

Writing Possibility:
Early Modern Poetry and Mathematics

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Introduction: From ancient critique to early modern possibility

In the *Timaeus* Socrates wonders at the failure of poets to articulate what is beyond their own immediate experience, that is, their failure to write about imagined possibilities rather than lived actualities. As the dialogue opens, Socrates and his companions have reconvened after having spent the previous day working out the details of an ideal city-state. Socrates is “seized by [a] desire” to see this imagined city “in motion,” to see the city animated by the business of an imagined life.¹ In particular, Socrates wants to know how the ideal city will “carry on a struggle with her neighbors . . . how she went to war in a becoming manner.”² Socrates admits that he is unable to bring this imagined city to life, and, while unsurprised by his inability, he is particularly confounded that poets, of all people, have settled for being a “tribe of imitators” equally unable to write the imagined city. Unable to do more than mime what they have learned through education or experience, poets have proven in his view to be a disappointingly mimetic bunch. The non-mimetic representational mode implicitly called for by Socrates is the subject of this project. Beginning with the English courtier Sir Philip Sidney’s functional (if not in direct) response to the Socratic critique of mimetic writing, this project offers several examples of responses to the Socratic request. These

¹ Plato, *Timaeus*, trans. Benjamin Jowett, *Plato: The Collected Dialogues*, eds Edith Hamilton and Huntington Cairns, (Princeton: Princeton University Press, 1961) 1154-5.

² Plato 1155. Following the critique of poets, the dialogue takes a different turn and the request for a hypothetical or imaginative narrative is answered with a historical one; Socrates’ companions offer a complicated and multipart (it extends into another dialogue, the *Critias*) creation history narrative in place of the story about the ideal city.

responses bring poetry, the subject of Socrates' critic, into view with a perhaps surprising companion discipline, mathematics, both of which developed into tools for non-mimetic representation before the end of the seventeenth-century. I consider Sidney's response along with the mathematical work of Sidney's English compatriot (and fellow Elizabethan courtier) John Dee. In the work of Sidney and Dee emerge some of the earliest theorizations of a non-mimetic mode that represents possibility rather than actuality. As advocates for their respective representational technologies, poetry for Sidney and mathematics for Dee, they each attempted to address the difficult challenge of writing about something that is "real" but somehow "non-existent," something without an experience-able being. While I suggest that Dee and Sidney were innovators, they were also rather timid in their innovation and regularly paired what was new with the utterly conventional. As we will see, Sidney and Dee, like many other authors of the sixteenth-century "produced notable change while staying often confusingly embedded in past authority."³ The confusions, as Timothy Reiss observes, are ours and not confusions in our early modern authors; this project attempts to clear some of the confusion that has occluded what is genuinely new in the sixteenth-century representational theories of Sidney and Dee and those, in the seventeenth-century, of Margaret Cavendish and René Descartes.

³ Timothy J. Reiss, Knowledge, Discovery, and Imagination in Early Modern Europe: The Rise of Aesthetic Rationalism (Cambridge: Cambridge University Press, 1997) 31.

The challenges of writing epistemologically valuable possibilities were many and raise a variety of questions: what are the constraints, ethical or otherwise, on the non-real? Is the signification of the non-real different from that of the real? What is the value, intellectual or social, of the merely possible when we have syllogistic certainty and an epistemology of probability? But perhaps the most difficult challenge was a social and intellectual critique that figured such writing as merely “pretty stories,” or worse, as “fresh pictures on rotten walles.”⁴ The latter, a complaint made by the English satirist Stephen Gosson in his scathing denunciation of literary art, is an image meant to evoke corruption not of form but of content, a sentiment echoed by the many exhortations that poetry, fictions, and drama might actually be dangerous to read.⁵ Far from serving as pleasant diversion, or damnable lies that threatened to swamp the delicate raft of the Christian soul, for the authors of this study possible worlds were textual spaces for productive and responsible learning. This is as true for Sidney and Dee as for the seventeenth-century writers who adopted similar theories of representation. Two in particular, Cavendish and Descartes, further extricated the writing of possibility in poetry and mathematics, respectively, from its imbrications with the more mimetic modes, which Sidney and Dee always paired with their new representational models. In his *Geometry*, Descartes offers a theorization of mathematic possibility that nearly completes (but

⁴ Robert Bage, Man As He Is (Whitefish, MT: Kessinger Publishing, 2004) 121. Stephen Gosson Schoole of Abuse (London 1579) 10.

⁵ See Peter C. Herman, Squitter-wits and Muse-haters: Sidney, Spenser, Milton, and Renaissance Anti-poetic Sentiment (Detroit: Wayne State University Press, 1996).

not quite) a shift that Dee began from the Neoplatonic realism to a nominalist mathematics of possibility. This entails a move from a direct referential relationship between word and thing, even if that “thing” is an idealized form or essence (realism) to a constructed and conventional (hence nominalist) language that references only what it produces (the possible). At the same time, Descartes offers in the suppressed text of *The World, or the Treatise on Light*, an example of a poetic language that similarly produces a possible world. In England, Cavendish, influenced by her own animistic philosophy and a deep frustration with the empirical and instrumental realism of her peers, appropriates a Hobbesian nominalist representational theory to further elevate the powers (epistemological, social, and individual) of poetic possibility in *A Description of a New World, Called the Blazing World* and her *Philosophical Letters*.

The trajectory that I am tracing is one of a non-mimetic creative mode of writing in both mathematics and poetry, in which the attempt to express or represent the non-actual but possible is explicit. As one consequence of this common trajectory, I argue that, in so far as literary history is the history of imaginative written representation, our canon, at the very least, must include early modern mathematics, along with contemporary poetry.⁶ In many ways this study is a supplement to the excellent analyses of early modern writing, knowledge, and

⁶ I am distinguishing here between “imaginative” and “descriptive” writing – or in more conventional terms between fiction and non-fiction (which is not to say that one is the special domain of the literary scholar). While it is not common to refer to mathematic writing as “fiction,” “imaginary” numbers and mathematics is a subset of mathematic writing more generally.

technologies that have been written in the last decade. As Timothy Reiss has observed, the early modern period was in many ways marked by the rising prestige of an “analytico-referential” mode that sought to replace an older logic and rhetoric of the trivium with a new mathematized denotative language and analytic method.⁷ David Sepkowski complicates what can be a rather one-sided narrative of modal triumph (analytic and referential modes “dominate”) with his study of a competing “nominalist-constructivist” tradition, dating back to the medieval period, that offers a representational model that is not referential in the sense elaborated by Reiss.⁸ Joining Mary Baine Campbell, I am suggesting a third mode characterized by its engagement with the possible, one that operates in a distinctly different register from that of the denotative language so aptly described by Reiss, which operates in tension with the kind of nominalist/constructivist but rather non-creative language discussed by Sepkowski.⁹ This third, non-mimetic mode of writing transformed what Jonathan Sawday and Neil Rhodes have called the early modern “paperworld”

⁷ Timothy J. Reiss, The Discourse of Modernism (Ithaca: Cornell University Press, 1982). For Reiss, this analytico-referential mode triumphs over other modes. While Reiss’ history of an analytic, rather than spatial, mode troubles that of Walter Ong, in which the “decay of dialogue” is the result of a spatialized “method” simply supplanting the older dialogic model, they both suggest that a newly emergent discursive mode dominates an older model. See also Walter Ong, Ramus: Method and the decay of dialogue (Chicago: University of Chicago Press, 2004). I suggest, contrary to both Reiss and Ong, that possible worlds writing participates in an ongoing struggle among different modes of discourse and different ways of knowing.

⁸ David Sepkowski, Nominalism and Constructivism in Seventeenth-Century Mathematical Philosophy (New York: Routledge, 2007).

