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Magnetic Theology as a Baroque Phenomenon*

KOEN VERMEIR

Introduction

When Elizabeth Drury died, John Donne wrote some of his most magnificent poetry in her honour. In *An Anatomy of the World* (1612), Donne describes the decay, transience and vanities of the world, and exalts the progress of the soul to the afterlife. Some of the verses that took root, even in Donne's time, are those that describe the disenchanting effect of the new philosophy, creating an empty and lifeless world. On the other hand, he also describes a *magnetic* force that keeps the parts of the world together in a meaningful whole, and that guides our 'compasse' to show us the right path. This magnetic force is attributed to Drury, but on the metaphorical level of the poem, it also refers to the divine love that provides meaning and direction to our lives. In other poems, Donne makes the divine nature of this magnetism more explicit. When Mr. Tilman had taken holy orders, Donne asks him: 'Dost thou find / New thoughts and stirrings in thee? and, as steel / Touch'd with a loadstone, dost new motions feel?', and in the *Holy Sonnets*, he describes how God draws us like the magnet draws iron.

In this paper, I will expand on these kinds of magnetic metaphors. I will discuss a particular tradition that combined the new magnetic philosophy with religious views, just like Donne did in his poetry. John Donne is known as one of the foremost English poets of the baroque. His oeuvre, and especially the poems referred to above, displays some characteristics that are often described as baroque. More than literary style, however, I am interested in the themes and worldview expressed by Donne: the vanity and transitory nature of earthly things, as well as the permanent presence of the transcendent. The horizontal axis - interest in the world, nature, commerce - intersects with the vertical axis - the influx and efflux of the divine. The magnet, a cohesive force countering the crumbling away of the world, represents this intersection, in bringing live and love to the world and at the same time directing us and attracting us to the world beyond.

Recently, two important arguments about the rise of natural theology in the 17th century have been made. Peter Harrison has argued that the early modern period saw a move away from allegorical readings of the bible towards a focus on the historical and literal, mainly under impulse of humanist scholars and Protestants. This new attitude towards the bible also led to a new approach to that other book: the book of nature. Medieval divines had read religious meanings in natural

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objects, but in the early modern period, the demise of allegorical interpretations opened up a way to a new mathematical and taxonomic ordering.

In a recent article, Scott Mandelbrote advanced a complimentary argument about the development of natural theology in 17th century England. He argues that what one can call an ‘Oxford style’ and a ‘Cambridge style’ of natural theology were developed, in response to radical challenges to university learning and traditional natural theology. The Oxford style, represented by John Wilkins and Robert Boyle, stressed the lawful operation of the universe under a providential order. In contrast, the Cambridge Platonists extolled the wondrousness of nature by focussing on marvellous and spiritual phenomena in their natural theology. At the end of the 17th century, the Oxford style would win out, and the design argument would come to dominate natural theology in the Enlightenment.

In this paper, I will study a tradition of natural theology that falls in between the distinctions made in the arguments of Harrison and Mandelbrote. Continuing work Martha Baldwin once initiated, I will study how a ‘magnetic theology’ was elaborated in the first half of the 17th century. I will show the different setting in which it was developed, and the changes it underwent. This tradition does not fit into the general story Harrison relates, as it was an attempt, perhaps against the grain of the time, to combine an allegorical reading of the book of nature with the new natural and experimental philosophy. I will also show that this tradition represented another possibility in 17th-century English natural theology, besides the radical style and an Oxford and Cambridge style discussed by Mandelbrote.

The tradition I study is not characterised by a detailed ‘style’ or ‘genre’ but rather by a special ‘content’. It pertains to how the newly studied phenomenon of magnetism was brought into natural theology. This was rare enough, and the main proponents knew enough about each others work to warrant us to speak about a tradition. One of the aims of this paper is exactly to see how this specific tradition is elaborated in and appropriated by different styles of reasoning (granting, however, that these styles can be part of a more general baroque style). Neither Harrison nor Mandelbrote address how Catholic philosophers and theologians elaborated natural theology. One advantage of studying magnetic theology is that it was adopted across confessional divides, even by the extreme ends of the confessional spectrum, which allows us to study the interactions and differences in elaboration.

My enterprise in this paper is complementary to the general sketches provided by Harrison and Mandelbrote. I aim at painting a richer and more complex picture of early modern natural theology by studying an intriguing but less well known tradition in natural theology. In this way, I hope we can come to a better understanding of the interaction between ‘science’ and ‘religion’ in the early modern period.

Ancient roots and medieval developments

The roots of magnetic theology can be found in classical and patristic times. In the early modern period, this was recognised to a certain extent when authors referred to Plato, who considered magnetism a divine power. Indeed, in Platon’s *Ion*, Socrates explains the inspiration of the poet Ion as a divine power, similar to magnetism: ‘there is a divinity moving you, like that contained in the stone which Euripides calls a magnet, but which is commonly known as the stone of

Heraclea.’ This stone attracts iron rings, and imparts its virtue to the iron, so that a whole chain comes into existence, just like the enthusiasm and inspiration of the poet spreads between people. In the *Corpus Hermeticum*, a collection of magical and philosophical text from Hellenised Egypt, in which influences from Greek and Egyptian thought are combined, including Neo-Platonism and mystery religions, we can find a genuine expression of magnetic theology: ‘The vision of [the image of God] has a special property. It takes hold of those who have had the vision and draws them up, just as the magnet stone draws iron, so they say.’ At the time, only the attractive virtue of the loadstone was known, and because this power was difficult to explain in current philosophical frameworks, it became a perfect metaphor for a transcendent, divine attraction.

The Church Fathers adapted this idea to Christianity. Now, Christ came to exert a ‘magnetic’ attraction. Gregory Nazianzen (329–389), one of the great Cappadocian Fathers, wrote in one of his orations: ‘Together with the great image of God He [Christ] draws also my body, which is my assistant, in the same manner as a magnet-stone attracts black iron.’ He used the metaphor not only for Christ, but also for those who imitated Christ, such as Athanasius the Great (295 - 373). Given the use Plato made of the magnetic metaphor, this seems fitting. The divine inspiration can be transmitted to others, who become inspired themselves, just like iron becomes magnetised when it clings to the loadstone. ‘In brief, [Athanasius] exemplified the virtues of two celebrated stones - for to those who assailed him he was adamant, and to those at variance a magnet, which by some secret natural power draws iron to itself, and influences the hardest of substances.’

It is interesting that the adamant and the magnet are used together here, as in later times, they became used interchangeably. According to the OED, early medieval Latin writers thought that the word was derived from the Latin ‘adamare’, which means ‘to have an attraction for’, ‘to love passionately’ or ‘to take a liking to’, and the adamant became associated with the magnet. The Latin ‘adamas’ stands for anything hard and inflexible, but in particular for hard minerals such as the hardest steel and diamond, as it is used in Gregory. The early modern confusion between the adamant and the magnet might attest something of the reception of the above quote and magnetic theology in general. Even Shakespeare identified the adamant with the magnet in *Midsummer’s Night Dream*: ‘You draw me, you hard-hearted adamant, / But yet you draw not iron, for my heart / Is true as steele.’ In a religious context, Donne identified adamant and magnet: ‘Thy Grace may wing me to prevent his art / And thou like Adamant draw mine iron heart.’

Both Jerome (331 or 347 – 420) and Augustine (354 - 430), the two greatest Church Fathers, wrote about magnetism in a religious context. Jerome used the now classic simile: ‘For if the loadstone can, as it is said, attract iron, how much more can the Lord of all creation draw to Himself whom He will!’ Natural objects had religious meanings, and through the visible world one could see the invisible world and understand spiritual truths. Origen (185 - 254) made a distinction in different ways of reading the bible, which corresponded to the different parts of man. Man was made up of body, soul and spirit, which corresponded to a literal, moral and allegorical reading of scripture. These levels of reading could also be applied to natural objects in the world, which Augustine appropriately termed ‘the book of nature’.

