The Fabrist Origins of Erasmian Science: Mathematical Erudition in Erasmus' Basle

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The Fabrist Origins of Erasmian Science: Mathematical Erudition in Erasmus' Basle

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The configuration of literary and theological interests of Erasmus' modern readers have often obscured his and his 16th-century colleagues' interests in natural philosophy, medicine, and mathematics. Yet the larger network of scholars who corresponded with Erasmus and took him as model included important representatives of the mathematical disciplines, both the quadrivium *(arithmetic, geometry, music, and astronomy) and the adjacent studies of optics and cosmography.*

In this article, I suggest that mathematical scholars in Erasmus' orbit shared certain priorities with Lefèvre d'Étaples; in this respect, 'Erasmian mathematics' might better be called 'Fabrist'. I shall first present several works of mathematics published in Basle during the 1530s, when Erasmus still wielded considerable influence on Basle printing. Then I shall review the curious relationship of Basle's humanists to Paris—Erasmus himself aggravated the growing distance between Basle and Paris—and compare the attitudes towards mathematics of the Fabrists, Simon Grynaeus, and Erasmus.

Here lies a a methodological lesson that has not yet reshaped our own historical studies. Tempted by Erasmus' own powerful account of erudition as mostly about non-technical knowledge, both historians of science and historians of literature have been encouraged to miss the place of mathematics in the liberal arts—and indeed in the shape of erudition—of that literary republic. Erasmus may have been complicit with the forces that gave us the "two cultures" divide.

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In 1533, Jerome Froben published the *editio princeps* of Ptolemy of Alexandria's *De geographia*. The prefatory letter is signed by Erasmus, making this the one book to his name that contemporaries would have recognized as mathematics. But the association raises problems. Catalogers have long assumed that, because the preface of the book is written in Erasmus' name, Erasmus was the editor[1]. But the fastidious Percy Stafford Allen pointed out already in 1941 that "neither the title-page nor the contents suggest that Erasmus had anything to do with the editing"[2]. More recently, Cornelis Reedijk argued that an aging Erasmus, sick and tired, and worn by the stresses of a dividing church, was unlikely to expend so much time on a completely new field of study; indeed, the autograph draft of this letter shows signs that Erasmus absentmindedly copied it from a rough draft by someone else[3]. Likely Erasmus had little, if any, direct concern with the project, but thought it worthy enough to lend his brand for advertising purposes. While this was not an unusual practice in early printing, Erasmus' probable absence from this book raises questions for the history of science. What was Erasmus' actual attitude towards the mathematical sciences? If he did not edit the book, what colleagues in Basle might have done the job? The 1533 *editio princeps* of Ptolemy's *Geographia* is an emblem of how Erasmus related to mathematical interests more largely in Basle. He permitted, perhaps even benignly encouraged, their publication. But his larger-than-life presence has obscured the community around him that did value such work, and the goal of this paper is to bring that community into view.

The configuration of literary and theological interests of Erasmus' modern readers have often obscured his and his 16th-century colleagues' interests in natural philosophy, medicine, and mathematics[4]. A possible exception is natu-

[1] E.g. Antoine de Smet, "Érasme et la cartographie", *Scrinium Erasmianum* 2 (1969): 276-291.
[2] *Opus Epistolarum Erasmi*, 12 vols., ed. Percy Stafford Allen, Helen Mary Allen and Heathcote W. Garrod (Oxford: Clarendon Press, 1906-1958), vol. 10, ep. 2760 (hereafter cited as *Allen*). Translations from the *Complete Works of Erasmus* (Toronto: University of Toronto Press, 1974-) are cited as CWE.
[3] Cornelis Reedijk, "The story of a fallacy: Erasmus's share in the first printed edition in Greek of Ptolemy's Geography (Basle, 1533)", in *Theatrum orbis librorum: Liber amicorum presented to Nico Israel on the occasion of his seventieth birthday* (HES Publishers, 1989), 264-66.
[4] Few studies have been devoted to Erasmus and science: William B. Jensen, "Erasmus on Alchemy", *Bulletin for the History of Chemistry* 31, no. 2 (2006): 58-65; Heinz-Günther Nesselrath, "Erasmus und die Astrologie", in *Zukunftsvoraussagen in der Renaissance*, ed. Klaus Bergdolt and Walther Ludwig (Wiesbaden: Harassowitz Verlag, 2005), 293-308.

ral history. It is no accident that the father of natural history, Pliny the Elder was the focus of Erasmus' earlier philological models, notably Ermolao Barbaro, as well as his closer circle of intimates at Basle, not least his friend, editor, and biographer Beatus Rhenanus. In 1526 the younger scholar formally claimed his place in among serious philologists with his *Annotationes in Plinium*; Beatus, who had been Erasmus's closest friend for over a decade, insisted that only the testimony of ancient manuscripts—not conjecture—reliably restored such texts to a pristine state[1]. The story of philology's crucial role in restoring classical natural history to Renaissance Europe has been told recently with new verve. We have learned the value of techniques of careful reading, habits of emendation, and the constant need to update and correct the reference works of antiquity[2]. The textual habits of Latinate readers—especially the readers shaped by the advice in *De copia* on commonplacing—formed the apparatus of Francis Bacon's new "method" of inference from tables of instances[3]. Such habits reinvigorated

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[1] Beatus Rhenanus, *In C. Plinium annotationes* (Basle: Johann Froben, 1526). On the titlepage, he advertised that not only had he corrected Pliny's *Natural History*, but this book "also showed a method by which not only Pliny, but any author you want can be restored with the help of manuscript books" (verumetiam modus ostenditur, quo tum ipse Plinius tum autores alii praesidio manuscriptorum codicum restitui queant). See Charles G. Nauert, "Humanists, Scientists, and Pliny: Changing Approaches to a Classical Author", *The American Historical Review* 84, no. 1 (1979): 72-85; Marie-Elisabeth Boutroue, "Les Annotationes in Plinium de Rhenanus et la tradition textuelle de l'Histoire Naturelle à la Renaissance", in *Beatus Rhenanus (1485-1547): Lecteur et editeur des textes anciens*, ed. James Hirstein (Turnhout: Brepols, 2000), 327-75.

[2] A sampling of this literature would include Anthony Grafton, April Shelford, and Nancy G. Siraisi, *New Worlds, Ancient Texts: The Power of Tradition and the Shock of Discovery* (Cambridge, MA: Belknap Press, 1992); Gianna Pomata and Nancy G. Siraisi, eds., *Historia: Empiricism and Erudition in Early Modern Europe* (Cambridge Mass.: MIT Press, 2005); Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe* (Chicago: University of Chicago Press, 2006); Ann Blair, "Annotating and Indexing Natural Philosophy", in *Books and the Sciences in History*, ed. M. Frasca-Spada and Nicholas Jardine (Cambridge: Cambridge University Press, 2000), 69-89; Ann Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age* (New Haven: Yale University Press, 2010); Sachiko Kusukawa, *Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-Century Human Anatomy and Medical Botany* (Chicago: University of Chicago Press, 2012).

[3] This connection has been made explicit by Ann Blair, "Humanist Methods in Natural Philosophy: The Commonplace Book", *Journal for the History of Ideas* 53, no. 4 (1992): 541-51. On Erasmus' influence more generally on commonplacing, see Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought* (Oxford: Clarendon Press, 1996), 101 et passim. The theme also informs more recent work on natural history and paper tools, such as Ogilvie, *The Science of De-*

the arts of categorization in the Renaissance—and insofar as such habits can be traced to Erasmus (especially to *De copia*), his legacy has nearly no end.

Our account is much thinner for the constellation of disciplines that made up the arts of quantification. Yet the larger network of scholars who corresponded with Erasmus and took him as model included important representatives of the mathematical disciplines, which included the four liberal arts of the quadrivium (arithmetic, geometry, music, and astronomy) and the adjacent studies of optics and cosmography. As the following pages will show, these included Henricus Glareanus, Cuthbert Tunstall, Sebastian Münster, and Simon Grynaeus[1]. In particular mathematics had long been important to Jacques Lefèvre d'Étaples, the older Paris humanist who was much admired in Erasmian circles[2]. In this article, I suggest that mathematical scholars in Erasmus' orbit shared certain priorities with Lefèvre; in this respect, 'Erasmian mathematics' might better be called 'Fabrist'. To set the stage, I first present several works of mathematics published in Basle during the 1530s, when Erasmus still wielded considerable influence on Basle printing. In the second part, I review the curious relationship of Basle's humanists to Paris—Erasmus himself aggravated the growing distance between Basle and Paris. The final section of the paper compares the attitudes towards mathematics of the Fabrists, Simon Grynaeus, and Erasmus, finding affinities between Lefèvre and Grynaeus.

1. Mathematics in Basle: The 1530s

By the 1530s, no place in Europe had better right to the title 'Erasmian' than Basle. Erasmus had arrived there in 1514, and he returned again and again until his death in 1536. Johann Froben, building on the successes of the Amerbach printing house, reshaped the firm to serve Erasmus' interests, recognizing that with Erasmus he could command a Europe-wide market. He bought a house and garden for his rock-star writer, and opened his door to a steady flow of visitors, would-be writers, and talented correctors who basked in the learning and attention of the famous scholar. As James Tracy put it, "A more intense and articulate group of 'Erasmians' was not to be found anywhere"[1]. Erasmus in turn remained loyal. After Johann's death in 1527, and even after he left the city as it turned to Protestantism in 1529, Erasmus kept close to Froben's son Jerome, who published the edition of Ptolemy's *Geographia* (1533) to which Erasmus attached his name. What, then, did mathematics look like among the Erasmians? Prior to 1531, printers in Basle spent little attention on such disciplines, with the exception of several medical texts, including Hippocrates and Galen, in translation, as well as some critical work on Pliny's *Natural History*[2]. But by 1543, when Vesalius printed his *De fabrica corporum* there, Basle printers had become well known for their beautiful editions of natural philosophy, medicine, and mathematics[3].

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[1] James D. Tracy, "Erasmus Becomes a German", *Renaissance Quarterly* 21, no. 3 (1968): 283.
[2] For a list of these works, see the alphabetically-ordered bibliography in Peter G. Bietenholz, *Basle and France in the Sixteenth Century* (Geneva: Droz, 1971).
[3] As just two examples, Leonhard Fuchs and Andreas Vesalius published their more innovative works first in Basle, beginning in the late 1530s. On the print culture of such printing, see Kusukawa, *Picturing the Book of Nature*, especially 29-97.

Here I will present five books as a sample of the mathematics that augmented Basle's reputation during the 1530s. Three are Greek *editiones principes*: Euclid's *Elementa* (1533), with Proclus' commentary; Ptolemy of Alexandria's *De geographia* (1533); and, finally, the *editio princeps* of Ptolemy's *Almagest* (1538). The first Greek Euclid, Proclus, and Ptolemy are enormously significant in the history of mathematics, yet they only suggest a very select audience of Greek readers. Two further examples of mathematical works published in Basle were more accessible. The 1535 edition of Gregor Reisch's *Margarita philosophica* presents the basic school mathematics any learned man was increasingly expected to know. The other was the Herwagen edition of medieval and Renaissance Latin *Elements* of Euclid. Examined in turn, these works clarify the place of mathematical publishing in Erasmus' context—and suggest Parisian precedents.

