Tropes, Facts, and Empiricism

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> Now, by the hidden and admirable Pow'r of the Loadstones, the Steel-Plates were put into motion, and consequently the Gates were slowly drawn; however, not always, but when the said Loadstone on the outside was removed, after which the Steel was freed from its Pow'r, the two Bunches of Scordium being at the same time put at some distance, because it deadens the Magnes and robs it of its attractive Virtue.
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> -Rabelais, *Gargantua and Pantagruel,* v.37

Once constituted, scientific facts have a way of roaming about on their own in the world, much divorced from the circumstances of their original constitution. An important part of Latour and Woolgar's discussion in Laboratory Life *was to draw attention to how facts are used once they are at the final stage of their constitution. What I propose to do here is to go one step further, and to follow a single fact around in the wild—to tag it, as it were, much as a biologist might tag an animal with a radio collar—and then look to see where it turns up. The fact I have chosen is especially taggable, simply because it happens to be fantastic: I refer to the fact that magnets will lose their power of attraction if they are rubbed with garlic. This fact is also useful because it shows up in authors spanning fifteen centuries, from Plutarch through Rabelais and beyond, and over this time it shows some interesting behaviors. Of course, in the end, the garlic-magnet antipathy was disproved, and so changed its epistemological status, moving from one extreme to the other: from the obviously true to the obviously ridiculous. What struck Rabe-*

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lais as self-evident strikes us as being just as self-evidently at the opposite end of the truth-continuum. The reasons for the obviousness on both sides are not so very different, as it turns out, and in particular they share one central common feature: in each, obviousness has more to do with the classifications *of facts than it does with the* experiences *of those facts. But the epistemologies on both sides try to tie that obviousness of kind to obviousness of experience, by surreptitiously including classification under the rubric of experience. We have been aware since Hanson that facts are messy things, and Goodman showed how that messiness of facts could in large part be accounted for by the messiness of kinds. I am adding that empirical epistemologies attempt to purify that messiness by trying to subsume kinds under experience, and that this happens symmetrically, such that under different world views, kinds get subsumed under experience even when the "experiences" are contradictory or impossible. Kinds fabricate facts, but they do so in such a way that those facts behave as though their justification is really experiential. And this so thoroughly that it may be futile to try and systematically distinguish all kind-fabricated facts from empirical facts.*

I: Garlic, Magnets

The story begins with a meal: Plutarch is having dinner with a few friends. They get together like this every few weeks, and they eat, and they drink, and they talk. And they talk. Every one of them has been trained in one or more of the schools of Hellenistic philosophy, and so they don't just have dinner, they have a *Symposium.* In the middle of one such feast,[1] Plutarch has the servants bring out a fish course to his guests, and one of the guests, Chaeremonianus, points out a fish on the platter that looks a little like a remarkable creature he saw once while on a sea journey, a fish called an *echeneïs* (the Romans call it a *remora).* The fish, it seems, has a noteworthy ability, which Chaeremonianus illustrates with a story: while under sail, the boat he was on suddenly and inexplicably slowed down almost to a stop, and the reason for the slowdown was discovered by a watchful sailor (who presumably knew to look for such things). The cause turned out to be a little *echeneïs* sticking to the hull of the boat. When the sailor peeled it off, the boat immediately regained its speed. Such, he tells us, is the power of that little fish that it can stop a boat under full sail.[2] Now some of Plutarch's guests find this tale risible, but it does get them to talking about the physical force that causes things of this sort to happen: that is, the force known in antiquity as *antipathy,* the correlate and

1. *Symposium* (641B).

2. On this power of the *echeneïs,* see Aristotle, *HA,* 505b19, where it is reported that the *echeneïs* is also thought by some to bring success in love and law; also Pliny, *NH,* 9.79.

opposite of *sympathy.* It is sympathy that causes, for example, the strings on a lyre to vibrate by themselves when a corresponding note is sung. Indeed, we still call this phenomenon *sympathetic vibration,* even if the sense of sympathy in our use is now only metaphorical.

But in antiquity there were a host of other examples of observable phenomena that were said to be instances of sympathies or antipathies, and Plutarch seizes on the story of the *echeneïs* as an opportunity to list them. One example is rubbed amber, that attracts things to itself (sympathy) unless the things have been wetted with oil (for oil is antipathetic to amber). While we have no problem believing the observation underlying this example (for we know that rubbed amber attracts because of its static electrical charge), it is the next "observable fact" that Plutarch drops into the discussion that attracts our attention:

> ἡ δὲ σιδηρῖτις λίθος οὐκ ἄγει τὸν σίδηρον, ἂν σκόρδῳ χρισθῇ.
> And the lodestone will not attract iron if it is rubbed with garlic (Plutarch, *Quaest. Conv.,* 641c5).

