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*Natural Philosophy Epitomised: Books 8–11 of Gregor Reisch’s Philosophical Pearl (1503)* translated by Andrew Cunningham and Sachiko Kusukawa

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This translation of four books on natural philosophy from Gregor Reisch’s *Margarita philosophica* (1503), a 16th-century introduction to the liberal arts and philosophy, is an excellent start to filling a gap in medieval, renaissance and early modern history. Charles Schmitt posthumously sketched the parameters of this gap in a short appendix to the *Cambridge History of Renaissance Philosophy* entitled ‘The Rise of the Philosophical Textbook’ [1988], where he drew attention to a 16th-century textbook tradition linked to the late medieval manuals on natural philosophy which circulated among arts students in *studia* and universities across Europe.<sup>1</sup> Among these, that of Reisch was especially thorough and popular. It was edited and republished throughout the 16th century, including an edition by the Parisian mathematician Oronce Fine in 1532 (Basel) and an Italian translation in 1600 (Venice). Now it has been translated anew, albeit in part, by Andrew Cunningham and Sachiko Kusukawa, two leading scholars in the history of early modern medicine and science.

The 66 pages of introduction are themselves a contribution to the history of science, not least by marking areas of 15th-century culture that need attention. The first area is the history of the book, which has become something of a celebrated discipline lately, notably with the work of Adrian Johns [1998]. Despite this celebration and despite Elizabeth Eisenstein’s assertions [1979] of how scientific printed books established the technology of print as a force for cultural progress, the bulk of book history focuses on astronomy from

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<sup>1</sup> Another key entry in the bibliography, which includes essays on natural philosophy, is [Campi et al. 2008](#).

the second half of the 16th century; and the field still needs encouragement from the likes of Cunningham and Kusukawa to help understand earlier scientific books. A pertinent example is how Reisch's printer negotiated with artists illustrating the text, showing the elaborate cooperation required for such illustrations. Printed schoolbooks may also be a good place to consider the economics of knowledge. Their calculations hint at print as an equalizing factor: a copy of Reisch in 1517 cost a day's wage for a builder—the highest-paid professor of medicine at Basel that year made little more [xxxii].

Cunningham and Kusukawa attend to a second field requiring workers when they place the production of this text against the backdrop of two late medieval communities that pursued pedagogy through writing and copying books. The first community was monastic. Gregor Reisch was a member of the Carthusian order, which was devoted to a rule mingling eremetical and cenobitic practices and committed to communal silence. Nevertheless, Reisch's path to monasticism began in the university. The year 1496 marked an important transition for Reisch: he graduated from the University of Freiburg; he entered the Carthusian order; he completed *The Philosophical Pearl*; and he apparently began editing the book with Johann Amerbach, a process which involved ongoing cooperation with the Carthusians at Freiburg, where the actual printing eventually took place. The second community to which Cunningham and Kusukawa draw attention is the Modern Devout, the lay communities of the Brothers and Sisters of the Common Life who exercised their spiritual calling through copying books, founding and running schools, and preaching throughout the Lowlands and down the Rhine. While the authors present this movement as a general measure of late medieval religiosity, they might have made a tighter material connection to the circle of humanists attracted to Amerbach's print shop in Basel, many of whom had been schooled in Paris, Strassburg, and Schlettstadt (now Sélestat) under teachers who admired the Modern Devout's example.

The Amerbach print shop and the fact that Reisch wrote *The Philosophical Pearl* during his studies at the relatively young University of Freiburg (est. 1460) signal the book's representative power and its popularity. This can partly be explained by the book's association with one of the leading, best-connected presses in northern Europe, and partly by how it pioneered the visual arrangement

and literary standards that would become standards for textbooks in the next two decades—the humanist Jacob Wimpheling recommended Reisch alongside other famous renaissance textbook writers: Jacques Lefèvre d'Étaples and Philip Melanchthon, compared to whom Rudolph Agricola was 'oversubtle' [xi n6].