⁹ Mary Baine Campbell, Wonder and Science: Imagining Worlds in Early Modern Europe (Ithaca: Cornell University Press, 2004) 9-13.

by creating new textual worlds.¹⁰ Books, manuscripts, and writing in general, were technologies “of the imagination and the intellect,” and when written in this alternative non-mimetic mode these multiple possible worlds ordered knowledge differently from the mimetic “paperworld” ushered in with the print revolution.¹¹

The relatively easy narrative of a third, largely unrecognized mode of representation inaugurated by Sidney and Dee and further elaborated by Descartes and Cavendish is troubled in this project by the coda, which serves partly to recognize the relative invisibility of this model of possibility from our critical and historical canon. The work of John Milton, from his early political and religious writing to the epic *Paradise Lost* and his unfinished history of the English nation, much of which falls chronologically in between the work of Descartes and Cavendish, serves as a tempering coda to this study, reminding us that while the fictions of possibility were powerful tools in the early modern period, the fictions of history were accorded at least as much, if not more, attention and legitimacy. The historical mode, as opposed to the future looking possible-world modes, offered a different repudiation of the nominalist/constructivist and analytico-referential models of representation. This study will not offer an assessment of the relative success of the historical fictions versus that of possible-worlds fictions, except in a provisional way. What the coda will offer by way of Milton’s negative example, is the

¹⁰ Neil Rhodes and Jonathan Sawday, The Renaissance Computer: Knowledge Technology in the First Age of Print (New York: Routledge, 2000) 1.

¹¹ Rhodes and Sawday 1.

suggestion that my own celebratory announcement that the history of poetry must include the history of mathematics, should also acknowledge that the poetic production of the early modern period draws on a number of representational practices, some of which may have had little interaction with the mathematic disciplines.

A Tale of Two Semiotics

Math and poetry do not make an obvious pair. Dee's re-introduction of classical Euclidean mathematics and Sidney's synthetic theory of poetry, Descartes' enduring and elegant analytic geometry and Milton's equally enduring and elegant epic seem to share little other than their status as foundational texts. To the modern age, early modern mathematics and poetics have appeared as the genius / genesis of two radically disparate disciplines. Simply put, math and poetry seem to be "about" different things. While modern disciplinary crossings, such as the experimental mathematized poetics of the Oulipo¹² or the mathematic "scientific patter" of modern science fiction novels,¹³ troubles such an easy disciplinary split, we seem nevertheless to understand the subject of the two representational practices to be fundamentally distinct. As part of this tendency, critical studies that take these two forms not as instrumental of one to the other but as of a kind together are rare. Such

¹² A loosely affiliated group of writers and mathematicians whose work, known as "potential literature," develops a compositional mode unconstrained by traditional writing practices. For more on Oulipian works, see Warren F. Motte ed., Oulipo: A Primer of Potential Literature (University of Nebraska Press, 1986) and Raymond Queneau, Italo Calvino, et. al. Oulipo Laboratory (London: Atlas, 1995).

¹³ Brian Aldiss and David Wingrove, Trillion Year Spree: The History of Science Fiction (London, Gollancz, 1986) 133.

unusual work has largely been done within histories of science, which have discussed the role of both mathematic and narrative forms in actuary science, astrology, astronomy, biological sciences, chemistry, cartography, demographics, economics and navigation. While not integrative of literary and mathematic history, studies such as those of Harkness, Reiss, Poovey, and Rotman have focused more closely on the role that mathematic practices have played in the construction and perpetuation of cultural forms, thus making mathematic practices available for comparative studies that include rhetorical and literary forms.¹⁴

In early modern studies the intersections of mathematic and literary practices have been studied under the rubric of either artisanal or mercantile practices where they have been studied at all. Amir Alexander has looked at the use of the merchant exploration narrative in the development of infinitesimal methods; Henry Turner has detailed the influence of the geometry of the “practical spatial arts” on poetic discourse and drama; Paula Blank discussed the problematic application of the rhetoric of common measurement to the contexts of the individual, society, and cultural production; and Mary Poovey’s landmark work on the early modern fact pointed to the ways in which mercantile double-entry

¹⁴ Deborah Harkness, The Jewel House: Elizabethan London and the Scientific Revolution (New Haven: Yale University Press, 2007) and John Dee's Conversations with Angels: Cabala, Alchemy, and the End of Nature (Cambridge: Cambridge University Press, 1999). Timothy J. Reiss, Knowledge, Discovery and Imagination in Early Modern Europe: The Rise of Aesthetic Rationalism (Cambridge: Cambridge University Press, 1997). Mary Poovey, A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society (Chicago: University of Chicago Press, 1998). Brian Rotman, Signifying Nothing: The Semiotics of Zero (New York: Palgrave Macmillan) 1987 and Mathematics as Sign: Writing, Imagining, Counting (Writing Science) (Palo Alto: Stanford University Press, 2000).

bookkeeping privileged numerical accounts over narrative.¹⁵ Scholars such as Mary Thomas Crane, Carla Mazzio, and Elizabeth Spiller have touched on mathematical practices in broader studies of cognition, affect, and reading practices in literature and the sciences.¹⁶ A similar interest in practice has been present within the history of science more broadly, where the emphasis in the last twenty years has remained strongly on the interactions between mathematical instruments, tools, and their uses in daily life.¹⁷ Such histories of practical knowledge have been interested in a mode characterized by a “hands-on” or daily practice, a philosophy of experience, if you will, and have helpfully recuperated the early modern focus on “useful” practices that transformed the value and deployment of knowledge.¹⁸ The recent case studies of mathematic instruments by Sachiko Kusukawa and Ian MacLean are exemplary, as is Paolo Mancuso’s work generally, for their move to study the interaction of this practical knowledge with the more elite modes of “theoretical”

¹⁵ Amir Alexander, Geometrical Landscapes: The Voyages of Discovery and the Transformation of Practical Mathematics (Stanford: Stanford University Press, 2002). Henry S. Turner, The English Renaissance Stage: Geometry, Poetics, and the Practical Spatial Arts (Oxford: Oxford University Press, 2006). Paula Blank, Shakespeare and the Mismeasure of Renaissance Man (Ithaca: Cornell University Press, 2006). Poovey, Mary, History of the Modern Fact (Chicago: University of Chicago Press, 1998). A notable exception to the practical emphasis is Carla Mazzio’s “The Three Dimensional Self: Geometry, Melancholy, Drama,” Arts of Calculation, ed. David Glimp and Michelle Warren (New York: Palgrave Macmillan, 2004) 39-66.

¹⁶ Mary Thomas Crane, “Analogy, Metaphor, and the New Science,” proceedings at the New England Renaissance Conference “Nature’s Disciplines” (October 20, 2007). See also Mazzio. Elizabeth Spiller, Science, Reading, and Renaissance Literature: The Art of Making Knowledge, 1580-1670 (Cambridge: Cambridge University Press, 2004).

¹⁷ Sepkowski’s text is a recent notable exception.

¹⁸ See Peter Dear, Discipline and Experience: The Mathematical Way in the Scientific Revolution (Chicago: University of Chicago Press, 1995); Mordechai Feingold, The Mathematician’s Apprenticeship: Science, Universities, and Society in England, 1560-1640 (Cambridge: Cambridge University Press, 1984); Steven Shapin, A Social History of Truth: Civility and Science in Seventeenth Century England (Chicago: University of Chicago Press, 1994) and Steven Shapin and Simon Schaffer, Leviathan and the Air Pump (Princeton: Princeton University Press, 1989).

knowledge.¹⁹ Matthew Jones' recent work has gone further to detail the connection between theoretical mathematics, the practice of math, and early modern ethics.²⁰

This study, in contrast to much of what precedes it, considers a different form of "utility" in the early modern period and its knowledge technologies. The math and poetry of this study are self-consciously elite modes of knowledge rather than ones based in workshops, engraving tables, or in medical theaters. This is not to say that they are purely theoretical, in the sense that they are only about the theory of an art and not its practice. In fact, reading between the lines of this study might suggest a need to reassess what we mean by "theory" and "practice" when theoretical texts produce novel worlds. It is clear that poetry and mathematics, as semiotic systems, are in many ways decidedly not material. They are not principally concerned with the creation of material objects, with the notable exception of the material text. Creative mathematics and poetry do draw on practical knowledge, in Richard Scholar's sense wherein it "is knowledge from practical experience."²¹ The theories of math and poetry discussed here are also analogous to Scholar's "material

¹⁹ Sachiko Kusukawa and Ian Maclean, Transmitting Knowledge: Words, Images, and Instruments in Early Modern Europe (Oxford: Oxford University Press, 2006). Paolo Mancuso, Philosophy of Mathematics and Mathematical Practice in the Seventeenth Century (Oxford: Oxford University Press, 1996).

²⁰ Matthew Jones, The Good Life in the Scientific Revolution (Chicago: University of Chicago Press, 2006).