Augustine used magnetism not in a metaphoric way but described it in a context where he used natural examples to make central doctrinal points more plausible. He gave examples from nature to prove that bodies may remain unconsumed and alive in fire, for instance, to give support for the plausibility of the eternal burning of the soul in Hell. After giving some examples that relate to fire, he starts to sum up the wondrous, unexplainable or ‘occult’ properties of other natural

substances, to show that the teachings of the bible are not more surprising. He perpetrates the story that diamond neutralizes the power of the magnet, for instance, a story that attests again of the curious relationship between diamond, adamant and magnet. Augustine also relates how he was struck by wonder when he saw a magnetic chain, similar to the one described by Plato. ‘Who would not be amazed at this virtue of the stone, subsisting as it does not only in itself, but transmitted through so many suspended rings, and binding them together by invisible links?’ This magnetic chain would later be interpreted in a devotional way, and came to stand not only for the divine attraction, but also for the divine power that ordered the cosmos by ‘invisible links’. (FIG 6)

From the patristic times onwards, magnetism became a (modest) part of readings of the ‘book of nature’. In the Middle Ages, a more formal semiotic system of allegorical readings (in the broad sense) of scripture was developed. The *quadrigia* distinguished four levels of reading: (1) a literal reading; (2) a tropological or moral reading. This reading focussed on what to do and corresponded to the theological virtue of charity; (3) an anagogical reading. This reading focussed on what to strive for and corresponded to the virtue of hope. It had a prophetic or eschatological meaning; (4) an allegorical reading (in the narrow sense). This reading focussed on what to believe and corresponded to the virtue of faith.



FIG 1: de Montenay (1584) *Emblematum Christianorum centuria*, p. 5

In the Middle Ages and the Renaissance, magnetic metaphors were never as popular or widespread as allegorical readings of animal lore, because it was not part of a popular genre such as the bestiaries. One can find regular expressions of the idea of a divine magnetic attraction, however, especially as the phenomenon of magnetism became better studied and more phenomena became associated to it. In the Revelations of Birgitta of Sweden (ca. 1302 – 1373), the mother of God herself speaks in magnetic metaphors to the saint: ‘As a magnet attracts iron to itself, so too I attract hard hearts to God.’ To give an example from another context, Johannes Mathesius (1504-1565) described Christ explicitly as the true loadstone in his *Berg-Postilla Oder*

Sarepta (1679), a well known and often reprinted collection of Lutheran sermons, delivered between 1553 and 1562. Just like a magnet, Christ has two sides. With His right side He pulls the poor sinner toward himself through the power of the Word; with His left side, He repels those with recalcitrant hearts.

Devotional emblem books were one genre in which magnetic allegories were particularly popular. In De Montenay's emblem book of 1584, for instance, the image of the magnet is used as a starting point for contemplating divine attraction (FIG 1). The corresponding caption reads: 'The iron is attracted by a magnetic power; and we are drawn to Christ by the merciful God. Therefore do not expect to live by your own power: but recognise your life as a gift granted to you by God.' Other emblems about divine attraction often figure sunflowers, because early modern naturalists believed that the sunflower derived its heliotropic characteristics from a magnetic interaction with the sun. Thanks to this perceived magnetic interaction, sunflowers became a powerful symbol of the love for God, and they were represented in many emblems of the 17th century. In the *Amorum Emblemata* (1608), created by the Dutch painter and humanist Otto Van Veen (1556-1629), the sunflower is only the general symbol of love, but in his later *Amoris Divini Emblemata* (1615), the sunflower came to stand for divine love (FIG 2).



FIG 2

Van Veen, *Amoris divini emblemata* (1615), p. 39



FIG 3

Hugo, *Pia Desideria* (1624), p. 168

Because of the virtue that attracted the sunflower to the sun, the flower came to stand for the constancy of honest love that follows its object everywhere. The sun was the noblest object imaginable, and it often represented God or Christ. It was thus not so unexpected that the sunflower came to stand for the love of the human creature to his creator, who gave it constancy and direction. In one of his lectures, for instance, the Church of England clergyman Robert Bolton (1572-1631) writes: 'By this time, being thus told and truly informed in the mystery and mercy of the Gospell, the poore wounded and weary soule begins to bee deeply and dearely enamored of Jesus Christ. [...] So that now the current of his best affections, and all the powers of his humbled

soule are wholly bent and directed toward him, as the Sun-flower towards the Sun; the iron to the load-stone; and the load-stone to the Pole-star.’

In Bolton’s description, we can see an extension in the allegorical use of the magnet. In the course of the late 12th century, the compass was introduced in the west and the directional capacities of the magnet became widely known. Petrus Perigrinus de Maricourt gives in his *Epistola de magnete* (1269, distributed as manuscript and finally published in 1558) an early careful description of magnetism and the compass. The work contained a clear description of some experiments and a summary of the known properties of the magnet. Perigrinus attributes the directive power of the magnetic needle to the attractive power of the poles of the heaven. This property of the magnet was for many an indication of the celestial and divine character of the magnetic virtue. It was gratefully used in allegorical renderings, which now included the constancy and directive characteristics of the magnet, Christ and God.

In *A theatre of politicall flying-insects* (1657), a book that explains the various meanings of the bee, Samuel Purchas (1605–1658) also mentions the sunflower and compares it to iron turning to the loadstone, to the loadstone turning to the polestar, and to how the ‘domestick honey-Bees embrace and affect the Queene-Bee. [...] Thus are the current of his best affections and all the powers of his humbled soule bent and directed towards Him.’ In Hermann Hugo’s *Pia Desideria* (1624, p. 168), we can find a beautiful example of an emblem which combines the divine attraction of magnetic needle and sunflower represented together (FIG 3). The caption refers to the *Canticle of Canticles*: ‘I am my Beloved’s, and his desire is towards me’ and the accompanying text elucidates the meaning of the emblem. The good soul renounces worldly love for a devotion to the divine. In this she is guided by the sympathetic power of sunflower and magnetic needle. Again, the constancy and the safe direction are stressed.

The age of magnetism and magnetic theology

I have shown that the Patristic allegories of magnetism were expanded when new knowledge about magnetism became available. The kernel of the magnetic metaphor was the comparison between magnetic attraction and the divine attraction towards the good, towards the imitation of Christ and towards salvation. The magnetic attraction came to stand for the unwavering attraction exerted by the love of God for his creatures. In the later Middle Ages and the Renaissance, the magnet could also give comfort and direction in a chaotic world. The magnet’s capacity to point out the North and the Pole-Star signified the direction and guidance that God provides our searching souls. John Donne wrote about Drury and God: ‘When she [Drury/God] observ’d that every sort of men / Did in their voyage in this worlds Sea stray, / And needed a new compasse for their way; / Shee that was best, and first originall / Of all faire copies and the generall / Steward to Fate.’

The baroque was the age of magnetism. Although the phenomenon of magnetism was already known since ancient times, Gilbert’s monumental *De Magnete* (1600) had put magnetic phenomena on the agenda of physicians, natural philosophers and mathematicians. William Gilbert (1544-1603), established physician, one time president of the Royal College of Physicians, and physician to Queen Elisabeth, had created a new paradigm in natural philosophy. In *De Magnete*, Gilbert provided a synthesis and evaluation of existing knowledge about magnetism, but added many new experiments, rejected persistent myths, and expounded new hypothesis, creating

a veritable ‘magnetic philosophy’. Others expanded his ideas in all kinds of directions, and more and more phenomena that were difficult to understand became conceptualized in terms of magnetism. Magnetism became the basis to understand all kinds of occult powers, medical properties and cosmological speculations. While Gilbert had treated the earth as a macrocosmical magnet, Fludd argued in his *Mosaical Philosophy* (1638) that the magnet was the archetype of the whole universe.

Many natural philosophers who wrote about magnetism remained in the shadow of Gilbert’s accomplishments. The first more independent work on magnetism was Cabeo’s *Philosophia magnetica* (1629). Niccolo Cabeo (1585-1650) was a Jesuit who tried to reinterpret magnetic phenomena from an Aristotelian framework. Another, more famous Jesuit, who would write a magnificent folio on magnetism was Athanasius Kircher (1602-1680), professor at the Jesuit College in Rome. Before his *Magnes* (1641), Kircher had already written a thesis on magnetism, the *Ars Magnesia* (1631).

