Idiotae, mathematics, and artisans

Idiotae, Mathematics, and Artisans: The Untutored Mind and the Discovery of Nature in the Fabrist Circle

Richard J. Oosterhoff

In his first work, the *Dialecticae Institutiones* of 1543, Peter Ramus urged those who wanted to learn the truth about the world not to approach scholars, but vineyard workers.[1] 'From their minds, as from a mirror, an image of nature will be reflected', he promised.[2] Ramus' dialectic reflected the humanist tradition of Lorenzo Valla and Rudolph Agricola, dissatisfied with the jargon of scholastic logic, searching for a 'common sense' way of arguing and speaking that could serve real audiences.[3] In this tradition, 'invention' was not only a means of finding material that one could then arrange and deliver for a rhetorical occasion, as Cicero and Quintilian prescribed.[4] It was also a way of knowing the natural world; to discover the right words was to uncover the order of things.

One of Ramus' most penetrating modern readers, Walter Ong, was troubled by this dependence on naïve knowledge. The problem was *how* invention worked: topics, places, or arguments seemed to come from nowhere. Why do *these* topics properly carve up the world? In Ong's view, Ramus did not account for how words tie onto the world, leaving the process of invention mysterious.[5] Medieval logic textbooks, such as Peter of Spain's *Summulae*, had

1 This paper was written during a fellowship at the Notre Dame Institute for Advanced Study, 2012-2013. I am grateful to Robert Goulding and James Hirstein for their thoughtful comments and corrections.

2 P. Ramus, *Dialecticae institutiones, ad celeberrimam, et illustrissimam Lutetiae Parisiorum Academiam* (Paris, 1543), 6v. On this passage and Ramus' belief that mathematics mirrored the real structure of nature see R. Goulding, *Defending Hypatia: Ramus, Savile, and the Renaissance Rediscovery of Mathematical History* (New York: Springer, 2010), 21–24.

3 L. Nauta, *In Defense of Common Sense: Lorenzo Valla's Humanist Critique of Scholastic Philosophy* (Cambridge, MA: Harvard University Press, 2009).

4 Cicero, *Rhetorica ad herennium*, 1.2.3; Quintilian, *Institutiones oratoriae*, 3.3.1. This view of 'invention' was standard through the middle ages: M. Carruthers, *The Craft of Thought: Meditation, Rhetoric, and the Making of Images, 400-1200* (Cambridge: Cambridge University Press, 1998), 10–14.

5 W. J. Ong, *Ramus, Method, and the Decay of Dialogue: From the Art of Discourse to the Art of Reason*

offered rules for finding places along with a theory of predication addressing how words tie onto things. Since Ong, some have blamed Rudolph Agricola's *De inventione dialectica* for imprecision about words, and for importing rhetorical priorities into dialectic. The standard narrative moves from Valla and Agricola to Johann Sturm, Philip Melanchthon and Ramus, university pioneers of method who brought rhetorical invention to the forefront of a new humanist dialectic.[6] Walter Ong, Paolo Rossi, and Cesare Vasoli have all identified a basic shift in the use of invention during this period, from a rhetorical technique for producing conviction, to a mechanism for sifting the truth of things.[7]

Here I focus on a key stage in this shift, in the circle of Jacques Lefèvre d'Étaples, an influential professor of arts at the University of Paris. Ong noticed that Lefèvre's new printed textbooks extended the medieval diagrams and visual aids for logic, a transition toward the increased quantification and visualization of logic.[8] Picking up on the same visual framework, Paolo Rossi noted Lefèvre's interest in Ramon Lull to supply mnemotechnical support to logic.[9] Vasoli deepened this point, observing that in his logic books Lefèvre followed Lull and Nicholas of Cusa when he used images to extend the medieval tradition of visualizing logic in diagrams and tables.[10] Neither Ong, Rossi, or Vasoli, however, discussed what the 'mystical' tradition that interested Lefèvre's circle had to do with their philosophical interests.

(Cambridge, MA: Harvard University Press, 1958), 182–183. On Ramus' failure to provide an experimental basis for his method, see 268-269.

6 For an overview of the literature, see P. Olmos, 'Sciences, Negotia and Domestic Conversations: Pedro Simón Abril's Conception of Logic in Its Renaissance Context', *Intellectual History Review* 22, no. 4 (2012): 481-497 (481–485).

7 K. Meerhoff, 'Agricola et Ramus. Dialectique et rhétorique', in *Rodolphus Agricola Phrisius 1444-1485*, ed. Fokke Akkerman and A.J. Vanderjagt, Brill's studies in intellectual history, 6 (Leiden-New York: Brill, 1988), 273. See also the important paper of T. Heath, 'Logical Grammar, Grammatical Logic, and Humanism in Three German Universities', *Studies in the Renaissance* 18 (1971): 9–64.

8 Ong, *Ramus, Method*, 74–79.

9 P. Rossi, *Logic and the Art of Memory: The Quest for a Universal Language*, trans. Stephen Clucas (1983; London: Continuum, 2000), 29, 38.

10 C. Vasoli, *La dialettica e la retorica dell'Umanesimo: 'Invenzione' e 'Metodo' nella cultura del XV e XVI secolo* (Milano: Feltrinelli, 1968), 187, 201–203.

In this paper I focus on Lefèvre's circle through the library of Beatus Rhenanus (1485-1547), and especially the books he acquired during his studies with Lefèvre between 1503 and 1507. From marginalia in these books, I delineate the theme of the 'untutored mind' as the source of invention from nature. Beatus himself, a butcher's son, never turned to artisans for 'real' knowledge; instead, he amassed a reputation for his erudition in Latin letters. Nevertheless, his library and annotations highlight sources of this theme in the late medieval mystical tradition, as I show in the first section. I then turn to invention in Beatus' logical education, focusing on how his teachers explained naïve knowledge and offered mathematics as a key example of such knowledge. Finally, I sketch how Beatus' teachers contributed to the growing common culture of artisans and scholars in Paris – that is, the context of Ramus and his esteem for unlearned knowledge.

1. *Idiotae* in Paris

The majority of the books that Beatus Rhenanus bought while studying with Lefèvre, Josse Clichtove, and Charles de Bovelles still fill the *Bibliothèque humaniste de Sélestat*, the Alsatian town where Beatus was born and died. These books address the whole cycle of the liberal arts and philosophy. Moreover, their marginalia witness to what was read at Cardinal Lemoine during the height of Lefèvre's influence on university education. Beatus bought all the greatest hits of Paris humanism. His library represents the circle of Robert Gaguin in the 1470s, the debates over Greek and Latin eloquence between Girolamo Balbi and Guillaume de Tardif in the 1480s, and the Europe-wide bestsellers of Marsilio Ficino, Giovanni Pico della Mirandola, and Desiderius Erasmus. After gaining the MA in 1507, Beatus studied Greek with Johannes Cuno at Basel, working in Johann Froben's print shop. Later he became Froben's philological consultant, emending manuscripts of Pliny, the Church Fathers, and Erasmus himself. But Beatus began his career at the heart of northern humanism in the

Collège du Cardinal Lemoine, where he went to study with Lefèvre, already famous for new printed university textbooks, chiefly on Aristotle and mathematics. Lefèvre had been taken by the growing passion for restored Latin and Greek letters of Florence, but he especially hoped to use the early sources of the Church Fathers and the medieval Christian mystics to revitalize university culture.[11] He advanced this program in printed textbooks as well as through training a generation of masters at Cardinal Lemoine, such as Josse Clichtove and Charles de Bovelles.12

This program of university reform can be excavated from three late medieval authors important at Beatus' collège, who shared the idea that things, not texts, should be the source for invention. The first was Ramon Lull, a thirteenth-century Majorcan mystic.[13] Beatus made his first appearance as author in Lefèvre's *editio princeps* of Lull's *Contemplationes* and *Blaquerna* (1505), with an epigram on the title page. In this poem, Beatus explained Lull's life as a conversion from illiteracy to grammar; he had lived for thirty years, 'pompous, mad, lazy, and stagnant', without the benefit of any Latin. When he had finally repaid 'the poisonous crimes of life gone by', he sought out the basics of the Latin language at Paris, grazed on grammar, and left 'innumerable books infused with the art of naked simplicity'.[14]

---

11 For Paris at this time, see A. Renaudet, *Préréforme et humanisme à Paris pendant les premières guerres d'Italie, 1494-1517*, 2nd ed. ([1916] Paris: Édouard Champion, 1953). Beatus' studies in Paris are described by E. Faye, 'Beatus Rhenanus lecteur et étudiant de Charles de Bovelles', *Annuaire des Amis de la Bibliothèque Humanist de Sélestat* (1995): 119–138. The relation of Lefèvre's program to monastic reform is explored in Jean-Marie Legall, Les moines au temps de Lefèvre d'Etaples et Guillaume Briçonnet à Saint-Germain-des-Prés', in *Jacques Lefèvre d'Etaples (1450?-1536)* (Paris: Honoré Champion Éditeur, 1995), 125-140.