II: Tropes

In Plutarch, the garlic-magnet fact emerges in the context of a philosophical discussion of antipathy. A look at the other instances of the claim that garlic negates magnetism will show that this claim is significantly concomitant with antipathy. That is, the garlic-magnet fact turns up almost exclusively in discussions of antipathy, and then always as corroborating empirical evidence for that force.[3] This concomitancy is a distinctive feature of this fact, and one that bears paying some attention to. To designate the distinctive way in which the garlic-magnet fact is wed to sympathy/antipathy, I will call this fact a *trope* of arguments for sympathy and

3. The precise details of the physics of sympathy and antipathy in antiquity are difficult to pin down. I have argued elsewhere that sympathy/antipathy are best seen as physical forces that manifest themselves through otherwise unexplainable cause-and-effect relationships between bodies (we will see some examples of these relationships in the next section). This physical reading of sympathy/antipathy is in agreement with the ancient sources, but notably disagrees with the modern default reading that derives ultimately from Frazer's (1900) outdated treatment of "sympathetic magic" in the *Golden Bough* (see e.g., Brown (1997) for a good discussion of the issues around magic as a category). There is nothing supernatural or "magical" about sympathy or antipathy in antiquity. That being said, sympathy/antipathy is usually invoked in antiquity as a physical *explanans,* rather than as an *explanandum.* This means that exactly how sympathy/antipathy is related to the various matter theories in play in the ancient world is often difficult to parse out (for how it plays out in Stoic physics, see Lehoux (2000) chapter 6). From the fact that it is invoked by so wide a range of authors, sympathy/antipathy seems to be flexible enough to piggyback itself on a number of different matter theories, though the details of how are often sketchy.

antipathy, in the same way that, say, space aliens wielding laser pistols are a trope of science fiction. There are two aspects to this I want to emphasize: (1) in sci-fi, the space alien is a standard tool in the literary repertoire, and (2) the presence of a space alien in a book or movie is sufficient (but not necessary) to categorize that book or movie as science fiction. A caveat: I do not want to suggest by this that tropes must be fictional or fantastical, however. They are simply deeply entwined in particular contexts. Sympathetic vibration, a perfectly factual and acceptable phenomenon, is just as much a trope of the sympathy/antipathy argument in antiquity as is the garlic-magnet story[4] or, to take a modern example, lateral gene transfer is a trope of molecular phylogenetics. Tropicality operates entirely independently of veridical facticity.

A couple of decades after Plutarch, the astronomer Claudius Ptolemy drops the garlic-magnet claim into a discussion of antipathy in his *Tetrabiblos* (I.3.13):

> *ὡσπερ γὰρ τούτων ἑκάτερον ἐαθὲν μὲν δι' ἀγνωσίαν τῶν ἀντιπαθησόντων, πάντη πάντως παρακολουθήσει τῇ τῆς πρώτης φύσεως δυνάμει, οὔτε δὲ τὸ ἕλκος τὴν νομὴν ἢ τὴν σῆψιν κατεργάσεται τῆς ἀντικειμένεις θεραπείας τυχόν, οὔτε τὸν σίδηρον ἡ μαγνῆτις ἑλκύσει παρατριβέντος αὐτῇ σκορόδου.*
> Similarly, when each of these (sc. wounds, magnets) is left alone because of ignorance of its antipathies, it will inevitably develop according to the power of its original nature (sc. putrefying, attracting iron); but neither will a wound undergo spreading or putrefaction if it is subject to the corresponding cure, nor a magnet attract iron after being rubbed with garlic.

As in Plutarch, Ptolemy invokes the trope, not for its own sake, but for the sake of a larger argument about sympathy and antipathy, where the antipathy is here acting as a cause that inserts itself into the normal order of things, and prevents other causes from falling out as they otherwise would had they been left to their own devices. The garlic-and-magnet story is a fact used as an illustration of a well-known force that prevents things from happening as they otherwise would. The trope is simply dropped into the discussion as an example that will serve to call a particular class of phenomena, that of *physical* interfering causes, immediately to mind.

The next time our trope surfaces is several hundred years later. In the seventh century A.D. an anonymous Greek alchemical treatise brings in

4. See, e.g., Cicero, *De div.,* II.33; Plotinus, IV.iv.41.

the garlic-magnet trope as an *explanandum,* for which the *explanans* is antipathy:

> οὐδὲν γὸρ ἀγνοεῖν χρὴ ὅτι κατὰ συμπάθειαν φυσικὴν ὁ μαγνήτης λίθος τὸν σίδηρον ἕλκει πρὸς ἑαυτὸν οὐδὲ ὅτι κατὰ ἀντιπάθειαν τὸ σκόροδον προστριβόμενον κατὰ τὸν μαγνήτην κωλύει αὐτὸν τῆς τοιαύτης φυσικῆς ἐνεργείας. (Berthellot and Ruelle 1888, 2.428.21)
> None should be ignorant that it is because of a natural sym- pathy that the magnetic stone attracts iron to itself, nor that because of antipathy garlic rubbed on the magnet impedes it in its natural action.