The book's importance can also be explained by how effectively it repackaged an older genre. Reisch's Latin certainly did not match the classical eloquence popular in Italy at the time, even though he did choose the pedagogically winsome conceit of a dialogue. Yet this was not new. Writers of catechetical manuals had done this for centuries, and Lefèvre—whose students were teaching in Alsace by 1495—was the first, to my knowledge, to have rendered Aristotle's natural philosophy palatable to young minds in this way. As Cunningham and Kusakawa observe, it is misleading to consider this an 'encyclopedia'. For one thing, the word was not technically coined until around 1531; Reisch himself uses the terms 'epitome' and 'compendium' to describe the book [ix–x], words which were used to refer to a specific genre of natural philosophical texts that was popular by the 15th century [lix–lxvi]. Cunningham and Kusakawa might have observed that older compendia, which stretched back to Robert Grosseteste's *Summa naturalium* and included pseudo-Albertus Magnus' influential *Philosophia pauperum*, had circulated in manuscript since the 13th century.<sup>2</sup> By the 15th century, these could resemble small collections of basic *quaestiones*, such as Paul of Venice's *Sumule naturalium* (Milan, 1476).

All this is significant because Reisch addressed more disciplines than natural philosophy—the first seven books introduce the seven liberal arts. The introduction to this translation gives a small hint of what the missing parts are like by interpreting the captivating woodcuts which introduce the linguistic arts of the trivium and the mathematical arts of the quadrivium [xxxii–xlvi]. But the back story of medieval compendia and epitomes (the words seem interchangeable) highlights the merits of Cunningham and Kusakawa's choice to select all and only the natural philosophical parts of the *Philosophical Pearl*: this is the section which shows closest continuity with the medieval tradition as a unified genre. In the medieval books, the subjects were

<sup>2</sup> On Grosseteste, see Lewis 2003. Grabmann 1918 is still the most thorough introduction to pseudo-Albertus' text that I have found.

predictable, comprising most of Aristotle's *libri naturales*. The compendium would open with an introduction to Aristotle's *Physica* and close with Aristotle's *De anima*. In between, the books would cover the material of *De meteorologia*, *De generatione*, and so on, sometimes even including some of the *parva naturalia*, notably Aristotle's psychological works on sleep, dreams, and memory. Sometimes the book would be organized around *quaestiones*, sometimes around Aristotle's books, sometimes simply by topic. All this reflected, of course, variations on how to progress through the arts curriculum, with more or less (often less) rigor.

Given the medieval origins of the genre, the decision to translate the natural philosophical section of Reisch has more than enough defense. But there is an even better reason for this translation. As Cunningham and Kusukawa point out, historians have often used the term 'natural philosophy' imprecisely, referring vaguely to anything we might like to include as 'natural knowledge' [xlvi–xlvii]. This translation offers an example of what a curious student around 1503 might discover was 'natural philosophy', properly speaking. Because this translation can expect a wide readership, it is important that those readers understand that polemics may be at stake here. In 1995, Cunningham wrote, with Roger French, a book-length argument for identifying natural philosophy as something completely other than modern natural science [French and Cunningham 1995]. In a sense, this argument is nothing new: Koyré [1968] claimed that a quantitative turn differentiated modern science from everything before; Kuhn set a new disjunction in place with sociological distinctions between many sorts of scientific paradigms; and more recent work pushes the notion of 'modern' natural science ever later into the 19th century.<sup>3</sup> As the definition becomes more precise, apparently, 'science' narrows to something that only we, or immediate ancestors, do. But Cunningham and French argued for another basis for the difference between natural philosophy and modern science: religion. Modern science is secular. Therefore, whatever sort of philosophy includes religious presuppositions, such as Roger Bacon's commitment to light as the basis for his optics, is not modern science. The thesis

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<sup>3</sup> The argument in [Daston and Galison 2007](#) has been widely acclaimed.