12 On Clichtove, see J.-P. Massaut, *Josse Clichtove, l'humanisme et la réforme du clergé*, 2 vols. (Paris: Les Belles Lettres, 1968); J. K. Farge, *Biographical Register of Paris Doctors of Theology, 1500-1536* (Toronto: Pontifical Institute of Mediaeval Studies, 1980), no. 101. For Bovelles, see the biographical material in J.-C. Margolin, ed., *Lettres et poèmes de Charles de Bovelles* (Paris: Champion, 2002); specifically on his role as Beatus' teacher, see E. Faye, "Beatus Rhenanus lecteur et étudiant de Charles de Bovelles," *Annuaire des Amis de la Bibliothèque Humanist de Sélestat* (1995): 119–138.

13 J. M. Victor, 'The Revival of Lullism at Paris, 1499-1516', *Renaissance Quarterly* 28, no. 4 (1975): 504–534; K. Emery, 'Mysticism and the Coincidence of Opposites in Sixteenth- and Seventeenth-Century France', *Journal for the History of Ideas* 45, no. 1 (1984): 3–23.

14 Edited in E.F. Rice, ed. *The Prefatory Epistles of Jacques Lefèvre d'Étaples and Related Texts* (New York:

Even in his Latin works, Ramon Lull assumed the persona of an *idiota*, someone who lacked Latin grammar.[15] Lefèvre and his circle were attracted to Lull precisely by the simplicity of his language. Lefèvre claimed that when he had first encountered the *Contemplationes* in 1491 he was 'seized by desire to read it' (*rapior ilico libri legendi desiderio*). Moved to tears, he nearly entered a monastery.[16] Before publishing the *Contemplationes*, however, Lefèvre published a series of dialogues by Lull, in which Lull presented himself as an outsider to academic culture. In the *Phantasticus*, Lull recounted a debate between himself as a hermit and a *clericus* on the road to the Council of Vienna. He and the learned man discussed which of them had chosen a lifestyle more detached from reality—which of them was the true dreamer or *phantasticus*. Not surprisingly, they concluded that the simple hermit sees the true order of things because he sees them in their right relation to the divine. In the introduction to that edition, Lefèvre defended Lull's humble status and awkward Latin: 'let not anyone be held back because this man was an *idiota* and illiterate, an ordinary inhabitant of the wild waste and vast solitude'. Rather, he had a 'certain infusion from above, by which he far excels the wise men of our age'.[17] Lefèvre's defense of Lull's artless Latin drew on the Apostle Paul, who warned about those who teach false knowledge in order to tickle prurient ears, constructing fables in their desire to appear

---

Columbia University Press, 1972) [hereafter cited as PE], ep. 45. "En pius egreditur latum Raemundus in orbem … Iam bene tricenos Raemundus vixerat annos | Pomposus, vecors, desidiosus, iners … Noxia praeteritae redimens ubi crimina vitae … Grammaticen libans primum, infus arte reliquit | innumeros nuda simplicitate libros." Beatus' copy is Bibliothèque humaniste de Sélestat [hereafter BHS] K 1134a.

15 The common translation of *idiota* as 'layman' is inaccurate; the term *laicus* was a perfectly good Latin word with that meaning. Moreover, the notion of 'layman' presumes an opposition between *clericus* and *idiota*; a common grammar commentary by Synthen (and Hegius) of Deventer, which Beatus owned, clarified that a *clericus* might not know grammar, and so be an *idiota*, while there were many examples of *laici* who commanded excellent Latin. J. Synthen, *Dicta Sinthis super prima parte Alexandri* (Strassburg: Martin Schott, 1487), sig. a2r. Lull's lay character is examined by M.D. Johnston, *The Evangelical Rhetoric of Ramon Llull: Lay Learning and Piety in the Christian West Around 1300* (New York: Oxford University Press, 1996).

16 PE, ep. 45, 141.

17 PE, ep. 22, 77. 'Neque vos quicquam deterreat quod vir ille idiota fuerit et illiteratus, horridae rupis et vastae solitudinis assiduus accola; nam et creditur quadam superna infusione dignatus, qua sapientes huius saeculi longe pracelleret'.

sophisticated.[18]

Lull was attractive to Lefèvre and students like Beatus because with his critique of unhealthy university culture he offered its solution: a combinatory 'art' that promised universal truth by means of necessary reasons.[19] In the *Contemplationes*, he applied that art to the discovery or 'invention' of God's excellent characteristics among his creatures, proceeding from God's own character and his knowledge of all things in quantity and number.[20] *De nichilo*, God created the firmament, elements, vegetation, sensitive animals, and humans with imaginative, rational, and intellectual powers. Lull's analysis of man's nature carries the reader to reflections on Christ's incarnation, death, and future glory.

In Paris, alongside Lull, Beatus read the natural theology of Ramond de Sebonde, a medical professor at Montpellier during the 1430s who shared Lull's commitment to necessary arguments based on naïve experience of nature.[21] In fact, Beatus bound Sebonde's book, originally titled 'book of nature or creatures,' with his copy of Lull's *Contemplationes*. In the prologue Sebonde proclaimed that his science would 'teach any man to know all necessary truth really, infallibly, easily, and effortlessly'.[22] This mode of reading the book of nature supplied immediate knowledge in part because it required no complicated education:

---

18 Ibid., where Lefèvre quotes 2 Tim. 4:3-4.

19 On the Lullian art, see F. A. Yates, 'The Art of Ramon Lull: An Approach to It Through Lull's Theory of the Elements', Journal of the Warburg and Courtauld Institutes 17, no. 1/2 (1954): 115–173; C. H. Lohr, 'Mathematics and the Divine: Ramon Lull', in *Mathematics and the Divine: A Historical Study*, ed. T. Koetsier and L. Bergmans (Amsterdam/Boston: Elsevier, 2005), 211–229; Rossi, *Logic and the Art of Memory*, passim.

20 R. Llull, *Contenta. Primum volumen Contemplationum Remundi duos libros continens. Libellus Blaquerne de amico et amato*, ed. Jacques Lefèvre d'Étaples (Paris: Guy Marchant for Jean Petit, 1505). For the repeated use of 'inventio' as the basic activity of the art, see fol. 2v. The section on 'qualiter deus scit quantitatem et numerum omnium rerum' is at fols. 17v-18v. See also Rossi, *Logic and the Art of Memory*, 46.

21 R. Sabundus, *Theologia naturalis sive liber creaturarum* (Nuremberg: Anton Koberger, 1502). 'Liber naturae, sive creaturarum' was the original title; *theologia naturalis* appears to be the addition of the first printer.

22 Sabundus, *Theologia Naturalis; Sive, Liber Creaturarum*, ed. Friedrich Stegmüller (Stuttgart-Bad: Verlag, 1966), 27*. 'ista scientia docet omnem hominem cognoscere realiter, infallibiter, sine difficultate et labore omnem veritatem necessariam..'.

'this science needs no other science or art, for it does not presuppose grammar, logic, or any other of the seven liberal arts, nor physics, metaphysics: because [this science] is first and necessary to man'.[23] The immediate power of the art lay in 'true experience' (*vera experientia*), and in the next 330 chapters Sebonde categorized nature as Lull had done. Experience not only accounted for the range of creatures, but taught that they all 'serve man and exist for his good'[24] – critics of natural theology from Montaigne to Voltaire would find this inference unconvincing. There are not enough notes in the book to isolate Beatus' view on the issue, but since Lull's name appears regularly in Beatus' notes, it is clear that Beatus and his Parisian colleagues were fascinated by the general program found in Sebond's *Theologia naturalis*, of reading the book of nature to gain naïve wisdom.