The theoretical part of the *Ars Magnesia* (1631) is very much indebted to Gilbert, but he also explored the utilitarian aspects of magnetism. Fascinating, for instance, is his description of the magnetic automata he constructed to visualise religious scenes. Kircher explains how to make a whale that could swallow Jonas by magnetic means (p. 50). He also describes a Christ walking on water, helping Peter who is gradually sinking, by a magnetic trick. Kircher also unveils this trick: ‘A strong magnet must be placed in Peter’s breast, and the hands of Christ, stretched out to come to the rescue, or any part of his toga turned toward Peter should be made of excellent steel, and you will have everything required to exhibit the story [...] This will happen with greater artifice if the statue of Christ is flexible in its middle, for in this way it will bend itself, to the vast admiration and piety of the spectators’ (p. 51). I have argued the theological relevance of these devices elsewhere.

In a section *Moralia & Symbolica*, Kircher discusses three allegorical elaborations of the magnet. In the first, he argues that magnetism should be seen from a ternary perspective, similar to what Augustine says about love in his *De Trinitate*: ‘there are three things: he that loves, and that which is loved, and love.’ Kircher sees a similar structure in the attraction between magnet and iron, but he stops short of explicitly reading the Trinity in this. In a second paragraph, Kircher identifies the magnet with justice, as the magnet keeps the attractive and repulsive forces of its two poles in equilibrium. Thirdly, Kircher gives a Christian interpretation of Plato’s and Augustine’s magnetic chain. A magnet does not only attract iron, he writes, but it communicates its virtue, just like eloquent masters that inspire their disciples and audience. In a similar way, the faithful happily cling to Christ. Here, we see some moral and theological reflections appended to a mathematical and philosophical treatise on magnetism. These reflections prefigure the tradition of magnetic theology I will discuss in the next sections. They would also form the basis of an elaborated and systematic magnetic theology that Kircher would publish 10 years later in his *Magnes*.

Samuel Ward: Puritan Magnetic Theology

In 1637 appeared the first book entirely devoted to magnetic theology: the *Magnetica Magnalia, Magnetis Reductorium Theologicum Tropologicum* by Samuel Ward. The authorship is somewhat contested, however, because there are two Samuel Wards, with almost the same lifespan, that have often been confused. Both have been Fellow of Sidney Sussex College Cambridge, and it is

very probable that they knew each other. The British Library catalogue ascribes the *Magnetica Magnalia* to Samuel Ward (1572–1643), who was Master of Sidney Sussex from 1609. The more probable candidate, however, is Samuel Ward (1577–1640), founder fellow at Sidney Sussex College in 1599, who vacated his fellowship on marrying and was appointed town preacher of Ipswich in 1605 (FIG 4).

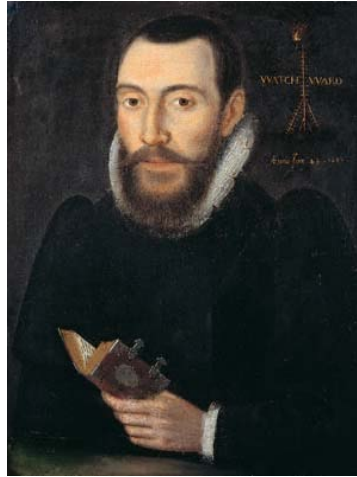


FIG 4: Samuel Ward of Ipswich

It is true that the *Magnetica Magnalia* is not enlisted with the works of Samuel Ward of Ipswich in the old DNB article of 1899. Furthermore, all his other books were printed in English, which would make the *Magnetica Magnalia* an exception. On the other hand, Ward did not intend to publish many of these sermons, and they were published by supporters from his notes. If Ward were the author, the *Magnetica Magnalia* was published after his tenure as a preacher, and should be considered an authored book, and this would explain why it stands out from the rest. Strong proof for Ward's authorship is that the 1640 English translation of the *Magnetica Magnalia* explicitly mentions Samuel Ward of Ipswich as the author. Second, the literator Thomas Fuller, himself a fellow of Sidney Sussex, uses magnetic metaphors to describe Ward in his *The History of the Worthies of England* (1662) and called him knowing in magnetism: 'From Cambridge he was preferred Minister *in*, or rather *of*, Ipswich, having a care over, and a love from, all the Parishes in that populous place. Indeed he had a *magnifick vertue* (as if he had learned it from the Load-stone, in whose qualities he was so knowing) to attract people's affections.' Finally, stylistic and textual evidence from Ward's sermons confirm that he is the author of the book. He used magnetic metaphors in other texts, for instance, which indicates that magnetic theology was a favourite topic of his.

As Fuller notes, Samuel Ward of Ipswich was very much loved by his parishioners, who strongly supported him in difficult times. From 1616, he began to exert a national influence, by preaching in London and by meddling in national politics. In the 1620s, church officials brought charges of nonconformity against him, and under the archbishopric of William Laud in the 1630s, Ward was more and more in trouble. It gave some protection that Ward was famous for his sermons and was 'very potent in London', but in the end he had to answer accusations to the court of high commission and on 26 November 1635 he was ordered to be removed from office and suspended from all ministry.

It was probably during this time that the *Magnetica Magnalia* was written, and the dedication to Charles I attests to the difficult political situation. At the verge of the Civil War, Charles governed without parliament, in conflict with his subjects, only with the support of the Church of England and the magistracy. In contrast, Ward commends a *magnetic* kind of governing, because a magnetic affection effectuates more than slavish terror and fear. Ward realises that it rarely befalls Princes that all they do seems good in the eyes of his subjects. A magnetic governing might help, however, as the loadstone subdues to it all kinds of iron, not by force and arms, but by the help of love. If that happens, the iron will cover the loadstone in some kind of shell, Ward writes, protecting it like a guard, similar to the bees that protect their King. The magnet, signifying love, and the King of the bees, which is without a sting, are ‘hieroglyphs’ of the peaceful dominion of Christ, which a Christian King should imitate. He wishes his sovereign that God may grant ‘that your Majesties Empire may be to your enemies and adversaries adamantine, but magnetic to your subjects and friends.’

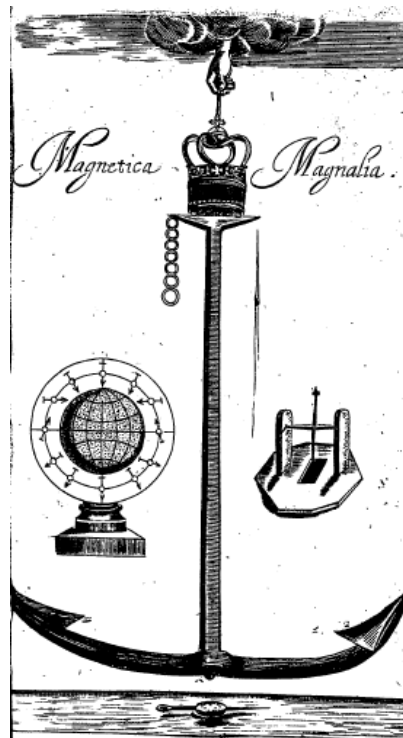


FIG 5: Frontispiece of S. Ward, *Magnetica Magnalia* (1637)

The *Magnetica Magnalia* abounds with magnetic metaphors. Ward (ch. 2) explains that Scripture has one sense but a threefold use: (1) the literal and historical use, (2) a tropological use, which serves for information of manners, and (3) an anagogical use to elevate the mind to spiritual and heavenly things. This is most clearly seen in the loadstone. The basic phenomena are widely known, but its uses to navigations and to understand the motions of the stars are less evident. The most excellent use, however, is the contemplation of this marvellous stone and its hidden properties, for stirring up the souls and for coming to a more manifest knowledge of Christ. According to Ward, God has engraved his visible foot-steps in the creation, and he has imprinted into the loadstone a lively representation of himself. Many make idols of gems by loving them too much, but this stone is able to teach us verity and virtue.