has the merits of simplicity and clarity, if the demerits of tautology (how could modern science exist before modernity?).<sup>4</sup>

Perhaps, this is too simple, aside from the implicit assumption of the pristine objectivity of modern science—is that what non-religious means? The reason given for this definition of natural philosophy is that to assume some sort of continuity between natural philosophy and modern science is to practice whiggish presentism. *Quelle horreur*. The unintended consequence is that ‘natural philosophy’ becomes something very strange—dare I say it, an Other. That is, describing natural philosophy as something only *they* did, also homogenizes it. In the effort to be sensitive to historical distance, this approach valorizes what *we* (or our colleagues in the science department) do as ‘real’ knowledge. (Presentism lurks everywhere!) This anti-presentism presentism also obscures distinctions that were real to medieval and early modern thinkers, particularly the difference between matters ‘secular’ and matters ‘religious.’ Cunningham and Kusakawa helpfully remind us that for a medieval, ‘secular’ did not mean ‘without God’. Nevertheless, from them one does not learn that the word also referred to scholars independent of the strictures of the theology faculty or an ecclesiastical rule. Natural philosophy was a ‘secular’ activity, even when done for ‘religious’ ends.

I fuss about this because the introduction tends to emphasize the theological coloring of Reisch’s natural philosophy to the point of obscuring the ‘natural’ part. It is certainly useful to learn about the influence of Augustine’s view of the Creator-creation distinction [lii–liv], his appropriation of *rationes seminales* [lvii–lviii], and the light-metaphysics of pseudo-Dionysius. It would also have been helpful to hear about the Aristotelian philosophy that such elements supported. As the translators point out, the epigraphs for books 8 and 9 depict the creation of Eve as narrated in *Genesis* 2. Natural philosophy in Reisch’s world is a matter of Christian thought as much as it is Aristotelian. Once we have realized this, however, we have not learned everything there is to know about natural philosophy. Thankfully, there is now an edition to examine!

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<sup>4</sup> The controversial nature of this discussion can be seen from [Grant 1999](#).

To hint at the topical richness in this epitome, I shall take up the remainder of this review in a swift overview of Reisch's natural philosophy, with a secondary aim of suggesting how Reisch's exposition acknowledges a difference between natural and theological thinking.

In books 8–11 of *The Philosophical Pearl*, Reisch follows the pattern of Aristotelian philosophy that characterized the medieval textbooks outlined above. Book 8 ('On the Principles of Natural Things') addresses 'the natures of things'. The questions and terms with which the book deals come out of Aristotle's *Physica*. The mode of proceeding is fundamentally Aristotelian, working from a definition of prime matter ('*per se*, not *per accidens*') through a discussion of the four causes to a discussion of motion, natural and violent. Reisch addresses questions typical of late medieval physics such as the continuum, mentioning more advanced texts such as Oresme's *On the Uniformity and Difformity of Forms* [Marg. 8.8, 9]. Cunningham and Kusukawa point out in the introduction how frequently Reisch turns to biblical and patristic authors, particularly Augustine. Indeed the answers and definitions to questions and terms that Aristotle broached are framed and inspired by consultation of these authorities.

Two examples will suffice. After defining matter, the Pupil desires a definition of privation. Although Aristotle had not dealt with privation in the *Physica*, he did suggest that it was impossible to define at *Metaphysica* 7.3. Reisch's Master decides to expand on the basis of Augustine's teaching in *Contra manichaeos* that privation is a lack, just as darkness is not a thing, but a lack of light [Marg. 8.10, 32]. A second example concerns unpredictable marvels, those things that seem beyond nature's normal course. To address such things, Aristotle listed chance and fortune as among the causes in the second book of the *Physica*. Again, the Pupil demands more, 'for the common folk attribute much causality to these.' The Master admits that 'it is not good' to overlook chance and fortune, 'over which errors damnably occur' [Marg. 8.16, 43]. He proceeds to cite Augustine and Boethius to the effect that such causes are 'inimical' to Christian faith; but that, in any case, these authors point out that people tend to use 'chance' and 'fortune' simply to explain events whose causes are not immediately apparent: a lucky person is one who happens to have a good disposition [Marg. 13.17–18, 46]. The Pupil observes that ultimately since God governs all things, nothing can actually