Euclid's *Elements* were edited by Simon Grynaeus, whom the University of Basle attracted in 1529 as its new professor of Greek. Grynaeus, who had many friends in Strassburg and Wittenburg, came not least for Basle's new affiliation with the young Protestant movement. The edition of Euclid had roots in Grynaeus' travels to England in the spring of 1531, where he met the new movement's latest protagonist, Henry VIII, as well as Sir Thomas More, who offered letters that allowed Grynaeus to visit Oxford. There he found several Greek manuscripts, which he was permitted to take from Corpus Christi College. Grynaeus' Protestant convictions do not seem to have marred his relationship with Erasmus, for he acted as Erasmus' broker with not only More but also Archbishop William Warham and other friends of Erasmus in England[1].

Grynaeus' attention to Euclid reflected a shifting focus in his scholarship, away from the discovery of Livy that had consolidated his reputation of an eye for classical manuscripts. One of the manuscripts Grynaeus found at Oxford was of the commentary on the first book of Euclid's *Elements* by the fifth-century Neoplatonist Proclus. Immediately on his return to Basle, he published a short work of Proclus, *De motu*, dedicating it to John Clement, librarian of Corpus Christi, Oxford (August 1531). The next year his growing appreciation for mathematics became clear in his preface to a collection of travel documents,

[1] These travels are detailed in M. E. Welti, "Der Gräzist Simon Grynaeus und England", *Archiv für Kulturgeschichte* 45 (1963): 232-42.

where he praised the recent discovery of the new world as a triumph of the *ingenium* of mathematicians[1]. He published the *Elements* of Euclid in 1533, and in the lengthy dedicatory letter to Cuthbert Tunstall, the bishop of London, Grynaeus effused enthusiasm for his new project. "Since I have often wondered", he said, "whether I too might somehow assist these studies in their birth, I decided to have the all mathematical disciplines (as much as we have of their authors today) published in order, in their own tongue. And I spared no effort in this task"[2]. To prove the extent of his efforts, he noted that the sources of his edition were two manuscripts of Euclid, one from Lazare de Baïf (then in Venice), and the other from Jean du Ruel in Paris. John Clement of Oxford had given him the manuscript for Proclus' commentary.

The first Greek edition of Euclid's *Elements*, arguably the most important work in the history of mathematics, was a triumph, the foundation for later philologist-mathematicians south of the Alps such as Federico Commandino and Francesco Maurolico in second half of the century[3]. Yet it seems unlikely Grynaeus' edition was often read on its own. Instead, his edition was excerpted or copied alongside Latin translations, usually only for the first six books of Euclid. For example, Oronce Fine published Grynaeus' Greek enunciations along with the eloquent but inaccurate translation of Bartolomeo Zamberti in Paris in 1536; but even his own 'corrections' of Zamberti's demonstrations showed he had cribbed from the medieval translation of Campanus rather than Grynaeus' Greek[4]. Latin was likewise significant for the commentary of Proclus on

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[1] Simon Grynaeus, *Novus orbis regionum et insularum* (Basle: Johann Herwagen, 1532), preface.
[2] Euclid, *Στοιχείων βιβλίον ιέ ἐκ τῶν Θέωνος συνουσιῶν (...) Adiecta præfatiuncula in qua de disciplinis mathematicis nonnihil*, ed. Simon Grynaeus (Basle: Johann Herwagen, 1533), a5r-v. "Haec cum saepe-numero mecum cogitarem, disciplinas mathematicas, quantum in authoribus est hodie, in sua lingua, ordine omnes emittere decrevi, si qua nascentia studia iuvare ipse quoque possem. Ac nullis dum in hoc sum laboribus peperci".
[3] On the complicated reception of Euclid in the wake of this edition, see Robert Goulding, *Defending Hypatia: Ramus, Savile, and the Renaissance Rediscovery of Mathematical History* (New York: Springer, 2010). Specifically on the rise of a philological tradition around Commandino and Maurolico, see Paul Lawrence Rose, *The Italian Renaissance of Mathematics* (Geneva: Droz, 1975), chapters 8 and 9.
[4] Oronce Fine, *In sex priores libros geometricorum elementorum Euclidis Megarensis demonstrationes: quibus ipsius Euclidis textus Graecus, suis locis insertus est; una cum interpretatione Latina Bartholomaei Zamberti Veneti, ad fidem geometricam per eundem Orontium recognita* (Paris: Simon de Colines, 1536). Other efforts to put the Greek and Latin together are listed by Thomas L. Heath and

Euclid's *Elements*, book 1, which Grynaeus published alongside Euclid. Eventually, Proclus would encourage mathematicians to renovate Aristotelian philosophy by means of mathematics (a point Grynaeus also raised in his preface, as discussed below)[1]. But besides Grynaeus's preface, there are few signs of direct engagement with Proclus' notion of a universal mathematical method until the commentary was translated into Latin in 1560[2]. It took time for Greek editions to filter into cultural consciousness.

The first Greek edition of Ptolemy's *Geographia* was in a different position, because it had been available in Latin for well over a century, under the title *Cosmographia.* The medieval Ptolemy had been the uncontested authority in astronomical matters. When the Italian humanist Jacopo d'Angelo had translated Ptolemy's *Cosmographia* around 1406, he also reinvented Ptolemy as an authority for mapmaking and geography—and so helped to birth a new mathematical discipline with wide resonance in an age of global discovery[3]. A measure of this Latin translation's popularity is that it was printed seven times before 1500—while the *Elements* had only been printed twice. Thus Ptolemy's authority transformed cosmography, previously a discipline of qualitative descriptions, into a discipline of quantitative techniques: his book included tables of longitudes and latitudes for ancient cities, and instigated a whole new genre of maps and accompanying handbooks[4].

Euclid, *The Thirteen Books of the Elements, Vol. 1: Books 1-2* (1908; New York: Dover Publications, 1956), 101-102.

[1] Guy Claessens, "Het denken verbeeld. De vroegmoderne receptie (1533-1650) van Proclus' Commentaar op het eerste boek van Euclides' Elementen" (PhD Dissertation, University of Leuven, 2011); Eckhard Kessler, "Clavius entre Proclus et Descartes", in *Les jésuites à la Renaissance: Système éducatif et production du savoir*, ed. Luce Giard (Paris: Presses universitaires, 1995), 285-308.

[2] Proclus, *In primum Euclidis Elementorum librum commentariorum (…) libri IIII,* trans. Francesco Barozzi (Padua, 1560). On this edition's influence, see Giovanni Crapulli, *Mathesis universalis: Genesi di un'idea nel XVI secolo* (Rome: Ateneo, 1969); David Rabouin, *Mathesis Universalis: L'idée de 'mathématique universelle' d'Aristote à Descartes* (Paris: Épiméthée, 2009).

[3] James Hankins, "Ptolemy's Geography in the Renaissance", in *Humanism and Platonism in the Italian Renaissance*, vol. 1, 2 vols., Storia e Letteratura: Raccolta di Studi et Testi 215 (Rome: Edizioni di storia e letteratura, 2003), 457-68.

[4] The novelty of this quantitative discipline is sketched by Klaus A. Vogel, "Cosmography", in *The Cambridge History of Science: Early Modern Science*, ed. Katherine Park and Lorraine Daston (Cambridge: Cambridge University Press, 2006), 469-96; Adam Mosley, "The Cosmographer's Role in the Sixteenth Century: A Preliminary Study", *Archives Internationales d'Histoire Des Sciences* 59,

As a result, there was already a community of cosmographers at hand when Jerome Froben published the first Greek edition of the *Geographia* in 1533. As mentioned earlier, if Reedijk is correct (and I find his evidence compelling), it is unlikely an aging Erasmus actually edited the work himself. So who helped Froben prepare and correct the text? Possibilities include Simon Grynaeus himself, Henricus Glareanus, Sebastian Münster, or Sigismund Gelenius, who all possessed enough technical skill and philological expertise to complete the task, and who all regularly frequented Froben's printing house. Glareanus had, as early as c. 1513, cut his teeth on the growing discipline of cosmography by writing a short introduction to cosmography, which eventually was published in Basle as *De geographia liber unus* (1527). Sebastian Münster likewise had long been interested in geography. In 1524 he and Beatus Rhenanus discussed how print a new geography of the Rhineland; by 1528 he planned instead to represent all Germany; his *Cosmographia* was finally printed in 1544, including maps and cityscapes of all Europe and beyond[1]. In 1533 Münster was highly respected for his Hebrew and Greek scholarship, and in 1540 he published a new Latin edition of Ptolemy's *Cosmographia* that drew on the original Greek as well as the extant Latin translations. As Reedijk admits, it seems strange that the 1533 *editio princeps* does not acknowledge the work of accomplished scholars, whom Erasmus respected, such as Grynaeus, Glarean, and Münster. For this reason, he suggests Sigismund Gelenius as the possible editor—Gelenius was known both for excellent Greek and for foregoing recognition. Thankfully, we need not identify the editor's true identity here. The point to emphasize here is that Froben's shop included several talented scholars with mathematical interests.

We do know that it was again Simon Grynaeus who produced the *editio princeps* of Ptolemy's *Almagest* in 1538[2]. Grynaeus presented the work to Henry VIII of England, whom he had met seven years earlier, as an extension of the work he had begun with the edition of Euclid. The dedication to Henry was especially appropriate because Ptolemy, according to long tradition, was himself an Egyptian king. Grynaeus mostly preached the power of astronomy to draw

no. 2 (2009): 423-39.

[1] The conversation is mentioned in a letter to Beatus of 1526, cit. Matthew McLean, *The Cosmographia of Sebastian Münster: Describing the World in the Reformation* (Aldershot, England-Burlington, VT: Ashgate, 2007), 146.

[2] Claudius Ptolemy, *Megales syntaxis* (Basle: Herwagen, 1538).

the king's mind upward to the divine mind evident in the heavenly motions. But he wisely intimated that astronomy also had practical value for the state, since by this art alone one "protects the sea power of our people, or may, in a position of command, go around the whole globe of our world"[1]. This attitude hinted at the practical value that Elizabethan erudites like John Dee and Gabriel Harvey would find in mathematics—all the more astonishing that the point is made so clearly in the first printing of the Greek *Almagest*. In the second half of the 16th century the book would be less and less valuable, as alternatives to Ptolemy's systematic account of the heavens became more and more popular, especially in the Wittenberg circles that knew Grynaeus' name well[2]. Indeed, Copernicus received a copy of Grynaeus' Ptolemy in 1539, and drew from it in the last revisions of *De revolutionibus* (1543)[3].

The new Greek editions of Euclid, Proclus, and Ptolemy represented a heady moment in what Grynaeus had called the new "birth of mathematics". They did not, however, capture the extent of mathematical publishing in Basle. Students, and indeed most masters, were unlikely to expend effort on mathematics in Greek. Instead, they used Latin works, such as two others printed at Basle in the 1530s: one was a collection of introductions to arithmetic, geometry, and optics that were added to the 1535 edition of Gregor Reisch's *Margarita philosophica*; the other was an edition of Euclid's *Elements* in facing medieval and Renaissance translations (1537). Both reveal origins in Paris.

