo)...contains a large mosque for assembly, which was the church of Rome before the conquest, and where there is an impressive shrine. I have heard from a logician that the philosopher (*hakim*) of the Greeks, Arastutalis (Aristotle), was suspended in a wooden coffin within this chapel, which Muslims have converted into a mosque. The Christians honored his tomb and went there to receive healing, because they had seen how the Greeks had regarded and revered him. He also told me that he lies suspended between heaven and earth so that people can beg him to send rain or bestow a cure, or for all other important matters in which it is essential to address God in the highest and propitiate him: in case of misfortune, destruction, or civil war. And there I saw a wooden coffin which was probably his tomb.

⁷⁴ Ibn Hawqal *Surat al-'Ard*, translation adapted from Vanoli 2008: 247-48.

Palermo had been Arab-controlled since AD 831, so Ibn Hawqal's informer was telling a tale set more than two centuries in the past.⁷⁵ This imagined veneration of Aristotle reflects mutual Christian and Muslim respect for him in the tenth century, when Sicily was pre-eminent in Aristotelian scholarship. These remains, surely belonging to a Christian saint, become those of Galen or Socrates in later Muslim references.⁷⁶ As a Greek *hakim* occupying a suspended coffin, Aristotle represents occult Hermetic knowledge reimagined as Christian hierolatrology. The *hakim*-saint purportedly received intercessory prayers while poised between heaven and earth, neatly encapsulating Sicily's cultural melting pot. On Cyprus, another "frontier island," Christian-Muslim interactions proved less harmonious. The silver-clad wooden cross of the Good Thief, which St. Helena brought to Stavrovouni Monastery, was miraculously suspended before the gaze of several pilgrims who recorded the experience.⁷⁷ Felix Faber's description is fullest: the

⁷⁵ The eleventh-century *Book of Curiosities* says only that Christians at Palermo used to pray to "a piece of wood" for rain (Savage-Smith 2014: 457), indicating that it was not revered during Arab occupation.

⁷⁶ In the thirteenth century, the Tunisian author Ibn al-Shabbāt says that Sicily is where Ġālīnūs (Galen) is buried; in the fifteenth century, al-Bākuwī says it was Sukrat (Socrates): citations in Vanoli 2008: 249-50.

⁷⁷ Daniel the Traveler *Puteshestive igumena Daniila*; Wilbrand of Oldenburg *Itinerarium terrae sanctae* 30 (*Itinera Hierosolymitana Crucesignatorum* III p. 230); Ogier d'Anglure *Le Saint Voyage de Jherusalem* 295; Felix Faber *Evagatorium* 36B-37B. These visits occurred respectively in AD 1106, 1211, 1395, and 1480. Around 1370, Guillaume de Machaut attested its fame in verse (*Prise d'Alexandrie* 291-98).

cross hung within a blind window, its arms and foot reaching into oversized recesses. Like Cosmas' Bellerophon (and Ampelius' Nike) it wobbled when touched,⁷⁸ and was probably suspended on a concealed metal bracket. But we have two Muslim retorts to Christian polemics that denounce it as a trick involving magnets. In mid-twelfth-century Cordoba, Al-Khazraji pours scorn on reputed miracles, the second of which is a cross hanging in mid-air. He calls this no miracle, merely a trick (*hīla*) achieved using magnets hidden inside the church walls.⁷⁹ In 1321, Al-Dimashqi confirms the identification by including in a similar list "the cross in Cyprus, suspended in mid-air using magnets."⁸⁰ These denunciations of idolaters tricking spectators with magnetism match those in the Talmud. However, as we have seen, Christianity possessed its own long tradition of such denunciations.

In the early sixth century, Cassiodorus passingly alludes to an otherwise unknown iron Cupid that hung in a temple of Diana "without any attachment": Helios has probably been replaced here with a better-known flying god, and the Serapeum with the better-

⁷⁸ *ut dicunt, nullo innitens adminiculo, in aëre pendet, et fluctuat; quod tamen non videtur de facili* (Wilbrand of Oldenburg *Itinerarium terrae sanctae* 30 = *IHC* III p. 230); "quant l'en y touche elle bransle fort" (Ogier d'Anglure *Le Saint Voyage de Jherusalem* 295).

⁷⁹ Al-Khazraji *Maqami al-sulban (Triumph over the Cross)*, framed as a retort to an anti-Muslim priest called Al-Quti ("The Goth"), cited in Vanoli 2008: 257.

⁸⁰ Ibn Ali Talib Al-Dimashqi *Response to the Letter from the People of Cyprus* 54r.

known temple of Ephesus.⁸¹ By contrast, a much later European source endows a different flying god—Mercury—with a similar statue using a direct Christian model. The relevant passages of the eleventh- or twelfth-century *Gesta Treverorum* spin tall tales of Treveri’s historic remains,⁸² aiming to establish that the town (briefly the Western Empire’s capital in the fourth century) had both a longer history and more splendid monuments than Rome.⁸³ Treveri’s include a temple with a hundred statues and a vast iron Mercury in flight. These correspond to wondrous monuments in High Middle Age accounts of Rome: the “Salvatio Romae” statue-group, and the aforementioned iron Bellerophon.⁸⁴ The Mercury hung inside an arch with magnets above and below (Augustine-style). The author forestalls doubt by including a documentary letter from an eyewitness, as well as a Latin inscription clearly aimed at readers, not observers: *Ferreus in vacuis pendet caducifer auris*, “The iron *caduceus*-bearer hangs in thin air.”⁸⁵

⁸¹ *mechanisma...fecisse dicitur...ferreum Cupidinem in Dianae templo sine aliqua alligatione pendere* (*Variae* 1.45.10).