happen by chance. Again citing Augustine's *City of God*, the Master observes that monsters and miracles must either come about by natural causes (hidden to observers) or be caused directly by God, sometimes through human or angelic agents—which, he hastens to add, God does in fact have the power to do. Is this theological speculation natural philosophy? At this point, the student recalls the original purpose of the conversation and the master resolves to avoid 'all digression' [*Marg.* 8.19–20, 47–51]. Unlike some pedagogical dialogues, the student plays an active role in Reisch's text. It may be worth considering whether the student is responsible for digressions on topics affected by, but not central to, natural philosophy.

This kind of argumentation, proceeding through Aristotelian topics while elucidating and arguing with examples and counterexamples from Christian authors, continues in book 9 ('On the Origin of Natural Things'). One merit of encountering this topic in such compressed form is that one gains a sense of the explanatory power of the simple elemental theory found in Aristotle's *De generatione et corruptione*, which covers a wide arrange of phenomena within a neat progression through mixed composites: first, the sublunary phenomena explained in the *Meteora*, including rain, dew, frost, thunderstorms, tides, earthquakes; then, the mixed composites of earthly minerals, which applies to a digression on the transmutation of metals; next, vegetation; then again, animals, including eggs developing into chicks and fish; and, finally, 'crawling and walking things,' of which the most significant is humanity. Reisch is compendious in both senses, briskly covering all this in 50 pages and also rounding out blind spots in Aristotle from the breadth of the Latin Christian tradition—using the biblical authors Job and David to describe the six stages of human life that Isidore of Seville had tabulated (himself probably using Augustine, who in turn got them from Cicero) [*Marg.* 9.42, 156].

The endpoint of natural philosophy, at least for the medieval curriculum, was what moderns will recognize as psychology; and this is the topic of books 10–11 of *The Philosophical Pearl*. A large part of the study of the soul was unproblematically defined as natural philosophy; since even plants possess organizational principles of life, they are animate. But while this was enough to explain most of the living natural world, two authorities blurred the definition of the last topic of psychology, the human intellect. First, *Genesis* 1

indicated that humanity had been made in the image of God; and the Christian theological tradition defined the soul, and specifically the intellect, as the seat of the *imago dei*. Second, Aristotle had conceded that the human soul is at least partly divine and the Neoplatonic tradition had made much of this. Following the usual progression through the disciplines, Reisch devoted book 12 to *divina*—the topic of Aristotle’s *Metaphysica*, universal entities which, at least logically, are considered separately from matter. No wonder that Reisch’s contemporaries followed their predecessors in debating whether the study of the intellectual soul should be part of a higher discipline or properly belonged within natural philosophy [Bakker 2007]. Reisch’s own exposition follows the basic contours of Aristotle’s *De anima*, which is divided between exposition of the vegetable and sensible soul [*De anima* 2; Reisch, 10] and the intellectual soul [*De anima* 3; Reisch, *Marg.* 11].

As with the other books of *The Philosophical Pearl*, it is not possible to present more than a sketch of Reisch’s science of the soul. But the depth of the tradition in this area presented a couple of ‘hot button’ topics which provide perspective on Reisch’s positions. In Aristotle’s *De anima*, what connects the organic soul (the kind every living thing has) and the intellectual soul (possessed by higher animals, notably humans) is an analogy between sense and cognition. Like Aristotle, Reisch surveys the five senses, which are common to all animals. Also like Aristotle, and in tune with a chorus of medieval commentators, Reisch prioritizes the sense of sight [cf. *Marg.* 10.6, 173]. Vision is especially important for moving from the exterior senses to the kind of intellectual cognition that is distinctive to human beings: following the Albertist interpretation of Avicenna that seems to have dominated the later Middle Ages [Park 1980], the sense of sight provides not only a mere analogy for cognition but, more importantly, its basis. It works in this way. Sensations are taken up by the internal senses: they are organized by the common sense, stored in the memory, and recombined in the phantasy (imagination). Then, the intellect, acting in some way on the material provided by these internal senses, makes judgments, decisions, and turns to understanding or action. A question which divided some late medieval commentators was whether material images taken in by the senses, notably vision (*phantasmata*), were the very stuff with which the intellect did its business of thinking. Or did the intellect act