²¹ "Creative" is used throughout this project to denote work that has "the quality of creating" or is "originative or generative" - not necessarily the fictive in our modern sense. "Creative, *a*^{1a}" The Oxford English Dictionary. 2nd ed. 1989. OED Online. Oxford University Press. 5 April 2009 <http://dictionary.oed.com/cgi/entry/50053531>. The OED cites a late seventeenth-century instance as the first: Ralph Cudworth, The true intellectual system of the universe (London: 1678).

knowledge,” which is knowledge that tells you how to make something.²² Unlike the maker’s knowledge of artisans or architects, whose knowledge tells them how to make something with a presence, a material existence, the “somethings” that the texts in this study tell us how to make are possibilities and possible worlds. While not “hands-on” arts, the poetry and mathematics discussed here used practical experience, observation, and reflection to produce new possibilities in the media of math and poetry. The texts included in this study actively sought to argue on behalf of and to practice simultaneously these two generative semiotics in order to create knowledge.²³ In this way, while not practical in a more general sense perhaps, generative mathematics and poetry were *practicable* or *actionable*. While different from the utility of an adding machine or compass in the work-a-day life of early modern England, both mathematics and poetry were deemed useful, essential even, by their advocates.

These practicable, if immaterial, poetries and mathematics, for all of their elite status, should be distinguished from the humanist tradition usually taken as characteristic of elite modes of knowledge production in the early modern period.

²² Kusakawa and Maclean 12.

²³ I am not using “semiotics” in the early modern usage, which restricted usage to mean the reading of symptoms in medical diagnosis. Rather, I use semiotics in the modern sense to designate the science of communication studied through the interpretation of signs and symbols as they operate in various fields (“semiotics, *n*” *The Oxford English Dictionary*, 2nd ed. 1989. OED Online. Oxford University Press. 5 April 2009 <http://dictionary.oed.com/cgi/entry/50219526>). In this usage, “semiosis” is the construction or production of meaning through the interpretation of signs. I use this more modern term in order to talk about both mathematics and poetics as systems for the creation of meaning, systems that were not designated as semiotic in the early modern period but were explicitly recognized to create meaning at the time.

The humanistic approach to knowledge emphasized the *reproduction* of classical modes of personal behavior, communication, and social governance. Using authoritative classical and medieval texts, copy processes such as common-placing and mimetic theater, visual art, and composition were the routes to the production of an ideal society and its members. In contrast to this neo-Aristotelian paradigm, the creative modes of writing with which this study deals reject repetition and copy in favor of generation. This is an historical development that has a set of important relationships to the classical humanism that dominated sixteenth-century elite learning, but it is not identical to that tradition. Further, as suggested earlier, while there are clear intersections with the artisanal modes of knowledge production that developed a new mechanist approach to the generation of goods and knowledge tools, creative math and poetry are characterized by a concern with the abstract that cannot be said to characterize the more artisanal approaches to knowledge. Additionally, the forms of utility imagined are very different.²⁴ Where artisanal practices emphasized material outcomes, creative writing, both mathematic and poetic, was focused on the ethical or epistemological values of new creation. Artisanal modes made *things* with a secondary constitutive force exerted upon the artisan and his customer, the user; creative math and poetry were used to make ideas and worlds in order to shape the ethical intellectual.

²⁴ Claims by practitioners of both the artisanal and the creative approaches about the utility of their practices are, in one respect, a symptom of early modern intellectual life. In a new knowledge market, it was important for the purveyors and creators of new knowledge systems to justify the personal labor involved.

Modern historiography has carefully accounted for the early modern deployment of a semiotics honed for accurate description of the material world, the denotative language often characterized by the writing of Sir Francis Bacon.²⁵ Histories of this mode (Shapin and Schaffer, Dear, Biagioli, Vickers, Latour) have traced the social, political, intellectual, and textual networks through which modern scientific practices and conceptions emerged. The early modern historian Sir Thomas Sprat argued for the denotative use of language in his *History of the Royal Society*:

Whoever shall soberly profess, to be willing to put their shoulders, under the burthen of so great an enterprise, as to represent to mankind, the whole Fabrick, the parts, the causes, the effects of Nature: ought to have their eyes in all parts, and to receive information from every quarter of the earth: they ought to have a constant universall intelligence: all discoveries should be brought to them: the Treasuries of all former times should be laid open before them: the assistance of the present should be allow'd them: so farr are the narrow conceptions of a few private Writers, in a dark Age, from being equall to so vast a design.

According to Sprat, in order to represent the fabric of nature one must explore it as it exists; the report and the record, the development of knowledge and its communication, should refer to the material world, to things as they *are*. To do as “few private Writers, in a dark Age” had done, a reference to the Scholastic tradition, was to produce defective knowledge. Scholastic writing, and by implication thinking, was intricate and insufficiently based on reference to the material: “For it may easily

²⁵ This may also be characterized by an extensional mode of writing, where the goal of communication is to address the phenomenology of the world, to describe things as they are. The authority on Bacon and his writing remains Brian Vickers. See in particular, Brian Vickers, Francis Bacon and Renaissance Prose (Cambridge: Cambridge University Press, 1968) and English Science, Bacon to Newton (Cambridge: Cambridge University Press, 1987).

be prov'd, that those very Theories, on which they built all their subtle webs, were not at all Collected, by a sufficient information from the things themselves." Sprat was a clever man and did not entirely dismiss a highly respected intellectual tradition that still held significant sway in Universities, courts, and even in the experimental theater. He recognized that the difficulty of scholastic method, its "subtle webs," had been read often as the sign of intellectual precision. Sprat refigured this dark intricacy as a failure with respect to knowledge and relocated its value in the poetic tradition:

If they would be content, with any thing less then an Empire in Learning, we would grant them very much. We would permit them to be great, and profound Wits, as Angelicall, and Seraphical, as they pleas'd: We would commend them, as we are wont to do Chaucer; we would confess, that they are admirable in comparison of the ignorance of their own Age: And, as Sir Philip Sidney of him, we would say of them; that it is to be wonder'd, how they could see so cleerly then, and we can see no cleerer now: But that they should still be set before us, as the great Oracles of all Wit, we can never allow.²⁶

Sprat allowed that scholastic writing was as great as the poetic achievements of Chaucer, but he insisted that scholastics failed because they created abstract narratives that did not refer to material and historical events. These narratives, which Sprat believed were abstract stories only proper to poetry, operate according to what modern semioticians call the intensional mode,²⁷ which is to say their

²⁶ Thomas Sprat, A History of the Royal Society of London for the Improving of Natural Knowledge (London: 1667) 21.

²⁷ "[T]he subject . . . stands for the nature of the subject alone. It does not stand for any of the individuals of the species but only for the concept; it does not refer to real beings (i.e. for the intension only)." Derek Rayside and Gerard T Campbell "[An Aristotelian Understanding of Object-Oriented Programming](#)," Proceedings of the 15th Conference on Object Oriented Programming Systems Languages and Applications conference on Object-oriented programming, systems, languages, and applications (Minneapolis, 2000).

language creates meaning not with reference to particulars with a material being, but with reference to an idea of what may be. According to Sprat, neither Chaucer nor the Scholastics describe the world as it is. We can see this from a different, more positive perspective, arguing that what Sprat sees as failure is instead the creation of possible worlds. This is essentially creative writing.²⁸

Sprat's critique of the "schoole-men" gives us a sense of what concerned early modern writers about language and written communication. The issue of intricacy or difficulty was important as a matter of style, as was seen in the critiques of *copia* and highly ornamental writing. As we will see with John Dee, others viewed intricacy favorably because it kept the vulgar masses away, and it is in part this fashion to which Sprat's critique responds. Along with the critique of intricate language, Sprat limited the value of abstracted narratives not based on material or empirical engagement -- they were valuable as poetry, a form Sprat did not consider essential to knowledge. Sprat's observations mark a moment near the end of the seventeenth-century, which is where this study will ultimately culminate. But we will begin in the late sixteenth-century with the concurrent (and competing) intellectual and semiotic systems developed within communities of early modern mathematicians and poets.

²⁸ See Vickers for a discussion of metaphor in Sprat and Bacon. Brian Vickers, "The Royal Society and English prose style: a reassessment," Rhetoric and the Pursuit of Truth: Language Change in the Seventeenth and Eighteenth Centuries (Los Angeles: William Andrews Clark Library, 1985) 3-76.