⁸² *PL* 154.1094-95, 1122.

⁸³ The *Gesta* contributes to a High-Middle-Age rebranding of Trier as “the second Rome” (Hammer 1944). Its comically majestic antiquities include a marble Jupiter commemorating how taxes withheld by five Rhenish cities were “extracted by thunder and celestial terror” (*fulmine et caelesti terrore extorto*, *Gesta* 23 = *PL* 154.1122).

⁸⁴ Note the competitive emphasis on the size and weight of the Mercury statue (*mirae magnitudinis*, 1094-95; *magni ponderis*, 1122).

⁸⁵ This hexameter has strongly Ovidian features, especially his characteristic epithet *caducifer* (compare metrical parallels: *Ars Am.* 1.473 *ferreus adsiduo consumitur anulus*

I suggest that this story is best compared with a Christian miracle, narrated later in the self-same text, concerning St. Paulinus of Treveri whose coffin was suspended from iron chains. When the Norman marauders of AD 882 ripped these away, it remained hanging in mid-air, only sinking to rest years later when some unbelievers pushed it downward, incurring doom in the process.⁸⁶ For this semi-fantasized crypt, as for the purely fantasized Mercury-temple, a fictive document is “quoted” extensively.⁸⁷ Another correspondence is that numerous fellow martyrs surround Paulinus. In an irreverent reimagining of local legend these became the hundred pagan statues, while Paulinus’ levitating wooden coffin became the levitating iron Mercury, hanging on the invisible “chains” of magnets. It is just possible that Christian relics really were suspended on chains in the High Middle Ages; most reports of chain-hung coffins are dubious, since

usu, cf. *Am.* 1.6.27, 1.7.50, 2.5.11, 2.19.4; *Met.* 8.820 *adflat et in vacuis spargit ieiunia venis*; *Fast.* 4.605 *Tartara iussus adit sumptis Caducifer alis*, cf. *Met.* 2.708, 8.627). It is tempting to see in *caducifer* a pun on *caducum ferrum*, “iron ready to fall.” Embrico shows Ovidian influence too: Cambier 1961: 376 notes that the lines *Nam si vixisset opus atque loqui potuisset / “Materiam vici!” diceret artifici* allude to Ovid’s comment on the sumptuous temple of the Sun, *materiam superabat opus* (*Met.* 2.5). South Germany’s early twelfth-century Ovidian renaissance (Conte 1994 [1987]: 360) is the mutual context for Embrico and the *Gesta*.

⁸⁶ *Gesta* 43 = *PL* 154.1164. This narrative combines miraculous suspension with the topos of the saint’s coffin becoming immobile, signifying his desire to remain on site.

⁸⁷ A verbose lead tablet incorporating a prophecy about the Normans: *Gesta* 42 = *PL* 154.1161.

they appear in travelers' tales, but a suspended reliquary appeared at Nuremberg in the fifteenth century.⁸⁸ However, a levitating tomb of any material has no Christian

⁸⁸ On suspended ostrich-eggs and similar objects in Eastern medieval churches and mosques, see Green 2006; in sacred art, Flood 2001:15-58. Two twelfth-century Jewish periegetes claim that the prophet Daniel's remains could be seen in a shining glass or bronze coffin in Susa, hanging from iron chains under a bridge over the Choaspes to shed blessings on both banks: Benjamin of Tudela *Itinerary* (Adler 1907: 52-53), Petachiah of Regensburg *Travels* (Benisch 1856: 38-41). In the same century (c. AD 1170), Barbarossa donated the four-meter-wide gilt chandelier hanging from 25 meters of chain in Aachen Cathedral. Al-Harawi, in his late twelfth- or early thirteenth-century *Guide to Knowledge of Pilgrimage Places*, claimed that Rome's largest church kept St. Peter's remains "within a silver ark hanging by chains from the ceiling" (trans. Lee 1829: 161). This may be a garbled account of Constantine's thirty-pound gold chandelier, which hung over St. Peter's bronze-clad tomb (according to the *Liber Pontificalis*, and is shown hanging on chains on the Pola Casket). Robert of Clari, narrating Constantinople's fall in 1204, claims that a shroud and a tile imprinted with Jesus' face hung in gold vessels from silver chains (83). From the fifteenth to eighteenth centuries, a casket of relics including the spear of Longinus (when not ceremonially displayed) hung on two chains in Nuremberg's Holy Ghost Hospital Church (Kahsnitz et al. 1986: 179-80). It is relevant that when a fourteenth-century source claims that Muhammad's embalmed foot occupies a golden casket at Bladacta, the three large magnets suspending it are "in the chains hanging above it" (*a tribus magnis lapidibus calamitis in cathenis pendentibus super eam*, Anon. *Liber Nicolay* fol. 353 verso, quoted in Eckhardt 1949: 85).