At first sight, this may appear to be a slight departure from how the trope has been used by the previous authors, insofar as in Plutarch and Ptolemy it was invoked as an *example* of sympathy and antipathy, and here it may look at first as if it is being invoked as a *fact that is explained* by antipathy. But the larger context of the alchemical text shows that it is sympathy and antipathy themselves that are being explained in this paragraph. Our trope is again just an example, even if the rhetoric suppresses this to some extent.

A few centuries later, the tenth century collection known as the *Geoponica* includes a short treatise called *On Physical Sympathies and Antipathies,* which is attributed to "Zoroaster." In a work with such a title, we should by now not be at all surprised to see our trope surface. And we are not disappointed:

> ἡ μαγντῆτις λίθος, ἤτοι σιδηρῖτις, ἐφέλκεται τὸν σίδηρον· ἐκπνεῖ δέ· σκορόδου προστριβέντος αὐτῇ· ἀναζῇ δὲ πάλιν τραγείου αἵματος ἐπιχυθέντος αὐτῇ.
> The magnetic stone, or the lodestone, attracts iron, but it loses this power when garlic is rubbed on it. It returns to life again, however, when goat's blood is poured on it (Geoponica 15.1.28.2).

The addition of the remedy for the magnet is new here. But goat's blood as an active substance is another trope of the sympathy/antipathy argument. Not only this, but we can even work out *why* goat's blood should act this way on a magnet: look at the following explanation of sympathy and antipathy in Pliny, *NH,* XX.1–2:

> pax secum in his aut bellum naturae dicetur, odia amicitiaeque rerum surdarum ac sensu carentium . . . quod Graeci sympathiam et antipathiam apellavere, quibus cuncta constant, ignes aquis restinguentibus, aquas sole devorante, luna pariente, . . . ferrum ad

> se trahente magnete lapide et alio rursus abigente a sese, adamanta, rarum et opum gaudium, infragilem omni cetera vi et invicum, sanguine hircino rumpente . . .
>
> Here the peace and war of Nature with itself will be told, the hatreds and friendships of things deaf and dumb, . . . which the Greeks call *sympathy* and *antipathy,* in which all things participate: water extinguishing fire, the sun evaporating water and the moon bringing it forth, . . . iron being drawn to the magnetic stone, and by another being repelled: adamant, a rare and delightful wonder, unbreakable and unconquerable by any other force, is smashed by goat's blood . . .

We see goat's blood being invoked here as antipathetic to adamant. But we know from book XXXVII of the *Natural History* that adamant works on magnets in exactly the same way as garlic does: robbing them of their power to attract (Pliny, *NH,* XXXVII.61).[5] Thus washing the magnet in goat's blood, a substance antipathetic to the kind of thing that robs magnets of their power, negates the original antipathetic power of the garlic, and so restores the magnets. Two *antis* make a *sym,* as it were.[6]

One other point is worth making: notice that the garlic-magnet trope is invoked not just incidentally to discussions of sympathy/antipathy. Rather it is called in as a primary piece of evidence. It is a leading actor, not an extra.

III: Facts

I started this paper by promising to track a certain *fact.* Then I changed my terminology and started referring to the garlic-magnet story as a *trope.* I made this switch in order to be clear on one important feature of the garlic-magnet antipathy, that is, how it is so deeply entrenched in one particular philosophical context. But my calling the trope a *fact* in the beginning was not accidental. What we shall see is that, within its context, the trope behaves in exactly the same way as facts do. In particular, we see its inclusion in enumerative arguments in exact parallel with other facts. We have already seen an example in Plutarch where the garlic-magnet trope was paralleled with a true example: rubbed amber attracts objects except when those objects have been wetted with oil, and the magnet attracts metal except when rubbed with garlic. So also in Ptolemy the garlic-magnet trope is paralleled in an enumerative argument with the fact that a wound will not spread or putrefy if it is subject to the corresponding cure.

5. See also Albertus Magnus, *De mineralibus,* II.i.1.
6. Della Porta works this out the same way (VII.54).

And we find that enumeration of parallel examples is a common way of arguing for the existence of sympathy and antipathy, as we have seen in Plutarch, Ptolemy, and Pliny, above. So we also see parallelism in these otherwise unknown verses quoted in a scholium to Hesiod's *Op.* 109:

> *χρυσὸν γὰρ ἰὸς τῶν κυνῶν ἰοῖ μόνος*
> *ὡς τὸν μαγνῆτιν ἑλκτικοῦ θραύει σθένους*
> *ἡ σκορδικὴ δύσπνοια προστετριμμένη.*
> Only the spittle[7] of dogs will tarnish gold,
> just as the stench[8] of rubbed garlic
> robs the magnet of its power to attract.