Like Descartes two generations later, Sidney and Dee consider imaginative possibility to be “true and real,” hardly the “airy nothing” that many condemned as the essence of fables.²⁹ Consequently, writing the possible is epistemologically significant; it offers the key to producing a new kind of knowledge unavailable to either the empirical eye or the Christianized inward gaze. While both Sidney and Dee clearly incorporate popular sixteenth- and seventeenth-century discovery/recovery tropes, they also both insist on the generative aspect of their writing.³⁰ And the end of such writing is ethical as much as it is epistemological. In writing a world unseen, the mathematician and poet express the “highest points of knowledge” in Sidney’s estimation. For those who want to “use” texts to learn, such

²⁹ The critique of imaginative writing can be characterized by the sentiment that such writing is mere diversion or deception and that it is void of epistemological value. Sidney responds to the critique by distinguishing poetry from what he calls the “wholly imaginative” (216). Such critique begins at least with Plato’s work, in which poetic imitation reproduces ‘phantasms,’ and it takes a number of modified forms throughout the early modern period, including its incorporation into evaluations of other modes of writing, including mathematics. Early critics of mathematics often figured it as a similarly deceptive art and by the 1620’s and the work of Descartes the use of the term “fiction” became regular feature of such critique. In his conversations with Frans Burman, for example, the debate is over whether or not a geometric figure is a mere “fictitious entity.” See René Descartes, The Philosophical Writings of Descartes, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch, 3 Vols., (Cambridge: Cambridge University Press, 1985) 3.343-4. For Plato’s discussion of “phantasm,” see especially *Republic* books nine and ten. Debates over the need for an ontological commitment to possible things, worlds, people, and states of affairs in order to have a viable theory of possible worlds continue within philosophy of language, linguistics, and semantics.

³⁰ In addition to their arguments on behalf of creation both men incorporate more familiar functions for their writing technologies. Sidney’s poetry and Dee’s math make things “better than nature” or they pull back the “veil of nature.” With these gestures toward improvement and discovery, Sidney’s and Dee’s writing function within a common Neoplatonic discovery trope, which concedes that knowledge “lay hid to the world,” but is nevertheless accessible (John Dee, “*Monas Hieroglyphica* (Antwerp 1564),” trans. C. H. Josten, Ambix, Vol. 12 Nos 2 and 3: 93). These kinds of revelatory tropes suggest that with enough effort and time man can uncover the knowledge of an ideal world, of which the fallen world was but a corrupted image, thus providing a path to its return.³⁰ The classic source of the corrupted image argument is in book ten of the *Republic*, where Socrates discusses with Glaucon the ways in which a mirror, like a painting or a poem, only reproduces “appearances” and hence cannot be considered to offer true knowledge. Plato, Republic, Plato: Collected Dialogues, eds. Edith Hamilton and Huntington Cairns (New Haven: Princeton University Press, 1961).

creative writing is simply the best technology for articulation of what “is fit to be said or done, [...] what should or should not be.”³¹ As such, the texts imagined by Sidney and Dee are alternatives to much Renaissance writing. Connoting a particular set of epistemological commitments, “Renaissance” signals a rebirth (and hence recovery) of the lost knowledge of the classical era, into which was integrated the Christian motif of the recuperation of pre-lapsarian knowledge.³² The use of the figures of the Renaissance (rebirth, recovery, and, re-discovery) was hardly monolithic, however, and the connotations of the terms shifted in England during the sixteenth- and seventeenth-centuries. Francis Bacon, among others, refigured the tropes of rebirth and recovery popular from the fourteenth- to the sixteenth-century, foregrounding the return to *method* rather than the resurrection of classical authority. This return to method for Bacon entailed recuperating what he saw as the “more prudent mean” in Greek inquiry, one that eschewed imbalanced dogmatism and outsized scepticism.³³ One consequence of this shift from received knowledge to received method was a rise in the prominence of knowledge encoded by visibility and experience. With this change came the tropes like those of lifting the veil and of

³¹ Sidney, Defence 223, 235.

³² As a name for cultural movements in fourteenth-century Italy (and perhaps France) and all or part of the sixteenth- and seventeenth-centuries in England, “Renaissance” is an artifact of a late nineteenth-century lexicon, rather than a term of the period so named. Nevertheless, many English writers of the period espouse the epistemological commitments that have come to be part of the meaning of the term. On this see: Jacob Burckhardt, The Civilization of the Renaissance in Italy (New York: Penguin Classics, 1990; first published 1860); Stephen Greenblatt, Renaissance Self-Fashioning (Chicago: University of Chicago Press, 1980); and Kate Aughterson, Renaissance Woman, A source book: the construction of femininities in England 1520-1680 (New York: Routledge, 1995), esp. 1-9.

³³ Francis Bacon, The novum organum of Sir Francis Bacon, Baron of Verulam, Viscount St. Albans epitomiz'd, for a clearer understanding of his natural history, translated and taken out of the Latine by M.D. (London: Printed for Thomas Lee, 1676; Latin edition 1620) 1-2.

empirical observations and the related figures of rhetorical, mechanical, and material “discovery.”³⁴ The early scholastic epistemology and the gradual shift away from textual authority and toward a methodology based in experience and experiment has been well documented by literary critics and historians, as have the numerous nuances that make early modern knowledge practices far more interesting than my simple and admittedly reductive sketch suggest. What has been largely neglected is the early modern interest in and practice of creative writing as a means to knowledge. Sidney and Dee were among the earliest proponents of such alternative creative modes, which produced and animated new possibilities and rejected a strictly mimetic function for poetic and mathematic writing.

Intension as “Right”

“Intension,” as a term, is never far from “extension,” a term not quite its opposite but a different manifestation of semantic content. Sidney, Dee, Descartes,

³⁴ The scholarship that has taken this to be the dominant model for early modern knowledge is too vast to be cited in full, what follows is a brief list of some of the more comprehensive texts on the topic. Paul Kristeller’s Renaissance Thought and its Sources (New York: Columbia University Press, 1979) offers an excellent introduction to the topic of integration of classical sources into early modern thought. Debra Shuger’s Habits of Thought in the English Renaissance (Toronto: University of Toronto Press, 1997) details the heterogeneity of the “dominant” epistemology. Michael Baxandall’s work offers a particularly helpful discussion of how this epistemology inflected art production and reception; see Giotto and the Orators: Humanist Observers of Painting in Italy and the Discovery of Pictorial Composition (Oxford: Oxford-Warburg Studies, 1986) and Words for Pictures: Seven Papers on Renaissance Art and Criticism (New Haven: Yale University Press, 2003). On Renaissance and the “discovery” of classical texts see Roberto Weiss, The Renaissance Discovery of Classical Antiquity (Oxford: Basil Blackwell, 1969). On Baconian method and his refiguring of the recovery trope into one of discovery, see Brian Vickers Essential Articles for the Study of Francis Bacon (Hamden, Connecticut: Archon Books, 1968). On mechanical and empirical modes of knowledge in the early modern, see Peter Dear, Revolutionizing the Sciences: European Knowledge and its Ambitions, 1500-1700 (Princeton: Princeton University Press, 2001). And on the balance between disciplined discovery and experiment, see Dear’s Discipline and Experience. For an excellent reassessment of the role of discovery in the work of John Milton see James Dougal Fleming, Milton’s Secrecy: and philosophical hermeneutics (New York: Ashgate, 2008).

and Cavendish all use an intensional mode to write possibility. As we will see in the coda, Milton deploys the intensional mode, but likely as a critique, rather than as the approved mode of production, as seen in our other authors. Extension in modern usage is often associated with denotative or descriptive writing, and may include the Platonic sense of mimesis as report or truthful account of the material; Thomas Sprat's suggestion that the best writing is tied to that "which lye before every mans observation" is a particularly good example of prioritizing extensive writing. Extension may also refer to a restricted Aristotelian sense of mimesis wherein language faithfully simulates phenomena, perhaps most familiar within early modern dramatic theory on the unities of time, place, and action.³⁵ Other examples of such extensive or "world-imaging" texts, as possible worlds theorist Lubomir Doležel calls them, are the botany texts, historical plays, mathematical surveys, and censuses of the period. By contrast, the content of "intensive" communication is characterized by mental concepts, created possibilities, and abstractions that deny reference to the "actual." That is, as Rudolph Carnap has suggested of much smaller semantic units, intensive semantics express propositions about the "nonactual possible."³⁶ Carnap writes within a tradition of philosophy of language known as

³⁵ Sprat 17. Aristotle's discussion of the unities appears in the *Poetics* (particularly XVII), wherein he asserts: "tragedy is an imitation of an action that is complete, and whole, and of a certain magnitude." Aristotle's Poetics, trans. James Hutton (New York: W. W. Norton and Co., 1986). On the unities in early modern dramatic theory, see Marvin Carlson, Theories of the Theater: A historical and critical survey, from the Greeks to the present (Ithaca: Cornell University Press, 1993) especially 37-112.