Grynaeus already had some contact with Paris in 1532. Johann Herwagen, who had married Johann Froben's widow and took over part of his press, published Grynaeus' collection of travel writings, the *Novus orbis regionum et insularum* in March 1532. After Grynaeus' prefatory letter to Tunstall, the first tract was the *Introduction to Cosmographical Maps* by Sebastian Münster, then

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[1] Ibid., a4v. "Ergo maris imperium sic illa genti nostrae sola tuetur, circuire globum orbis nostri totum huius ut ductu liceat".

[2] The classic picture of the 'Wittenberg Circle' is given by Robert S. Westman, "The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory", *Isis* 66, no. 2 (1975): 164-93. On Grynaeus's importance to them, see his name in the index of Charlotte Methuen, *Kepler's Tübingen: Stimulus to a Theological Mathematics* (Aldershot: Ashgate, 1998).

[3] Alain-Philippe Segonds and Concetta Luna, "The Greek Text of Ptolemy, Almagest XIII, as Source of Book VI of Copernicus's De Revolutionibus", *Journal for the History of Astronomy* 44, no. 157 (2013): 413-27.

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teaching theology and Hebrew at Heidelberg, but who often traveled to Basle. Münster may have also provided the map that immediately followed his *Introductio* in this first edition[1]. But in November of 1532, a second edition was published in Paris. In place of the original map, possibly by Münster, the Paris edition included the remarkable double-cordiform world map of Oronce Fine[2]. Fine, the first royal professor of mathematics of the newly-instituted *Collège Royal*,had earned his position through the offices of Guillaume Budé, one of Grynaeus' Paris correspondents. The unique cordiform projection announced Fine's ingenious mastery of mathematics, and therefore his right to the most prestigious mathematical professorship in Europe.

It is not clear whether Grynaeus had an active hand in the Paris edition of the *Novus orbis*. But Oronce Fine must have established some formal relationship with the Basle group, because within a couple of years, Basle printers published Oronce Fine's new edition of Gregor Reisch's popular textbook *Margarita philosophica*. Judging from his preface, Oronce Fine had already "corrected and augmented" Reisch's book in 1525. It appears Paris printers were unwilling to reprint the older textbook, whereas he or his agent was able to convince Basle printers of the volume's marketability. The book on which he drew, originally published in 1503, contained only dialogues addressing the seven liberal arts as well as a survey of Aristotle's natural philosophy and ethics—the basics of the university arts curriculum. Already in 1508, printers added several appendices of practical mathematics, notably the standard medieval introduction to the quadrant, useful in surveying[3]. But Fine's Basle edition of 1535 expanded

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[1] The map does not indicate its maker, but Shirley suggests that Münster designed it. Rodney W. Shirley, *The Mapping of the World: Early Printed World Maps, 1472-1700*, Holland Press Cartographica 9 (London: Holland Press and Moxon, 1983).

[2] Later editions of geographical works, such as the Freiberg 1536 edition of Glareanus' *De geographia* (with a preface from 1529) also used this map, which was very influential. Robert Karrow, *Mapmakers of the Sixteenth Century and Their Maps* (Chicago: Speculum Orbis, 1993), 179-180. Shirley, *Mapping of the World*, no. 67. Note that this is not the single cordiform map Fine produced in 1525, titled "Nova totius Galliae descriptio".

[3] See the introduction to Gregor Reisch, *Natural Philosophy Epitomised: Books 8-11 of Gregor Reisch's Philosophical Pearl (1503)*, trans. Andrew Cunningham and Sachiko Kusukawa (Farnham, Surrey; Burlington, VT: Ashgate, 2010). In 1522 Jacob Wimpfeling, former headmaster of the Latin school of Sélestat (Schlettstadt), recommended it for use at the University of Heidelberg; in Basle, Konrad Pellikan used it in the Franciscan stadium (xi-xii).

much further. He also added large excerpts from several mathematical textbooks by the Paris humanists whose tradition he hoped to extend. In 1503 Jacques Lefèvre d'Étaples, Josse Clichtove, and Charles de Bovelles had produced a suite of mathematical treatises on arithmetic, geometry, optics, and astronomy, aimed primarily at education in the Collège du Cardinal Lemoine in Paris[1]. Fine selected parts of each of these works to further augment Reisch's encyclopedic textbook, thereby cementing his own relationship to the Fabrist mathematical tradition[2]. In Fine's Basle edition, these texts were republished until 1600, including an Italian translation.

Parisian precedent also lay behind another widely read translation of Euclid. The Latin Euclid was in growing demand in Basle; in 1537 Grynaeus wrote a friend on behalf of a student, asking for a copy of the *Elements*, because he could find none for sale[3]. Spotting a market, the printer Johann Herwagen turned to Lefèvre's edition from 1516[4]. Lefèvre had set the standard medieval translation by Campanus (13th century) alternating with the humanist Venice translation of Bartolomeo Zamberti. Unlike the Greek editions, which were certainly highly significant in the long term, the alternating translations had more immediate benefits, and seem to have been a standard volume in mathematicians' libraries all over 16th century Europe[5]. The twin translations recognize the challenges of mathematical philology: Zamberti's new translation was certainly eloquent,

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[1] Jacques Lefèvre d'Étaples, Josse Clichtove, and Charles 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).

[2] On this relationship, see Isabelle 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.

[3] Alfred Hartmann, ed., *Die Amerbachkorrespondenz* (Basle: Verlag der Universitätsbibliothek, 1942), ep. 2100, vol. 5.

[4] Jacques Lefèvre d'Étaples, *Euclidis Megarensis mathematici clarissimi Elementorum geometricorum libri XV, Campani Galli Transalpini in eosdem Commentariorum libri XV, Theonis Alexandrini Bartholamaeo Zamberto Veneto interprete, in Tredecim Priores, Commentariorum libri XIII, Hypsiclis Alexandrini in Duos Posteriores, eodem Bartholamaeo Zamberto Veneto interprete, Commentariorum libri II* (Paris: Henri Estienne, 1516).

[5] For just a few examples of libraries that contain such volumes, see catalogues for libraries of John Dee, Jean du Temps, Francesco Maurolyco, Federico Commandino, Francesco Barozzi, Bernardino Baldi, Marin Mersenne.

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but also included elementary mathematical mistakes; Campanus' translation, on the other hand, was not exactly faithful or elegant Latin, but made better mathematical sense. By setting the two side by side, Lefèvre offered the virtues of both mathematical and Latin eloquence[1]. Herwagen published this edition in August 1537, corrected and restored by Christian Herlinus, the public professor of mathematics at Johannes Sturm's academy in Strassburg[2]. Herwagen republished this book at least two more times (1546 and 1558).

To some degree, the Greek scholarly editions and Latin "popular" editions reflected the German tradition of mathematical scholarship. This German tradition often traced itself back to Regiomontanus in Vienna, with figures like Erasmus' friend Willibald Pirckheimer, Georg Tanstetter (of Vienna), some of the circle of Conrad Celtis in Ingolstadt, and even in the Wittenberg of Philip Melanchthon—Melanchthon's oration "to studious youth" on the utility of geometry prefaced the Basle 1537 edition of Lefèvre's dual Latin version of Euclid. Grynaeus had indeed studied with Melanchthon before the latter went to Wittenberg, a relationship he maintained. Especially after 1529, when Basle chose for a Protestant model of reform, the city attracted Germans unhappy with Rome. One such figure was Jakob Ziegler (also known as Tanstetter), long a member of the Ingolstadt community around the German poet laureate Conrad Celtis[3]. He originally appears to have worked in the papal curia, but in August of 1531 he crossed the Alps from Rome to Basle, to join the Protestant cause and to publish his commentary on book 2 of Pliny's *Natural History*, on astronomy and cosmography[4]. To some degree, Tanstetter's works, like those

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[1] On this question, see Richard J. Oosterhoff, "Neolatin Mathematics", in *Brill's Encyclopaedia of the Neo-Latin World: Macropaedia*, ed. Philip Ford, Jan Bloemendal, and Charles Fantazzi (Leiden: Brill, 2014), 694-695; Rose, *The Italian Renaissance of Mathematics*, 51-52.

[2] Campanus and Bartholomaeo Zamberti, *Euclidis Megarensis Geometricorum Elementorum Libri XV*, ed. Jacques Lefèvre d'Étaples (Basle: Johannes Hervagius, 1537), a1v. Herlinus has the distinction of being singled out by Leibniz in his critique of Locke, for his later study of Euclid in which he expanded Euclidean proofs in syllogistic form—the height of inelegance: *Analyseis geometricae sex librorum Euclidis* (Strassburg: Iosias Rihelius, 1566).

[3] On the mathematical interests of this circle, see C. Schöner, *Mathematik und Astronomie an der Universität Ingolstadt im 15. und 16. Jahrhundert* (Berlin: Dunker & Humblot, 1994). Note that Ziegler is to be distinguished from Georg Tanstetter, professor at Vienna.

[4] Jakob Ziegler, *Commentarius in Plinii De naturali historia librum secundum* (Basle: H. Petrus, 1531).

of Simon Grynaeus, represent the German tradition, extending even back to Regiomontanus, perhaps the mathematician Ziegler cited most.

But these German connections should not overshadow deep roots in France as well, also in mathematics. Ziegler also reflected the Parisian legacy when he cited Lefèvre among the "musici recentiores" who explained how the distances between planets can be described as proportional in the same manner as musical tones[1]. The relevant work was Lefèvre's Boethian *Elementa musicalia* (1496). Ziegler also cited Lefèvre's *Introductorium Astronomicum*, implying that since the work was commonly known he need not repeat Lefèvre's explanation[2]. Erasmians often, it appeared, had more use for mathematics than did Erasmus himself.

2. The Fabrist Legacy in Basle

The brilliant community Erasmus savored in Basle, as Bietenholz has pointed, owed a great deal to the exchange of people, training, books, and ideas they enjoyed with Paris in the first part of the century. Yet such influences are difficult to trace in Erasmus' correspondence, and infrequently recognized in Basle letters. Rehearsing the contacts between Lefèvre's circle and Basle helps explain why Parisian influence might have been greater than first appearances suggest[3].

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[1] Ibid., 232.

[2] Ibid., 233.

[3] This paradox permeates Bietenholz, *Basle and France in the Sixteenth Century*, 181-186; Margaret Mann Phillips, "Erasmus in France in the Later Sixteenth Century", *Journal of the Warburg and Courtauld Institutes* 34 (1971): 246-61; André Stegmann, "Erasme et la France (1495-1520)", in *Colloquium Erasmianum*, Actes du Colloque International réuni à Mons du 26 au 29 octobre 1967 (Mons, 1968), 283. Although I do not address the question, a growing sense of German nationalism among Alsatian humanists like Beatus Rhenanus is partly to blame, no doubt, and Erasmus seems to have catered to the growing pride in *Germania* over *Gallia*. Tracy, "Erasmus Becomes a German"; Lisa Jardine, "Penfriends and Patria: Erasmian Pedagogy and the Republic of Letters", *Erasmus of Rotterdam Society Yearbook* 16 (1996): 1-18.