Another example of such enumeration, and one that is quite striking because it comes in the middle of what is usually taken to be a Sceptical argument, is from Cicero's *De divinatione.* At *De Div.,* II.xiv.33, Cicero says:

> ut enim iam sit aliqua in natura rerum cognatio[9]—quam esse concedo; multa enim Stoici colligunt; nam et musculorum iecuscula bruma dicuntur augeri, et puleium aridum florescere brumali ipso die, et inflatas rumpi vesiculas, et semina malorum quae in iis mediis inclusa sint in contrarias partis se vertere, iam nervos in fidibus aliis pulsis resonare alios, ostreisque et conchyliis omnibus contingere, ut cum luna pariter crescant pariterque decrescant, arboresque ut hiemali tempore cum luna simul senescente, quia tum exsiccatae sint, tempestive caedi putentur.
>
> Yet I do concede that there exists some kind of sympathy in the nature of things. And the Stoics have drawn this inference from many (examples). The livers of mice are said to grow larger in winter; and dried pennyroyal to bloom on the exact day of the winter solstice, and its inflated seed-pods to burst and the fruit seeds that are contained in them to spread themselves out in all directions; and strings in a lyre to resonate when different ones are struck; that it befalls oysters and all shellfish to grow with, and decrease with the moon; and trees are supposed to be best felled in winter when the moon is waning, for then they are dry.

7. Literally: *venom* (a pun on "tarnish" in Greek), but compare Sextus Julius Africanus, *Cesti,* 9.1.15 (quoted in Michael Psellus, *Opuscula logica, physica, allegorica, alia* 32.27), where he tells us (as an example of antipathy, no less) that the spittle (*σίελον*) of mad dogs can tarnish gold.

8. A second scholiast has commented on this word by explaining that δύσπνοια, *stench,* implies δύναμις, *power.*

9. Following the MSS. Ax emends it to *contagio.*

Now, we should resist the temptation to think that the use of parallelism was some kind of attempt to bolster the questionable facticity of the garlic-magnet trope by placing it alongside more pedestrian—and so epistemologically less problematic—facts. That this is not the case becomes clear when we compare how different facts are enumerated in these authors (Fig. 1). What we see is that each author sets facts we would see as true up against facts we see as fantastic, with no clear epistemological distinction between them. This is no mere rhetorical trick on the part of our authors. Rather, they themselves see no epistemological distinction between these various facts. All are equally true.

	Pliny	Cicero	Ptolemy	Plutarch
$Fact_1$	water extinguishes fire	mouse livers grow in winter	wounds won't spread if treated with proper cure	sight of a ram stops a mad elephant
$Fact_2$	sun evaporates water	dried fleabane blooms at winter solstice	magnets will not attract if rubbed with garlic	oak twig stops a viper
$Fact_3$	magnets attract iron	strings of lyre vibrate when others struck		wild bull quieted if bound to a fig tree
$Fact_4$	goat's blood smashes adamant	oysters grow and decrease with moon		rubbed amber attracts, unless objects oiled
$Fact_5$		trees driest in winter under waning moon		magnets attract iron, unless rubbed with garlic

Fig. 1: Parallelism in enumerative arguments for sympathy and antipathy

IV: Empiricism

Why is it that the ancients think that garlic interferes with magnetism? How is it that such a belief could have come into the canon of ancient physics? Obviously, some theoretical considerations about the nature or powers of magnetism and the nature or powers of garlic (perhaps attraction and repulsion, respectively?)[10] led the ancients to posit that each of

10. Bartholomaeus Anglicus certainly seems to think of garlic in these terms: "Item allium virtutem habet aperiendi, diuiendi, & incidendi humoros grossos & consumendi . . . " (*De proprietatibus rerum,* XVII.2), "And Garlicke hath vertue to open, and to tempre, and to dyvyde and to departe, kytte and waste grete humours and thyck . . . " (in de Worde's translation).

these two substances should cancel the powers of the other. Opposites negate. Then a fact is generated from theory, and the theory in turn bolstered with that fact. Or so it would seem. But we need to keep in mind that this epistemological story is deeply rooted in a modern standpoint, and notably does not agree with how the ancients tell us they came by this belief. Look back at the passage from Plutarch that started us off:

> ἡ δὲ σιδηρῖτις λίθος οὐκ ἄγει τὸν σίδηρον, ἂν σκόρδῳ χρισθῇ.
> And the lodestone will not attract iron if it is rubbed with garlic.

In the very next sentence he tells us how he knows this fact to be true:

> τούτων γὰρ ἐμφανῆ τὴν πεῖραν ἐχόντων . . .
> We have palpable experience of these things . . .

Experience? Either Plutarch is (a) lying, (b) living in a world whose physical laws operate quite differently from those of our own, or (c) betraying an overconfidence in the ramifications of the theory of antipathies, and allowing it to steer him into thinking that he (or at least someone he knows) has experienced (or should have experienced) this particular phenomenon.[11] I think that (c), the overconfidence hypothesis, rings truest to the modern ear, and it should serve to remind us (as if we needed reminding) that the category of "experience" is heavily intertwined with the category of "theory."