precedent, and I would instead connect it with Ibn Hawqal's earlier report that a wooden coffin once hung in mid-air. It is also notable that the historical Paulinus died in AD 358 during exile in *Phrygia*, returning in the damask-wrapped cedarwood coffin where he remains today.⁸⁹ Paulinus himself therefore links the levitating Mercury in Trier's fanciful *Gesta* (or should that be *geste*?) back to the late classical Near East. This may reflect a broader European tendency to associate artificial marvels with the East.⁹⁰

The "sacred physics" of the Stavrovouni cross and the coffins at Palermo and Trier consistently resembles magnetic suspension because, I propose, medieval Christendom substituted holy relic-matter for iron as the "active ingredient" of suspended objects.⁹¹ This finally lets us explain an enigmatic monument in the eleventh-century Norman *Life of St. Illtud* which, like Rome's Bellerophon, found its way into a list of wonders.⁹² It combines the levitating tombs of Ibn Hawqal and the *Gesta Treverorum*

⁸⁹ The rectangular coffin has no chains but its iron fittings have eyelets on the sides, probably for ring handles.

⁹⁰ "In general, the marvels of art came from Africa and Asia, lands believed far to surpass Europe not only in natural variety and fertility, but also in fertility of human imagination" (Daston and Park 1998: 88).

⁹¹ This also explains the ninth-century claim that inserted relics held Hagia Sophia's dome upright (*Diegesis* 14).

⁹² On this episode, and our sources, see Evans 2011. Illtud's altar is the longest and the only man-made or Christian item in the *De Mirabilibus Britanniae*, appended to some manuscripts of the *Historia Brittonum*, which cannot be securely dated before the twelfth

with another class of miraculous object, the miraculously buoyant altars attributed to several Celtic saints.⁹³ In the longer version, two strangers sail to Illtud's cave, bringing him a saint's corpse with an altar above his face, "supported by God's favor" (*Dei nutu fulcitur*). Illtud buries the saint, who requested anonymity to avoid being sworn upon, and builds a church around the altar, still levitating "to the present day" (*usque in hodiernum diem*).⁹⁴ Church altars stood over a saint's tomb wherever possible, and likewise portable altars (wood, metal, or stone) featured a compartment for saints' relics.⁹⁵ Further confirmation of the parallel with Paulinus' coffin comes in the fates of two empiricists who later examined this altar. The first passes a withy underneath the altar and proves its levitation, but dies within a month, as does the second who looks underneath and is blinded; they resemble the doubters at Trier, who pushed Paulinus' levitating tomb downward and later fell sick. Lifris claims extensive cultural property for Cadoc, including descent from Roman emperors, burial in Italy, travels in Jerusalem, and

century. These idiosyncrasies imply that it was culled from a hagiography, apparently a lengthier version of the extant *Life*.

⁹³ Patrick, Brynach, Carannog, and Padarn's disciple Nimmanauc (Evans 2011: 59, 63-64).

⁹⁴ *De Mirabilibus Britanniae* 10, cf. *Life of Illtud* 22.

⁹⁵ An extant example (c. 690) was found with the body of St. Cuthbert at Durham Cathedral. In 714, Jonas of Fontenelle described another, owned by St. Wulfram (*altare...in medio reliquiae continens sanctorum in modum clypei, quod, secum dum iter ageret vehere solitus erat*). In 787, the Second Council of Nicaea stipulated that every new altar must contain saints' relics.

interactions with King Arthur. These also include the relic-powered levitating monument, which brought this Christianized version of magnetic suspension as far west as Wales.

6. THE TOMB OF MUHAMMAD

The iron Bellerophon, perhaps too fanciful and arbitrary for belief, apparently faded from memory after pseudo-Bede and Gregory. But in the High Middle Ages, in a politically charged context and with enough plausibility to retain credence across Europe until the sixteenth century, the tomb of Muhammad becomes history's most notorious magnetic monument.⁹⁶ Eckhardt astutely traces its development through anti-Muslim polemics back to the early twelfth-century *Vita Mahumeti* by Embrico of Mainz, but claims that Embrico borrowed the motif directly from Pliny and Rufinus, which I shall show to be incorrect.⁹⁷ In *Chant 16*, a magician installs Muhammad's corpse in a sumptuous temple using this trick:

Thus the lofty creation (*opus elatum*), furnished with a single magnet,
stood in the center which was shaped like an arch.

Muhammad is carried under this and put in a tomb,

⁹⁶ Gibbon 1789: 6.262 finds it still necessary to deny that Muhammad's tomb was suspended by magnets.

⁹⁷ Eckhardt 1949. The *vita auctoris* has since been discovered, correcting the misattribution to Hildebert of Lavardin.

Which, in case you should ask, had been made from bronze.
And indeed, because [the magnet] pulls together such a mass of bronze (*tam grandia contrahat aera*),
The tomb in which the king lay was lifted up.
And there he hung, by the power of the stones.
Therefore the ignorant public, after they saw the prodigy of the tomb,
Took as fact what was merely a show (*rem pro signo tenuerunt*),
Believing—miserable people—that Muhammad made it happen (*per Mahumet fieri*).

Embrico goes on to say that the tomb hangs “without a chain” (*absque catena*), by “magic” (*ars magica*). Gautier de Compiègne repeats most of the same details in his *Otia de Machomete*,⁹⁸ also composed early in the 1100s, although he explains the magnetic trick differently:

...For, as they say, the vessel in which the remains
of Muhammad lie buried seems to hang,
So that it is seen suspended in the air without support,
But no chain pulls on it from above either.
Therefore, if you should ask them how come it does not fall,
They think (in their delusion) it is by the powers of Muhammad.