³⁶Rudolph Carnap, Meaning and Necessity (Chicago: University of Chicago Press, 1988) 65. The Aristotelian proposition is presented as a clause or sentence that either affirms or denies the predicate of the subject. In contrast, for Carnap, working out from the scholarship of C.I. Lewis and A. von Meinong, a proposition is divided in terms of extension and intension, so that the intensional and

“possible worlds semantics” or “possible worlds theory,” which includes the work of Doležel, Alexius Meinong, and Umberto Eco, among others.³⁷ Possible worlds semantics offers us the ability to discriminate between writing concerned with empirical truth in both the particular and abstract modes and writing that operates in a more conditional or propositional vein in order to explore, as Sidney might say, “what may be and should be.”³⁸ As Ruth Ronen suggests, such texts do not make meaning “relative to an extratextual universe.”³⁹ Instead, we see within an “intensional world...discourse constructing its own world of referents.”⁴⁰ In such a model the imaginary objects (referents) to which the propositional discourse of poetic writing refer do not carry a fixed ontological status, they exist neither in physical-material reality, nor in a kind of mental existence. Instead “they remain

propositional nature of the statement (and its meaning) is distinguished from the truth-value bearing extension. A statement may be meaningful without needing to be true. Carnap is thus able to talk about intension as a meaningful proposition about the “non-actual possible” for which no material testimony is available and hence there is no meaningful extension. This strategy allows Carnap to avoid the logical problem of positing non-actual but possible objects, the existence of which is an obvious difficulty. For full discussion of Lewis, Carnap, Meinong, and Russell, among others, on intension, see Pieter A. M. Seuren, Western Linguistics: An Historical Introduction (Malden, MA: Blackwell Publishing, 1998).

³⁷ Lubomir Doležel, Heterocosmica: Fiction and Possible Worlds (Baltimore: Johns Hopkins Press, 1998). Umberto Eco, “Small Worlds,” Versus: Quaderni di Studi Semiotici 52-3 (1989) 53-70 and Semiotics and the Philosophy of Language (Bloomington: Indiana University Press, 1984).

³⁸ On possible world semantics and related issues in modal logic see: Thomas L. Martin, Poesis and Possible Worlds (Buffalo: University of Toronto Press, 2004); Barbara Partee, “Possible Worlds in Model-Theoretic Semantics: A Linguistic Perspective,” Possible Worlds in Humanities, Arts and Sciences: Proceedings of Nobel Symposium 65, ed. Allén Sture (Berlin: de Gruyter, 1989): 93-123; C. I. Lewis, “The Modes of Meaning,” Semantics and the Philosophy of Language (Urbana: University of Chicago Press, 1970). Bertrand Russell’s rejection of possible worlds appears in “On Denoting,” Mind 14 (1905): 479-93.

³⁹ Ruth Ronen, Possible Worlds in Literary Theory (Cambridge: Cambridge University Press, 1994) 41.

⁴⁰ Ronen 29.

inherently indeterminate; their state of being is confined to what meaning-units of the text reveal.”⁴¹ We can think here of a character like Hamlet, of whom it would be rather useless to ask “what was his first word.” There is no world, and consequently no parent of a baby Hamlet, “out there” of which we might ask such a question.

While many possible worlds theorists, including Ronen, make a conceptual leap from possible world semantics to “fictional” worlds, I utilize the notion of compound or complex intension/propositions in order to “scale up” without turning to the term fiction, which was so problematic for many of the early modern writers. In particular, Descartes, who denies the epistemological value of fiction, finds extraordinary value in an alternative possible world that we would likely call fictional. Simple propositions are those for which the extensions can be empirically and logically true or false. Complex propositions are meaningful combinations wherein individual components may have an empirical extension (and hence may be “true”) but the complex proposition itself need not refer to something “exemplified in nature.”⁴² One of the values of this strategy is that it allows philosophers and semanticists to talk explicitly about linguistic meaning that is not tied to empirical verifiability without having to claim that it is somehow non-referential, a claim that would leave us in the paradox of language as a referential system with nothing to which to refer. For Carnap in particular, this enables him to

⁴¹ Ronen 98-99.

⁴² Carnap 29-31 and 60. Carnap offers this model in response to Bertrand Russell’s attempt to deal with false propositions and the nature of their meaning by turning to mental meaning or belief as the referential object.

talk about three different vectors of intension: first, intension as an “actual” proposition that is referential and the extension of which is verifiable; second, intension as a meaningful proposition about the “non-actual possible” for which no material testimony is available and hence there is no meaningful extension; third, intension as an impossible proposition, where the extension is logically impossible and yet the proposition is meaningful in some way. The paradigmatic and historically relevant example of an intension that is an impossible proposition is the square circle. While the squaring of the circle is logically impossible the phrase is not nonsensical and the concept and the possibility of such an action were of great interest to early modern writers. It is intension as a proposition of the “non-actual possible” and, to a lesser degree, the impossible, in which I am particularly interested.⁴³ I argue that entire texts can be described as operating in an intensional mode, especially as complex propositions such as Carnap discusses.

Indeed, for Sidney, Dee, Descartes, and Cavendish the point of writing was the creation of these intensional or possible worlds, wherein language referred not to the actual world, but to the poetically or mathematically created world. Whereas extensive meaning can be evaluated through the testimony or evidence of the material world, intensive meaning cannot be evaluated in the same manner. Writing

⁴³ The definition that I am using here is importantly different from either Frege’s (intension as what I meant to say) or J.S. Mill’s (connotation/denotation). For Frege, intensional meaning is trivial meaning, thus relegating the imaginary to a role with no epistemological value. See James Dougal Fleming’s discussion of intension in “Making Sense of Science and the Literal: Modern Semantics and Early Modern Hermeneutics” The Word and the World: Biblical Exegesis and Early Modern Science, eds. Kevin Killeen and Peter J. Forshaw (New York, Palgrave 2006).

the possible in the intensive mode entails creation in thought and language, a kind of stipulation rather than discovery, and the veracity of such writing is subject only to systems or regulations imposed by the writer and reader.⁴⁴ The preeminent early modern academic traditions of rhetoric, grammar, and logic, along with the emerging practices of natural science and medicine often used an extensional mode of communication to detail information about problems and phenomenology. Even when this was done using abstracted concepts, as in the case of metaphysical logic or theology, such writing sought to express a phenomenon or a problem perceived to be part of creation. By contrast, creative poetry and math were not expressions of material problems or phenomenology. Like their contemporaries who wrote on the plurality of worlds (a nonactual or unverifiable possibility explored by Bernard Fontenelle and Cyrano de Bergerac) and on squaring the circle (a meaningful but a logically impossible proposition wrestled with by John Wilkins and disparaged by John Donne), Sidney, Dee, Descartes, and Cavendish use an intensional mode of writing to explore relationships, operations, and even worlds that they cannot be sure exist except in the pages of their own texts.⁴⁵

⁴⁴ Citing Kripke, Ronen notes that “Possible worlds are ‘stipulated not discovered by powerful telescopes’” (103). Part of what Ronen is arguing here is that we should not be led into thinking of possible worlds as newly discovered mental lands as that would attribute a kind of “thereness” to them that the model of intensional meaning refutes.