In the Fabrist circle, the third authority of naïve knowing was Nicholas of Cusa, whose name emerges in Rhenanus' class notes as the model *sapiens*, alongside Pythagoras himself. In 1501 Lefèvre had already set Cusanus alongside Pythagoras and Dionysius as teachers of 'intellectual' philosophy, who used reasoning about opposites to move beyond the mere 'sensible' and 'rational' philosophy of Aristotle.[25] Cusanus fit comfortably alongside Lull and Raymond de Sebonde; already in 1428 Cusanus had been in Paris to copy Lull's manuscripts from the same Parisian monasteries that Lefèvre frequented.[26] As with Lull, Beatus had some role in shaping the sixteenth-century reception of Cusanus, for in his edition of the Cusan *Opera omnia* (1514), Lefèvre thanked Beatus along with luminaries such as

23 Ibid., 30*–31*. 'Ista scientia nulla alia indiget scientia nec aliqua arte. Non enim praesupponit grammaticam nec logicam nec aliquam de septem liberalibus artibus, nec physicam, nec metaphysicam, quia ista est prima, et est homini necessaria'. As Emmanuel Faye points out, Sebonde goes on to say that the liber naturae is open to all sorts of people, 'est communis clericis et laecis, et omni conditioni hominum'.

24 Ibid., Titulus 97, 122. 'Hic declaratur experimentaliter, quod omnia serviunt homini, et sunt ad bonum hominis'. Famously, Montaigne responded to Lull with something akin to fideism; Voltaire lampooned the Lullian tradition of natural theology (*vis-à-vis* Leibniz) in the figure of Pangloss, in his *Candide*.

25 C. de Bovelles, *In artem oppositorum introductio* (Paris: Wolfgang Hopyl, 1501), sig. a1r.

26 K. Reinhardt, 'Die Lullus-Handschriften in der Bibliothek des Nikolaus von Kues. Ein Forschungsbericht', in *Ramon Llull und Nikolaus von Kues. Eine Begegnung im Zeichen der Toleranz*, edited by Ermenegildo Bidese *et al.* (Turnhout: Brepols, 2005), 1-23.

Gregor Reisch and Johannes Reuchlin for helping him gather and correct manuscripts of Cusanus' works.

Cusanus took up the Lullian theme of the unlearned knower 'inventing' truths from the book of nature in a three-part work titled *Idiota de mente, de sapientia,* and *de staticis experimentis*. The source of wisdom in these dialogues is the *idiota*, an artisan lacking Latin. He meets an Orator in a Roman Forum, and urges the Orator to see how his education has haltered his intellect to the opinion of authority in books. He invites the Orator cultivate learned ignorance instead, by reading from 'God's books', the ones that God 'wrote with his finger' and which are available in the streets and marketplaces. Intrigued, the Orator shows enough humility to draw out the conversation. In the *Idiota de sapientia* we learn that wisdom exists beyond the contradictions of normal words, in God's creative art: 'infinite wisdom is simplicity that enfolds all forms and the most adequate measure of all things; just as in the most perfect idea of the omnipotent Art, everything formable by the Art exists in the most simple form of the Art itself'.[27] In fact, in the next dialogue, Cusanus reveals that the *idiota* is a spoon-maker. This artisan conjectures that mind (*mens*) is related to measuring (*mensurare*).[28] In this context, this standard etymology emphasizes that the *idiota* gets his knowledge from things themselves. The art of making spoons is found to be better than linguistic games for understanding the soul or mind, because it provides 'symbolic illustrations' of God's creative art, since 'every finite art derives from the Infinite Art'.[29] Spoonmaking turns out to involve the creative measurement of a block of wood into

27 N. of Cusa, *Haec Accurata recognitio trium voluminum, Operum clariss. P. Nicolai Cusae Card.*, ed. Jacques Lefèvre d'Étaples (Paris: Badius Ascensius, 1514), fol. 77v. 'sic infinita sapientia est simplicitas omnes formas complicans et omnium adaequatissima mensura, quasi in perfectissima omnipotentis artis idea, omne per artem formabile simplicissima forma ars ipsa existat'.

28 Ibid., fol. 81v. 'mentem quidem a mensurando dici coniicio'. Translations, with modifications, from J. Hopkins, ed., *Nicholas of Cusa's Complete Philosophical and Theological Treatises* (Minneapolis, MN: Banning Press, 2001), 535–536. In this second dialogue, the orator is replaced by a philosopher.

29 Cusanus, *Opera*, fol. 82r; Hopkins, *Cusa's Complete Treatises*, 538. 'Symbolica paradigmata'. 'IDIOTA. Omnis ergo ars finita ab arte infinita […]'.

proportions that mirror the artisan's mental exemplar. The artisan takes pains to display human making as the creative measurement of proportions, a theme taken up in the third dialogue, *Idiota de staticis experimentis*, in studies of moving objects, from the heavens to the power of magnets. By virtue of being an artisan, the *idiota* emerges as a special authority in measuring and governing rough material, since by performing such activities in daily life he more deeply understands the basis of the Divine Artisan's creation in number, weight, and measure.

Throughout the dialogues, Cusanus made the *idiota* the source of the correct categories with which to speak about the world. By means of a dialogue between an *idiota* (illiterate in Latin) and an Orator or Philosopher, Cusanus clarified the proper role for learned *inventio*. The Orator reformulates the *idiota*'s distinctions and relations into learned speech, sometimes by supplying the relevant word, regularly restating the *idiota*'s point in the words of Plato, Hermes Trismegistus, or Vitruvius.[30] Arriving at these categories is the process of invention, in two senses. This Roman Orator, skilled in the art of rhetoric, would have known that Cicero defined *inventio* as finding material to speak about. Moreover, since he was Cusanus' creation, this Roman would have known Aristotle's *Topica*, where Aristotle discussed invention as a method for proposing material for argument. Yet throughout these dialogues it is the *idiota* who finds or invents the material written in the book of things, even when the Orator recognizes the topics or places noted in texts.

In picturing the *idiota* as the best reader or *inventor rerum* of the book of nature, Cusanus expanded a topos growing in importance in late medieval Christianity: that the eyes of simple faith can see farther than eyes dimmed by books. The issue was real among critics of the academic status quo. Henry of Langenstein, who left Paris to help found the new

30 Cusanus, *Opera*, fols, 81r, 83r, 83v, 84r, 86r, 91v, 92r, *et alia*.

university of Vienna in the early 1380s, turned away from Aristotelian syllogistic to permit theological reasoning its own rules.[31] Similarly, the Paris university chancellor Jean Gerson launched a series of sermons and tracts to unroot 'moderni'; in the place of academic quarreling over words, he encouraged a posture of faith in mystical treatises such as *De consolatione theologiae* that quickly became best-selling classics.[32] Clerical orders were not the only devotional ideal; the late medieval holy man or woman possessed of penetrating insight was just as likely to be a layperson.[33] These trends nourished a growing vernacular religious literature that was meant, as John Van Engen says, 'for private religious women like Sisters of the Common Life or recluses, as well as for lay brothers attached to religious houses'.[34] Cusanus' Europe was a religious world of 'multiple options', in which the holy fool had a growing authority and audience.

Yet even in offering the *idiota* as authority, Cusanus was not turning his back on the liberal arts, especially not the mathematical ones. Rather, such learning *translates* experience. Like Lull and even Sebonde, Cusanus should be read as part of an intellectual tradition of mysticism, that seeks God through the movements and vision of the intellect rather than in the affections.[35] Like Lull, he was fascinated by mathematics as a kind of intellectual vision that could inform philosophical and theological method. The theme of 'man as the measure of

31 M. H. Shank, *'Unless You Believe, You Shall Not Understand': Logic, University, and Society in Late Vienna* (Princeton: Princeton University Press, 1988).

32 D. B. Hobbins, 'Gerson on Lay Devotion', in *A Companion to Jean Gerson*, ed. B.P. McGuire (Leiden: Brill, 2006), 41–78. On Gerson's success at shifting the academic culture from 'nominalism' to 'realism' of Albert the Great, see Z. Kaluza, *Les querelles doctrinales à Paris: Nominalistes et realistes aux confins du XIVe et du XVe siècles* (Bergamo: Lierluigi Lubrina, 1988).

33 The lay origins and investment in the cults of the saints has become a commonplace, thanks to A. Vauchez, *Sainthood in the Later Middle Ages*, trans. J. Birrell (1981; Cambridge: Cambridge University Press, 1997). See also perceptive comments by R. Kieckhefer, *Unquiet Souls: Fourteenth-Century Saints and Their Religious Milieu* (Chicago: University of Chicago Press, 1984), 87–88.