Ward uses the traditional magnetic similes that we have already seen, such as the directive and the attractive nature of loadstones and their power to communicate their virtue to iron. He greatly expands this repertoire, by adding numerous examples and experiments which can be given religious meanings, to more than forty. Each chapter explores a new experiment or property of the magnet. To give some examples: the loadstone neglects gold and silver, just like Christ who neglects the angels and draws man. The magnet only draws iron, and is indifferent to ornament. Both the loadstone and Christ demand cleanness in their object. The needles do not return to the pole without trembling, symbolizing the disquieted and trembling nature of the soul after sin. Goldsmiths clean iron dust from the table with loadstone in order to separate it from gold dust: 'So, the lord shall purge his floor: some shall be taken, some left' (ch. 29).

Ward often refers to his first hand experience and refers to experiments he performed. The 'elevating virtue', its 'love' and 'longing', was demonstrated in experiments: the iron needle flies upward to the loadstone, and it even swims to it if placed in water (ch. 5). He also argues that both the loadstone and Christ effectuate more by an instrument. His experiments showed that a small stone cannot lift much by itself, but if armed with iron, it will lift up huge weights. Similarly, God also redeems by his Son, and he uses his ministers to draw and convert (ch. 18). He also elaborates on the difference between the first motions and the later motions of iron and the soul. The first time, the iron is passive. It is not an agent itself but is drawn by the magnet. After a touch by the magnet, however, it runs speedily of its own accord. Something similar happens with the conversion to Christianity: at first, there is no love or even hate towards God, while after the conversion the soul actively seeks God (ch. 13).

In Chapter 16, Ward relates how interposed obstacles do not hinder the action of the loadstone, and he describes his own experimental experience with this phenomenon. 'Yea, now as I write these things, do see a Loadstone with these eyes of mine; which, under a table six inches thick, on the other side of a Brick-wall, doth speedily turne here and there the Needle of the Compasse upon a table, as also in a little vessell of water.' Ward continues from the visual witnessing of the experiment to the theological simile which it makes plausible and reinforces. He makes the transition from natural philosophy to theology by subtly shifting the rhetoric from eye-witnessing in experimental science to the eye of the mind in theology, yet at the same time keeping a close connection between both in that the one supports the other. 'When I see [these magnetic experiments] with mine eyes, and consider with my mind, I doe altogether cease to wonder, that no perils were so terrible, no kind of torment so cruell; no, not prisons, fire or wracks, which could separate the Saints and the faithfull from the love of Christ, or hinder them any way.'

Ward concludes chapter 16 by arguing that Augustine related the wonders of the loadstone, 'that by sense he might informe the understanding, and so by a visible miracle, make the Article of the resurrection to be credible'. Natural and experimental wonders can serve to undergird revealed theology. Just like Kircher, Ward explicitly stages visible magnetic miracles, and gives them a place in his magnetic theology. He writes (chapter 5): 'As I seriously considered these Magneticke miracles, and wonderfull works of God; that came to my mind, which is recorded in sacred Scripture,' and he relates biblical stories in which some kind of magnetic attraction seems to take place. A prophet could raise an axe that fell into the river. Elisha followed Elias, forsaking everything, attesting of a magnetic attraction. And Peter travelled over the sea to Christ. It was exactly this episode which Kircher staged with some magnetic trick, and which Ward explicitly

frames within the idea of a magnetic theology. He that cannot believe these histories, Ward writes, take notice of my experiments with the loadstone.

In the Preface, Ward had urged the reader to procure a good loadstone, and to use it when reading the book. The reader should replicate the experiments described, because one should be an eyewitness of these phenomena, in order for them to retain their grace, for the reader to gain belief, and for the demonstration to serve its moral and theological end. This is an empirically oriented theology, which stresses the role of eye witnessing, even if the bible denounces doubting Thomas. Ward defends his approach: 'They are blessed, I doe not deny, who having not seene, doe beleeve; yet notwithstanding these sensible helpes of Faith, are not altogether to be despised, which after their manner and measure, doe further and strengthen our Faith.' Our souls have become troubled and lumpish after the Fall, and we need sensible signs to help us.

In some passages, Ward lets the experiments confirm the truth of biblical statements, going far beyond mere analogies. He 'tooke experiment, and made triall in a strong stone', seeing that a horseshoe magnet, which has the two ends in one direction, has a much stronger attractive power than a bar magnet. He concluded that the saying of Salomon and common wisdom were confirmed (ch. 19). Sometimes, he is even so bold as to present a case as if the experiment decides the correct theological position. In the Pelagian controversy, theologians disputed about whether our faith and the good works we do are to be attributed to our free will, to God only, or to both in equal measures. Ward shifts his attention to the loadstone to solve this problem. He argues that many would unthinkingly praise the iron, but if one considers it with reason and understanding, all the praise for this power to draw shall be given to the loadstone. By the same reason, Ward argues, we will see that all praise for our faith and good works is due to God, 'wherefore this Gordian knot which otherwise seemes impossible to be loosed, is easily cut asunder'. Here, Samuel Ward suggests that a problem, almost impossible to untie with traditional theological means, can easily be cut if one takes another approach: magnetic theology. This magnetic theology is a curious breed between the new experimental philosophy and traditional theology, resulting in this case in something that one could call 'experimental theology'.

Ward is aware of his uncommon approach, and that some might think he is going too far. In chapter 4, he urges that his approach does not describe divine honour to a stone. Much less is it an equal comparison between a vile stone and the Lord. But he sees no impediment to liken the one to the other. In the preface, he considers the loadstone a 'lively emblem', in which a person is resembled to a thing, or in which something is placed before the eyes of the body in order to enlighten the mind and move the affections. In this way, it will more easily sticks in the memory. Ward argues that the prophets also used 'this kind of cunning, or artificial skill', and Jesus too made his teachings clear by symbolical demonstrations and acts, which made abstract truths visible. He writes: 'It is a wonder how Artificially and to the Life [the loadstone] expresseth and imitates Christ, who embraceth us poore meane men, with Brotherly love.'

Despite his assertions that he does not want to take his analogies too far, Ward often literally identifies Christ or God with a magnet. He uses terminology like 'this magnetic rock' (ch. 41) and 'Great Loadstone' (ch. 42) to denote Christ and God, even in a direct address. He even devotes a whole chapter (ch. 4) to how the diverse names of loadstone can usefully be applied to Christ. He is aware that some people might find this blasphemy and idolatry. But Ward remains confident: 'No man I thinke will be so Atheologicall or void of Divinity, as to make the Load-stone a Stone of offence' (ch. 4).

Jesuit Magnetic Theology

Two of the most important works in magnetic theology are by Jesuits. The first book is Athanasius Kircher's *Magnes sive de arte magnetica opus tripartitum* (1641). Here, a metaphysical-theological epilogue is appended to a voluminous work that treats of the theory of magnetism as well as of its applications in various disciplines, such as statics, mechanics, geography, navigation and astronomy. The other book is the *Nova Demonstratio Immobilitatis Terrae Petita Ex Virtute Magnetica* (1645) by Jacques Grandami (1588-1672), a French colleague and acquaintance of Kircher. In this book, Grandami sets out to counter Gilbert's attempt to use magnetic arguments in support of the Copernican hypothesis. Grandami accepts Gilbert's assertion that the earth is a big loadstone, but by means of experiments with spherical magnets in a tub of water, Grandami aims at demonstrating that the earth is immobile. The magnetism is needed to keep the earth stable and in line with the poles of the sky if it would be disturbed by tidal effects or storms.

Although Kircher wrote two other books on magnetism, the *Ars Magnesia* in 1631 and the *Magneticum Naturae Regnum* in 1667, the *Magnes* is his great work on magnetism, in which he sets out to bring together all knowledge about magnetism. The frontispiece of the *Magnes* shows the divine eagle, holding up the entire cosmic system and/or body of knowledge, with theology on top (FIG 6). The Judeo-Christian God was often associated with an eagle (in the Torah and the Bible, e.g. Deut. 32, 11) and he sometimes assumed the symbolism of Jupiter, His pagan equivalent. The chains symbolise the hidden magnetic interactions and equivalences between the disciplines, and connect them to the microcosm and the sideral, sublunar and archetypal worlds, in the middle of the frontispiece. The mentioned disciplines are: theology, philosophy, physics, poesis, rhetoric, cosmography, mechanics, perspectives, astronomy, music, geography, arithmetic, natural magic and medicine.