⁹⁸ Verses 1057-77. Alexandre du Pont’s thirteenth-century *Li Romans de Mahon* faithfully follows Gautier (1902-15) and adds no new details.

But in fact the vessel is clad in iron on all sides,
And stands in the center of a square house,
And there is adamant-stone⁹⁹ in the four parts of the temple,
At equal distances in one direction or another;
By natural force it draws the bier towards itself equally,
So that the vessel cannot fall on any side.

Importantly, Embrico specified that the coffin (*tumulum, tumba*) was bronze, like the statue in George the Monk without its iron nail. However, Gautier clearly has an independent source. He omits the dazzling wealth and moves the shrine from Libya to Mecca.¹⁰⁰ He also specifies that the tomb has iron all around, and that four magnets balance it horizontally, not just one suspending it inside an arch. I suggest that Gautier's

⁹⁹ Gautier's term *adamas* reflects the confusion in Old French between the homonyms *aymant* < Lat. *adamas* "adamant, diamond" and *aymant* < Lat. *amans* "lover, magnet" (von Lippmann 1971 [1923]: 182, 194, 213).

¹⁰⁰ Muhammad's tomb is actually at Al-Masjid al-Nabawī, but the confusion between Islam's two oldest sites of pilgrimage is understandable. In the thirteenth century, Cardinal Rodrigo Ximénez claimed that the sacred Black Stone embedded in the Kaaba was a magnet (*Historia Arabum* 3, published in van Erpe 1625), perhaps taking literally Nasir Khusraw's remark in the *Safarnama* that the Qarmatians thought the stone was a "human magnet" and would draw crowds when relocated. Al-Mas'udi says much the same about a temple at Multan in India (*Muruj adh-dhahab wa ma'adin al-jawhar* 63.1371).

independent source also informed Glycas' description of the Serapeum some sixty years earlier, which diverged from earlier descriptions by adding the same details. Both specify a four-magnet configuration and explicitly state that this prevents the iron-girt idol from tipping over.¹⁰¹ Whatever this shared source may be, it strongly resembles Ampelius' description of the Nike bobbing between four columns. Apparently this (or a text from the same chain of transmission) circulated in the twelfth century, causing both Gautier and Glycas to diverge from their immediate models.

A third twelfth-century poem, Graindor's *Chanson d'Antioche* (c. AD 1180), can reveal more about Muhammad's tomb.¹⁰² Graindor drew on an earlier *chanson* by a shadowy "Richard the Pilgrim," very likely adding fantastical elements. These include the erection of a Muhammad-statue above a tent, so nicely balanced upon four magnets that a fan rotated it:

On the top [of the tent] the Sultan had an idol set up (*fist mestre...un aversier*),
Made all in gold and silver, finely carved.
If you had seen it, without a word of a lie

¹⁰¹ Compare ἰσοδυνάμως γὰρ τετραμερόθεν ἐλκόμενον, καὶ μὴ ἔχον ὄπου καὶ νεύσεις (Glycas *Chronicle* 4.257 = PG 158.433) with *pendere res plena quod pendeat absque catena, nec sic pendiculum quod teneat tumulum* (Graindor *Chanson d'Antioche* 1143-44).

¹⁰² Allusions to Muhammad's magnetic suspension in subsequent *chansons de geste* (e.g. *Les Quatre Fils Aymon* 9613-16: iron statue; *Le Bâtard de Bouillon* 1364-66: golden statue) are brief and add little.

You could not see or even imagine a finer sight:
It was large and shapely, with a proud face.
The Sultan Emir ordered it to be lowered:
Four pagan kings run to embrace it,
Erecting it in position (*le font metre et drecier*) upon four magnets,
So that it does not tilt or lean in any direction.
Muhammad was in the air, rotating (*si prist à tournoier*),
Because a fan (*uns ventiaus*) moved him and set him rotating
...
Muhammad was in the air, by the power of the magnet (*par l'aimant vertus*),
And pagans revere him and offer him their salutes.

Sansadoine denounces the false cult, punches the idol to the ground, and overleaps its belly, much as Quodvultdeus' inspired Christian destroys the Helios in the Serapeum.¹⁰³ The precious metals and absence of iron recall Embrico, but the four magnets preventing it from tipping (*quatre aimans...qu'il ne puist cliner ne nule part ploier*) recall Gautier. The suspension *above* magnets (*de sor*) and the fan-powered rotation are entirely new, probably inspired by a description of the panemone windmill. Many scholars assume that our version of the *Chanson*, despite postdating Embrico and Gautier, represents an earlier phase involving a suspended idol based on classical accounts, later supplanted by

¹⁰³ The statue's precious materials and proud appearance may recall the Alexandrian cult-statue of Serapis, whose description routinely accompanies that of the magnetically levitating Sun statue from Rufinus onwards.