34 J. Van Engen, 'Multiple Options: The World of the Fifteenth-Century Church', *Church History* 77, no. 2 (2008): 277.

35 For a typology of these traditions, see K. Emery Jr., 'Benet of Canfield: Counter-Reformation Spirituality and Its Medieval Origins' (PhD Dissertation, University of Toronto, 1975), 147–248. Cusanus chose intellect over affections quite deliberately, in a debate with Johann Wenck, recounted in B. McGinn, *The Harvest of Mysticism in Medieval Germany* (New York: Crossroad, 2006), 445–456.

things', knowledge as an approximation of the mind to the object of knowledge, is found throughout Cusanus. The Cusan linguistics of mental movements that modeled creation (and so, indirectly, the Creator) was succinctly captured by Lefèvre in his defense of theoretical astronomy:

> Just as the wisest, best craftsman [*opifex*] of things produces the true heavens and the true motions from the workmanship of the divine mind, so our mind always imitates him our parent (when the blemish of ignorance is wiped away), and produces in itself made-up [*effictos*] heavens and made-up motions, as certain simulacra of the true motions, in which it apprehends truth as in traces of the maker's divine mind. Therefore, the astronomer's mind, when it diligently makes up the heavens and their motions, is like the maker of things, the creator of the heavens and their movements … For who doubts that a kinship to to immortal nature arises from this?[36]

For Lefèvre, as for Cusanus, a fundamental similarity between mind and world permitted one to reason from one to the other, to assume that mental categories fit the world. But was this an innate mental capacity, or was it taught?

2. Mathematics in the Untutored Mind

In practice, the ideal of learned ignorance fostered simpler ways to get at knowledge. In collecting his library, Beatus displayed one of the central motivations of an ambitious student: to know everything, quickly. He bought a popular treatise by Matteo da Perugia on rules and medical aids for helping one's memory, including Aristotle and Cicero's advice to associate

36 Lefèvre d'Étaples, Clichtove, and Bovelles, *Epitome compendiosaque introductio in libros arithmeticos divi Severini Boetii, adiecto familiari [Clichtovei] commentario dilucidata. Praxis numerandi certis quibusdam regulis (auctore Clichtoveo). Introductio in geometriam Caroli Bovilli. Astronomicon Stapulensis.* (Paris: Wolfgang Hopyl and Henri Étienne, 1503). "Et haud secus quam rerum sapientissimus optimusque opifex veros caelos et veros motus divinae mentis opificio producit, mens nostra sui semper aemula parentis (cum ignorantiae labes pluscum detergitur) effictos caelos effictosque motus intra se profert, verorumque motuum simulacra quadam, in quibus ut in vestigiis divinae mentis opificii deprehendit veritatem. Est igitur astronomi mens, cum caelos caelorumque motus gnaviter effingit, similis rerum opifici caelos caelorumque motus creanti … Id enim quis dubitat ex immortalis naturae cognatione illi obtingere?"

ideas with physical 'places', and to eat ginger and rhubarb.[37] Besides such practical tips, Beatus read highly schematic summaries of the liberal arts such as Giovanni Foeniseca's *Quadratum sapientiae*, which handily listed desirable bits of erudition such as the Hebrew alphabet, the names of musical proportions, and rules for determining commensurate angles. Diagrams and colored foldout charts detailed the universe's creation and composition.[38] Such small volumes promised shortcuts to the secrets of the universe, while delivering pharmaceutical and visual aids for recovering one's mental stock – that is, for the practice of invention.

Beatus' teachers wrote new textbooks in part designed to meet such hunger for immediate and universal knowledge. The core of their books were short introductions and paraphrases meant to provide elementary starting points of disciplines; Lefèvre's amanuensis and traveling companion Guillaume Gontier, one of the several students who corrected Lefèvre's very popular *Introductio in suppositiones*, defended its shocking brevity: 'No one should condemn its brevity, for a preliminary art should be brief … because the intellect rejoices in brevity'. He described Lefèvre's texts as a *methodus*, for 'by this extremely brief method you are called to the studious gates of the disciplines, as if aided by a blowing wind and rowing oarsmen'.[39] At the Cardinal Lemoine, mathematics was the model art for such immediate apprehension of universal knowledge, as I shall argue in the next section.

---

37 M. Perusinus, *Tractatus de memoriae augenda per regulas et medicinas* (Strassburg: M. Schott, 1495), sig. 5r. BHS K 981d. 'Unde utile est locum considerare in quo dicta ut facta sunt illa, quorum volumus reminisci. Unde Cicero pro memoria artificiali habenda docet stabiliri quedam loca, et illis cogitatis facile venimus in oblitum'.

38 J. Foeniseca, *Opera Ioannis Foenisecae Augn: haec in se habent. Quadratum sapientiae: continens in se septem artes liberales veterum. Circulos bibliae iiii. in quibus metaphysica mosaica. Commentaria horum* (Miller et Foeniseca, 1515). BHS K 825m.

39 J. Lefèvre d'Étaples, *Introductiones logicales in suppositiones, in predicabilia, in divisiones, in predicamenta, in librum de enunciatione, in primum priorum, in secundum priorum, in libros posteriorum, in locos dialecticos, in fallacias, in obligationes, in insolubilia* (Paris: Guy Marchant, 1496), sig. d6v. 'Nemo item brevitatem damnet, nam quicquid ars praecipit breve esse debet … adde quod intellectus brevitate gaudet …. ita quoque et vobis iter philosophiae ingressis summopere gratum esse debet, hac methodo etiam quam brevissima ad disciplinarum portus ocissime appelere, quasi aura flante secunda et quasi transtris remigibusque iuti'.

In Gontier's account, a *method* supplies the basic elements of an art, the material that can be then arranged, combined, and reorganized to produce new knowledge. Invention accounts for the parts that make up an art. Certainly, this was a historical process, as developed in Polydore Vergil's *De inventione rerum* (1499). But in Lefèvre's circle the invention of the arts also was about the discovery of nature. In a handbook summarizing all the arts and sciences, Bovelles described their 'inventio', beginning with the liberal arts of words and things (*sermocinalia*, grammar, etc.; *realia*, mathematics), and including the mechanical arts such as architecture and agriculture. Bovelles began his account of *scientia* with sight, the most important bodily sense: 'sight is a material sense for finding (*inventionis*) the property of things and therefore of real sciences (*realia*), which determine the properties of things'. He added that "through words, learning occurs of everything that was first seen or heard by inventors'.[40] With this statement, Bovelles took his position in the longstanding philosophical debate that humanist concerns over speech had given new life: knowledge is ultimately about the things to which words refer, not words alone. Bovelles made the point even clearer in the chapters devoted to the *inventio* of each art, in which he presented each domain's 'principles' as based on discovery. Even the bookish study of the liberal arts is based on some original experience, thought now mediated by words.

Beatus Rhenanus' notes on the logic course at Cardinal Lemoine display how mathematics exemplified knowledge of the world's deep structures that is both true and naïve. First, the *truth* of such knowledge was guaranteed by psychological immediacy. On an endpaper to his logic textbook, Lefèvre's *Libri logicorum* (1503), Beatus drew six circles,

40 Bovelles, *Libellus de constitutione et utilitate artium humanorum, in quo et applicatio sermocinarlium ad rerum disciplinas atque imprimis Dyalctice edocetur* (Paris: Jean Petit, 1500), fol. 4v–5r. 'Visus est materialis sensus inventionis proprietatum rerum atque ideo et scientiarum realium, que rerum proprietates determinant … Idem quoque et realium et sermocinalium eruditionis sensus est. Enimvero sub vocibus, eruditio fit omnis inventorum prius aut visu aut auditu'.

representing the several domains of knowledge (Figure 1). The top three circles represent the 'greater world' of the universe, from smallest to largest, including the sensible region of individuals, the heavenly region of species, and the spiritual region of genera. The lower three circles of the 'lesser world', the microcosmic human soul, depict the symmetry of knowledge within as a *similitudo* of the macrocosm. Most remarkably, the circles all meet at one point. This infinitesimally disappearing point of contact between circles – the senses – where the human mind meets the sensible, celestial, and spiritual worlds without.

[insert figure 1 here]

Figure 1. Beatus' copy of Lefèvre, *Libri logicorum* (Paris: H. Estienne, 1503) (BHS K 1047), front endpaper, verso.