The connected rings refer to the magnetic chains in Plato's *Ion*, as well as to the traditional theme of the great chain of being. The banner states 'Omnia nodis arcanis connexa quiescunt' (all things linked by arcane knots are at rest), and suggests that the arcane magnetic forces hold everything in harmonious equilibrium according to the divine plan. The divine hands hold the chains which connect worldly and divine power (crown and imperial globe) symbolised by palm branches (faith) and swords (power). On top of these two chains, the inscription 'occult power' on a magnetic stone identifies the nature of the bond. In this way, Kircher also interprets the power of the Holy Roman Emperor as a 'magnetic' interaction, extending the magnetic metaphor to the political realm.



FIG 6: Frontispiece of Kircher's (1654) *Magnes*, composed by I.B. Rinalducus

The *Magnes* is subdivided into three parts: (1) on the nature and properties of the magnet, (2) on its applications in astronomy, natural magic, geography, navigation, etc., and (3) on its hidden workings throughout the world. This third part is divided into 10 sections, which are associated with the 10 branches of the Cabbalist Zephirotic tree. The ten sections of part three deal with the magnetism of the earth, the planets, the stars, the elements, the different parts of the earth, the tides, the plants, medicine, music, love and God. The body of the text, with its descriptions of mathematical and natural philosophical theories and instruments, is framed by a metaphysical or theological frontispiece and epilogue. This prominent placing at the beginning and end suggests that the whole work has a metaphysical and theological bearing.

The epilogue of the *Magnes* examines the source of all magnetic interaction, being the foundation of the 'magnetic chain' that connects everything. Everything emanates from the universal nature God, termed by Kircher 'the central magnet of all things' in the table of contents. These emanations are diffused by means of divine rays, from which the order of the created universe springs (represented in the 10 sections/*Zephiroth*). This 'central Magnet' is identified with the divine Trinity: its *attractive* power with the Father (divine Power); its *ordering* capacities with the Son (the Word or Wisdom); and its connective power with the Holy Spirit (divine Love). These powers are of course never really separable, constituting a tripartite unity.

Then the different stages of the emanation are explored in both directions. The ascending movement passes from the first form, through the intermediary elemental, mineral, vegetable, sensible, imaginary, rational, intellectual stages, to the divine Mind and Wisdom, both source and

pole of attraction of the whole movement. It is the divine Wisdom that exerts a magnetizing attraction for man's disquieted soul. In the epilogue of the *Magnes*, Christ's magnetic nature is made explicit: 'When I shall be lift up from the earth, I will draw all things unto myself [John 12,32]. There is indeed nobody who does not know how this is fulfilled. Because by means of these magnetic strings of the cross, attracted by these fetters, the whole world has followed him presently, and rulers, kings, emperors, leaving their sceptres behind, are attracted by this magnet, and disparaging the world, they clung to the Magnet Christ.'

Specific for Kircher is his strongly metaphysical approach. We see little of an 'experimental theology', although the magnetic theology is appended to a work on natural philosophy and mixed mathematics. Kircher's approach is inspired by Neo-Platonist metaphysics - itself already surprising for a Jesuit - and in particular by the metaphysics of light. In his work on light and optics, Kircher had already expounded a theological version of the traditional metaphysics of light. Magnetic theology is adapted to the 'sacrament' of the Trinity and God is identified with an infinite incorruptible light, from which everything comes into being. Kircher identifies the Father with the infinite eternal Light (the sun's natural and invisible fecundity), the Son with the emission of this light (the manifest light and its radiation and brilliance), and the Holy Spirit with the heat produced, which nourishes the whole universe with its warmth. The sun is the *visible symbol* of this invisible 'tripartite' Light. Kircher's attitude to magnetism is very similar, and his earlier interpretation of the metaphysics of light gave him the boldness to be very explicit in reading the Trinity in magnetism and in identifying God and Christ with the magnet.

The second Jesuit book is the *Nova Demonstratio* (1645) by Jacques Grandami. Grandami's account is interesting, but it was less influential than Kircher's. His theological reflections did not accompany a general tome on magnetism, but a polemical work that was part of the cosmological controversy. In the first parts of the book, the magnetic virtue of the earth is established a posteriori and a priori, after which he demonstrates the immobility of the earth experimentally. The argument is simple: (1) no magnetic body turns around its poles, (2) the earth is a magnetic body, thus (3) the earth does not move around its poles. In later sections, he elaborates the use of the magnet for geography and he explains some magnetic wonders. What interests me most here, however, is the last section, which treats of magnetic theology.

The first part of his analysis corresponds better to what we would expect of natural theology than the authors we have hitherto seen. Grandami argues that the magnet is excellent to outline the divine perfections, and in different sections he elucidates by means of the magnet the divine wisdom, goodness and power that is visible in the world. He praises the wisdom of God, for instance, by pointing out the role of magnetism in keeping the earth stable and immobile (supporting his main argument), the beneficent role of magnetism in the natural order, and the wisdom of distributing sympathies and antipathies in the world to the advantage of all. God's goodness is clear from the utility of the magnet, for instance, because reliable navigation generates commerce and makes it possible to convert pagans far away.

But Grandami does not confine himself to showing the order and design in nature. He also shows God's goodness allegorically by exploring how the magnetic needle is agitated and attracted by the magnet, but finally comes to rest when it approaches it, pointing out the similarity with our souls and the divine love. The divine goodness is best demonstrated in the comparison of the relation between God and the soul with the power of the magnet to communicate its virtue, without diminishing its power and without tiring, and without being hindered by obstacles (p.

150). In later sections, Grandami explains that the mystery of the incarnation of the Word of God can be seen in the magnet, that the Lord Christ is the true magnet of the soul, and that in the magnet the divine power can be perceived.

In 1691, Sor Juana Ines de la Cruz, a Mexican nun, made clear that the religious message of the Jesuits came across. For her, the essence of Kircher's *Magnes* was the Neo-Platonic emanations coming from God, establishing the link between the mundane and the transcendent: 'The Reverend Athanasius Kircher demonstrates this in his curious book *On the Magnet*. All things proceed from God, who is at once the center and circumference, whence all lines are begotten and where they have their end.' In a very baroque statement, she stresses the importance of the 'interdisciplinarity' practiced by Kircher, which is able to show the hidden harmonies in the world, represented by the magnetic chain of hidden knots: 'Far from interfering, these subjects help one another, shedding light and opening a path from one to the next, by way of divergences and hidden links - for they were set in place so as to form this universal chain by the wisdom of their great Author. Thus it appears that they correspond each one to another and are united with a wondrous bond and harmonious agreement. This is the very chain the ancients believed to come forth from the mouth of Jupiter, whence hung all things, each linked to the next.' This quotation is almost a verbal statement of the frontispiece of the *Magnes* (FIG 6), and expresses nicely the 'unity without unification' in Kircher's work.

Robert Boyle's Seraphic Magnetism

In his *Pseudodoxia Epidemica* (1646), the physician and versatile author Sir Thomas Browne (1605 - 1682) wrote favourably about Kircher's research into magnetism. Browne exposed many common myths about magnetism, for instance that garlic undoes the attractive power of the magnet. He is also sceptical about 'pretended magnetisms' that assume magnetic attractions, metaphorical or not, in all the creatures of Nature. Whether the sun acts magnetically, whether the tides are a magnetic effect, or whether plants have magnetic sympathies or antipathies is open to discussion, but he thinks Kircher might have struck a good balance in the third book of his *Magnes*.

Robert Fludd (1574 - 1637), physician, occultist and one of Browne's compatriots, had been less prudent in distributing magnetic virtues through the world. In his *Philosophia moysaica* (1638), published posthumously, discussions of magnetism are embedded in a complex mystical philosophy that took Christ as its corner-stone. Christian revelation could be developed in philosophy and could be confirmed by experiments and observations, in which magnets figured prominently. Magnetism was an emanation from the divine power, infused in all objects, causing the many sympathies and antipathies in the world. Although much of the *Philosophia moysaica* relates about God, Christ and magnetism, only a few passages can be counted as 'magnetic theology'.