Muhammad's real body.¹⁰⁴ I suggest that the partly "classicizing" variant involving an idol and magnets (which nonetheless contains no iron and lacks any direct model) is actually later: the suspension of the prophet's own remains came first, directly counterfeiting Christian relic-powered suspension. Geographic proximity does not in itself prove oral or literary influence, but seems particularly relevant in this case. Embrico wrote at Mainz, Gautier at Marmoutier; around the same time, the anonymous monk (or monks) behind the *Gesta Treverorum* wrote at Trier. These three towns form an approximate triangle less than a hundred miles wide in the northeast Holy Roman Empire, and although the *Gesta* is hard to date, it belongs to a Latin literary scene whose coherence is implied by Gautier's obvious dependence on Embrico. I suggest that relic-miracles, and not classical reports about Alexandria, are the true model for Muhammad's magnetically levitating tomb, which ironically makes the same accusation against Muslims that Al-Khazraji and Al-Dimashqi were almost simultaneously hurling against Christians.

One late thirteenth-century author reclaims Muhammad's suspended tomb for Christendom using a different fantastical setting. The *Account of Elysaeus* of the 1280s¹⁰⁵ is an interpolated version of the *Letter of Prester John*, containing a description of St. Thomas' tomb.¹⁰⁶ This occupies a mountain in central India where, when the Indus

¹⁰⁴ E.g. Tolan 1996.

¹⁰⁵ Thus Zarncke 1876: 120.

¹⁰⁶ The tomb description (except its levitation) was extracted from the anonymous *De adventu patriarchae Indorum ad Urbem sub Calixto papa secundo* (AD 1122).

annually recedes, Thomas' incorruptible hand is used to dispense the Eucharist (closing its grip to reveal any person's guilt):¹⁰⁷

Now, the apostle is in a church on that same mountain, and he is entombed in an iron tomb (*in tumulo ferreo tumulatus*); and that tomb rests in the air by the power of four precious stones. It is called *adamans*; one is set in the floor, a second in the roof, one at one corner of the tomb, and another in the other. Those stones truly love iron (*isti vero lapides diligunt ferrum*): the lower one prevents him from rising, the upper one from sinking, and those at the corners prevent him from moving this way or that. The apostle is in the middle.

The iron coffin locked in position, the four magnets, and the term *adamas* (here *adamans*) are recognizable from Gautier. As irreverently as when Paulinus' relic-miracle was separately transferred onto both Muhammad and the iron Mercury, only in reverse, the author transfers Muhammad's magnets onto a saint's tomb, albeit in an exotic Eastern setting. The ease with which Muhammad's false miracle is reclaimed for a Christian context shows how closely it was patterned on Christian relic-miracles in the first place. The author takes a positive attitude to magnetic suspension by turning it from miracle-substitute to miracle in itself, unconsciously echoing our earliest pagan sources, and to be echoed in turn centuries later.

¹⁰⁷ *Account of Elysaeus* 16-17. The relevant portion (16-17) is published in Zarncke 1876: 123-24.

7. ASIA AND INDIA: GNOSTIC, HINDU, AND BUDDHIST WONDERS

At the time when magnetic suspension was giving rise to a form of relic-miracle in Western Europe, which would later contribute to the fantasy of Muhammad's tomb, Muslim sources were already counting it among the marvels of India. I shall demonstrate that whereas very early Asian sources attribute self-levitation to holy individuals in Hinduism and Buddhism, and Sanskrit medical texts describe the properties of magnets, Muslim descriptions of magnetic suspension show the influence of Western antiquity.¹⁰⁸ The remarkable result is that just as eastward-facing Christians ascribed the technique to Muslims, eastward-facing Muslims were simultaneously ascribing it to other non-Muslims. Independent channels of transmission had produced such ironies before, yet this branch of the tradition (in which the Eastern dome replaced the Western arch or vault) flourished for centuries longer, relocating and evolving. Always in the margins, magnetic levitation illuminates the thought of many ages: from Hellenistic and Roman learning, across a spectrum of medieval Christian beliefs, into medieval and later Islam. As I shall show, a Hindu appropriation finally brought it into the modern era.

¹⁰⁸ On Hellenic (largely Hellenistic) influences on medieval Islam, see Peter 1988. Any evidence contradicting this Eurocentric model would of course be very important. I have only found one thirteenth-century Sanskrit example of magnet folklore, not involving levitation. In Hemadri's *Chaturvarga Chintamani*, Shukracharya creates a mountain-like magnet to divert the gods' iron-tipped arrows from the besieged daityas; Indra's lightning shatters it, distributing magnetite worldwide.

The earliest Muslim references to suspended monuments arise from allegory and fables. Later, these develop into reports anchored to Indian cities, in exegetical genres such as travel writing and historiography. The latter resemble many earlier pagan and Christian sources, especially those concerning the Serapeum, which served as a template for the idolatrous splendor of Hinduism and Buddhism. One early reference, redolent of Gnostic allegory, appears in Al-Mas'udi's tenth-century world history. He describes an ancient seven-sided "Sabian" (Harranian) temple on China's borders—meaning at the world's end—containing a well inside which all past and future knowledge may be seen. It is also crowned with a radiant gemstone that kills anyone who approaches it or attempts to destroy the temple. Al-Mas'udi says that according to "certain sages," the effect was created using magnets regularly placed around the temple.¹⁰⁹ India attracted curiosity and wonder among Muslim intellectuals, a fact exploited later in the tenth century by Abu Dulaf al-Yanbu'i in his first *risala* (letter), which blends gleaned knowledge with Mandevillean fantasy. He counts among India's wonders a solid-gold temple, reputedly levitating somewhere between Makrana and Kandhar (over 700 miles apart).¹¹⁰ This statement is cited by a contemporary geographer, and another geographer three centuries later, implying that levitation could feature among "wonders of the East"

¹⁰⁹ Al Mas'udi 67 (de Meynard 1914: 69-71). For commentary on the Gnostic symbolism of this and other temples, see Corbin 1986: 132-82.