Generally, this cognitive scheme encapsulated the standard Aristotelian account of the outer and inner senses, in which sense impressions from the outer senses are stored in the inner sense of memory, recombined by the imagination, and analyzed by the common sense.[41] Late medieval natural philosophers argued intensely over the particular status of mental images, and whether it is possible to have any knowledge without images.[42] Specifically, these circles mark the influence of Charles de Bovelles, who began his *Liber de sensibus* (published with several other works in 1510) with the distinction of inner and outer senses, as the respective

41 The doctrine of internal senses was most influentially stated by Albert the Great, based on Avicenna. For more detail, see K. Park, 'The Organic Soul', in *The Cambridge History of Renaissance Philosophy*, ed. C. B. Schmitt et al. (Cambridge: Cambridge University Press, 1988), 464–484. Lefèvre gave his own version of this psychology in his *Totius philosophae naturalis paraphrases* (Paris: J. Higman, 1492), sig. D2v-D6r.

42 For an orientation to these debates, see K. Park, 'Albert's Influence on Late Medieval Psychology', in *Albertus Magnus and the Natural Sciences*, ed. J. A. Weisheipl (Toronto: Pontifical Institute of Mediaeval Studies, 1980), 501–535; K. H. Tachau, *Vision and Certitude in the Age of Ockham: Optics, Epistemology, and the Foundations of Semantics*, Studien und Texte zur Geistesgeschichte des Mittelalters 22 (Leiden: E. J. Brill, 1988); L. Spruit, *Species Intelligibilis: From Perception to Knowledge, Vol. I: Classical Roots and Medieval Discussions* (Leiden: Brill, 1994).

domains of the *mundus maior* and *minor*.43 In this work, Bovelles explained that the exterior senses are the union (*copula*) of the major and minor worlds, by which the species of all things penetrate within, to the interior senses.44 Bovelles then elaborated a hierarchy of the senses from the material senses (touch, imagination), to the immaterial senses of vision (angelic intellect) and hearing (divine mind).45 While Beatus' circles do not precisely reproduce this hierarchy, these circles do show that either Bovelles was one of Beatus' logic teachers, or Bovelles' innovative account of the senses was shared among the Fabrists already in 1503. This cognitive structure justifies the assumption that the human mind – just because human – reflects the real world.

The hierarchy of the mind then orders the academic disciplines, so that those closest to the mind (and so nature) are the most trustworthy. Beatus diagrammed this cognitive scheme in a logic textbook because logic was meant to start, in Lefèvre's circle, with the categories of knowledge immediately available to the mind. Lefèvre's *Libri logicorum* was published in two stages in 1501 and 1503. As Cesare Vasoli noted, Lefèvre offered the traditional texts. The first part of the volume included Porphyry on the *predicamenta*, Aristotle's *Categoriae*, and Boethius' commentaries on them.[46] Lefèvre added a substantial apparatus for these books – introductions, paraphrases, and commentaries – arguing that these disciplines for discovering categories were the most certain part of ratiocination, properly called logic. The second part of the volume dealt with dialectic, namely Aristotle's *Priora* and

43 *Liber de sensibus* in Bovelles, *Liber de intellectu; Liber de sensu; Liber de nichilo; Ars oppositorum; Liber de generatione; Liber de sapiente; Liber de duodecim numeris; Epistole complures. Insuper mathematicum opus quadripartitum: De numeris perfectis; De mathematicis rosis; De geometricis corporibus; De geometricis supplementis* (Paris: H. Estienne, 1511), 22r *et seq*..

44 Ibid., 22v.

45 On this hierarchy, see T. Frangenberg, '"Auditus Visu Prestantior": Comparisons of Hearing and Vision in Charles de Bovelles's "Liber de sensibus"', in *The Second Sense. Studies in Hearing and Musical Judgement from Antiquity to the Seventeenth Century*, ed. C. Burnett, M. Fend, and P. Gouk, Warburg Institute Surveys and Texts 22 (London: The Warburg Institute, 1991), 71-94.

46 Vasoli, *La dialettica e la retorica*, 206–209.

Posteriora analytica, which addressed arguments of merely probable reasoning. After these two parts, Lefèvre added a third, and to all appearances he did so for the sake of completeness more than out of conviction of its intrinsic value: this third part was actually printed two years after the first two parts, and simply comprised a sparsely annotated translation of Aristotle's *Topica* and the *Sophisticis elenchis*, texts that Lefèvre associated with oratory and debate for its own sake – rhetorical *inventio* for sophistic causes.[47] Being further from immediate experience of the world, such oratorical topics were less trustworthy. Beatus' densest notes are on the predicaments and Aristotle's *Categoria*, reflecting Lefèvre's emphasis on the first (and more traditional) part of the logic curriculum.

How Beatus annotated his copy of the *Libri logicorum* illustrates his teachers' view of logic as a matter of words *and* things, and particularly Lefèvre's focus on mathematical objects. Aristotle himself was ambiguous about whether the categories were about the words (such as individuals, species, or genus) conventionally applied to things, or in fact reflected things in themselves – precisely why medieval schools could fight bitterly over the issue.[48] Vasoli, following Renaudet's excerpt of a phrase from Beatus' *cahier d'étudiant* (BHS MS 58) concerning the views of the nominalists as 'vera et pulchra', has suggested that Lefèvre and his circle were friendly to conventionalist accounts of language.[49] A closer examination of Beatus' notes themselves, however, reveals a different account.

Beatus reprised his diagram of circles in the section on Aristotle's category of quantity. Aristotle famously prioritized qualities over quantity, making quantity merely a

47 Lefèvre described this third section on its separate titlepage (1503), as about invention.

48 My object here is not to comment on the vexed distinction between nominalists and realists in the fifteenth century (which often makes assumptions based on fourteenth-century polemical stances). Practically, I take the categories still to be useful, following M. J. F. M. Hoenen, 'Via Antiqua and Via Moderna in the Fifteenth Century: Doctrinal, Institutional, and Church Political Factors in the *Wegestreit*', in *The Medieval Heritage in Early Modern Metaphysics and Modal Theory, 1400-1700*, edited by R. L. Friedman and L. O. Nielsen (Dordrecht: Kluwer, 2003), 9–36.

49 Renaudet, *Préréforme et humanisme*, 131, 473. Vasoli quoted this at *La dialettica e la retorica*, 187.

product of the process of abstraction; for him, mathematical objects did not exist 'out there'.[50] The diagram Beatus drew in the margin suggests a more complicated view of numbers (Figure 2).

[include figure 2 here]

Figure 2. Beatus' copy of Lefèvre, *Libri logicorum* (BHS K 1047), fol. 27r.

Here the three circles again reflect the microcosm man (*homo*), with rational soul (*rationalis anima*) and mind (*mens*) within. The bottom of the diagram is open, expanded to include the series of discrete numbers 1 through 5, each existing in its own bubble in a realm labeled 'numeri formales numerantes'. Each of these, moreover, projects its own aggregated unities onto the world, the *numeri materiales numerati*. Immediately below, Beatus listed three kinds of number-objects: *numerantia*, *numerata*, and *numeri*. Lefèvre's commentary helps make sense of the diagram. In the text beside the diagram, he claimed that among the animals only man can count, a demonstration of the uniqueness of the human soul. Moreover, numbers are of three kinds: 'there are counting numbers, counted numbers, and numbers in themselves. Counting numbers are souls applying their own numbers to things; counted numbers are those things to which the soul correctly and appropriately applies numbers; numbers [i.e. in themselves] are those discrete reasons of counting'.[51] This three-fold distinction is particularly important, because Lefèvre explained that the soul applies numbers in a special way – as an instrument – to things in the world, in a way that matches or harmonizes the number in the world with the number in the mind. He used the example of a forearm or

50 Aristotle, *De anima*, 3.7, 431b12-16; *Physica*, 2, 193b22-35, 194a4-7; *Metaphysica*, 6.1, 1026a13-17, 11.7, 1064a31-35; 13.2, 1076b12-13, 1076b40-1077a19, 1077a31-b18.

51 BHS K 1047, 27r. 'Unde sunt numerantia, sunt numerata, sunt numeri. Numerantia sunt anime numeros suos rebus applicantis. Numerata sunt ea quibus anima numeros apte accommodeque applicat. Numeri sunt discrete ille rationes numerandi'.

thumb used to measure out a length of cloth. The quantity of cloth was already there, just as the number was already in the mind; but there was a necessary extension, through the arm, of the mental number to the cloth in order to *know* the cloth's quantity. The thrust of Lefèvre's account, instead of focusing on Aristotle's arguments against the real existence of quantity in the world, drew on Boethius' more realist account of numbers.[52] As the next section shows, it was significant that Lefèvre centered on instruments of measurement for aligning one's mind with the world.