In August 1514, Erasmus traveled up the Rhine to Basle to a hero's welcome. Along the way, he was greeted with a feast at Strassburg, and then offered flagons of wine and more feasting in Schlettstadt (now Sélestat). From there Johannes Sapidus, headmaster of Schlettstadt's famous grammar school, accompanied him the rest of the way to Basle, where Johann Froben and his family paid his bill at the inn and then insisted he stay at their own home. Of course, we know of this triumphal procession because Erasmus wrote an extended account of his welcome in a letter he wrote to the literary sodality at Strassburg to thank them for their hospitality[1]. Skilled publicist that he was, Erasmus' own narrative about his triumphal journey up the Rhine has obscured the very reason he made Basle his home: the city already possessed talented men of letters. His success in the next couple of years, publishing the *Proverbiorum chiliades* (i.e. the second major revision of the *Adages*, 1515), the Greek New Testament (1516), the Letters of Jerome (1516), and the *Moriae encomium*, and the sudden flood of his letters inundating Alsace makes it easy to think that it was Erasmus who attracted illustrious colleagues[2]. To be sure, letters and scholars did come to Froben's already-busy house all the more, but Erasmus decided to remain in Basle because he found there a community that already loved him, and was already accomplished enough to assist his own work. Recent work has shown just how much Erasmus effectively leaned on others such as Oecolampadius, Wolfgang Capito and Konrad Pellikan to correct, compare Hebrew examples, and ensure doctrinal coherence in his editions of Jerome's letters and of the Greek New Testament[3]. Such colleagues, he knew, were not to be taken for granted. In delight he wrote Johannes Sapidus, headmaster in Sélestat, of the intellectual

[1] Ep. 305 (CWE 3.23-33). This letter was printed four months later with Erasmus' best selling work to date, the *Copia* (Strassburg: Matthias Schürer, December 1514). Erasmus wrote in response to the several lines of welcome that Jacob Wimpfeling sent from Strassburg in early September; Erasmus' extended response takes more than nine pages, and his humble thanks skilfully publicizes this moment for an international audience.
[2] On Erasmus' self-promotion, see Lisa Jardine, *Erasmus, Man of Letters: The Construction of Charisma in Print* (Princeton, NJ: Princeton University Press, 1993); Hilmar M. Pabel, "Credit, Paratexts, and Editorial Strategies in Erasmus of Rotterdam's Editions of Jerome", in *Cognition and the Book: Typologies of Formal Organization of Knowledge in the Printed Book of the Early Modern Period*, ed. Karl A.E. Enenkel and Wolfgang Neuber (Leiden: Brill, 2005), 217-56; Hilmar M. Pabel, *Herculean Labours: Erasmus and the Editing of St. Jerome's Letters in the Renaissance* (Leiden: Brill, 2008).
[3] This picture emerges, for example, in Tracy, "Erasmus Becomes a German".

community he had found in Froben's print shop: "They all know Latin, they all know Greek, and most know Hebrew too; one is an excellent historian, another an experienced theologian; one is skilled in mathematics, one is a studious antiquary, another a legal scholar. You yourself know how rare this is. Before now, I certainly have never had a chance to live in such a happy group. And to say nothing of that, how open they are, how joyful, how harmonious! You would say they shared but one soul"[1].

Indeed, by 1516 Basle was a humanist hothouse. As a mid-sized, free imperial city, Basle straddled several key trade-routes, including the Rhine, between France, Germany and Italy, forming a corridor taken by many scholars. In the 1460s, Johannes Heynlin von Stein taught at the newly founded university of Basle (est. 1459), where his students included Johannes Amerbach and Johannes Reuchlin. After gaining a prestigious degree in theology at Paris, where he partnered with the Sorbonne's librarian Guillaume Fichet to set up the first Paris press, Heynlin returned to Basle as city preacher in 1474. In the next decade Johann Froben and Johannes Amerbach founded their famous presses in the city, much praised by the Basle poet laureate Sebastian Brant (before he left for Strassburg in 1501)[2].

In an age of entrepreneurial printers, Amerbach and Froben succeeded in part because they cultivated a growing stable of talented authors, editors, and correctors[3]. In 1509, the gifted Greek scholar Johannes Cuno came to Froben's after several years with Aldus Manutius in Venice. Others followed. In 1511 Beatus Rhenanus joined Cuno, and then Ludwig Bär, Henricus Glareanus, Wolfgang Faber Capito, and Johannes Oecolampadius—as well as Erasmus. In 1515 Hans and Ambrosius Holbein came to Basle from Nuremberg and designed numer-

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[1] Ep. 364 (*Allen* I.154). "Nemo Latine nescit, nemo Graece nescit, plaerique et Hebraice sciunt; hic in historiae cognition praecellit; ille callet theologiam; hic mathematis peritus est; alius antiquitatis studiosus, ille iuris consultus. Iam hoc quam sit rarum ipse nosti. Mihi certe hactenus non contingit in aeque felici versari contubernio. Verum ut haec sileantur, qui candor omnium, quae festivitas, quae concordia? Unum omnibus animum esse iures". This was published in the *Epistolae elegantes* (Basle, 1518).

[2] This paragraph is especially based on Hans Rudolph Guggisberg, *Basle in the Sixteenth Century: Aspects of the City Republic Before, During, and After the Reformation* (Wipf and Stock Publishers, 2010).

[3] Earle Hilgert, "Johann Froben and the Basle University Scholars, 1513-1523", *The Library Quarterly* 41, no. 2 (1971): 141-69.

ous frontispieces for Froben[1]. Froben also made the most of his city's resources. Basle's monasteries were on the decline, but some, and especially the Carthusians, had once been centers of manuscript copying and book-making—their libraries supplied Froben with material to print. The largest convent belonged to the Franciscans, who included important scholars among their number, notably Konrad Pellikan and Sebastian Münster, both hebraists. After joining the Protestant cause with Basle in 1529, Münster would go on to write the *Cosmographia* (1544), the bestselling collection of maps and city-scapes, and become rector of the city's university.

The Rhineland community drew on long relationships with Paris, and in particular with the circle of scholars around Jacques Lefèvre d'Étaples in the 1500s. Johann Amerbach, having earned the Paris MA in the 1470s, in 1501 sent his sons, Bruno and Boniface, to Paris for the same training. He demurred when he found out his sons had skipped the Scotist schools he had frequented; instead they spent afternoons at the Collège du Cardinal Lemoine, at Lefèvre's lectures "without commentaries", which Bruno thought would be as useful as the more traditional Scotist studies[2]. The Amerbach boys were only some of the schoolboys from the Rhineland attracted to the Collège du Cardinal Lemoine. Jerome Gebwiler was master of the Latin school at Schlettstadt from 1501 to 1509, after he earned the MA with Lefèvre at Paris. He taught Martin Bucer and prepared several Sélestat students to go to Paris, including Boniface Amerbach, Michel Hummelberg, Johann Sapidus, and Beatus Rhenanus[3]. The students of the Collège du Cardinal Lemoine knew well the *Écu de Bâle*, the sign under which Basle publishers sold their books in Paris.

Beatus Rhenanus is perhaps the most intriguing of the Rhenish scholars with close ties to Lefèvre, in part because his surviving archive of books from this pe-

[1] Frank Hieronymus, "Jacobus Faber (c. 1500-c. 1550), un graveur français à Bâle", *Bulletin du bibliophile* 1 (2005): 64-84.

[2] Hartmann, *Die Amerbachkorrespondenz*, 1:120 (no. 146). Augustin Renaudet, *Préréforme et humanisme à Paris pendant les premières guerres d'Italie, 1494-1517*, 2nd ed. (1916; Paris: Édouard Champion, 1953), 404-406. See also Richard J. Oosterhoff, "Mathematical Culture in Renaissance Paris: University, Print, and the Circle of Lefèvre d'Étaples" (PhD Dissertation, University of Notre Dame, 2013), 127-128.

[3] Paul Adam, *L'Humanisme à Sélestat: L'école, les humanistes, la bibliothèque*, 5th ed. (1967; Sélestat: Imprimerie Stahl Sélestat, 1987).

riod serve as a unique window onto Lefèvre's teaching. Beatus arrived in Paris in the summer of 1503, and bought more than 250 books during his four years in Paris. Yet his annotations show that the books he read for classwork were those by Lefèvre and other professors at Cardinal Lemoine[1]. In broad outlines, these books included the usualprogression throughAristotelian logic, natural philosophy, and ethics. But besides focusing on the primary texts, with minimal commentary, Lefèvre's teaching differed from the common *modus Parisiensis* in a key way: he began the curriculum with mathematics, insisting that this would open all the other disciplines. At each stage, Beatus read introductions and short commentaries by his teachers, including Lefèvre, Josse Clichtove, and Charles de Bovelles, including the compendium of mathematics that Oronce Fine would later excerpt for the 1535 edition of the *Margarita philosophica*. In fact, Beatus bought three mathematical books in 1503, which he bound together in one *Sammelband*[2]. The first was a compendium of shorter introductions by his professors: Lefèvre's epitome of Boethian number theory; Josse Clichtove's practical introduction to arithmetical operations; Charles de Bovelles' short introductions to geometry and optics; and finally Lefèvre's brief introduction to planetary theory[3]. The second was a collection of advanced treatises on number and music theory, one edited and another authored by Lefèvre[4]. The third book was Lefèvre's commentary on the basic astronomy textbook of the medieval university, Sacrobosco's *Sphere*[5]. By studying the "cursus Fabri", Beatus and fellow-students like the Amerbach boys enjoyed a training in mathematics unusual at the time[6]. By 1506 Beatus was reading for the MA, and probably

[1] For a bibliography describing the works Beatus bought and annotated in Paris, see Oosterhoff, "Mathematical Culture", Appendix C, 406-23.
[2] This volume is now in the Bibliothèque humaniste de Sélestat, shelfmark K 1046.
[3] Lefèvre d'Étaples, Clichtove, and Bovelles, *Epitome, etc.*, Bibliothèque humaniste de Sélestat K 1046a.
[4] 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), Bibliothèque humaniste de Sélestat K 1046b.
[5] Jacques Lefèvre d'Étaples, *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 Estienne, 1500), Bibliothèque humaniste de Sélestat K 1046c.
[6] See also Oosterhoff, "Mathematical Culture", 56-61.

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teaching the same books in the college as a licentiate. Certainly he assisted Lefèvre and others by correcting books, a skill that would put him in high demand as a corrector among the printers of Strassburg and Basle after he left Paris in 1507[1]. While Beatus never appears to have taken a creative interest in mathematics, his experience would have been familiar to the other Rhineland humanists who first studied in Paris.