Like many others, Fludd's account is focussed around the biblical passage about Christ drawing all things, but he elaborates this in the context of his philosophy and makes explicit that a magnetic virtue resides in the Spirit: 'Whereby it is evident, that the catholick Magneticall virtue, which resideth in God's eternall Spirit, shall at the last be exalted after, his glorious victory, and draw all things unto him, and all things shall be one in him, and he in them, and consequently all Discord and Hatred being banished and laid apart, Love, Peace, and Vnity, shall erect the

perpetuall and never-dying Trophy of this hallowed Victory. This universall Magnetick Virtue, is acknowledged by the Spirit of Christ in these words: *Si exaltatus fuero à terra, omnia traham ad meipsum*: If I shall be exalted from the earth, I will draw or attract all things unto my self.'

Notwithstanding Browne's criticism of seeing too many magnetic principles in nature, he is not opposed to magnetic theology. At least, it falls outside the purview of his criticism, because it implies a different form of reasoning. These uses of magnetism 'fall under no Rule, and are as boundless as mens inventions'. It is perfectly all right to glorify God by all kinds of means, but according to Browne, the best way is not to speculate, but to demonstrate God's greatness experimentally. 'And though honest minds do glorifie God hereby; yet do they most powerfully magnifie him, and are to be looked on with another eye, who demonstratively set forth its Magnalities; who not from postulated or precarious inferences, entreat a courteous assent; but from experiments and undeniable effects, enforce the wonder of its Maker.' It is not clear here if Browne means that natural philosophy, by means of experiments, is best suited to show God's greatness, or that Samuel Ward's 'experimental theology' and similar approaches where allegorical and natural philosophy are brought together would also meet with his approval. The start of the respective paragraph, 'Other Discourses there might be made of the Loadstone: as Moral, Mystical, Theological' suggests that he is talking specifically about magnetic theology and the different ways in which the natural world - and the magnet in particular - can be read.

In the 1640s, magnetic theology seems prominent and widely accepted in England. An important example of its scope is a youthful work by Robert Boyle (1627-1691). The *Motives and Incentives to the love of God*, also known as the *Seraphic Love*, finished by Boyle in August 1648 as a letter to a friend. The theme of the letter is to give consolation for being rejected by a woman, and urging his friend to direct his love to its proper object: God. Boyle had been working for a long time on this project. The letter was meant to be the last part of a never finished collection of fictional letters, the *Amorous Controversies*, detailing different stages and attributes of love. But a much expanded version of the letter itself was printed in 1659, more than ten years after being written, and just before his first famous works in natural philosophy. Boyle's first published book would turn out to be his most popular work for contemporaries.

The *Seraphic Love* is interesting for Boyle scholarship, as it marks the transition from Boyle's early interests in moral philosophy and theology towards his work in natural philosophy. Although in the published 1659 version, Boyle uses many comparisons from natural philosophy, in the original manuscript of the letter, only the loadstone is present. This might suggest that Boyle's early interests in natural philosophy might have been in magnetic philosophy. More plausibly, in the light of the foregoing discussion, it might be that there was a vogue connecting magnetic speculations with popular theology. A bold conjecture would be that the intriguing intermeshing of experimental philosophy and theology in 'magnetic theology' might have inspired Boyle to look more into natural philosophy as a way to praise God, and might have helped directing his vocation into a new direction. It is at least clear from one addition in the published version ('the Load-stone, a Minerall, in which I have made too many Experiments, not to be allow'd to make some Comparisons to it') that by 1659 Boyle had increased his expertise in magnetic experiments, and that he thought this relevant for his theological discourse.

In the *Seraphic Love*, Boyle argues that God adorns its creatures with hints and impressions, as well as with his loveliness. In the context of the discussion, Boyle implies that a beautiful lady should be taken as an adumbration of the divine beauty, and this beauty should lead us beyond its

physical manifestation to the beauty of God. But Boyle is also interested in the natural world, but we should see it as a sign of God, and we should find the divine aspect in it. Boyle likens it to children who admire the appearance and craftsmanship of a telescope, but the real astronomers look through it to the heavens. The loadstone is an example of such a natural object with divine significance, and it shows that God actively helps us to transcend the visible world and reach to the invisible. Boyle writes that God draws us with an immutable constancy like a magnet attracts the purest steel. This magnetism is proportionate to its object - most strong for angels, and least intense for apostate spirits - so that our soul would not break the connection with the body by too strong an attraction (62-64).

According to Boyle, the three properties of divine constancy are 'shadowed' in the operations of the magnet (103-104). First, it never forsakes its inclination to the steel. Second, if it is united to it, it retains constantly its attractive qualities. Third, it never touches the 'amorous steel' without leaving an impression on it, 'which ever after disposes it to a Conversion to that Magnetick Posture, which best fits it to receive fresh Influences.' And there is an additional resemblance between God and the magnet, in that the magnet attracts the iron not to its own advantage, but to impart its virtue to what it draws. In another passage, Boyle tries to elucidate a theological conundrum about the role of good works, related to the debate about predestination. Boyle explains that true faith leads to good works, but these works are not the cause, but the effects and signs of God's first love for us. This is exemplified by the iron needle that points towards the pole. This pointing out of a direction obviously is not the cause of anything. It is a sign of an original magnetization; it is the effect of being imbued with magnetic virtue (80-81).

In this early devotional tract by Robert Boyle, we can see how someone whose interests are drawn in two directions, to religion and to natural philosophy, ends up with propounding aspects of a magnetic theology. Magnets had a double function in this context. They could work as a visible sign of God's presence in the world and lead the faithful to the contemplation of God. They were also metaphor of how this drawing to God actually happened. Boyle's and other's reflections at the same time prove that the magnet was indeed a powerful object for religious contemplations, as at least the loadstone inspired all these authors to make a connection between this wonderful stone and the attributes of God.

Sir Mathew Hale and the appropriation of magnetic theology

Magnetic metaphors were popular in devotional works in the second half of the 17th century, but they were seldom so strongly elaborated as to constitute a systematic position or a 'theology'. Only those authors who had both a strong theological and a strong scientific interest initiated a more systematic approach to magnetic theology. Interestingly, magnetic metaphors were especially well liked by nonconformist, often ejected, ministers.

Thomas Watson (fl. 1646 - 1686) uses many of them in his exhortatory and devotional books. Some examples of magnetic expressions from his work between 1653 and 1663 are: 'A true saint is a loadstone that will be still drawing others to God', 'true obedience is like the needle, which points that way which the loadstone draws (as iron attracts a needle of a compass', 'a parent can only be a guide to show his child the way to heaven, the Spirit of God must be a loadstone to draw his heart into that way', 'By love we cleave to God, as the needle to the loadstone'. Similarly, another ejected minister and important figure in the puritan movement, Samuel Annesley (1620 –

1696), wrote: ‘The soul’s love to God may be a little shadowed forth, by the love of the iron to the loadstone,—Which ariseth from a hidden quality; though to say so, is but the hiding of our ignorance’, ‘Love is the needle in the compass, that is still trembling towards its divine loadstone.’ Also in the German lands, magnetic metaphors were popular, and Angelus Silesius (1624-1677), a Lutheran apostate turned catholic and famous baroque author, used them in his *Cherubinischer Wandersmann* (1657).

Although such metaphorical uses would persist into the eighteenth century, and beyond, the heydays of magnetic theology ended in 1695, with the last theological work exclusively devoted to the phenomenon of magnetism. The posthumously published *Magnetismus Magnus: or Metaphysical and divine contemplations on the magnet or loadstone* (1695) was written around 1672 by Sir Mathew Hale (1609–1676), chief justice of king’s bench and one of the greatest legal minds in the history of England. In his spare time, Hale occupied himself with many topics, including religion and natural philosophy, and he wrote prolifically about his interests, although he was not interested in publishing his writings. He was writing about natural philosophy already before the 1660s, and he was particularly interested in those phenomena that were difficult to explain by the mechanic philosophy. He defended a view inspired by the work of Van Helmont which involved active principles in the world, originating in a divine command. At the time when he was working at the *Magnetismus Magnus*, he was embroiled in a controversy with Robert Boyle and Henry More about fluid bodies and the ‘spring of the air’.