Second, Lefèvre's account of mathematical knowing depended on naïve or untutored knowledge. One need not be learned to measure, a point Beatus and Lefèvre conceded with such examples from the marketplace. The idea that rational principles, the basic structures of reasoning, already exist in the untutored mind is related to Lefèvre's argument that counting is basic and therefore common to human nature.

Lefèvre expanded on this point in his opening commentary on the *Posteriora analytica*, the fundamental text for Aristotelian accounts of 'scientific' method.[53] In the first chapter of the *Posteriora analytica*, Aristotle considered how knowledge proceeds from previous knowledge. Aristotle's goal was to describe in what sense the conclusion of a syllogism provides more knowledge than its premisses, rather than to offer a Platonic account of recollection, though he alerted readers to the dilemma of Plato's *Meno*, in which a slave boy's untutored knowledge of geometry demonstrates that learning is either illusory or only

52 In fact, Lefèvre never produced an introduction to last part of the *Metaphysica*, where Aristotle's chiefly argued for his abstractionist account of numbers; he only ever addressed the first six books: J. Lefèvre d'Étaples, *Introductio in metaphysicorum libros Aristotelis*, ed. Josse Clichtove (Paris: J. Higman, 1493). Such a distinction of numbers can be traced to Boethius, *De trinitate* 3.10-22; the notion of formal numbers was also important for Pico: J.-M. Mandosio, 'Beyond Pico Della Mirandola: John Dee's ''Formal Numbers'' and ''Real Cabala''', in *John Dee and the Sciences: Networks of Knowledge*, ed. J. M. Rampling, Studies in History and Philosophy of Science Part A, 2012.

53 See, for example, N. Jardine, 'Epistemology of the Sciences', in *The Cambridge History of Renaissance Philosophy*, ed. C. B. Schmitt et al. (Cambridge: Cambridge University Press, 1988), 685–711.

recollection what one already knows.[54] To avoid the dilemma, Aristotle offered the syllogism as a way to infer from known instances to universal statements. In Lefèvre's Latin edition, Aristotle described three ways that syllogisms depend on prior knowledge:

> All teaching and all intellectual learning comes from preexisting knowledge. This is evident to those looking into everything, for mathematical science and the other arts work in this way. Likewise also concerning the speeches which operate through syllogisms and induction, for both made teaching out of something previously known … Rhetoricians also persuade in the same way, either by examples, which is induction, or by enthymemes, which is a sort of syllogism.[55]

Lefèvre divided Aristotle's three kinds of knowledge into the fundamental liberal arts, followed by dialectic and rhetoric. He lumped together mathematics and the liberal arts, as those that teach by 'their own, certain reasoning'. Dialectic, in contrast, works with 'common judgments'; while oratorical reasoning merely addresses 'apparent truths'.[56] The truths of mathematics and the liberal arts are not quite innate, but they are the next best thing: they are so certain that they can be learned without a teacher – such truths, as Beatus noted in the margin, are open to *autodidacti*, those who can teach themselves. The men of such 'better nature and powerful wit' (*melioris naturae et genii viros*) that Lefèvre lists is telling: Mercury Trismegistus, Euclid, Aristotle, Nicholas of Cusa, and Giovanni Pico della Mirandola. (In fact, the very word *autodidactus* may mark Pico's influence.[57])

---

54 *Meno* 80e.

55 J. Lefèvre d'Étaples, *Libri logicorum* (Paris: Hopyl & Stephanus, 1503), fol. 177v. 'Omnis doctrina et omnis disciplina intellectiva ex preexistente fit cognitione. Manifestum autem hoc speculantibus in omnibus mathematice enim scientie per hunc modum fiunt, et aliarum unaqueque artium. Similiter autem et circa orationes que per syllogismos et que per inductionem, utreque enim per prius nota faciunt doctrinam . . . similiter autem et rhetorice persuadent, aut enim per exempla quod est inductio, aut per enthymemata quod quidem est syllogismus'.

56 Ibid. 'enim mathematice scientie et alie liberales artes propriis certisque ratiociniis instituunt; dialectice, communibus disceptationibus; oratorie autem et rhetorice, verisimilibus'.

57 See A. Ben-Zaken, *Reading Hayy Ibn-Yaqzan: A Cross-Cultural History of Autodidacticism* (Baltimore,

Thus Lefèvre made geometry the example of systematic thought, following Aristotle's rare championing of mathematics in the *Posteriora analytica*: it is clear from mathematics how theorems flow from previous knowledge 'sometimes from principles, at other times from those things that are understood from the principles'.[58] But Lefèvre went further, using mathematics as the example for the other liberal arts and a foundation for the two other kinds of reasoning, dialectical speech and oratory.[59] The threefold account of the disciplines mirrors his threefold division of the logical *organon*, and his prioritization of mathematics matches his emphasis on the *predicamenta.* In the following pages Lefèvre offers a reading of Plato's classic argument for knowledge as the recollection of innate ideas in the *Meno*, going far beyond Aristotle's passing reference. Without granting that humans actually share innate knowledge, Lefèvre focuses on the shared capacity for immediate knowledge. He uses an analogy to vision, with the intellect as eye, axioms as the light – as Beatus clarifies, an intellectual principle is therefore 'absolute light' and like light is immediately available to the mind's eye.[60] There are therefore two kinds of propositions; those immediately available in themselves, and then propositions that can be inferred from them. Self-evident propositions (i.e. axioms) are the 'proloquia' for each discipline.

Reflections on the *Meno* and Neoplatonic light imagery in a commentary on Aristotle's syllogistic is at first glance a long way from the *idiota* of Cusanus. But Cusanus'

MD: The Johns Hopkins University Press, 2010), chap. 3. Ben-Zaken argues that Pico had found an autodidactic example in the twelfth-century Arabic tale *Hayy Ibn-Yaqzan*, about a boy who grew up alone on an island, prodigiously making philosophy out of his isolated experience of the world. Lefèvre could have encountered Pico's account of autodidacticism in his *Heptaplus* or *Disputationes adversus astrologicam divinatricem*.

58 Lefèvre d'Étaples, *Libri logicorum*, fol 178r. 'in mathematicis scientiis ex antecedente cognitione scientiam nasci, nunc principiorum, nunc eorum que ex principio sunt cognita, quam manifestum est.

59 The oratorical faculty 'deals with civil affairs' (*oratoria facultas circa civilia versatur*, ibid.).

60 Ibid., 'Verum quedam talia sunt, que cognitis terminis (attentione mentis adhibita) **statim cognoscimus,** perinde ac apertis fenestris, et revelatis ciliis. Statim lumen cognoscimus. Est intellectus oculus.'. It should be noted that Lefèvre uses Plato's account in part to provide authority for innate knowledge, in part because he wants to support the immortality of the soul. At the end of this passage, referring to Augustine's *Retractationes*, he warns readers off from incautiously reading Plato, notably for supposing the human soul to be uncreated.

artisan was a character from Roman antiquity who spouted lessons that the Orator then categorized according to the authority of Aristotle and Plato. The *idiota* might possess the deepest insight, but required learning to communicate that knowledge. The reading of the untutored mind in Lefèvre's circle did not simply cast aside all learning to start over with Rousseau's *Émile*. Instead, it was an effort to include naïve experience as an important starting point for a simplified, useful philosophy – with a division of labor that required a community, a society of both theorists and artisans.

3. Thinking for Artisans

Did Lefèvre, Cusanus, and Lull's appreciation for the untutored mind lead to productive partnerships between artisans and theorists, the kind of 'trading zones' between domains of knowledge that Pamela Long has found among sixteenth-century artisan/practitioners?[61] A detailed account is impossible here, but a sketch can reinforce arguments for overlap advanced by Isabelle Pantin, Pascal Brioist, and Alexander Marr.

Lefèvre's own works were firmly within the liberal arts, but like many Renaissance pedagogues he trumpeted their practical utility: geometry for surveying, arithmetic for keeping accounts, and music for therapy.[62] Some of this was boilerplate *captationes benevolentiae*; but at other times Lefèvre thought practical philosophy worth his time. In the early 1490s, Lefèvre wrote a *De magia naturali,* deploying Pico's cabbala and Ficino's Pythagorean arithmetic to expand on the 'practical part of philosophy' that could effect real

61 P. O. Long, *Artisan/Practitioners and the Rise of the New Sciences, 1400-1600* (Corvallis, OR: Oregon State University Press, 2011). The term 'trading zones' comes from Peter Louis Galison, *Image and Logic: A Material Culture of Microphysics* (Chicago: University of Chicago Press, 1997). The question, if not the term, has long history: L. Olschki, *Geschichte der Neusprachlichen Wissenschaftlichen Literatur*, 3 vols. (Leipzig: Leo S. Olschki, 1919).