⁴⁵ It is important to observe that the terminology of modern philosophy of language – my “intensional” and “non-actual possible” – was not available to the early modern author. While in many cases there are explicit references to figuring the “non-existent,” just as often the exploration of early modern intension requires interpretation. Propositional markers such as “if” “perchance” or “perhaps” are helpful, as are the structures of distance and difference used in the case of inter-world travel, as is seen in Cavendish’s *Blazing World*. Other examples in this genre include Bernard Fontenelle, Conversations on the Plurality of Worlds (1686), trans. H.A. Hargreave (Berkeley:

From Abstraction to Intension: a pre-history

The concept of a semiotics of the possible was familiar long before the late sixteenth-century.⁴⁶ Aristotle famously asserted, “the poet’s function is not to report things that have happened, but rather to tell of such things as might happen.”⁴⁷ In mathematics a slightly different argument was made about the abstract nature of the semantics. The Aristotelian mathematician “investigates abstractions...he eliminates all sensible qualities...and leaves only the quantitative and continuous.”⁴⁸ While missing the predictive sense present around poetry, mathematics is similarly divorced from a one-to-one correspondence between word (*verbum*) and thing (*res*). Further, in the Aristotelian system both the imitative poet and the mathematician abstract from ordinary experience, as opposed to tapping into inherent knowledge of Platonic forms.⁴⁹ This imitative or abstractionist impulse is

University of California Press, 1990) and Cyrano de Bergerac, Voyages to the Moon and the Sun, trans. John Aldington (New York: The Orion Press, 1962).

⁴⁶ The Jesuit mathematician Christoph Clavius claimed, “mathematical disciplines treat of things which are considered apart from all sensible matter.” Importantly, both Dee and Clavius offered a Platonic twist on the idea by situating mathematics as intermediate between metaphysics and a more materially grounded natural philosophy. As Douglas Jesseph has noted this was an important step in the development of a socially viable mathematics because it allowed for a pure theory of mathematics – or an intensional mathematics – as well as a theory of applied mathematics that takes the abstracted notions of theoretical math and re-dilates them in order to deal with material considerations. Douglas Jesseph, Berkeley’s Philosophy of Mathematics (Chicago: University of Chicago Press, 1993).

⁴⁷ Aristotle, Poetics 1451a (54).

⁴⁸ Quoted in Jesseph 10.

⁴⁹ As Peter Dear has noted Aristotelian natural philosophers did not consider the mathematical arts as true sciences given that they did not seek to understand the underlying causes or the essences of what they studied. Dear notes that they understood mathematics as descriptive rather than explanatory. While this is certainly the critique leveled against many mathematical writers, I am attempting to delineate what I think has been an obscured tradition of intensional math that is neither descriptive nor explanatory in the senses used by natural philosophers; rather, it offers a tool for the creation of a different category of things not addressed by natural philosophy. See Dear, Revolutionizing 65-80.

familiar in the early modern period, and, in its insistence on construction from experience, it does circumscribe the kind of creative liberty we can claim for the mathematician or the poet. Nevertheless, even with the Aristotelian system there is room for a system of signification that is not rigidly bound up in a connection between the material thing and the word.

Similarly, medieval writers preserved the ability to write from abstraction rather than with clear reference to the material world. Medieval theologian Thomas Aquinas argued in the *Summa Theologica* (1265-74) that the mathematician “abstracts from ‘sensible matter’” certain intellectual constructs.⁵⁰ Aquinas further refined the Aristotelian natural philosophical model of *abstractio totus*, that is, abstraction from particulars to general or universal concepts. In his commentary on Boethius’ text on the trinity, Aquinas developed the more restricted *abstractio formae*, which was a mathematical abstraction from a perceived particular.⁵¹ These abstractions were a “peculiar kind of purely mental entit[y] which can be grasped by the intellect but not found in nature.”⁵² For Aristotle and Aquinas such derived forms were necessarily lower in the hierarchy of knowledge, subordinate to certain logical knowledge. Nevertheless, the naming and theorizing of mental entities without a material correlate was an early step in the very long work of the development of semiotic practices that partook of the material world in the

⁵⁰ In this text the constructs are called “intelligible matter” and they are more essential than sensible matter. See Jesseph 11.

⁵¹ Thomas Aquinas, *Expositio super librum Boethii de Trinitate* (c. 1261); quoted in Jesseph 11.

⁵² Jesseph 11.

development of concepts, but whose referential practices did not depend upon a signified present in the material world. Instead the sign -- the word, the number, and the geometric figure -- referred to mental conceptions or formations, which is to say that the semiotics were intensional.

At this point in our history, however, the terminology becomes tangled. While Aristotelian and Thomistic abstraction were functionally intensional, in the modern sense, the etymological history of the term traces a genealogy back not to Aristotelian abstraction, but to the related concept of “comprehension.” Comprehension -- for an Aristotelian of the classical, medieval, or early modern periods -- referred to the complete set of properties that a single term might entail. According to the seventeenth-century Port Royalist language theorists, Antoine Arnauld and Claude Lancelot, “comprehension” was defined as “those attributes which an idea involves in itself, and which cannot be taken away from it without destroying it.”⁵³ For example, the comprehension of the term “animal” might be that it has a body, it is organic, it requires nourishment, it is sensitive, etc. The “extension” of animal is a verifiable instance in which these properties are present; said another way, extension is the class of individuals for which the intension of

⁵³ As quoted in C.S. Pierce, *Peirce Selected Writings* (www.iupui.edu/~peirce/index.htm; volume 2.3). Peirce was a prolific nineteenth-century philosopher of language and mathematician. The relevant texts by Arnauld and Lancelot are the *Port-Royal Logic* (Paris, 1662) and *Port-Royal Grammar* (1660).

“animal” is true.⁵⁴ In modern theory, “comprehension” has been variously refigured as either “intension” or “connotation.” Connotation, as “that which is implied in a word in addition to its essential or primary meaning,” brings into consideration a wide range of associative and/or affective meanings and theories.⁵⁵ Connotative meaning of this sort is notoriously slippery, multiple, and context dependent. Such meaning is far outside of what I am trying to deal with here, and so it will not be considered.

Intension, as defined by Carnap, is much closer to my usage of the term. For Carnap, intension is figured as a proposition while extension bears the truth-value of that statement.⁵⁶ There is an important distinction between Aristotelian propositions and their relationship to comprehension and Carnap’s proposition. The Aristotelian proposition is presented as a clause or sentence that either affirms or denies the predicate of the subject. As in the case “man is animal” - where the comprehension of the term “animal” is such that “man” is part of its extension; man is an instance of that class that possesses the properties of “animal.” The Aristotelian proposition is itself the truth bearer; the statement *is* either true (and, if a first principle, axiomatic) or false. In this case, extensive meaning is a function of

⁵⁴ Note that this is not identical with the Platonic doctrine of “Forms”, in which the non-spatial, non-temporal ideal form exists somewhere outside of material creation and each instance of that form is an inferior spectral instance.

⁵⁵ “Connotation^{1b}” *The Oxford English Dictionary*. 2nd ed. 1989. OED Online. Oxford University Press. 5 April 2009 <http://dictionary.oed.com/cgi/entry/50047611>.

⁵⁶ Carnap 26.

intensive and the two are collapsed into the expression of the statement itself.⁵⁷ In contrast, a Carnapian proposition can be divided in terms of extension and intension, so that the intensional and propositional nature of the statement (and its meaning) is distinguished from the truth-value bearing extension. A statement may be meaningful without needing to be true.

J. L. Lemke's work on mathematic semiotics has been particularly useful for this project as a model of "social semiotics," that is studying how people use or purport to use signs to make meaning. This is in contrast to a more formalist mode of semiotic scholarship. My arguments focus on how people thought math and poetry made meaning and what kind of meaning they thought it made. I will not be attempting to prove that early modern texts made meaning in any way that the modern scholar can responsibly reconstruct. Lemke observes that what defines mathematic writing is not the mode of writing, rhetorical, numerical, or equational for example, but the "kinds of meaning it makes: meaning about addition, subtraction, multiplication, and division, about numerical difference and equality, about . . . relationships."⁵⁸ The kind of distinction between the modes of writing and the kind of meaning made by Lemke is, in part, motivated by what Kay O'Halloran

⁵⁷ This is the characteristic mode of logical positivism. Intensions are often said to be a function of possible worlds, meaning that they are a set of rules for selecting the particular possible worlds in which those intensions obtain.