Plutarch's appeal to experience in this matter is not unique. An identical appeal, and one even more strongly worded, shows up fifteen centuries later, just before the belief in garlic-magnet antipathy disappears from serious scientific discussion forever. Alessandro Vicentini, in 1634, composes an argument against occult qualities in which he says that garlic negates the power of a magnet, and that this is known *by experiment* (Thorndike 1923–1958, vol. VII, p. 310–1).[12] Two years later, Bernardo Cesi says the same thing:

11. An anonymous referee correctly pointed out that there is logically a fourth possibility, (d) that it is possible that Plutarch may mean something significantly different by "experience" than we do. But Plutarch's wording avoids this objection: πεῖρα in Greek covers the English *experience, trial, test,* and *experiment.* Indeed, its semantic connotation leans toward an actual *test* of the theory rather than just an observation made in passing. Such a wording is strong enough to limit us to the three possibilities discussed in the body of this paper. On ancient empirical arguments generally, see Lloyd (1979), chapter 3.

12. Although he does not mention a particular and specifically located trial, which means he is really making an old-fashioned generalized appeal to experiences of the world rather than to *experiment* as we understand it. On the use of such appeals to *generalized expe-*

> . . . retundi vires magnetis allio, experimentis discimus quotidianis (Cesi 1636, p. 40).
>
> . . . we know by daily experiments that the power of the lodestone is weakened by garlic.[13]

And as late as 1653, Arnold de Boate (an anti-scholastic, by the way) is still propounding the garlic-magnet antipathy in a work on minerals:

> . . . though the Adamant be the hardest of all stones, yet it is softned with Goats bloud, and there is a special Antipathy between that and the Loadstone, which . . . hath an admirable vertue not onely to draw Iron to it self, but also to make any iron upon which it is rubbed to draw iron also, It is written notwithstanding, that being rubbed with the juyce of Garlick, it loseth that vertue, and cannot then draw iron, as likewise if a Diamond be layed close unto it.[14]

De Boate's phrasing, "It is written . . . ," alerts us to another factor in the longevity of the garlic-magnet fact: these Early Modern authors have, at first blush, an apparently more complicated set of reasons for accepting the garlic-magnet antipathy than did Plutarch. They may be accepting the fact not just because of its plausibility under a certain worldview (as Plutarch did), but also perhaps because of the authority of what has by their day become a long-standing textual tradition. But even if this is the case, Cesi and Vicentini still do make the claim to *empirical* justification. Why? It would seem that, like Plutarch, they are allowing other categories, in this case both *inference* and *testimony,* to bleed over into the category of experience.[15]

Cesi and Vicentini's claims for experimental proof of the theory stand out all the more sharply, coming as they do half a century after Della Porta is supposed to have disproved the effect of garlic on magnets—*by experiment,* no less!—in his *Magiae naturalis* of 1589.[16] At VII.48, Della Porta says:

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rience in the Early Modern period, and on how such claims differ from later experimental claims, see Dear (1995).

13. Albertus Magnus, in his *De mineralibus,* had earlier also claimed that the diamond-magnet antipathy is known *by experiment* (II.i.1), a point reiterated and emphasized (clarissimis experimentis . . .) by Cesi (1636) p. 543.

14. de Boate was writing pseudonymously as "D.B. Gent.," in Plat (1653, p. 218).

15. On the epistemological questions surrounding testimony, see Quine and Ullian (1970); a good recent overview is Kusch and Lipton (2002).

16. To be sure, Cardano had earlier raised serious doubts, saying in essence that the purported action of garlic on magnets is false, "except maybe a little bit in the case of weak (lodestones)": "Nec, ut fabulantur, allio, cæpisúe impeditur, multò minus adamante: nisi forsan adeò leuiter, ut in minimis solùm ac debilibus depræhendetur, in reliquis autê

> Sed quùm hæc omnia experirer, falsa repperi; nam non solû flatus, & ructus alliorum magnetem à suo trahende munere non distrahebant, sed totus allij succo perunctus, ita priores functiones obibat, ac si nunc; allio perungeretur, vt ferè nulla . . .
>
> But when I tried all these things, I found them to be false: for not onely breathing and belching upon the Loadstone after eating of Garlic, did not stop its vertues: but when it was all anoynted over with the juice of Garlic, it did perform its office as well as if it had never been touched with it (English trans. of Young and Speed 1658).