upon the images presented by the imagination and come up with its own sort of rarified, spiritual images (*species intelligibilis*)? Reisch's answer was conciliatory. He claimed that the phantasma is material but that the active intellect strips away non-essential material aspects from the sensible species [*Marg.* 10.3, 224].

But by this point, once one has left behind the last bit of materiality at the beginning of book 11, we can ask Reisch whether he has reached a border, if he is facing outward from the field of natural philosophy to make inroads into theology. His sources suggest that this is his goal. No longer does Reisch refer to Aristotle's *De anima* but increasingly to Augustine. This is not sleight of hand either, an effort to divinize what should properly be naturalized. The study of the soul ends in a study of epistemology: knowledge of the soul provides knowledge of cognition, the basis of how humans know. The first part of psychology is devoted to knowledge gained through the senses. But once one turns to the soul—the intellectual soul—one is paradoxically required to cognize cognizing. As the Pupil realizes, 'if we are unable to derive knowledge of corporeal and incorporeal substances by other means [than the soul], then our knowledge is diminished' [*Marg.* 9.6, 229]. How much less can one search out the knowledge of heaven? Reisch seems to suppose that Aristotle had an inkling of how to get out of the paradox: greatest certainty is about causes in themselves, farthest away from accidents connected to the senses, which only speak to how things happen 'for the most part'. The challenge is then to get beyond this to what Nicholas of Cusa, 'the very wise investigator of secrets', described in his *De docta ignorantia* [*Marg.* 9.6, 229–230]. By invoking Cusa, I would argue that Reisch is indicating the end of natural philosophy; he realizes that, in these farthest reaches of the human soul and its astonishing ability to reason, we have stretched the limit of natural philosophy and have entered the field of theology—or at least metaphysics.

Two lessons are to be learned from this exposition of Reisch. The first is that although Reisch enriches his introduction to natural philosophy with speculations and definitions from scripture, the Church Fathers, and Christian philosophers, he has a sense for the distinction between natural and nonnatural causes; moreover, the proper domain of natural philosophy is to understand—fully, with every available tool—these natural causes to their breaking point. The second lesson follows, and Reisch's Aristotelian language will help get to

the point. Even though theological language is *de facto* inseparable from natural philosophy, this does not mean that theology belongs to the *essence* of natural philosophy.<sup>5</sup> (Remember that, for Aristotle, disciplines like mathematics or psychology were about entities which were not *de facto* inseparable from matter, but nevertheless could be pursued as distinct disciplines in their own principled way.) In *Before Science*, French and Cunningham [1995, 242–274] made the strong claim that ‘the true nature of natural philosophy’ was ‘religio-political’ and not an ‘objective “*scientific*” tradition of looking at nature’. Here the argument is somewhat attenuated:

The fact that natural philosophy dealt with “the *created* world” [*sic*] more than anything else distinguishes it from modern natural science, for in the eyes of medieval philosophers the Creator was the Christian God, so natural philosophy dealt with God’s handiwork. [xlviiii]

It is indeed typical of medieval philosophers, perhaps especially in compendia, that they were eager to credit authorship of the book of nature, which gives their interpretation of that book a thoroughly distinctive texture. But for Reisch and other medievals, the essence of natural philosophy—its ‘true nature’—was study of the book of nature in terms of natural causes, even if that study was motivated by how studying the book would result in praise of the author.