62 J. Lefèvre d'Étaples, *Arithmetica elementa; Musica elementa; Epitome in libros arithmeticos divi Severini Boetii; Rithmimachie ludus que et pugna numerorum appellatur* (Paris: Higman and Hopyl, 1496), sig. a1v (=PE, ep. 5, 18), sig. f1v (=PE ep 10, 32).

change in the natural world – even though he later denounced magical practices.[63] Moreover, Lefèvre seems to have gone out of his way to learn from artisans. In his most original treatise on music theory, he thanked two music teachers. Their tutelage affected Lefèvre's theoretical work too, as he apologized for breaking formal rules in music theory in order to accommodate certain elements of practice. The work's crowning example was Lefèvre's geometrical technique for dividing the interval into 'irrational' proportions – proportions of the sort musicians actually used to tune instruments.[64] Elsewhere, Lefèvre recalled attending the lectures of the Italian architect and humanist Fra Giocondo, who had accompanied Charles VIII on his triumphal return to Paris in 1495, and who designed royal fountains and the replacement to the *pont de Notre Dame* that collapsed in 1499.[65] (These same lectures also inspired the great Hellenist Guillaume Budé, who quoted Giocondo on the details of Italian and ancient Roman architecture and instruments.[66])

Scholars and artisans found common space in the bustle of early print shops. When Lefèvre went for the second time to Italy in 1500, primarily for the papal Jubilee, he also visited Aldus Manutius' print shop in Venice. There he met Muslims or 'Hagarenes' (*gens Agarena*) who were particularly good at physionomics, the art of judging inner character from one's physical attributes. These men were exceptionally accomplished in this science

63 See J.-M. Mandosio's chapter on the *De magia naturali* forthcoming in *Les Muses secrètes: Kabbale, alchimie et littérature à la Renaissance* (Geneva: Droz), graciously shared with me in manuscript. On Lefèvre's turn from magic, see especially E. F. Rice, 'The *De magia naturali* of Jacques Lefèvre d'Étaples', in *Philosophy and Humanism: Renaissance Essays in Honor of Paul Oskar Kristeller*, ed. E. P. Mahoney (Leiden: Brill, 1976), 19-29; J. R. Veenstra, 'Jacques Lefèvre d'Étaples: Humanism and Hermeticism in the De Magia Naturali', in *Christian Humanism: Essays in Honour of Arjo Vanderjagt*, ed. A.J. Vanderjagt, A.A. MacDonald, and Z.R.W.M. von Martels (Leiden: Brill, 2009), 353–362.

64 Jacques Lefèvre d'Étaples, *Arithmetica elementa; Musica elementa; Epitome in libros arithmeticos divi Severini Boetii; Rithmimachie ludus que et pugna numerorum appellatur* (Paris: Johannes Higman and Wolfgang Hopyl, 1496). On music theory and mathematics in the sixteenth century, see P. Pesic, 'Hearing the Irrational: Music and the Development of the Modern Concept of Number', *Isis* 101, no. 3 (2010): 501–530.

65 Lefèvre, *Libri logicorum*, fol. 77r; P. de Nolhac, 'Recherches sur Fra Giocondo de Vérone', *Courrier de l'art* 8 (1888): 77–79.

66 V. Juřen, 'Fra Giovanni Giocondo et le début des études vitruviennes en France', *Rinascimento* 14, 2nd ser. (1974): 101–115.

because of their marketplace experience, since when buying and selling slaves they were keenly interested in those with a good nature.[67] In Italy, possibly at Rome, Lefèvre picked up a small treatise on an 'astronomical ring' published there a few years earlier by the pope's personal physician and astrologer Bonetus de Lattis.[68] Immediately on arriving in Paris, he requested his student Charles de Bovelles to edit it for publication along with his own *Textus de sphaera*; later editions always included the *Annulus astronomicus*.[69]

This short account of a miniature astrolabe locates Lefèvre's books between the worlds of the practitioner and the pedagogue. On the one hand, there is no indication that Lefèvre or Bovelles actually made the ring described in the treatise – in fact, they probably did not see the object until well after publishing its manual, when they met its maker Bonetus in Rome in 1507. If Bovelles accurately recounted the event, their discussion of the ring rapidly devolved into a debate over the Trinity.[70] On the other hand, the ring shows the circle's pedagogical use of objects (especially wonderful and imaginative ones) to encourage student understanding. Lefèvre's own printed publications display what we might call the *instrumentality* of images, typography, and page layout, with a special attention to visual aids to serve memory, and the early use of innovative divisions such as paragraph indentation.[71] An example different from either diagrams or tables was Lefèvre's image of a metalworker's lathe, complete with semi-circular blade to help students visualize a sphere.[72] Books,

67 Lefèvre, *Libri logicorum*, fol. 176r.

68 On this fascinating figure, see J.-C. Margolin, 'Bonet de Lattes, médecin, astrologue et astronome du pape', in *L'umanesimo e l'ecumenismo della cultura*, 3 (Florence, 1981), 107–148.

69 J.-C. Margolin, *Lettres et poèmes*, 66.

70 Bovelles recounts the meeting as a dialogue between himself and Bonetus: Bovelles, *Quaestionum theologicarum libri septem* (Paris: Badius, 1513), fol. 53r.

71 Besides the references to Ong and Vasoli mentioned above, see F.A. Janssen, 'The Rise of the Typographical Paragraph', in *Cognition and the Book: Typologies of Formal Organization of Knowledge in the Printed Book of the Early Modern Period*, ed. K.A.E. Enenkel and W. Neuber (Leiden: Brill, 2005), 9–32.

72 Lefèvre, *Textus de Sphera Johannis de Sacrobosco, Cum Additione (quantum necessarium est) adiecta: Nouo commentario nuper edito ad utilitatem studentium Philosophice Parisiensis Academie: illustratus. Cum compositione Anuli Astronomici Boni Latensis. Et Geometria Euclidis Megarensis* (Paris: Henri

especially pedagogical ones, were never merely containers for texts, but deployed visual tools to tutor students.

Charles de Bovelles is especially important because of his interest in the world of artisans and practical mathematics, and because he links Lefèvre's circle with Oronce Fine, Paris' preeminent mathematical practitioner of the sixteenth century. Bovelles systematically constructed his philosophy and mystical theology around mathematical and visual analogies, loosely inspired by Nicholas of Cusa. He possessed an enduring interest in geometry, and already in 1511 published the *Geometrie en françoys*, one of the first practical geometries in the French language.[73] Bovelles later wrote an updated *Géométrie practique*, which Oronce Fine corrected and illustrated for its first printing in 1542; the book was revised and reprinted until 1608.[74]

Bovelles asked Fine to illustrate his *Géométrie practique* precisely out of respect for him as both scholar and artisan. Bovelles apparently met Fine in Noyon, but they also were connected through the Paris print shops that Lefèvre's circle frequented, notably that of Henri Estienne. In fact, Fine's first appearance in print was in 1515 as the illustrator of Reginald Chaudière's editions of Thomas Bricot's *Meteorologia* and a collection of astronomical treatises – Chaudière was Estienne's son-in-law.[75] In 1521, when Estienne died, Simon de Colines took over the press and hired Fine to design magnificent new titlepages and frontispieces for updated editions of Lefèvre's *Textus de sphaera*, complete with Bonetus'

Estienne, 1500), sig. a4r.

73 C. de Bovelles, *Géométrie en françoys. Cy commence le Livre de l'art et Science de Geometrie : avecques les figures sur chascune rigle au long declarees par lesquelles on peut entendre et facillement comprendre ledit art et science de Geometrie* (Paris: Henri Estienne, 1511).

74 C. de Bovelles, *Livre singulier et utile, touchant l'art et practique de Geometrie, composé nouvellement en Francoys* (Paris: Simon Colines, 1542). See now P. Brioist, 'Les singularités de la géométrie pratique de Charles Bovelles' (forthcoming). My thanks to the author for sharing this work before publication.

75 P. Renouard, *Documents sur les imprimeurs, libraires, cartiers, graveurs, fondeurs de lettres, relieurs, doreurs de livres, faiseurs de fermoires, enlumineurs, parcheminiers et papetiers ayan exercè à Paris de 1450 à 1600* (Paris: H. Champion, 1901), 128–130.