¹¹⁰ Dulaf's temple in the sky probably derives from the splendid city built for Kay Kavus, Persia's legendary shah, "between heaven and earth" (al-Tabari *Tarikh* 1.602), or alternatively the *vimanas* of Hindu myth.

without mention of magnets or other rationalizations.¹¹¹ In the same text, Dulaf describes the “idol” at Multan as not merely suspended in the air, but a hundred cubits distant from both floor and ceiling, itself a hundred cubits tall.¹¹² Whether Dulaf read about a smaller suspended statue is unknown, but this has an air of satirical exaggeration, much like Lucian’s hundred-cubit footprint of Heracles.¹¹³ Dulaf is the earliest known Muslim scholar to locate a suspended statue in India, as his successors would do for centuries to come, though at different locations.

Another Muslim echo of Western accounts of the Serapeum is denouncing magnetic suspension as religious fraud. The first trace of this is Al-Mas’udi’s claim that the Hindu temple at Multan contained magnets.¹¹⁴ Three centuries later (AD c. 1220), a catalog of fraudulent miracles in Al-Jawbari’s “Book of Selected Disclosure of Secrets” includes a levitating iron statue, in India’s “Monastery of the Idol” (*deir al-sanam*).¹¹⁵ This seems to be an adaptation of the iron Helios in the Serapeum, being not only suspended under a dome—the Eastern answer to a vault—but also ascribed to a Greek *hakim*, this time Apollonius (“Yablunus”).¹¹⁶ Apollonius was also (as “Balinas”) the

¹¹¹ Ibn Al-Nadim *Kitab al-Fihrist* 347; Yaqut al-Hamawi *Mu’jam Al-Buldan* 3.457.

¹¹² MS. Rishbad f. 192a.

¹¹³ Lucian *Ver. Hist.* 1.4. Scythia’s Heracles footprint was two cubits long (Hdt. 4.82).

¹¹⁴ Al-Mas’udi 63.1371 (on “Mandusan”), cited by Vanoli 2008: 25.

¹¹⁵ Al-Jawbari *Kitāb al-mukhtār fī kashf al-asrār* (*The Meadows of Gold and Mines of Gems*) chapter 4, cited in Wiedemann 1970: 359.

¹¹⁶ Apparently here, as often in medieval Islam, the wonder-working Apollonius of Tyana is confused with the astronomer Apollonius of Perge.

purported author of a near-contemporary hermetic text, which described another allegorical seven-sided temple.¹¹⁷ This suggests that the magnetic marvels of both the “Monastery of the Idol” and the allegorical Harranian temple may ultimately derive from Byzantine historians’ reports of the Serapeum.¹¹⁸

Although magnetism as religious fraud starts to appear in these High Middle Age Muslim accounts of unreal Asian temples (particularly those of Al-Mas’udi and Al-Jawbari), it features more prominently in later descriptions of real ruined temples. This is the strongest indication that the suspension motif itself passed from European texts through Muslim mediation into India, where it served many of the same cultural functions, especially since another iconolatry-iconoclasm conflict was under way. The great ruined Hindu temple of Somnath becomes, so to speak, the first Serapeum of Indian historiography. Somnath was destroyed in 1025, but around 1263 (decades after Al-Jawbari and his “Monastery of the Idol”), the Persian geographer Zakariya Al-Qazvini endowed it with splendors as lavish as those described in Rufinus or the *Chanson d’Antioche*. These include a suspended statue that initiates a drama of empirical analysis.¹¹⁹

¹¹⁷ Heptagonal temples, one side for each known “planet,” suggest the astronomical mysticism of Harranian culture: see Van Bladel 2009.

¹¹⁸ “Balinas” *Book of the Seven Idols (Kitab al-Asnam al-Saba)*, cited and discussed in Al-Jaldaki *Al-Burhan*. This heptagonal temple contains seven talking statues representing the planets, whose sermons initiate the reader into alchemy.

¹¹⁹ Al-Qazvini, trans. Eliot and Dowson 1871 = 2.63 Wüstenfeld.

This idol was in the middle of [Somnath] temple without anything to support it from below, or to suspend it from above. It was regarded with great veneration by the Hindus, and whoever beheld it floating in the air was struck with amazement, whether he was a Mussulman or an infidel... When the king [Sultan Mahmud of Ghazni] asked his companions what they had to say about the marvel of the idol, and of its staying in the air without prop or support, several maintained that it was upheld by some hidden support. The king directed a person to go and feel all around and above and below it with a spear, which he did, but met with no obstacle. One of the attendants then stated his opinion that the canopy was made of loadstone, and the idol of iron, and that the ingenious builder had skilfully contrived that the magnet should not exercise a greater force on any one side—hence the idol was suspended in the middle... Permission was obtained from the Sultan to remove some stones from the top of the canopy to settle the point. When two stones were removed from the summit, the idol swerved on one side; when more were taken away, it inclined still further, until at last it rested on the ground.