The *Magnetismus Magnus* was the last part of a trilogy about magnetism. The first two parts, the *Magnetismus magneticus* and the *Magnetical Observations* were never printed and discuss theory and experiments of magnetism in the Gilbertian tradition. The manuscripts display a close acquaintance with Gilbert’s work and a propensity to experiment. He gave a Helmontian twist to Gilbert’s ideas, however, talking about ‘the attractive ferment of the poles or of other parts of the magnet’ (*Magnetismus magneticus* 99v). In the *Magnetismus Magnus*, he argues that the true philosophy consists of using physical observations for moral and divine purposes. Natural philosophy is interesting, but one should not forget that the noblest part of the true philosophy is the glorification of God. Hale explicitly places himself in the tradition of magnetic theology, and cites as precedents Grandami, Kircher and Ward, who also brought magnetic philosophy into divine speculations. But Hale is very explicit in stating that he will pursue magnetic theology differently.

For Hale, the magnet is not particularly special. According to him, everything can teach us the same lesson about God, but he chooses to illustrate it by means of a study of the magnet. In his ‘magnetic theology’, he hardly uses the special properties of magnetism. His work is reminiscent of other, better known examples of natural theology of that time, such as Richard Baxter’s *The Reasons of the Christian Religion* (1667), Matthew Barker’s *Natural Theology* (1674) or John Ray’s *The Wisdom of God manifested in the creation* (1691). In different chapters, Hale gives conceptual proofs of the existence of God, and of His wisdom, power, goodness. One typical argument that could be applied to most natural objects is the following. The virtue of the magnet has to come from somewhere, and via a chain of possible intermediaries, we ultimately end with the original cause: God. God’s goodness can be derived from the fact that all things are adapted for the good of themselves, their species, and finally the universe. God’s wisdom is reflected in the beauty, order, accommodation of the creation, in which everything has its uses and ends.

Hale accuses his predecessors in magnetic theology of having gone too far. The use of symbols and similes is fine, but only within clear limits, like Christ himself did. His predecessors have taken analogies too far, and they have presented their physical metaphors as full and adequate explanations, even as proofs and demonstrations of theological truths. Hale argues, against Ward, Kircher and Grandami, that divine mysteries are not measured and governed by magnetic motions. In the second part of Hale's book, magnetism almost disappears from the stage, and the relevance of his discussion in a book on divine contemplations on the magnet can only be derived from the framework in which the discussion takes place, and from the subtle implicit use of words related to magnetism, such as attraction, conversion, aversion, position, verticity, direction, motion, rest. Ironically, in the publisher's preface to the printed version of the book, the only explicit analogy can be found, in which God is identified with the magnet. The publisher writes about Hale's early vocation that the author 'had received very early a special Touch of the Divine Magnet.' But Hale would probably not have been happy with this overextended use of analogy.

Conclusion

In this paper, I have shown that for a few decades in the 17th century, there flourished an intellectual tradition, not discussed in the standard historiography, which combined religion and the new philosophy in a special way. Traditional natural theology, represented by Richard Baxter, Gideon Harvey, but also John Wilkins and the later Robert Boyle, put a particular stress on reason. More radical natural theology, such as John Webster and William Dell (also Fludd might be placed in this category), propounded a spiritualistic natural theology, in which inspiration by the Holy Spirit was essential. In contrast, in the magnetic theology that I have discussed above, faith had a central place. Not reason, not inspiration, but faith, guided by the right analogies, would lead the faithful from the creatures to the contemplation of God. It is not an accident that the magnetic metaphors, especially for those working in a protestant context, found a place in devotional and exhortatory literature, where faith stood more central than reason. Furthermore, magnetism itself was used as a metaphor for the divine love and for the faith God inspired by means of his attractive virtue.

The exponents of magnetic theology all had strong interests in both natural philosophy and religion. Most of them were in religious orders, but some of them, like Robert Boyle and Matthew Hale, were something like prominent 'lay theologians'. For both of them, it applied that their religious works were the most popular, and were widely read far into the eighteenth century. All of these magnetic theologians were experimentalists of sorts. All of them had a lot of experience with experiments, and with magnetic experiments in particular, which can be deduced from their works and from accounts of witnesses. When they discussed magnetic theology, all of them also urged the readers to take a magnet and to experiment with it in order to verify their claims and in order to enhance and heighten their religious experience. Because their discourse was so much informed by natural philosophy, their work was of course 'rational', but (except for Hale) this was different from traditional natural theology. They did not focus on rational proofs for God's existence or wisdom, a priori or a posteriori. They wanted to bring people closer to God by an allegorical attitude to the natural world, and in the discussion of this world, they used mathematical, experimental en philosophical reasoning.

Despite the general similarities in outlook, there were huge differences between our magnetic theologians. Foremost, of course, is the confessional divide that runs through our selection of authors. First, it is necessary to point out the surprising fact that their attitude was so similar notwithstanding this obvious difference. Second, we should note that there were not just Catholics and Protestants involved, but the most extreme sides of this division: on the one hand the Jesuits, knights of the counterreformation, on the other hand, nonconformist puritans, who vigorously rejected the relatively moderate stance of the Church of England. There seemed to have been something in this magnetic theology that drew the more radical thinkers from both sides. (Note here that the early Boyle was much more open and daring in his writings than his later scientific and religious persona.)

What position does this magnetic theology represent from a theological point of view? Well, it verges to the radical side in that some forms of it endanger the distinction between natural and revealed (or supernatural) theology. This distinction indicates that there are limits to what can be known about God and religion by the study of nature and by the natural light of reason alone. Reading the book of nature can establish a number of important truths about God, such as his existence, his omnipotence, his goodness and wisdom. Everyone can follow the natural law that is imprinted in mankind and that leads man to God, for instance. Therefore, early modern theologians reasoned, the pagans who lived before the coming of Christ can be held responsible for their sins. On the other hand, certain aspects of Christianity can only be known because of the revelation in the bible, such as the work of redemption, the incarnation, the correct account of sin and the resurrection. The triune nature of God was normally also assumed to be part of revealed theology. Natural theology was 'deficient' in this respect, as Barker called it (p. 111).

The distinction between natural theology and revealed theology had not always been so clear, and in the time of the church fathers, it was not specified as such. But the distinction had been established in the course of the Middle Ages, and it had been challenged, most notably, by the fifteenth-century Spanish theologian Raymond Sebonde (fl.1434) in his *Theologia naturalis seu liber creaturarum* (1434-6). (Note that this was the first book with the term 'natural theology' in the title). In this book, Sebonde argued that studying and interpreting the book of nature was sufficient for salvation, and that it communicated something of God's triune nature. Sebonde wrote in the introduction of the book: 'by means of this [natural] knowledge man comes to know without difficulty whatever is contained in Holy Scripture, and whatever is narrated or commanded therein by means thereof comes to be known infallibly and with great assurance.' During his own lifetime, Sebonde's *Natural Theology* did not have a strong impact, but his position would provoke a lot of controversy later on, which proves that the distinction between natural theology and revealed theology hardened during the Renaissance. Interestingly, the book became widely read at the end of the sixteenth century, because Michel de Montaigne translated it in 1569 at the request of his father. Montaigne also defends Sebonde in one of his longest essays: the *Apologie de Raimond Sebonde*, and this started a Sebonde vogue in Renaissance France. Probably as a result of this fad and the ensuing controversy, the book was put on the *Index* in 1595.

Some of the authors in the magnetic theology tradition come close to Sebonde's 'extremism'. In his oeuvre, Kircher argued in different ways against the necessity of the revelation. On the one hand, *Prisca Theologia* knew theological truths, and some of the original knowledge from before the deluge was still preserved in the Egyptian hieroglyphs, as well as in arcane and hermetic

works. Pagan philosophers could have had divine knowledge and insights without the revelation of the bible. On the other hand, in his natural philosophical and mathematical work, he was able to deduce a lot of theological issues from phenomena such as magnetism or light, which normally were reserved for revealed theology. Especially the Trinity played an important role in his natural philosophy. (There was, of course, a long tradition of reading the vestiges and foot-prints of the Trinity in nature, which mitigates claims of radicalism.) In any case, Kircher's Neo-Platonism mixed with experimental philosophy and hermetic influences was, to say the least, unorthodox.