And Gilbert begins his *De magnete* by mocking the garlic-magnet story openly. Though he does not claim to have tested it himself, he does say (later in ch.I) that it is *by his experiments* that the *nature* of the lodestone will be revealed, and thus will such folly be disproved. Once experiment has shown us the *physiologia,* then we will know the story to be folly.[17]

In their counterarguments, both Della Porta and Gilbert notably divorce the garlic-magnet story from antipathy. In both cases, the fact—one that was formerly a trope of antipathy—is re-contextualized in a new ontological and classificatory setting: *antipathy* is no longer the phenomenon under investigation, but instead a new, pared-down entity is: *the power of the lodestone.* The garlic-magnet story had to try to account for itself from scratch in this new territory, and it failed. This recontextualization had already begun a few centuries earlier: as early as the late thirteenth century, just a generation after Aquinas, the garlic-magnet fact was beginning to divorce itself from sympathy/antipathy: Pietro d'Abano cites it as an instance of *attraction,* rather than sympathy (d'Abano, *Conciliator,* Differentia li). Jacques Rohault's mid-seventeenth century rejection of the effect of garlic on the magnet, still being published in English as late as 1735, may at first look like a throwback to the old tropic context, insofar as he talks about "what some have called the *Sympathy* and *Antipathy* betwixt the Load-stone and Iron," (II.iii.32) but this is late in the chapter in which he has already been discussing the powers of the lodestone. Sir Thos. Brown moves the garlic-magnet antipathy onto even more difficult turf.

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sensum effugiat" (Cardano 1582, book VII). Note also that Della Porta's appeal to experience is still not what Dear (1995) would call an event experiment: although it is a specific claim to a particular experience, it is more like Chaeremonianus's report about the *echeneïs* than it is like Pascal's about the barometer. And Della Porta's account does not serve as a touchstone or a proof for future commentators. Instead they all just return to the old and familiar kind of general experience claim.

17. Or, to be more precise, once Gilbert's testimony of the experiments has convinced us of a particular *physiologia,* then that theoretical understanding will allow us to infer that the story must be false.

He contextualizes it as a "common public folly" in his *Pseudodoxia epidemica* of 1646:

> But certainly false it is what is commonly affirmed and beleeved, that Garlick doth hinder the attraction of the Loadstone; which is notwithstanding delivered by grave and worthy Writers; by Pliny, Solinus, Ptolomy, Plutarch, Albertus, Mathiolus, Rueus, Langius, and many more. . . . But that it is evidently false, many experiments declare (Browne, 1646, II.iii).[18]

Notice again the appeal to *experiments.*

At III.lxx, Rohault makes a wonderfully hyperbolic claim:

> Quant à ce que quelques Ecrivains rapportent que l'ayman n'attire pas le fer à la presence du diamant, ou que l'oignon & l'ail luy font perdre sa vertu, ce sont des contes, qui sont démentis par mille experiences que j'ai faites.

". . . these things are refuted *by a thousand experiments* that I have performed." Note how Rohault's wording mirrors Cesi's earlier phrase, "we know by daily experiments. . . ," but of course Cesi's experiments were supposed to prove exactly the opposite point.

So also Della Porta is supposed to have disproved the theory by *actually trying it out.* And this is the answer encountered most often when asking people how they would go about disproving the theory of garlic-magnet antipathy. "Just try it," they say. Such an argument is all well and good, but it always stays at exactly that point, at the *saying* "just try it" stage. It never gets to the *actually* just trying it stage. Who would bother to check it out? Of course garlic does not interfere with magnetism! How could anyone think it would? A simple experiment with cheap household materials would be enough to disprove such a monstrous theory once and for all. The proof that it is false is—empirical.

But it is a strange kind of empirical argument, is it not? For none of us will ever *actually* test such a transparently ridiculous theory.[19] We won't because we do not need to. Every experience we have ever had with magnets, and every experience with garlic, leads us to infer that putting the two together and expecting significant results would be some kind of cate-

18. I should also add to Browne's list of authors Nicholas of Cusa *(Idiota de sapientia,* I.16).

19. Or at least: would not have bothered had I not just upped the stakes. In presenting this argument to different audiences, it seems that some people will, after being provoked like this, make a point of trying it out after all. So someone invariably does try it out, and comes back to me and reports that it doesn't work. I of course, don't accept a proof on the authority of their testimony.

gory mistake. We are thus letting *inference from experience* bleed over into experience itself. Not only this, but our experiences of magnets, and our experiences of garlic, are quietly being mediated by our understanding of magnets and our understanding of garlic, just as Plutarch's experiences of those things were being mediated by his own understandings. In short: our argument *against* the garlic-magnet antipathy is no stronger, and, more importantly, no more or less empirical, than Plutarch's argument *for* it.

Have we ever been modern?[20] It is often said that our epistemology changed radically in or around the seventeenth century, but in this instance, it seems all we did was to shuffle classifications.[21] Indeed, if it were otherwise, we should have to think of a book like Della Porta's as one giant "to-do list" for empiricists: did anyone ever empirically disprove the claim attributed to Albertus (and repeated in Ficino and Della Porta) that there exists a certain unidentified kind of bird, "like a blackbird," which is generated by the putrefaction of sage? No. When the class of things generated spontaneously began to be seen as a null set, this bird quietly moved to the realm of either the fictitious or at best the misunderstood (along with all the geese, frogs, snakes, mice, bees, eels, and so on that had formerly been in the class of things generated from putrefaction, as Della Porta lists them). So also the claim that bears love honey because it (indirectly) improves their eyesight (the bees that sting the bear's mouth serve to draw down the thick humor that otherwise clouds the poor bear's normally bad vision). Certainly no empirical test, no "crucial experiment" involving bears and bees, can be cited. Here again the implausibility stems from the fact that we no longer think of ailments as manifestations of humoral imbalances, nor of stings and infections as moving those humors about. But under differing sets of classifications of the causes of disease, such things just do or do not make sense. And one could go on and on here (given the delightfulness of the examples, it is certainly tempting), but the point is by now abundantly clear. Plausibility and obviousness have much to do with classification. In garlic-magnet antipathy, however, there is the added problem of the explicit empirical claims.