In this version of the focal-point model (in a dome, as in Al-Jawbari), removing the stones does not topple the statue instantly. Instead it dangles lower without falling, until reaching the ground, as if numerous chainlike bonds were progressively detached from highest to lowest. Although no connection with the Serapeum is visible here, a similar story among the Muslim Bohra of Gujarat confirms it. In this story of uncertain date, set less than 250 miles away at Khambhat around a century later, Moulai Yaqoob visits a

Brahmin temple and removes four magnets suspending an iron elephant (Ganesh?) inside. This, with other feats, causes mass conversion to Islam.¹²⁰ This story of a false miracle exposed resembles that of Somnath in its setting, but in other respects strongly resembles that of Alexandria as told by Quodvultdeus.¹²¹ Yaqoob follows in the footsteps of the “servant of Christ,” who validates his own new faith by dislodging the hidden magnets supporting the old one.

Since the early nineteenth century, a similar tale of magnetic levitation has been told much further east, about Konark’s thirteenth-century Sun Temple on the Bay of Bengal. This owes much to the earlier accounts of Eastern temples in Muslim geographies and other prose genres, but has emerged from oral tradition and, furthermore, remains current today. Konark probably fell into disuse after the sixteenth-century Afghan conquest of Odisha, and by the eighteenth century its tall *vimana* (sanctum) had almost completely collapsed. A local tale recorded in the mid-nineteenth century claimed that its capstone had been a massive magnet that frequently caused shipwrecks on the nearby coast (presumably defending it from attack by sea), until a band of Muslims landed further away and stole it to prevent this effect, thereby desanctifying

¹²⁰ During the reign of “Sadras Singh” (Siddharaj Jaisingh, AD 1094-1143), Yaqoob visited a Brahmin temple containing the elephant: see Forbes 1856: 343-44. A summary of Bohra legends is provided by Jivabhai 1882: 328-45. Yaqoob and Graindor’s righteous iconoclast seem independently derived from a shared source.

¹²¹ One detail points to a later retelling of Quodvultdeus’ story: the four magnets, seen in High Medieval texts (Glycas, Gautier, Graindor, *Account of Elysaeus*).

the temple.¹²² In more recent variants this capstone suspended a cult-statue in mid-air, as at Somnath, and it was the Portuguese or British who removed it.¹²³ This tale seems to merge Al-Mas'udi's deadly gemstone with the shipwrecking magnetic mountain; the copious iron clamps and girders in Konark's masonry probably seemed like evidence, especially if some were magnetized by lightning.¹²⁴ The tradition of suspended monuments being destroyed, previously communicated from Christian to Muslim chroniclers, survives at Konark in a final, post-colonial inversion. This temple magnet was no fraud, nor mere spectacle, but an immensely powerful weapon, as even its destroyers had to acknowledge.

It is instructive to compare the legends of Somnath and Khambhat with that of Konark. All explain why the miraculous object is absent from any extant ruins, but the first two condemn deception, whereas the last praises ingenuity. At Somnath and Khambhat, pious myth-busters expose the marvel as a heathen trick by destroying it, as in *Quodvultdeus*. At Konark it remains a cultural treasure, as in the earliest pagan sources and the Christian *Account of Elysaeus*, although spoilt by impious vandals, like the relic-powered tomb of Paulinus. This shows that for suspended monuments across a range of cultural contexts, the epistemological statuses of trick and miracle remained closely

¹²² Stirling 1825: 327.

¹²³ For a recent version involving the Portuguese, see Gupta 2012: 463. Further variants may be found online.

¹²⁴ Compare the magnetized ironwork pieces obtained from church spires at Mantua (Gilbert 1893 [1600]: 214-15), Rimini, Aix (Brewster 1837: 9), and Chartres (Lister 1699: 80-84).

related, even interchangeable. I have shown that there are many continuities among accounts of suspended monuments, but perhaps this changeability itself is their most enduringly transcultural property.

8. CONCLUDING REMARKS

Static suspension has recurrently given foreign wisdom ostentatious material forms. In collected lore, travelers' tales, and religious denunciations from the Hellenistic period to the present and from Western Europe to the Far East, this mutable "wonder of the world" represents hidden knowledge inspiring faith, usually false, sometimes true. The suspended artifact is usually a cult-object: a sacred statue or, later, a holy person's remains. The notable exception is the statue of Bellerophon, which is better associated with other flying beings from pagan myth: Helios, Nike, Cupid, and Mercury. However, the medieval tradition of divinely or magnetically levitating relics, most notoriously Muhammad's body, does not (as some have claimed) come straight from Pliny and other classical sources. Instead it follows centuries of relic-miracles imitating magnetic monuments, including the coffins of Sicily and Trier, the cross on Cyprus, and the altar of Illtud. The idea of suspending relics from chains may have assisted this development. Descriptions of objects (for example in the Talmud, Ibn Wahshiyya, and Ibn Hawqal) with phrases meaning "between heaven and earth," which can metaphorically denote things high above ground as in the Greek "Meteora," could also have been misunderstood to mean miraculous levitation.