Samuel Ward's approach is also radical in the sense that he seems to allow experiments on natural objects to decide theological questions. The question becomes how far natural knowledge can be taken into the realm of the divine, and how seriously one has to take the proposed allegories. It is not always clear in Ward's case that the direction is always from natural knowledge to divine knowledge, and not the other way around. To give an example: Gilbert had argued that the magnet does not really 'attract' the iron, but they both move to each other, and he therefore termed this phenomenon 'coition'. Taken anagogically, this would represent the difference between a God who does all the work (attracting) and deserves all praise, and a situation in which the action is due to both creature and creator. This again related to vexed theological issues, such as particular doctrines of predestination, responsibility and grace. In this case, it is not so clear whether Ward opposes Gilbert because of his theological preferences that were relevant anagogically, or because his experimental evidence was decisive and guided his theological judgement. 'Experimental theology' might therefore be more of a rhetorical strategy than a genuine conviction that experimental knowledge decides theological conundrums.

Matthew Hale recognised that Kircher and Ward were verging into unorthodox realms and stated in response that one cannot take natural phenomena as adequate explanations or demonstrations in theology. Kircher, Ward and others who used magnetic metaphors only in passing, had also a radical tinge because they literally identified God with a loadstone, or they used the terms Magnet or Loadstone interchangeably with Christ or God. A lot depended on how strong one makes an analogy, how far one takes it, and how this analogy is interpreted by the reader. But these issues were crucial, as Hale pointed out, and he urges to stay 'within the due Bounds of Sobriety and Modesty'. He writes: 'it is easie and too usual for Men herein to transgress their Bounds, and then the Discourses of this Nature become dangerous [...] and possibly some that have gone before me in the bringing Divine Mysteries to the Rule and Model of Magnetical Observations, have gone to far herein.' (65)

These issues of analogy, allegory and so forth were also relevant for the discussion between Catholics and Protestants. Catholics, and Jesuits in particular, had few qualms about visualizing and embodying religious themes. Protestant 'literalism' also implied an aversion from icons, statues and other religious images. It is not so surprising to read that Kircher constructed little magnetic statues representing Christ drawing Peter to him over the water. But it is very particular to see that the puritan Ward uses the same example of Christ drawing Peter, after which he continues with a defence of sensible helps of faith (Ch. 5). The magnet can help our faith, he argues, but it is not an 'idol' such as many gems are, but this stone is able to teach us verity and virtue (Ch. 2). He reinforces his claim by arguing that the reformation came almost together with the invention of the properties of the loadstone, and he suggests that both can restore the light of the gospel (Ch. 3). Hale is less ambiguous. He writes that Catholics are the worst pretenders: they debase the nature of God and Christ, especially because of their image worship, and they replace

God with toys. (In the context of his magnetic discussions, this is reminiscent of Kircher's little toys, representing biblical episodes.) Hale is clearly against all kinds of practices that come close to idolatry, including such 'sensible helps of faith' as the loadstone, and one should take care not to use them in the wrong way. Distinctions between Protestants and Catholics were thus an issue for those defending magnetic theology, especially the typical divide relating to idolatry. But some of them could handle this issue with enough flexibility to make it serve their purposes. Especially Ward did not worry that he was verging towards idolatry, although he was concerned enough to argue against possible accusations.

Confessional differences were not the only relevant differences between the authors I have discussed. The works analysed are part of very different genres, and it is interesting to note that magnetic theology could be adopted in such diverse contexts. I have argued that the tradition of magnetic theology is not a 'genre' in itself, but it should be delineated by looking at the content. This was also recognised by Hale, when he defined this tradition as the 'bringing of magnetical philosophy into divine speculations.' But this magnetic theology was developed in very diverse genres. In the case of the Jesuit authors, an allegorical theological chapter was appended to a tract on mixed mathematics or astronomy. In the case of the Protestants Ward, Boyle and Hale, magnetic theology was part of a devotional literature, but the contexts in which they wrote differed. Ward's book was written in the last stage of his career, when he was expelled from his post in Ipswich. His earlier works consisted of sermons that were published by admirers and supporters. In the case of Boyle, the magnetic reflections were part of a literary exercise, a youthful work, an attempt to a collection of fictional letters about human and divine love. For Hale, it was the third part of three manuscripts of magnetism, in which he took reflections about the magnet into a religious realm. It seemed to be part of a private meditative exercise, and the manuscripts were shared with some friends to start discussions about natural philosophical and religious matters. Interestingly, these works, maybe with the exception of Ward, were not written with a direct intent of publishing, and were meant to be part of a personal intellectual and religious context.

The authors did share a strong sense for wonder, however. Ward's book was not for nothing entitled 'The Wonders of the Load-stone, or, the Load-Stone newly reduc't into a Divine and Morall Use'. This wonder is not the marvel for the praeternatural or for spirit phenomena that Mandelbrote ascribes to the Cambridge style of natural philosophy. It is a different wonder, evoked by natural things that are special but not extra-ordinary or praeter-natural. It is even more an allegorical wonderment. It is a reaction to a strongly felt sense that we can draw religious lessons from these special natural objects. This is not just the wonder for the divine design and wisdom, expounded by later natural theologians, but a more direct wonder that brings the faithful in direct contact with the divine - as iron clings to a magnet, as it were. It is the wonder of seeing Christ or God *in* the magnet. The 'style' of magnetic theology therefore falls in between the Oxford and Cambridge styles identified by Mandelbrote.

In Harrison's article, 'The Bible and the Emergence of Modern Science', it seems logical and even necessary that a new literal attitude to the bible implied a new approach to nature, opening the way for a mathematical and taxonomic method in natural philosophy, and ushering in a rationalized natural theology. Although this is what broadly happened in early modern England, I have shown that there were other possibilities open to the historical actors. I have argued that the tradition of magnetic theology represented a way to combine mixed mathematics and

experimental philosophy with allegorical approaches towards nature and the divine. In Athanasius Kircher, we see an allegorical attitude to the bible, to history and to nature, but this does not hinder him to do experimental philosophy and mathematics, and to be part of a vast scientific network. In Samuel Ward, we see a puritan preacher, working in a tradition of literalism, opposing all kinds of flourishes in devotional practice, and still propounding an allegorical view on nature combined with a Baconian rhetoric and an experimental approach.

Magnetic theology is a baroque moment in the relation between early modern 'science' and 'religion'. In combining an experimental and natural philosophical study of magnetism with an allegorical approach that refers to the divine, it creates a convergence between the mundane and the transcendent. It is a movement that brings together older styles of theological reasoning, based on analogies, and modern ways of doing natural philosophy. It is hardly a systematic theology, and it finds its place particularly in devotional literature, which stresses its emotional component and the central role of faith instead of reason. Its analogies bring a transcendent divine order in the world that harmonized with the transcendental order of mathematics and natural philosophy. The magnetic chain that connects all parts of the universe with hidden knots also represents a baroque unity without unification. The combination of these tensions turned out to be unstable, or at least, in the new intellectual context of the late 17th century, it was not a match anymore for the rationalized natural theology that focussed on the argument from design.

With Matthew Hale, this curious tradition gets integrated in the mainstream natural theology of the time, marking the transition from baroque to enlightenment. The magnet is a fascinating object, but it has no special theological meanings for Hale (it is relevant to propound his natural philosophy, however). Hale puts it as follows: 'I cannot say that Magnetical Speculations are my instructions or Guide in them [his considerations]; for they are of a higher Nature, and a nobler Use than Magnetical Appearances are fitted for. These are therefore but Occasions and Exercitations of my ensuing Thoughts and Meditations (64).' Where the loadstone could still be the occasion for Hale of a whole book of divine meditations, John Ray limited himself to summarising some surprising effects of magnetism and pointed out the usefulness of the magnet in navigation, spurring commerce and advancing geographical knowledge. In Ray's *The Wisdom of God manifested in the creation* (1691), the loadstone was worth not even two pages (69-70).