We find, sandwiching it at both ends of its life history, claims that the garlic-magnet antipathy is empirically justified. We are equally certain, *and for exactly the same reasons,* that it is not. The claims to empirical

20. Or, as Hacking might put it: did our science ever mature? (Hacking 1979). On the change in the ontology of kinds, see Hacking (1993). Kuhn (1962) should perhaps also get a mention here, in light of where I am going with this idea.

21. Kuhn, in his later work (1987, 1993) was beginning to move to an idea of taxonomic classifications as a way of dealing with the sticky problem of incommenurability. Taxonomy is at best, however, an analogy for how classification is working in the present instance.

justification on both sides are not disingenuous, but they are exaggerated.[22] We may not have had the particular experience that would prove what we want to prove, but it is so laughably obvious that we may as well have. Moreover, it is supported by a host of other experiences we have had. Is such a foundation empirical? Strictly speaking, no. But we do and will continue to talk and act as is it were. (Think about how we explain Newtonian mechanics by alluding to the behaviour of billiard balls: how much do we really know about billiard balls? How far is the nearest billiards table?) I am not saying there is anything wrong with this. Just the opposite, I think it is inevitable (as Mersenne put it, "l'expérience n'est pas capable d'engendrer une science"). But it is important to be aware of the fact that theory does not just underlie and inform observation, worldviews blind us to our sloppiness with the very category of the empirical.[23]

But if this is the case, should we not reconsider the verdict we passed on Plutarch's claim for empirical justification? Recall that we enumerated the possible explanations for his claim as follows:

> Either Plutarch is (a) lying, (b) living in a world whose physical laws operate quite differently from those of our own, or (c) betraying an overconfidence in the ramifications of the theory of antipathies. . .

I said that (c) overconfidence in the theory of antipathy rings truest to the modern ear, but if empiricism, ours and Plutarch's alike, is so tightly entwined in our respective worldviews, and specifically in particular ontological contexts, does (c) not reduce to (b), that Plutarch simply lives in a different world?

It is tempting to parse the difference of worlds here as a change in ontology. This because "the power of the lodestone" (call it "magnetism") was a newly-existent thing (force) that inhered in magnets but not garlic

22. Jay Foster illustrates one way of reading this in his comments on a draft of this paper: "We have the modern who says 'I don't need to rub garlic on a magnet, because I know it will not do anything' and the premodern who says 'I don't need to rub garlic on a magnet, because I know it will wreck the magnet.' They are offering exactly symmetrical claims. Neither feels that detailed justification is required because the proposition is self evident. Justification is taken to mean: (a) rational coherence, (b) empirical testability, and if we accept the recent philosophical turn, (c) testimony. Both sides claim justification by (b) experience but they really mean that they are offering a justification by (a) rational coherence. In this case, (b) experience is being evacuated into (a) rational coherence. The remaining interesting feature is that modern and premodern claims are so wildly different that it is bewildering how a criteria like 'rational coherence' could be applied. That is, they are just such different claims that it throws the conditions and criteria for 'rational coherence' up in the air."

23. See also Quine (1953); Goodman (1978).

and thus served to distanced garlic from magnets. But this would only be to tell part of the story. The answer to the problem is not just located in ontology, for the force of magnetism, replacing sympathy, served as a kind-predicate. Magnets used to be the *kind of thing* that was sympathetic, as was garlic. Now magnets are the kind of thing that are magnetic, and garlic in our experience is not. While we do see a shift in ontology here, the real work is not being done by the new force *qua* entity, but by the new force *qua* class of thing to which magnets belong. Garlic and magnets had been of a kind in Plutarch's day, and during the scientific revolution magnets got reclassified.

To put it in another idiom: it is as though physics were predicting two objects as green, and then switched it around in the sixteenth century to parsing one as grue and the other as bleen. (See Goodman [1983]) Where garlic and magnets had been both green, they are now one of them grue and the other bleen.[24] They no longer go together in the same suit of clothes. But, reading it in these terms spins us right back to Plutarch's different world. As Goodman himself puts it: "to project 'grue' and 'bleen' rather than 'green' and 'blue'—would be to live in a different world" (Goodman [1978], p. 101). What is remarkable, though, is that both before and after this change occurred, green on the one hand and grue/bleen on the other were thought to be tied to experience in exactly the same way and, curiously, to "experiences" that no one making or accepting the claims had probably actually had. Classification was doing the epistemological work, but experience was getting the credit.