⁵⁸ While these may be tropes of mathematic writing, the meanings of "difference," "equality," and "relationships," can extend well beyond a restricted "purely mathematic" meaning. Paying attention to the ways in which mathematical meaning, such as the numerical equality of land holdings or the relationships of proportion that suggested the work of the divine hand in a face, is not neutral meaning, allows us to see more fully how mathematic semiotics was indeed social and creative.

calls the “multimodal” nature of mathematic writing. Lemke’s statement is an attempt to distinguish mathematic writing from other forms of writing despite the use, especially before the seventeenth century, of a largely rhetorical prose mode. At least since the work of Euclid, mathematic writing has featured number, figure, and prose. Specialized symbols were gradually added, plus and minus (+ and -) appeared first in John Widmann’s arithmetic of 1489 and Robert Recorde introduced the equals sign (=) in his *Whetstone of Witte* (1557).⁵⁹ With the work of François Viète, mathematics has also incorporated a more symbolic mode of writing, familiar to most of us as variables named “x” or “y” and often including superscripted exponents as in x^2 . As we know, however, it is not just mathematic writing that is multimodal. Herbert’s shape poems, such as the “Altar,” are excellent examples of multimodal poetic writing, where the linguistic text interacts with the figure created by the layout of the text to produce meaning. Materialist scholarship has demonstrated as well that visual features of the text such as illuminations, decorative initial capitals, plates, the script, orientation, and even the paper itself are additional modes that interact with the text to develop meaning. As the work of Mazzio, Crane, and Nicholas Dew has demonstrated, early modern mathematics were never just about measurement, they also express affect, create new

⁵⁹ Florian Cajori, *A History of Mathematical Notations* (New York: Dover Publications, 1993) 139. See also D.E. Smith, *History of Mathematics*, Vol. II (New York: Dover Publications. 1958) 395.

connections, are sites of political struggle, and articulate the desires and fears of early modern writers.⁶⁰

Why go to all this trouble just to talk about what we might call the imaginary or fictional, especially when the objection raised is that what philosophers of language are talking about is meaning at the level of the word or the clause? Admittedly, to use the term “intension” and to speak of non-actual but possible propositions at the level of a poetic work rather than at the sub-sentence level is to stretch these concepts outward beyond where philosophers of language would likely go. And yet, it is also to take the fundamentals of counterfactual and possible worlds theory, both philosophic fields derived from work on semiotic and semantic theory like Carnap’s, into a realm where they seem quite at home. It seems nowhere more reasonable to talk about the unrealized logical possibility or the mind-bending impossibility than in the context of imaginative writing. Indeed, counterfactual and possible world theory has begun to appear in the literary scholarship of Catherine Gallagher and Jennifer Riddle Harding, and the historiography of Niall Ferguson, in addition to the work of Martin, Ronen, and, to some extent, Doležel, that focus on possible worlds theory as such.⁶¹ Perhaps the question remains, however, of the

⁶⁰ Nicholas Dew, “*Vers la ligne*: Circulating measurements around the Atlantic,” Science and Empire in the Atlantic World, ed. James Delbourgo and Nicholas Dew (New York: Routledge, 2007): 53-72.

⁶¹ Catherine Gallagher, “Forum: Counterfactual Realities” and “When Did the Confederate States of America Free the Slaves?” Representations 98 (2007): 51-61; and “War, Counterfactual History, and Alternate-History Novels.” Field Day Review, 3 (2007): 53-66. Jennifer Riddle Harding, “Evaluative stance and counterfactuals in language and literature,” Language and Literature, Vol. 16, No. 3, (2007): 263-280. Niall Ferguson, ed. Virtual History: Alternatives and Counterfactuals (New York: Macmillan, 1997).

utility of these unfamiliar terms, of the use of calling a work intensional, when the risk of confusion or misunderstanding is high. The answer I offer is this: it is very difficult to talk about the creation of meaning in mathematics and poetry at the same time in terms familiar to one or the other of those fields. Aside from social semiotic work like Lemke's and O'Halloran's, there is no single lexicon familiar to both practices, and the ability to talk precisely about creation of the possible in both math and poetry does not yet feature in such work. Further, my goal in this project is not to argue that math can be poetic or that poetry is mathematic, though both statements are certainly true in some cases, and to choose the terminology of either discipline, literary or mathematic, enacts a kind of disciplinary subordination that I would like to avoid.

There is yet another reason: rather than looking at how both mathematics and poetry were capable of expressing a perspective on the material or empirical world, as discussed earlier, I want to demonstrate how the two modes of writing were thought to call the previously non-actual into being. That is, to see how they can both be understood as creative, how that understanding incorporated an epistemological and ethical value for the creative, and to suggest that they both continue to create the world in which we live. By detailing the ways in which theorists and practitioners argued that their texts were propositions of the non-actual possible, I am able to illuminate a shared strategy in mathematic and poetic writing. By insisting on the language in which philosophers have theorized meaningful expression, I am foregrounding the provisional status of intension (as

proposition rather than truth-bearing statement) and highlighting its function as a technology to explore what, as Sidney said, may or should be. And here we come to a last, historical justification. According to many early modern writers what is being discovered as possible through mathematic and poetic creation is different from what they understand as the strictly “fictional.” The possibilities are real in an important way, and this “realness” is at least partially obscured if I simply use the terms “imaginary” or “fictional,” terms they would not have applied to these powerful possibilities.

Mathematicians and poets such as Sidney, Dee, Descartes, and Cavendish grappled with intensionalist writing and resisted the realist demands of emerging empirical practices on the grounds that the possible was essential for ethical and civic development.⁶² While the intensional aspect of early modern creative writing suggests something like the concept of the literary imagination that we have inherited from post-enlightenment critique, especially when literary authors such as Sidney are evoked, this is not a study of “the literary” *only*.⁶³ The goal of the project

⁶² Many of these writers situate their ethical arguments specifically within the context of the English kingdom. My use of the term Englishman here and elsewhere is meant to signal the corporate aspect of these semiotic theories. While it is tempting to say that these texts hope to create the English citizen or the English individual, this move to establish a nationalist ideology is anachronistic. The solution of “English subject” more accurately captures the royal and perhaps imperial aspects of the corporate body referred to but it has the undesirable effect of obscuring the hierarchy challenging move that many of these texts make on behalf of elite men (and in the case of Cavendish, women). While “Englishman” leaves us to contend with the imprecision of the boundaries of the English kingdom at this time, it is less problematic than the imposition of more modern senses of corporation and allows us to see the ways in which non-royals were encouraged to think about rule and ruling through these texts.

⁶³ This not an argument that both poetry and math could be aesthetic practices, in the sense suggested by Kantian aesthetic theory, despite the important role that pleasure will play in the

has been to understand the ways in which both poetry and mathematics were available as creative technologies, to understand the ends to which those technologies could be used, and to offer insight into their historical trajectory.⁶⁴

For the early modern scholar, the histories of early modern poetry are far more robust than those of mathematics. They have directed our attention to the political deployment of poetry, and of Puritan associations of the art with a dangerous frivolity; to the impact of the return of many poets to the models of antiquity on society, culture, and modes of knowledge; to the creation of different religious and political communities through poetic exchange; to the roles that poetry played in the creation of the idea of the nation of England and its political structures. The scope of scholarship on poetry can be dizzying. The most recent work on the poetry of John Donne, an English metaphysical poet whose publication history places him right in the crux of the historical period considered here, for example, has pointed to the creation of a religious subject and to the relationship of the devotion motif to early modern subjectivity, to the integration and transformation of tropes from natural philosophy and the kind of comments Donne

various theories of creative math and poetry. The early modern mathematicians and poets dealt with here envisioned a semiosis productive of vital knowledge about the early modern world, and while they utilized concepts of pleasure and delight, these are not the same as a transcendent, “art for art’s sake,” rapturous pleasure as seen in Kantian aesthetics. Responding to a crisis presented by a denotative system of representation, which had troubled the ethical dimension of early modern knowledge, these creative models specifically sought to teach and delight through writing.

⁶⁴ It is important to recall here and throughout that I am using the term “writing” to refer to both writing of language and the writing of mathematics. What remains to be studied is the ways in which these modes of writing are received in acts of reading, which is just as surely part of the larger story here.

may have been making about the “new science” (William Empson, Laura Lojo Rodríguez, Anthony Low). Scholars have suggested that Donne’s religious work was an important part of an English national identity (Claire Elizabeth McEachern) and that the political has been overly emphasized to the detriment of Donne’s metaphysical interests (Ramie Targoff). They have focused on Donne’s notions of love and their impact (Charles Fowkes), on his construction of female identity and representation in his love poetry (Ilona Bell), on his creations of space and a cartographic imagination (Lisa Gorton), and on economics and colonial interests in his poetry (Shankar Raman) - to touch on just a few. As the example of Donne scholarship suggests, while poetry might have been subject to critique in the period, it is clear that modern critics see it as a major force in early modern intellectual life.