Although Basle's earliest and most accomplished humanists and printers had warm relations with Paris and especially Lefèvre, the connection seems to have cooled with Erasmus. The reasons for this change reflect Erasmus' complicated and ambitious response to the intellectual culture of Paris. As both Stegmann and de la Garanderie have pointed out, he seems to have connected closely with only two figures during his initial stay in the 1490s[2]. The one, the Mathurin Robert Gaguin, was the central figure in an earlier wave of Paris humanists with close ties to Italy; the other was Fausto Andrelini, an Italian poet who had made Paris his home while he taught Latin letters at the university. But although Erasmus must have known Lefèvre, he never indicated any intimacy with the pedagogue who had become the new center of more 'eloquent letters', hailed as the French heir to Ficino and Pico. Possibly Erasmus, studying theology at the Collège de Montaigu, found the philosophical education at Lemoine to be beneath him. Or perhaps it was distasteful, since it was still structured along traditional Aristotelian lines, and Erasmus himself pursued a very different approach to the liberal arts (a point addressed below). James Farge has even suggested that Erasmus may have found Parisian theological education not merely a bore and inhumane, as he often said, but perhaps more difficult

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[1] Beatus' first appeared in print with some verses on the titlepage of Ramon 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). On correcting practices in Lefèvre's circle, see Elizabeth Armstrong Tyler, "Jacques Lefèvre d'Etaples and Henri Estienne the Elder, 1502-1520", in *The French Mind: Studies in Honour of Gustave Rudler*, ed. W. Grayburn Moore (Oxford: Sutherland and Starkis, 1952), 17-33. On Beatus as an outstanding corrector and editor, see now also Anthony T. Grafton, *The Culture of Correction in Renaissance Europe* (London: The British Library, 2011), passim.

[2] Marie-Madeleine de la Garanderie, "Les relations d'Erasme avec Paris, au temps de son sejour aux Pays-Bas meridionaux", in *Scrinium Erasmianum* (Leiden, 1969), 29-53; André Stegmann, "Erasme et la France (1495-1520)", in *Colloquium Erasmianum*, Actes du Colloque International réuni à Mons du 26 au 29 octobre 1967 (Mons, 1968), 283.

than he liked to admit[1]. In any event, Erasmus became famous without Parisian help, while traveling England and Italy. Meanwhile, after Lefèvre retired from university teaching in 1507, he turned to scholarship on the Church Fathers and the Bible. It was these fields that put him into conflict with Erasmus.

In 1516, Erasmus generously praised the older humanist's biblical scholarship. The firstfruits of Lefèvre's biblical studies was the *Quincuplex Psalterium* (1509), quickly followed by the *Epistolae Pauli* (1512), which focused on establishing good Latin editions, corrected against the Greek, with short commentary largely focused on how the text might lead the devout reader to Christ[2]. In August of 1516, Erasmus wrote that "recently Lefèvre, my friend, did for Paul what I am doing for the whole New Testament. Indeed Lefèvre was much more daring than me. He set his interpretation against the ancients and against Paris, queen of all universities—while I merely claim to have fixed or explained a few places, like a corrector"[3]. In the annotations of the *Novum instrumentum* (Basle, 1516), Erasmus often disagreed with Lefèvre, but always with great respect, setting him alongside Lorenzo Valla and describing him as "that wonderful man Lefèvre, our incomparable friend"[4]. Certainly, there were obvious differences. Erasmus gave a complete Greek edition, and reflected a secure mastery of Greek. And Erasmus took a more critical perspective, for example, doubting whether Paul authored the letter to the Hebrews, since its Greek style was so

[1] James K. Farge, "Erasmus, the University of Paris, and the Profession of Theology", *Erasmus of Rotterdam Society Yearbook* 19 (1999): 18-46.

[2] Guy Bedouelle, *Lefèvre d'Étaples at l'intelligence des Écritures* (Genève: Droz, 1976); Guy Bedouelle, *Le Quincuplex Psalterium de Lefèvre d'Étaples: Un guide de lecture* (Geneva: Droz, 1979). For details of the dispute sketched here, see Margaret Mann, *Érasme et les débuts de la réforme française (1517-1536)* (Paris: Honoré Champion, 1934), 23-46; Guy Bedouelle, "Lefèvre d'Etaples et Erasme: une amitié critique", in *Jacques Lefèvre d'Étaples (1450?-1536)*, Actes du colloque d'Etaples les 7 et 8 novembre 1992 (Paris: Honoré Champion, 1995), 23-42; Jacques Lefèvre d' Étaples and Sheila M. Porrer, *Jacques Lefèvre d'Etaples and the Three Maries Debates* (Genève: Librairie Droz, 2009), 26-32.

[3] 16-26 August 1516, Ep. 456 (*Allen* II:324). "Iacobus Faber Stapulensis, amicus noster, dudum id fecit in Paulum quod ego in totum Novum Instrumentum. Ille suam interpretationem veteri opposuit, idque in academiarum omnium regina Lutetia; ego recognitorem modo professus locus aliquot aut corrigo aut explico".

[4] Desiderius Erasmus, *Novum instrumentum* (Basle: Johann Froben, 1516), 417. "Tametsi dissentit eximius ille vir et amicus noster incomparabilis, Iacobus Faber Stapulensis, quem ego quoties nomino, honoris causa nomino (…)".

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much more elegant than other New Testament letters. In fact, Lefèvre found this attitude approached disrespect. His concern sparked into flame on a passage of Hebrews where Erasmus adopted a reading that Lefèvre thought diminished the divinity of Christ[1]. In the second edition of his *Epistolae Pauli* (1516), Lefèvre burst out in a rare moment of intemperance, saying that Erasmus was flirting with heresy. The details of the exchange have been frequently described; their results have often been mis-characterized. Erasmus felt betrayed. In less than two weeks he dashed off an *Apologia ad Fabrum*, which tore apart the older scholar's Greek, and offered plausible theological reasons for his better readings of the manuscripts. He had the pamphlet delivered personally to Lefèvre, along with a note that threatened Lefèvre with worse, if he continued the dispute: "do not let provocation by other people drive you into a position in which you may later be very sorry to find yourself. Restrain the language of your supporters as well as yours; I have restrained my own friends so far"[2]. It worked. Lefèvre never responded. He was so quiet that Erasmus seems to have grown nervous. In the next months he frequently worried about rumors that Lefèvre was preparing a response[3]. Finally, he strenuously defended his severe rearguard action to Guillaume Budé: "it is not very honourable, you say, to dispute in public with a friend. But is it, I ask you, honourable to make such attacks on a friend who does not deserve them? (…) for a friend's sake to be counted a blasphemer against Christ is not only absolutely mad but grossly impious"[4]. Erasmus, without waiting for a response, added his defensive letter to the next edition of the *Novum Testamentum*; it was circulated far more widely than Budé's

[1] The passage was Hebrews 2:8: Erasmus adopted the reading "God made man a little lower than the angels", which was more common in both Latin and Greek manuscripts, instead of "a little lower than God" which Jerome had approved. Lefèvre held the minority view for theological reasons: since Hebrews was describing Christ, this diminished Christ in Lefèvre's eyes.

[2] Ep. 776 (CWE 117). Erasmus attributes several shocking charges to Lefèvre: "'words most unworthy of Christ and of God', 'words self-destructive from every point of view, and from every aspect exhibiting their own falsity', 'words which are hostile to the understanding of prophecy', 'words which support the case of those pestilent Jews and treat Christ with contumely as they do', 'words worthy of Bedlam', 'words which if obstinately adhered to, would make me a heretic', and plenty more of the same kind". But only the first three of these charges have any textual basis in Lefèvre's writing. Erasmus seems to have indulged in some posturing for effect.

[3] E.g. ep. 719.

[4] Erasmus to Budé, 22 Feb 1518, ep. 778.

response, which gently chided Erasmus for descending into unworthy battles with a fellow soldier of truth[1]. The damage was done.

The dispute between Erasmus and Lefèvre clanged all the more loudly in their corner of the republic of letters because friends of the one usually hoped to be friends of the other. When scholars traveled from Basle to Paris, they sought out the aging Lefèvre. In 1516 the Franciscan Konrad Pellikan, who had helped Erasmus with Hebrew notes in his editions of the New Testament and Jerome, visited Paris, met with Lefèvre, and passed on news of Beatus Rhenanus, and Bruno and Basil Amerbach[2]. The next year the Swiss savant Henricus Glareanus, who had lived with Erasmus in Basle since 1514, moved to Paris. Erasmus consistently praised the young Swiss savant, and when Erasmus himself politely declined the invitation of the bishop of Paris, Etienne Poncher, to accept the Francis I's patronage, Erasmus commended Glareanus in his stead[3]. Glareanus spent five years in Paris, and at the height of the Hebrews controversy boasted to his countryman Hüldrich Zwingli:

"Lefèvre d'Etaples is now often my close companion. Above all, this completely honest and eminent man sings, plays, disputes, and laughs with me, especially at this foolish world, as someone so humane and kind that it often seems—even though it does not really happen—as if he has forgotten his difficulties"[4].

By 1519, even though friends and colleagues remained on good terms with Lefèvre, Erasmus himself sensed strained relations with Paris as a whole. He had fled the theological training of Paris, and joined in vociferous criticisms of the university's most powerful interest group, the faculty of theology; he had overreacted in criticism of France's most venerable and ancient man of letters, Lefèvre; and he had—delicately, elegantly—declined Francis I's invitation as well as that of the king's middle-man, the bishop of Paris. In 1519, Lefèvre

[1] Budé to Erasmus, 12 April 1518, ep. 810 (*Allen* III.268-281).
[2] *Das Chronikon des Konrad Pellikan*, ed. B. Riggenbach, (Basle, 1844), 53. Cit. Bietenholz, *Basle and France in the Sixteenth Century*, 181.
[3] To Etienne Poncher, 14 February 1517, ep. 529 (*Allen* II.454-458).
[4] To Zwingli, 29 August 1517: "Faber Stapulensis, qui saepe iam comui meae fuit. Is supra modum me amat, totus integer et candidus, mecum cantillat, ludit, disputant, ridet mecum stultum praecipue hunc mundum, vir humanissimus atque ita benignus, ut nonnunquam videatur—quamquam id revera minime facit—fideatur tamen suae gravitates oblitus" (*Zwinglis Sämtliche Werke*, VII, ep. 26, p. 59).

wrote to apologize for not having written Erasmus sooner[1]. But in the next year Lefèvre took a direction that must have galled Erasmus[2]. Lefèvre wrote to Beatus Rhenanus (the last letter we have between them), asking Beatus to give his regards to Luther. Then Lefèvre was invited to Meaux, along with Gérard Roussel and Guillaume Farel, to reform the diocese through popular education and especially preaching. Under pressure from the Paris Faculty of Theology, the project folded in 1525. While Farel fled to Basle, Lefèvre appears to have gone straightaway to Strassburg. Erasmus' comment was hardly complimentary: "The Frenchman Lefèvre d'Étaples fled to Strassburg, but after changing his name, like that old comic Chremes of Athens, in Stilpho's commentary"[3]. The Basle printer Andreas Cratander was known for publishing Lutheriana, and Erasmus withheld his support from him. The more measured proponents of reform in Basle found Farel too much of a firebrand, and soon expelled him from the city. In sum, Bietenholz suggests, Lefèvre's "Lutheran turn" around 1519 forced Froben to choose between Lefèvre and Erasmus, which goes some way towards explaining why Basle humanists were careful not to mention Lefèvre much to Erasmus after that point[4].