V: Epilogue

The kind of *experience* to which both the pro and con claims about garlic and magnets appeal in this paper is not the experimental kind of experi-

24. Such a change immediately raises the question of how entrenchment, which is supposed by Goodman to have been the reason for predicating "green" in the first place, gets overridden by some other mechanism in order to allow grue and bleen their turns at bat. Hacking argues that revolutions override entrenchment (Hacking 1993, p. 304), implying that Goodman's account of projectibility has something to learn from Kuhn's account of a revolution. But the particular instance under consideration adds a little nuance to this picture. When "the power of the lodestone" replaced "sympathy" as the kind of force manifested by the magnet, it was not an entirely new category. Natural philosophers had known for generations some of the ways that lodestones behaved. The new category included those well-entrenched behaviors. Not only that, but it also included another now-well-entrenched fact about magnets: that natural philosophers were learning a lot about them of late. Magnets had become the kind of thing that showed new and interesting behaviors every time you turned around. For natural philosophers, they were, to combine Goodman and Kuhn, entrenched as *anomaly-generating.* It is this space that the new classification wedged itself into.

ence. It is a generalized claim that nature behaves in certain ways, and that a particular professional community thinks it understands those ways well enough. What is interesting about this appeal is just that it is *not* an explicit appeal to understanding, but hides itself, to a large extent, behind an appeal to something else, something called experience. The ambiguity that should, and does, trouble us about this is that our understanding of experience as a category wants to suppress the theoretical commitments that so heavily inform what we think of as our experiences. The point, though, is not just the old one about the theory-ladenness of observation (where theories inform how we perceive what we observe), nor is it that experience can be illusory (as in the case of hallucinations).[25] The point is instead that the theoretical aspects of this category called experience are so strong that, at their extremes, they have led some of the actors in this paper to really believe that they have had experiences that are impossible. It simply cannot be the case that both sides of the garlic-magnet debate—both appealing to experience—are right. One set of these experiential claims is *entirely* the product of theory. Or is it both?

Now, an important part of the point of this paper is methodological. I have taken as my starting point a question since put better by van Fraassen: "is there any *rational* way I could come to entertain, seriously, the belief that things are some way that I now classify as absurd?"[26] I have then tried to frame a way of understanding how we can deal with the many apparently—or even *trans*parently—ridiculous claims of premodern science, and it is this:

> We should take them seriously at face value (within their own contexts). Indeed, they have the exact same epistemological foundations as many of our own beliefs about how the world works (within *our* own context).

This methodological approach sidesteps an objection that those of us who work on premodern science must (alas, still) frequently deal with. The objection generally goes something like this: How is it that the practitioners of Early Modern/Medieval/Ancient science could have been so blind to the *fact* that theory *x, y* or *z* is patently contradicted by observation (where theory *x, y,* or *z* is typically something in the general vicinity of astrology, alchemy, or natural magic, but can even be theories like Aristotelian uniform circular motion, which makes the objection a sweeping one indeed)?

25. For these as standard critiques of philosophical empiricism, see van Fraassen (2002, pp. 121ff.).

26. van Fraassen 2002, p. 73.

Both sets of the experiential claims around garlic and magnets seem to be entirely the product of theory.[27] Think about my initial statement of "the fact that magnets will lose their power of attraction if they are rubbed with garlic." I contend that the reasons that this "fact" is so implausible, even laughable (did the reader at least raise an eyebrow when I first mentioned it?) are identical in kind to the reasons for which it struck Plutarch as obvious. The small trick I play on the reader, inviting her to unreflectively reject the plausibility of garlic-magnet antipathy, is not crucial to my argument (I am happy to let the historical story make the case by itself), although it does help in one respect if the reader at the very least found garlic-magnet antipathy *prima facie* implausible. Where the reader's surprise at the initial claim comes in handy is in support of my auxiliary contention that the experience claims on both sides were not disingenuous. The belief that experience falsifies garlic-magnet antipathy is an absurdly easy one to make. Just as absurdly easy, and in exactly the same way, as it once was to believe that experience proved it true. The generalized appeal to experience has a lot of force, and still has the power to trick us into thinking that the so-called "empirically obvious" is more properly empirical than it is just obvious. Garlic-magnet antipathy is as obviously false now, *in the same ways and to the same extent,* as it was obviously true to Plutarch. We may well have invented a new kind of experience, *experiment,* in the Early Modern period, but we should not overestimate how much work that new category does for us in parsing out the ways we allow our world to work.

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27. This both broadens and limits Dear's classification of the generalized experiential claim as "Aristotelian." This kind of experience is not just Aristotelian, it is ubiquitous. It is likewise not really experience (or "observation" [Dear 1995, p. 6]).

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