In the large, this interpretation is, like so many scholarly debates, a matter of emphasis, and one which Reisch’s translators have shown their own eminent ability to nuance. My worry is that emphasizing natural philosophy’s theological orientation as its sole distinctive characteristic will obscure the *differentiae* within medieval and renaissance natural philosophy, as well as under-represent the extent to which modern science also depends on socio-political motivations and assumptions. Faced with Reisch’s exotic array of quotations and arguments taken from traditional Christian sources, a reader of this translation might be led to dismiss medieval natural philosophy as

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<sup>5</sup> I use this example heuristically, without committing to a form of essentialism regarding historical objects, in order to highlight that things which are never actually found separate *in situ*, can yet be distinct in principle. In a response to Peter Dear’s criticism [2001a] of their book, Cunningham [2001] accepted that he might be using essentialist language to define natural philosophy—and replied that this was no problem. See Dear 2001b for a further reply.

theology by another name. A subtler reading of Reisch himself will show that judgment misleading.

My worry should be relativized, since Reisch also agreed that substances are known by their accidents, a conundrum that the Aristotelian tradition never fully resolved. If the theological setting of natural philosophy is accidental to its essence, then it is crucial that we become well acquainted with this set of accidents in order to learn how to recognize medieval natural philosophy. In this enterprise, Cunningham's and Kusukawa's good translation and excellent introduction of this renaissance classic are a gift to scholarship of late medieval and early modern natural philosophy and should be prized by teachers of the period. One of the exciting things about this volume is that it allows precisely this sort of debate about what exactly natural philosophy encompasses. With access to this translation and its excellent bibliography on Gregor Reisch, scholars can rapidly consider Reisch as a representative of natural philosophy—and recommend Reisch to non-Latinate colleagues interested in a characteristic primer on medieval and early modern natural philosophy. The translation is solid. The translators represent Reisch in clear and literal translation, opting for faithfulness over fluidity (Reisch's Latin is fluent, but often not fluid). Many Latin words which are key technical terms in Reisch's vocabulary are included in brackets, *latine*. Although a facing original is always the most desirable, the translators note at least one online digitized edition, so a reader has quick access to the original—also helpful for considering the original presentation of the text. To Ashgate's credit, many original woodcuts are reproduced in this translation, which is accompanied by a thorough index and a collection of topical outlines of the text. At least one heading has been added silently (i.e., 'Peroration' on page 15). The subdivision 'tractatus' is translated as 'tract' in book 1, while in book 10 it is translated as 'treatise' [157ff]; so far as I can tell, translation inconsistencies are minor.

This text is a boon to teachers of medieval and renaissance philosophy and history of science, though the book's price will mean that assignment will be at the mercy of Ashgate's policy for granting permission to photocopy. Despite our realization of how deeply Aristotle was implicit in intellectual life from the 12th through the 17th centuries, that fact makes it far too tempting to provide surveys of medieval philosophy from the perspective of reading Aristotle

himself. That is an excellent start, of course—and anyone who has taught this will be aware of the pedagogical challenge that it is to turn high-school classical physicists into Aristotelians. (What are the distinctions between first principles, and a formal and final cause?) But the challenge only grows with teaching medieval Aristotelianism. The Latin Aristotle was by no means our Aristotle, and not only because of the distinctive lenses offered by medieval translators mostly working from Neoplatonized Arabic editions. The concepts that Aristotle offered gained meaning and nuance from what Augustine had said, along with a host of commentators. This conglomeration of antique wisdom is what allowed natural philosophy such elasticity, and which gives medieval and renaissance Aristotelianism such a different texture from Aristotle himself. While experts in the field will not be surprised by the eclectic use of authority on every possible topic, this texture is hard to convey to students without strong examples. Gregor Reisch wrote this dialogue using simple-to-follow language in order to introduce students to the basics of science in his day, and it may prove to be a superb introduction for today's history of science classroom as well.

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