In part, Lefèvre could fade from view because Erasmus and his Basle coterie found another key representative of Paris in Guillaume Budé. In 1519, Erasmus responded to some comments of Louis de Ruzé, who had tried to make out Budé as the only real humanist of the day—a Frenchman, not Erasmus. Erasmus cleverly relativized Ruzé's judgment by suggesting that there were, in fact, a great many more stars in France: Lefèvre, Guillaume Cop, Paolo Aemilio,

[1] Ep. 674 (*Allen* III.954).
[2] Lefèvre's biblical humanism at this time has often been characterized as more "Erasmian", another example, I think, of Erasmus' massive reputation distorting perspective on his actual influence. E.g. Mann, *Érasme et les débuts de la réforme française (1517-1536)*, 47; Renaudet, *Préréforme et humanisme*, 686-687.
[3] To John O'Lasco, 8 March 1526, ep. 1674 (*Allen* VI.281). "Faber Stapulensis Gallia profugus agit Argentorati, sed mutate nomine, quemadmodum comicus ille senex Athenis Chremes erat, in Lemno Stilpho".
[4] Bietenholz, *Basle and France in the Sixteenth Century*, 184. In note 20 Bietenholz hints that Erasmus withdrew his support from Cratander in part because everyone knew the close relationship between Lefèvre and Farel. Moreover, Cratander and Wattenschnee (who managed the *Écu de Bâle* in Paris) published Lefèvre's biblical works on the Psalms and his French translation of the New Testament.

Germain de Brie, and Nicholas de Bérault. Not even a Frenchman would praise these more than would he, Erasmus. But he closed with a reminder that in Basle he possessed the next generation of brilliant humanists: "Henricus Glareanus, Guillaume Nesenus, and Beatus Rhenanus will testify to this, and with them I am accustomed to saying whatever is on my mind"[1]. Despite the generous recognition of Franc's intellectual luminaries—while simultaneously reminding readers of Erasmus' exceptional position—the bulk of Erasmus' letters after 1520 suggest that Ruzé was not far off the mark. It was Budé who represented Parisian learning, from Erasmus' viewpoint[2].

3. Lefèvre, Grynaeus, and Erasmus on the Uses of Mathematics

The first section of this paper listed books in which Lefèvre's mathematical legacy lingered in 1530s Basle; the second looked at the exchange of people between Paris and Basle. Here I turn to the expectations about mathematics that Simon Grynaeus and Lefèvre shared, and compare them with Erasmus' own statements about mathematics. In drawing these comparisons, I do not wish to obscure other potential sources of Grynaeus' mathematical interests, such as his old friendship with Melanchthon, or his studies with Georg Tanstetter[3]; Grynaeus' contacts with the "Wittenberg orbit" also deserves study. But such a study would have to take Parisian influences into account as well.

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[1] To Louis Ruzé Ep. 928.
[2] See also Marie-Madeleine de la Garanderie, "Les relations d'Erasme avec Paris, au temps de son sejour aux Pays-Bas meridionaux", in *Scrinium Erasmianum* (Leiden, 1969), 29-53.
[3] Such interests are assumed to originate in studies with Tanstetter by Jan N. Pendergrass, "Simon Grynaeus and the Mariners of *Novus Orbis* (1532)", *Medievalia et Humanistica* 19 (1993): 29.

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As professors of the Paris arts curriculum, before all else Lefèvre and his close colleagues Josse Clichtove and Charles de Bovelles saw mathematics as a tool for sharpening student minds. In the early 1490s, when Lefèvre immersed himself in study of the traditional quadrivium—arithmetic, geometry, music, and astronomy—he turned to the long tradition of Platonic pedagogy to explain the use of numbers:

"Pythagoras held that without the help of numbers nothing can be known, and Plato engraved on the doorway of his academy this epigram: 'Let no one lacking mathematics enter here.' Indeed he discusses the nature of things by means of numbers in nearly the whole *Timaeus* and says much on the topic in the eighth and ninth book of the *Republic*, which the mathematician Theon of Smyrna left covered on account of their difficulty"[1].

Lefèvre thus used the Platonic tradition of numbers to preface his edition of an important 13th-century text, the *Elementa arithmetica* of Jordanus Nemorarius, which expanded on the fifth-century *Arithmetica* of Boethius. Jordanus belonged to Paris; Boethius belonged to the Platonic tradition of using mathematics as the middle or mean by which the soul moved between higher and lower studies, as Lefèvre put it, "a path necessary both for rising to divine matters and for descending to human ones"[2]. A couple of years later he added that mathematics sharpened the *ingenium* of students, preparing them to study letters in general[3]. For musical theory, he likewise gathered examples of how mathematical harmonies moderated the soul's motions, even those of unruly students—another classical trope of mathematics[4].

If mathematics mediated earthly matters and heavenly thoughts, it could

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[1] Preface to Lefèvre d'Étaples, *Arithmetica*, a1v (Rice, *Prefatory Epistles*, ep. 5, 18.): "Pythagoras enim sine numerorum praesidio nihil posse sciri contendebat; et Plato in suae academiae vestibule hoc insculpsit epigramma: Nemo huc mathematicae expers introeat, qui in toto ferme Timaeo de natura rerum per numeros disputant et in octavo et nono Reipublicae multa de hac re disserit, quae Theon Smirneus mathematicus ob rei arduitatem intacta reliquit". This preface was probably written around 1493.
[2] Ibid., 18. "tam necessaria semita, tum ad divina assurgendi tum descendendi ad humana".
[3] Jacques Lefèvre d'Étaples, *Textus de sphera Johannis de Sacrobosco, cum additione (quantum necessarium est) adiecta: nouo commentario nuper edito ad utilitatem studentium philosophice parisiensis academie: illustratus* (Paris: Wolfgang Hopyl, 1495), a1v.
[4] Lefèvre d'Étaples, *Arithmetica*. On the humanist attention to this trope, see Ann E. Moyer, *Musica Scientia: Musical Scholarship in the Italian Renaissance* (Ithaca, NY: Cornell University Press, 1992).

serve both interests, and in the prefaces to his mathematical publications Lefèvre d'Étaples offered both practical and theoretical reasons to study these books. His practical examples were mostly culled from ancient authors: measuring the earth, stories about Archimedes using machines of war to fight off the Romans, and legal reasoning about justice (i.e. Aristotle's use of means). Indeed, he emphasized to patrons such as Jean de Ganay, president of the Paris *parlement*, and his brother Germain, then a councilor of the same *parlement*, that mathematics served the "public use"[1]. At the same time as he offered such practical promises, Lefèvre reserved his greatest praise for philosophical and theological benefits. Mathematics was important for theology, according to the Hermetic tradition that Lefèvre propounded in his editions of Hermes Trismegistus (1494) and the Dionysian Corpus (1499). In 1514, he introduced his famous edition of Nicholas of Cusa's *Opera omnia* with an account of the German cardinal's expertise in mathematics—the basis for Cusa's brilliance (Lefèvre rated Cusa alongside his hero Dionysius the Areopagite) was that "no one had penetrated mathematical learning more deeply"[2]. In his preface to the 1516 edition of Euclid, Lefèvre recapitulated the reason for these studies: "Besides mathematics, what discipline, I ask, can offer quicker, more abstract, purer analogies for rising to divine matters, without bearing any trace of stain or flesh?"[3]. Besides this theological benefit, in his Aristotelian teaching Lefèvre hinted at a deeper method of analogies.

Most remarkably, Lefèvre and his closest colleagues hinted that mathematics was the archetype of analogies, and that analogy was fundamental to philosophical method. For the Greeks and for Boethius, they recalled, *analogiae* were

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[1] For these examples, see Lefèvre d'Étaples, *Arithmetica*, a1v (Rice, ed., *Prefatory Epistles*, ep. 5); Jacques Lefèvre d'Étaples, *Introductio in metaphysicorum libros Aristotelis*, ed. Josse Clichtove (Paris: J. Higman, 1494), a1v (Rice, ed., *Prefatory Epistles*, ep. 6).
[2] Nicholas of Cusa, *Haec Accurata recognitio trium voluminum, Operum clariss. P. Nicolai Cusae Card.*, ed. Jacques Lefèvre d'Étaples (Paris: Josse Bade, 1514), 1:aa2v (Rice, ed., *Prefatory Epistles*, ep. 109, 345).
[3] Jacques Lefèvre d'Étaples, *Euclidis Megarensis mathematici clarissimi Elementorum Geometricorum libri XV, Campani Galli Transalpini in eosdem Commentariorum libri XV, Theonis Alexandrini Bartholamaeo Zamberto Veneto interprete, in tredecim priores, Commentariorum libri XIII, Hypsiclis Alexandrini in duos posteriores, eodem Bartholamaeo Zamberto Veneto interprete, Commentariorum libri II* (Paris: Henri Estienne, 1516), a2r-v (Rice, ed., *Prefatory Epistles*, ep. 119, 380). "Sed quae (obsecro) promptiores, abstractiores, puriores ad divina surgendi praebere possint analogias, quae nullius foedi nulliusque rei carnalis prae se ferant vestigium, quam litterae mathematicae?".

originally mathematical ratios or proportions. Furthermore, Aristotle frequently used analogies to argue, and in some key passages he stated that analogies supplied a kind of super-methodology that allowed one to compare disciplines. In the opening sections of his commentary on the *Nicomachean Ethics*, for example, Lefèvre schematically compared the basic objects of politics (man, city, universe) with the basic elements of grammar (objects, words, and sentences). By developing analogies between the elementary principles or starting points of different disciplines, one might find the basic structure they share, and reason from one to the other. Thus analogical reasoning allowed one to make connections between the starting points (*principia*) of disciplines, a kind of universal *mathesis*[1]. How did one get these starting points, as the basis for analogy? Lefèvre here turned to the most evocative of Aristotle's methodological statements in the *Posterior Analytics* 71a1-11, where Aristotle gestured towards mathematics as an example of immediate intuition of principles, perhaps with geometry in mind. The unique starting points of every discipline, Lefèvre repeated, are available through intuition—this explains autodidacts, he added, such as Nicholas of Cusa or Giovanni Pico della Mirandola, whose *ingenium* let them master so many fields of study without a teacher[2]. Indeed, Lefèvre, Clichtove, and Bovelles seemed to have designed textbooks to cut through the drudgery of long reading, using diagrams and tables to facilitate the immediate perception of a discipline's principles. With short images rather than long *quaestiones*, such methodical handbooks helped a student see the essential principles more clearly.

Lefèvre's respect for the philosophical lessons of mathematics informed his circle of students and colleagues at the Collège du Cardinal Lemoine. In the mathematical compendium from 1503 that Oronce Fine used to augment the 1535 Basle edition of the *Margarita philosophica*, Clichtove praised the mathematical arts for their capacity, on the one hand to defend the nation, as Archimedes had devised machines against the Romans. On the other hand, Clich-

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[1] On the idea of analogies as a universal method, see Oosterhoff, "Mathematical Culture", 157-165.
[2] Jacques Lefèvre d'Étaples, *Libri logicorum ad archteypos recogniti cum novis ad litteram commentariis ad felices primum Parhisiorum et communiter aliorum studiorum successus in lucem prodeant ferantque litteris opem* (Paris: Hopyl & Stephanus, 1503), 177v-178r: "in mathematicis scientiis ex antecedente cognition scientiam nasci, nunc principiorum, nunc eorum que ex principio sunt cognita, quam manifestum est".

tove repeated that "antiquity also thought such learning especially led to divine analogies and assurrections"[1]. A decade later, now an influential member of Paris theology faculty, Clichtove wrote a short book on the *De mysteria numerorum* (1513) to help theologians see how numbers are used in the Bible—an exegetical manual of divine mathematics. Gérard Roussel, once Lefèvre's student, and later chaplain to Marguerite de Navarre, extended this work in a commentary on Boethius' *Arithmetica* (1521) that was meant to help see the theological meanings of numbers[2]. Charles de Bovelles likewise was long preoccupied with mathematics as a way to model philosophical insight[3]. Such contemplative ambitions for mathematics hardly stifled their practical value; after all, one would expect theoretical truths also to bear practical fruit, as Bovelles demonstrated in two French practical geometries, first in 1511, and again in 1542—the latter with the help of Oronce Fine, *lecteur* of mathematics in the *Collège Royal*[4].