Annulus astronomicus.[76] In 1534, Fine appended Bovelles, Lefèvre, and Clichtove's mathematical introductions to the first Paris edition of Gregor Reisch's famous encyclopedia, the *Margarita philosophica.* By that year, Fine's mathematical expertise had earned him the first royal professorship in mathematics.[77] His expertise was as a practitioner as much as a theoretician. While it is not clear whether Fine himself traced and cut the woodblocks, or simply designed them, he was certainly known as someone who actually made instruments. His father had been a physician trained at Paris, who had made a model of the planetary motions 'by his own hand and industry'.[78] Morever, Fine's student and friend Antoine Mizauld observed that royalty, clergy, and nobility frequented Fine's home 'to see what, by his own hand, he had painted, or sculpted, or described – I say not only maps or books, but also a thousand mathematical instruments, and devices of other sorts'.[79] In a poem that Fine wrote when seeking the royal professorship, *Epistre touchant la dignité, perfection, et utilité des sciences mathematiques*, Fine emphasized the philosophical utility of the mathematical disciplines, but also detailed their practical importance to the 'gens de pratique' and the arts 'qui sont maneuls corporaux'.[80] As testimony to Fine's distinctive practical bent, the poem concludes with geography and perspective.

Like Lefèvre, Fine associated mathematics with naïve knowledge. As Angela Axworthy has shown, Fine framed mathematics as a 'philosophy' which was not only the

76 F. Schreiber and J. Veyrin-Forrer, *Simon de Colines: An Annotated Catalogue of 230 Examples of His Press, 1520-1546* (London: Oak Knoll Press, 1995). On these frontispieces, see I. Pantin, 'Altior incubuit animus sub imagine mundi. L'inspiration du cosmographe d'après un gravure d'Oronce Finé', in *Les méditations cosmographiques à la Renaissance* (Paris: Presses de l'Université Paris-Sorbonne, 2009).

77 I. Pantin, 'Oronce Fine's Role as Royal Lecturer', in *The Worlds of Oronce Fine. Mathematics, Instruments and Print in Renaissance France*, ed. Alexander Marr (Donington: Shaun Tyas, 2009), 13–30.

78 O. Fine and Nicolas Savetier, *Aequatorium planetarum, vnico instrumento conprehensum, omnium antehac excogitatorum, & intellectu & vsu facillimum ...* (Paris: Nicolas Calceolarius, 1526), fol. A2r. 'Cuiusmodi est insigne illud theoricarum instrumentum in formam libri digestum et tam mediis quam veris planetarum motibus ornatum, quod inter philosophicam suppellectilem mei patris Francisci Finei, medici ac philosophi praestantissimi primum animadverti, propria eius manu ac industria aliquando fabrefactum'.

79 A. Mizauld, *Vita Orontii*, fol. 6r; quoted and translated by A. Marr, *The Worlds of Oronce Fine*, 8.

80 This poem, first published in 1531, cited in the edition in O. Fine, *Le sphere du monde, proprement ditte cosmographie* (Paris: Michel de Vascovan, 1552), fol. 59r–64v.

'clefz de tout perfet sçavoir', but also a 'miroer de toute certitude', and so a worthy propaedeutic to all other disciplines.[81] It could be so because it required no previous training, yet was itself excellent training in the disposition and procedures of judgment required in all the other arts.

Fine advertised the cognitive simplicity of his instruments, as Lefèvre and his students did of their textbooks. In his *Planetarum aequatorium*, published in 1526 and 1538, Fine presented his own version of the medieval instrument that calculated the positions of planets against the zodiac, along with rules of use – all of which were 'very easy to understand and use' (*et intellectu et usu facillimum*). His own version was better, he claimed, because it was simpler; rather than the many wheels of older instruments, his own required only two. Like Lefèvre before him, in his prefaces Fine advanced his own program of mathematics by contrasting its cognitive 'purety' with sophistic debates that put 'certain frivolous fights over terms in place of the good arts.'[82] Fine proposed the clarity and certainty of mathematics as a better tool than *sophismata* and other scholastic *cavillationes* for studying a world God had created, after all, by means of number.[83] Fine drew on the skills of both pedagogue and artisan to propose that mathematics led to the most productive knowledge of nature – as Ramus would do in the following decades.84

Conclusion

While Lefèvre's interests were not particularly novel in any one feature, his efforts to

81 A. Axworthy, 'The Epistemological Foundations of the Propaedeutic Status of Mathematics According to the Epistolary and Prefatory Writings of Oronce Fine', in *The Worlds of Oronce Fine*, 31–51.

82 Oronce Fine, *Protomathesis* (Paris: G. Morhii, 1532), sig. AA2v. 'Quique in locum bonarum artium frivolas quasdam terminorum altercationes ….'

83 On this theme, see A. Axworthy, 'Le Statut des mathématiques en France au XVIe siècle: le cas d'Oronce Fine,' (PhD, Université de François-Rabelais, 2011), 76ff.

84 On the timing and enduring significance of mathematics in Ramus' pedagogical program, see R. Goulding, 'Method and Mathematics: Peter Ramus' Histories of the Sciences', *Journal of the History of Ideas* 67, no. 1 (2006): 63–85.

harmonize Aristotle, Plato, and Christian doctrine resulted in an important configuration of erudition around the hunt for immediate, certain, and common knowledge of the world, and the conviction that such common knowledge could be modeled on mathematics. Beatus' student notes sharpen the point, and raise the significance of the exemplarist psychology of Lull and Cusanus. In this way, I join Timothy Reiss in arguing that Lefèvre's circle contributed in important ways to the sixteenth-century emphasis on mathematics for understanding the world.[85]

To this picture, I would add that the *idiota* was an important feature in Lefèvre's circle, who linked late medieval hunger for the experience of God and objects on the one hand[86], with the rising interest in experience of nature on the other.[87] Cusanus' writings found their way into the library of John Dee, who found authority for the term 'Experimentall Science' in the *idiota* dialogues *de staticis experimentis*: '*Nicolaus Cusanus* termeth it so, in hys *Experimentes Statikall*.'[88] Nagel noted that these dialogues were the explicit source for Dee's conviction that mathematics should be the instrument for probing nature's secrets.[89] This could be true in a more general sense; Cusanus' attitude fed a growing desire to simplify reasoning, to emphasize 'naïve invention' in 'method'. This was not simply about trying to get away *without* thinking, as Charles Schmitt implied in his influential note on the rise of the philosophical textbook, and as Ong accused Ramus.[90] Put another way, the trope of the *idiota*

85 T. J. Reiss, Knowledge, *Discovery and Imagination in Early Modern Europe* (Cambridge: Cambridge University Press, 1997), 33–37; *idem*, 'From Trivium to Quadrivium: Ramus, Method, and Mathematical Technology', in *The Renaissance Computer: Knowledge Technology in the First Age of Print*, ed. N. Rhodes and J. Sawday (London: Routledge, 2000), 45–58.

86 On this 'hunger for reality' see H. Oberman, *The Dawn of the Reformation* (Edinburgh: T.&T. Clark, 1986), 55; S. E. Schreiner *Are You Alone Wise?* (Oxford: Oxford University Press, 2011), 210-259; and C. W. Bynum, *Christian Materiality: An Essay on Religion in Late Medieval Europe* (New York: Zone, 2011).

87 On 'experience' see P. Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago: University of Chicago Press, 1995).

88 Dee, *Mathematicall Praeface*, ed. Debus (London: John Daye, 1570), sig. A3v.

89 F. Nagel, *Nicolaus Cusanus und die Entstehung der exakten Wissenschaften* (Münster: Aschendorff, 1984), 142–148.

90 C. B. Schmitt, 'The Rise of the Philosophical Textbook', in *The Cambridge History of Renaissance*

and the push toward immediate knowledge was as much an attempt to naturalize intellection as it was anti-intellectual.

I should qualify my argument by noting that I do not mean to suggest that the *idiota* was the only paradigm for knowledge, or even the most important. Cusanus, Lefèvre, and to a lesser extent Ramus himself fit the standard mold of the old, pious, and impossibly erudite sage, a model of wisdom that perdured the Renaissance.[91] Nevertheless, the example of untutored knowledge offered by the mystic or the artisan supported a growing paradigm, from Baconian natural history to Rousseau's *bon sens*, for direct access to nature.

Philosophy, ed. Charles B. Schmitt et al. (Cambridge: Cambridge University Press, 1988), 792–804. For Ong, see introductory comments above.

91 E. F. Rice, *The Renaissance Idea of Wisdom* (Cambridge, Mass: Harvard University Press, 1958).