Although the oral traditions so important for the study of marvels lie all but hidden, this collation of glimpses from erudite channels has brought historical developments to light. Our starting-points Pliny and Ampelius are both brief and paradoxographic, but probably represent earlier texts of the Hellenistic period documenting either scientific developments, or the growing taste for marvels, or both. From late antiquity onward, Rufinus and his successors describe the Helios in the Serapeum (possibly transferred from Carrhae) as a trick. They imagine the workings of magnetism in varying ways, describing different numbers of magnets under a vault or coffered ceiling, and circulate the classical concept eastward from Constantinople. Separately from the Serapeum tradition, a Bellerophon statue mentioned by Cosmas becomes a magnetically suspended monument in Rome through progressive reinventions. Meanwhile, the invisible chains of magnetic monuments inspire a form of Christian relic-miracle, possibly influenced by actual suspensions of Christian relics on chains,¹²⁵ just as other suspension-miracles imply invisible ropes. This (and not the Alexandrian Helios or Arsinoe) ultimately leads to the fantasy that Muhammad's tomb was magnetically suspended. The fanciful Mercury statue at Trier and St. Thomas' coffin both "re-magnetize" relic-miracles in similar ways. Medieval Muslim authors show an equally broad, though somewhat refracted, range of attitudes to static suspension. Some locate examples in a marvelous East, with or without domes containing magnets; others cite magnetic suspension to refute Christian relic-miracles; still others attack Hindu idolatry

¹²⁵ The medieval travelers who report chain-hung relics are Christian (Robert of Clari on Constantinople), Jewish (Benjamin and Petachiah on Susa), and Muslim (Al-Harawi on Rome).

by claiming that Muslims exposed magnetic suspension in now-ruined Indian temples (Multan, Khambhat, Somnath). The last category of tales echoes Quodvultdeus' account of the Serapeum. The latest reported magnetic monument is Konark, still renowned among some Hindus, which reasserts magnetism as a true miracle and powerful technology whose destruction was impious.

For historians of the marvelous in religious, scientific, and folkloric contexts, one of the most striking aspects of the suspended monument tradition is that until now it was virtually invisible. One might even say that it never existed. Despite the chains of influence linking antiquity to the Middle Ages and the modern era, our sources barely acknowledge one another and almost without exception (even including Christian relic-miracles) envisage one unique example. The result is an enduring disconnectedness, mirroring the physical phenomenon on the epistemological level. Furthermore, world religions ascribe magnetic levitation-frauds to one another in an unwitting chorus: Christians accuse pagans and Muslims, Jews accuse idolaters, Muslims accuse Christians and Hindus. This shows common ground not shared by our two earliest authorities, the Roman compilers Pliny and Ampelius, who describe without comment. Rufinus' late antique report of the Helios in the recently destroyed Serapeum is what turned magnetic levitation into both a means of scientific rationalization and a tool of religious polemic. This not only ensured rapid circulation in early Latin chroniclers and lasting popularity among Byzantine Greeks, but led to ongoing migrations and evolutions throughout the Middle Ages and beyond.

The re-emergence of static suspension as a Christian relic-miracle, replacing iron and magnetite with sacred wood and bone, is not as marked a change as one might think.

Non-ferromagnetic substances appeared in earlier sources, showing that empirical phenomena held little sway over any suspended monument. Although iron predominates, alternatives included the suspended objects of gold in the Talmudic and purportedly Babylonian sources, Dulaf's hundred-cubit idol and golden temple, Embrico's tomb of bronze, and Graindor's composite idol. The chroniclers who pictured the Serapeum Helios with a small talisman-like magnet and a concealed iron nail may reveal why this is. For those whose magnetic theory has an empirical foundation, however indirect, the suspended object must be made of iron, but for most it is a form of sympathetic magic, whose power can be used on mostly or entirely non-ferrous objects (for example, in the magical papyri, figurines or people). Given that heavy iron objects hanging unsupported already seemed absurd, it was a short step from there to other metals, and (for Christians) to the potent and imperishable matter of holy relics.

I have shown that the static suspension motif migrated eastward after antiquity, which is apt enough since it had frequently pointed in that direction. The Alexandrian branch of the tradition held its place, although the Serapeum became the template for other locations, notably in India. The other and less continuous branch, starting from Ampelius, tended to locate levitating monuments in the Roman provinces of the Near East (especially Syria).¹²⁶ Later descriptions of magnetic monuments clustered further East: tales of Muhammad's tomb and statue postdating the First Crusade are set in Libya, Antioch, and Mecca; the Harranian temple is towards China; even the Mercury at Treveri

¹²⁶ Ampelius places the Nike in Magnesia-under-Sipylos and Cosmas locates the Bellerophon in Smyrna, though I have suggested that it might well have stood at Bargylia.

playfully reimagined the coffin of St. Paulinus with its Near Eastern provenance of “Phrygia.” Finally, Dulaf’s golden temple, St. Thomas’ tomb, the “Monastery of the Idol,” Multan, Somnath, Khambhat, and Konark are all located in India.¹²⁷ If Alexandria were not so familiar to the educated elite of the Roman Empire, we might conclude that the entire history of magnetic levitation is dominated by Orientalism. It is better to say that suspended monuments are symptoms of speculation: not only about science, magic, and religion, but also about unfamiliar cultures, especially those subjected to conquest and ruination. Over many centuries of such speculation the motif spread across Europe and Asia.

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¹²⁷ At the time of writing, a levitating statue of Vajravarahi is displayed (under a cloth inside a glass case) at Chumphu Nye Buddhist temple in Bhutan.

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