Simon Grynaeus' approach to mathematics shared with Lefèvre and his circle the general fascination with mathematics for its formative possibilities, including an appreciation of practical mathematics. As one reason for his edition of the Greek Euclid, he told Cuthbert Tunstall that mathematics (and, by implication, other disciplines) had to be understood within the context of the rest of the arts. "For only those who teach beyond their calling as teachers, properly pursuing every other discipline, give an example with the greatest clarity as if it were a law"[5]. Grynaeus made clear that he saw mathematics as a training

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[1] Lefèvre d'Étaples, Clichtove, and Bovelles, *Epitome, etc.*, 2r. "Et hanc quoque disciplinam ad divinam anagogen assurrectionesque quamplurimum conducere putavit antiquitas".
[2] Gérard Roussel, *Divi Severini Boetii Arithmetica duobus discreta libris, adiecto commentario, mysticam numerorum applicationem perstringente, declarata* (Paris: Simon Colines, 1521). See Michael Masi, "The Liberal Arts and Gerardus Ruffus' Commentary on the Boethian De Arithmetica", *Sixteenth Century Journal* 10, no. 2 (1979): 23-41.
[3] E.g. number theory is found throughout Charles de Bovelles, *Theologicarum conclusionum libri decem* (Paris: Josse Bade, 1515). Jean Céard, "Bovelles et ses traditions numérologiques", in *Charles de Bovelles en son cinquième centenaire, 1479-1979*, ed. Guy Trédaniel, Tenu à Noyon les 14-15-16 septembre 1979 (Paris: Éditions de la Maisnie, 1982), 211-28.
[4] Charles 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); Charles de Bovelles, *Livre singulier et utile, touchant l'art et practique de Geometrie, composé nouvellement en Francoys* (Paris: Simon Colines, 1542).
[5] Grynaeus, preface to Euclid, *Στοιχείων βιβλίον ιέ*, a2r. "Cum solae hae, supra quam ex professo

ground for everyone—beginning very early. Contemporary philosophy was, he thought, a disordered mess, populated by men with no training in careful, methodical linking of one idea to the next, incapable of recognizing the difference between an argument and an opinion. Without the "holy anchor" of geometry, they were unmoored, so that they even drifted into the most "monstrous absurdity": "others not only *thought* that nothing can be perceived, or indeed that nothing exists, as many do, but they even argued it openly"[1]. The answer to such thorough skepticism could only be a training in geometry, from the tenderest years. "Therefore, it is sensible to philosophize from these things immediately from the cradle, and to dare to pour down their throats less of opinions than of food (…) the simplicity and clarity [of mathematical studies], so wonderfully fitting to pure minds, should be neatly brought into the schools immediately after languages have been learned"[2].

Grynaeus wrote with special eloquence of how learning in letters—especially mathematical letters—had practical uses. He introduced his collection of New World travelers' tales with the trope that God created the world as a mirror, "like a living book", to display himself. Introducing the language of the "divine theater" of nature that would become prominent later in the century, Grynaeus identified *mathematikoi* as those who are driven by "this theater of nature filled with marvels" to reflect hard on the mathematical features of the world—which then leads them to circumnavigate the globe. Because of this capacity to "go around the very ends of the earth in their mind's eye", they have the intellectual vision necessary to sustain their travels to discover new seas, men, animals, and new social orders. Of course, this practical benefit has a further theological benefit: the light of "that ancient nobility of humankind" shines in such

docent, recte disciplinas omnes caeteras persequendi, illustre maxime claritate sua exemplum, et velut normam prebeant".

[1] Ibid., a5r. "Eos contra retroactis etiam seculis quicunque ad has disciplinas velut anchoram sacram, non diligenter respexerunt, totum hoc turbulentum et tumultuarium philosophorum genus inquam, in monstrificam absurditatem relapsos videmus—dum alii, tale quidque esse quale appareret, solem etiam hunc pedali non maiorem, alii nil prorsus posse percipi, quidam nil esse prorsus, ac ne deum quidem ipsum, non sentirent solum, quod faciunt multi, sed propalam contenderent".

[2] Ibid., a5r. "Igitur philosophandum ab ipsis statim incunabulis sobrie est, ac longe minus opinionum temere ingurgitanda turba, quam ciborum (…) Id ita fiet arbitror, si disciplinarum illarum simplicitas et claritas, puris adhuc mentibus mire congruens, statim post linguas imbibitas, scite scolis inferatur".

accomplished travelers[1]. This complex passage links several key ideas about liberal arts, human nature and its place in the divine order, and the relationship of theory and practice. In sum, however, Grynaeus claims for the mathematical liberal arts the glory of the New World. Contemplative vision has practical consequences; those without a theoretical vision of theoretical mathematics, as Grynaeus would put it in his preface to geometry (1533), could not expect to explore it. "But this instrument [the *Elements of Geometry*] is that very machine worked out by the industry of wise men, which will lead humankind through dangerous seas to the boundaries of the lands and the ends of the earth; it draws out nature when it seems inaccessible"[2].

Grynaeus, like the Fabrists, evinced the profound conviction that mathematics could reform philosophical method. Like many other pedagogues, Grynaeus student learning was intimately wound up with "method". In a letter to Jean Fichard that circulated among the Basle humanists, Grynaeus reflected on method in legal studies. Here his theme was the familiar oscillation between particular and general, between observations of countless things and the generalizations one might make from them. Grynaeus stressed both the use and danger of wrongly trusting one's inborn wit, the *ingenium*, to navigate these poles: "thus it happens often that the best men, not really knowing their fac-

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[1] Grynaeus, *Novus orbis regionum et insularum*, a2r-v. "Nam ex hoc pleno rerum mirabilium naturae theatro, quum studiosi omnes, animis velut oestro concitis, et profundissima admiratione sauciis rediissent, alii hoc impetus impulsi, maiora conari coeperunt, et intimius naturam scrutari, *Sophous* vocant; alii (hi sunt *mathematikoi*) quum et ingenii et animi ope summa in hanc solam contemplationem incubuissent, et acie mentis finibus iam suis terrarium orbem circumscripsissent, in angustum vastitate eius, prae coeli et maiorum corporum consideratione, redacta, inventione tantarum rerum excitati, ire oculis quocunque mentis acies praeivisset, et animi cogitationem per omnes difficultates exequi, ac molem terrarium orbis dudum animo suo permeabilem, et undique accessibilem circuire lustrareque ausi: quod caeteri mortals per insano habent, patriam parentes uxorem, liberos relinquere, e tuto felicique rerum statu (est enim et haec cogitare, et cogitate exequi, amplissimae simul et mentis et fortunae) in tot tamquam certa rerum discrimina, et mortem mediam coniicere se, illi non solum gloriosum sed necessarium homini, sibi vero unum prae omnibus rebus maxime expetendum iudicarunt, invicti et vere divini animi, quique soli ius natura concessum homini, id est, genuinam et non degenerem spiritus sui nobilitatem retulisse, et imperium terrae et marium, a primis parentibus haereditarium sibi vendicasse videntur, in quibus solis vetus illa humani generis nobilitas reluxit".

[2] Grynaeus, preface to Euclid, *Στοιχείων βιβλίον ιέ*, a2v. "Atqui hoc illud instrumentum est haec illa machina hominum sapientum industria excogitata, qua per infesta maria, ad extremos terrarum et mundi fines, hominum genus excurrit, et naturam qua inaccessa videbatur, eruit".

ulty of nature, undertake great studies. These great, whose excellent wits pre-
pare some opinion, as no certain reason were needed furnish the studies that
wit can pursue"[1]. Besides mental aids that might give the mind certainty, one
should rely on an accumulated common heritage: "There are things written by
the most learned men concerning this matters, on dividing, sharing, defining,
gathering, and when and what crimes are committed, and how to arrest, charge,
and defend—the wit of neither Aristotle, whatever the learned crowd thinks, nor
of Plato gives us these things. Instead, these were birthed by nature, revealed by
utility, noted down by care of the ancients, and finally were tested with great
effort"[2]. Arguing that such concerns belong to law as much as any other disci-
pline, Grynaeus presents method as a way to moderate historical acquisition of
particulars and the immediate judgments of *ingenium*, as a way of assembling
a discipline into a well-ordered body of knowledge, allowing the mind to travel
between particular cases and general headings.

Most like Lefèvre, Grynaeus connected mathematical reasoning with the im-
mediate access to first principles that should characterize good learning. Pre-
sumably drawing on the parts of Aristotle that had also resonated with Lefèvre,
Posterior Analytics I, Grynaeus argued in his preface to Euclid that:

"that light which Aristotle himself shone in all his disputations came from none other
than geometry. I can show a thousand places where the most abstruse thing is com-
pletely drawn out and brought to light by the power of geometrical demonstration. The

[1] Grynaeus to Fichard, edited in Johann August Roderich von Stintzing, *Ulrich Zasius: ein Beitrag
zur Geschichte der Rechtswissenschaft im Zeitalter der Reformation: mit urkundlichen Beilagen*
(Schweighauser, 1857), 358-364, at 359. "unde accidit, ut praestantissimi saepe viri, naturae facul-
tate quamquam ignota sibi, magna aggressi sint studia, qui excellentia ingenii, opinionem quondam
peperere, quasi ratione nulla certa opus esset, ad eas disciplinas parandas quas consequi ingenio
liceret". On the letter's circulation, see letters in Hartmann, *Die Amerbachkorrespondenz*, IV.1706,
V.7-9.
[2] Grynaeus to Fichard, 360. "Extant autem doctissimorum hominum de his rebus scripta in divi-
dendo, in partiendo, in difiniendo, in colligendo, quoties et qua vitia incidere, quemadmodum de-
prehendi arguique et vitari possint, quae non unius Aristotelis, quemadmodum vulgus literatorum
putat, aut Platonis ingenium nobis suppeditarunt, sed ipsa primum natura ingenuit, usus patefecit,
sedulitas, veterum annotavit ac summis tandem conatibus absolvit". See also Grynaeus, preface to
Euclid, a4v, where he argued that geometry had been passed on by the ancients as the most pure
example of method: "Erat igitur methodus, id est ordine quanque rem explicandi ratio inventa vet-
eribus, eam consecratam literis ad nos transmiserunt; habemusque non solum methodum, sed hac
scripta monumenta veterum plurima, cum Aristotelis ipsius, tum aliorum insuper haud paucorum".

whole book *Peri apodeixeos* [of Galen] says so in examples of this sort that are spread throughout; there he explicitly places these very disciplines before all others on account of their evident nature"[1].

The basic point was fairly uncontroversial, though the emphasis unusual. Grynaeus followed it up with a short account of the self-evident nature of principles—they are not themselves subject to demonstration, but their evident nature is rooted in common, shared experience. His point was that mathematics therefore was the model on which all other knowledge should be built. Geometry, that is, supplied the basic structure of *all* reasoning:

"So if anyone wants the habit of the human mind to be expressed in a kind of image, nothing is better than geometry, which is a kind of absolute and perfect image [formula] of all method, marvelously shining its native light. Therefore the power of distinction indeed belongs to dialectic, but only obscurely, while it is helped by the clarity of the mathematical disciplines. I also understand how marvelous it seems when the reason of method which is common to all, is said to be derived and learned especially from [geometry]—the reason is actually evident, even though it perhaps seems so hidden that not many can see it"[2].

The claim that mathematics was not merely a nice example of reasoning, but captured the entire essence of reasoning and method itself was a remarkable thing to say in 1533. Grynaeus surely was inspired by Proclus, edited in the same volume with Euclid, who made similar claims[3]. Arguably, the closest perspective was that of Lefèvre, or Oronce Fine, who had likewise presented math-

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[1] Grynaeus, preface to Euclid, *Στοιχείων βιβλίον ιέ*, a3v. "Quid quod ipse Aristoteles, lucem disputationibus omnibus suis, non aliunde quam e geometricis influsit, locos mille proferre possem, cum abstrusissimae res demonstrationum geometricarum vi prorsus erutae et in lucem prolatae sunt. Declarat *peri apodeixeōs* liber totus, generis huius exemplis ubique maxime scatens, ubi nominatim etiam disciplinas has ab evidentia caeteris omnibus anteponit".

[2] Ibid., a4r. "Ut si quis mentis humanae morem, simulacro quodam expressam velit, nullo possit melius, quam geometriae, quae methodi totius absoluta et perfecta formula est, domestica insuper luce sua mirabiliter fulgens. Ergo differendi vis penes dialecticen est quidem, sed obscura tantisper, dum mathematicarum disciplinarum claritate iuvetur. Nec ignoro mirum videri, cur methodi ratio quae communis omnium est, hinc potissimum trahenda discendaque dicatur, verum in promptu causa est, tametsi abstrusior forte, quam ut vulgo multis percipi queat".

[3] E.g. Glenn R Morrow, *Proclus: A Commentary on the First Book of Euclid's Elements* (New Jersey:Princeton University Press, 1970), prol. 19-20; def. 93.

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ematics as the gateway to all the other disciplines, and as a possible source of philosophical method. It may be, indeed, that the high view of mathematics in Melanchthon's orations on geometry and astronomy (1536) also has roots in such statements by his friend in Basle.

Erasmus was wary of such commitments to formal descriptions of philosophical method, let alone to mathematics. While both Lefèvre and Grynaeus wrote about the value of mathematics with serious interest in university teaching, Erasmus seems never to have found a vocation in the lecture hall. When Erasmus tutored students during his early years in France, England and Bologna, these rapidly turned into new opportunities or better patronage. Although he shared with Lefèvre and Grynaeus a commitment to the liberal arts ostensibly taught in the universities, Erasmus consistently emphasized different parts than they did. An emphasis on language over mathematics pervades even his short declamations of advice on how students might methodically deploy the best authors, stock a commonplace book, and craft sinewy sentences for varied audiences. These were not meant to guide neophytes through the whole cycle of learning, but to promote a larger vision of literary life. Mathematical arts came up only in passing in his more programmatic declamations on education in *De pueris instituendis* (1529) and *De ratione studii* (1512), both written around 1509 with some eye to John Colet and the new foundation of Saint Paul's School in London[1]. Both works share Lefèvre and Grynaeus' concern with religious and ethical formation. But whereas they had expended great effort on mathematics, Erasmus noted only that everyone's nature makes them apt for different studies, "just as one says that some are born for mathematical learning, others for theology; some for rhetoric or poetry, and others for soldiering"[2]. In *De ratione studii* he recommended slight learning in cosmography, "which can be used in history, not to speak of poetry"[3]. In 1516, in his methodological preface to the *Novum instrumentum*, Erasmus did allow that mathematics belonged to a the-

[1] Note Colet also was the dedicatee of *De copia* (Paris: Josse Bade, 1512).
[2] *De pueris instituendis* (*Erasmi Opera omnia*, I-2, 44). "veluti quosdam mathematicis disciplinis, alios theologiae, has rhetoricae aut poetieae, illos militiae natos dicas". Later in the declamation he simply noted that Caesar, as a youth, had been skilled in both mathematics and eloquence; Erasmus then listed arithmetic and geometry between antiquarian and ethical learning (ibid., 76).
[3] *De ratione studii* (ASD, I-2, 122). "Tenenda cosmographia, quae in historiis etiam est vsui, nedum in poetis".

ologian's liberal training, which should include "dialectic, rhetoric, arithmetic, music, astronomy, and some knowledge of natural things such as animals, trees (…)"[1]. The way, therefore, that mathematics and *naturalia* come up in Erasmus' writing is usually by way of situating *other* disciplines, and especially the role of the expert in literature, the *Grammaticus.*

In the dialogue *De recta Latini Graecique sermonis pronuntiatione,* the interlocutors Ursus and Leo explicitly revive Quintilian's account of the *grammaticus* as an interdisciplinary master, deploying other disciplines in order to understand poetry, history, antiquity, and properly to emend textual errors. As Leo observes, "in the same work, the *grammaticus* will deal with all disciplines, since in poetry often one finds matters that properly belong to geometry, arithmetic, astrology, and the mysteries of medicine—add, if you like, magic. For without the knowledge of nature and cosmography, what place in poetry can the *grammaticus* correctly explain?"[2]. Here Erasmus' point was the role of the humble grammarian as the greatest philosopher, echoing Poliziano's famous defense of the philologist in the *Lamia*, because in explaining words he perforce deals with all the disciplines[3]. One could not be farther from Grynaeus' encomium of geometry.

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[1] Nesselrath, "Erasmus und die Astrologie", 294n8.

[2] *De recta Latini Graecique sermonis pronuntiatione* (ASD, I-4, 16). "*Leo*: Eadem opera exiget a grammatico cognitionem omnium disciplinarum, quandoquidem in poetis frequenter incidunt quae ad musices, geometrices, arithmetices, astrologiae, medicinae mysteria pertinent; adde his, si libet, magicen. Nam absque rerum naturalium et cosmographiae scientia quis est locus in poetis, quem recte possit exponere grammaticus?".

[3] For a detailed reading of Poliziano on this point, see Denis J.-J. Robichaud, "Angelo Poliziano's Lamia: Neoplatonic Commentaries and the Plotinian Dichotomy between the Philologist and the Philosopher", in *Angelo Poliziano's "Lamia": Text, Translation, and Introductory Studies*, ed. Christopher S. Celenza (Leiden: Brill, 2010), 131-89.

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4. Conclusions

Grynaeus appears to have turned to mathematics around 1531, the same year his old schoolmate Philip Melanchthon dedicated the Wittenberg edition of Sacrobosco's *Sphere* to him[1]. In 1538, Grynaeus also published the first Greek edition of the *Almagest*, the standard western treatise on astronomy since Ptolemy had written it in Alexandria in the second century. In its preface he repeated some of the same high praise of mathematics that accompanied his 1533 edition of Euclid. It may be that his approach to mathematics in these volumes had, however, a role in undermining Ptolemy's influence in the long run. As scholars such as Gingerich, Westman, and Methuen have argued, the Wittenberg circle included an unusually high view of mathematics that can in part be traced to Philip Melanchthon's prefaces and orations on arithmetic, geometry, and astronomy, which were reprinted throughout Europe. Very likely, the high view of mathematics in Melanchthon's orations owe something to his friend in Basle, and perhaps to the larger network of mathematicians around Basle[2]. Yet Melanchthon's high praise of all the mathematical disciplines never reaches the emphasis on mathematics as archetypal method, as it does in Grynaeus.

Grynaeus and his colleagues in Basle, I have suggested in this article, reflect some of Basle's ongoing debt to the circle of humanists, pedagogues, and printers around Jacques Lefèvre d'Étaples, in Paris. Further research will no doubt reveal many other connections as well. But the Fabrist contribution is the one longest forgotten. Isabelle Pantin suggested that Oronce Fine kept abreast of developments among German mathematicians; my suggestion is that the exchange of knowledge went in both directions[3].

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[1] *Liber Iohannis de Sacro Busto, de Sphaera. Addita est praefatio in eundem librum Philippi Mel. ad Simonem Gryneum* (Impressum Vitebergae: per Iosephum Clug, 1531). This preface is translated in Sachiko Kusukawa, ed., *Philip Melanchthon: Orations on Philosophy and Education*, trans. Christine F. Salazar (Cambridge: Cambridge University Press, 1999), 105-112. See especially Isabelle Pantin, "La lettre de Melanchthon à S. Grynaeus: avatars d'une défense de l'astrologie", in *Divination et controverse religieuse en France au XVIᵉ siècle* (Paris: ENSJF, 1987), 85-101.

[2] See Karin Reich, "Philipp Melanchthon im Dialog mit Astronomen und Mathematikern: Ausgewählte Beispiele" in *Mathematik und Naturwissenschaften in der Zeit von Philipp Melanchthon*, ed. Franz Fuchs (Wiesbaden: Harrassowitz, 2012), 27-58.

[3] Pantin, "Oronce Fine's Role as Royal Lecturer", 27-30.

Although he supported the Greek edition of Ptolemy's *De geographia*, and quite possibly encouraged such learning at the new trilingual college in Louvain, on balance Erasmus presented a view of erudition that minimized the more systematic knowledge of Aristotelian natural philosophy or even the mathematical portion of the liberal arts[1]. My suggestion is that this configuration of erudition was at odds with that presented by Lefèvre and Grynaeus. The epilogue to this tale may well be a divergence of interests. On the one hand, Wittenberg and Jesuit humanists pursued a vision of scholarship in line with Lefèvre and the Parisian curriculum-wide style of humanism, equally concerned with Aristotle and geometry as with Church Fathers and biblical scholarship. On the other hand, those envisioning themselves as 'Erasmians' took an approach that tended to separated mathematical learning from hermeneutical ones.

There lies a methodological lesson for historians of this place and period that is simple, perhaps even well-known, but has not yet reshaped our own historical studies. Tempted by Erasmus' own powerful account of erudition as mostly about non-technical knowledge, historians looking at the republic of letters have often construed its interests as primarily literary in a way that lines up with the "humanities" of the modern disciplines. This has encouraged both historians of science and historians of literature to miss the place of mathematics in the liberal arts—and indeed in the shape of erudition—of that literary republic. Erasmus may have been complicit with the forces that gave us the "two cultures" divide. That is no reason for us to read that division back into his context.

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[1] Steven Vanden Broecke describes Erasmus' possible influence on the teaching of geography and cosmography at Louvain in *The Limits of Influence: Pico, Louvain, and the Crisis of Renaissance Astrology* (Leiden: Brill, 2003), 126ff.

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Frans Floris – Cornelis Cort, Arithmetica, Antwerp, H. Cock, 1565 *(Folger Shakespeare Library,* `http://luna.folger.edu/luna/servlet/detail/` `FOLGERCM1~6~6~355553~129922`*).*