While poetry was an important tool, we have also been reminded of the heated debates about language during the early modern period, of the anxiety that many felt about an unruly, indeterminate, and relatively young language and its use in observation, law, politics, drama, and even poetry (Bono and Vickers). It is this debate, the debate about how people should use language, what its limitations were, and where it failed or succeeded, that I am exploring in this project. Now this debate -- if it can have a monolithic identity as is suggested by my use of the definite article and the singular noun -- this debate is really far too large and complex for a single study. The way that this project engages with it is limited in two ways. I am only considering language as poetry and as mathematics. Poetry, as defined by Sidney, was not reducible to versifying; rather, it encompassed creative writing more

generally. Hence the “poetry” considered in this project will include both prose and verse. Lemke has suggested that “mathematic statements” express a kind of “meaning that natural language has trouble articulating.” This project is an attempt to understand how a difference developed between what math and poetry express. There is a clear, shared vocabulary for mathematics and poetry in the early modern period that derived from classical rhetoric. Given this commonality and the co-presence of new mathematic and poetic theories in the early modern period, it is worth considering if perhaps the difference was produced during this period of extraordinary semiotic exploration. If the history of mathematic writing is “a history of the gradual extension of the semantic reach of natural language into new domains of meaning,” then a history of poetry is also this history, which in turn is a history of the creation of the demarcation of those new domains of meaning as either poetic or mathematic.⁶⁵

A second important limit of this project is the focus on poetry and math as creative. For reasons of economy and clarity I am not dealing with the more denotative modes of poetry and math that record the material world or images of its ideal. As discussed earlier, this choice is also motivated by a sense that a great deal of scholarship on the early modern period, both literary and historiographic, has focused on denotative and material practices. This has in many ways left the impression that while early modern authors explored the metaphysical along with

⁶⁵ J. L. Lemke, “Mathematics in the Middle: Measure, Picture, Gesture, Sign, and Word,” 31 March 2009 <http://academic.brooklyn.cuny.edu/education/jlemke/papers/myrdene.htm>.

the material, they did not actively understand language to be creative. Such conclusions often include the argument that the early modern writer saw language as a tool for discovery and communication of discovery, but not for the creation of new possibilities, new visions, and even new worlds.⁶⁶ The interaction of language and number in denotative genres is of great interest to me, as are the interactions between creative and more denotative modes of communication, both of those are topics for subsequent projects. But first, we turn to the history of early modern math and poetry as creative instruments.

⁶⁶ The issue of utopian genres will be dealt with later in the project, for now it is enough to say that utopias, as a general rule, draw on the material world in order to offer an ideal or improved version of it. Consequently, utopias do not produce new worlds in the same manner as the texts considered in this project.

Chapter One: Sidney's "Right" Poet: writing possibility with poetry

While Sir Philip Sidney, defender of poets, may not have read the *Timaeus* and the passage with which this project opens, the Platonic critique of poets as imitators and, consequently, as incapable of producing knowledge was well known and often repeated in the sixteenth-century.¹ In his *Schoole of Abuse* (1579), Stephen Gosson invokes Plato as he opines that poets are "effeminate writers, unprofitable members, and utter enemies to virtue" because of their imitative and ornamental practices.² Whether in response to Socrates' diagnosis of poetic failure, to Gosson's complaints of poetic abuses, or to a broader critique of "poesy" generally, Sidney offers the most complete early modern defence of poetry's ability to animate the possible.³ Confronted by anti-poetic tracts like Gosson's *Schoole*, Sidney finally met

¹¹ Significant debate continues about the influence of classical authors such as Aristotle, Plato, and Horace on Sidney's *Defence*. Sidney wrote his brother, Robert Sidney, a long letter on education in October 1580, in which he references the preference at Oxford for teaching Cicero, who had translated a partial version of the *Timaeus*. According to Paul Kristeller, the *Timaeus* was the only Platonic text available widely during the Middle Ages and is therefore among the few Platonic texts that may have had significant influence in the sixteenth-century. For an excellent discussion of the availability and provenance of Platonic and other classical texts in the Renaissance and their influence, see Paul O. Kristeller, *Renaissance Thought and Its Sources* (New York: Columbia University Press, 1979). On Sidney's Platonism, see John P. McIntyre, "Sidney's 'Golden World,'" *Comparative Literature*, Vol. 14, No. 4 (Autumn, 1962): 356-365. For a discussion of Sidney's Aristotelian ethical perspective see Henry S. Turner, *The English Renaissance Stage* (Oxford: Oxford University Press, 2006) 84-85. Turner notes that Roger Ascham in particular recommended Plato's work in his chapter on imitation in *The Scholemaster*.

² Stephen Gosson, *Schoole of Abuse, containing a pleasant invective against Poets, Pipers, Plaiers, Jesters and such like Caterpillars of the Commonwealth* (London: 1579). Gosson's puritan pamphlet, which he dedicated to Sidney, accuses poets and dramatists of inciting social disorder through excessive stirring up of the humors and of recourse to vulgar comedy.

³ While the record attests to Sidney's knowledge of and distaste for Gosson's text, I think that S. K. Heninger is right to suggest that Sidney's *Defence* was a response to the critique of poetry made by many, in part because Gosson's text is not only an attack on poetry but on a much larger range of imitative arts to which Sidney's text does not speak. See S. K. Heninger, *Sidney and Spenser: The Poet as Maker* (University Park: Pennsylvania State University Press, 1989) 228. For more on the topic, see Katherine Duncan-Jones and Jan van Dorsten, eds., *Miscellaneous Prose of Sidney* (Oxford:

the Socratic challenge by suggesting that poetry can indeed animate imaginative intellectual constructs and, in so doing, argued for a new kind of creative epistemology; Sidney's poet succeeds where according to Socrates the classical poets had failed.⁴ With his sixteenth-century theorizations of poetry, Sidney offered a new role for the technologies of the book and the manuscript as machines of the imagination, as generators of possibility, and suggested that creation is as important to knowledge as the scholastic pursuit of Aristotelian causes or the search for new discoveries.⁵

Sidney's answer to Socrates' complaint appears in the *Defence of Poesy* (1595), likely written in 1579/80, and while it does not directly address the issues raised by Plato in the *Timaeus*, his argument that poetry was capable of growing "in effect another nature, in making things either better than nature bringeth forth, or quite anew, forms such as never were in nature," certainly addresses the spirit of the Socratic critique.⁶ Sidney's argument not only refutes the charge of imitation, in addition to the ability to create "anew" (or renew), it also introduces a new role for

Clarendon Press, 1973) 62 and Philip Sidney, *An Apology for Poetry or the Defence of Poesy*, ed. Geoffery Shepherd (London: Thomas Nelson, 1965).

⁴ Sidney directly addresses the issue of animating an imagined commonwealth in his discussion of Sir Thomas More's *Utopia*, of which Sidney claims that the failure of More to enliven his imagined city is not a fault of the form, i.e. not a problem with poetry, but a failure of performance on More's part (222-3).

⁵ My phrase "machines of the imagination" is meant to echo Jonathan Sawday's *Engines of the Imagination: Renaissance culture and the rise of the machine* (New York: Routledge, 2007). My phrase borrows from Sawday's analysis of the mechanics and mechanisms imagined by early modern writers and places the emphasis on the "machine" of the book rather than machines in books.

⁶ Philip Sidney, *The Defence of Poesy*, *Sir Philip Sidney: The Major Works*, ed. Katherine Duncan-Jones (Oxford: Oxford University Press, 2002) 213 and 216. On the dating of the composition of the *Defence* see Duncan-Jones and Dorsten 59-83.

writing to “bringeth forth” new creations. While many early modern writers express anxiety about the clarity and precision of “natural” language,⁷ suspicious of its ability to represent or reflect the world responsibly, Sidney defends poetry by supplementing language’s mimetic function with a new creative one.⁸ Sidney’s poetry (defined *not* as versifying but as creative writing more generally) writes the possible, bringing what does not exist to life through meaningful marks on the page.

Sidney’s poet is capable of writing a world not yet seen, and such writing expresses the “highest points of knowledge” in his estimation. For those who want to “use” texts to learn, such creative writing is simply the best technology for articulation of what “is fit to be said or done, [. . .] what should or should not be.”⁹ By

⁷ Sixteenth century philosophy of language included theories of human language as innate and “natural,” i.e. uncreated by man. Other theories suggested that language was more conventional, or arbitrary and created by human practice. Generally the attempt to argue that language is connected to its referents in some innate way, whether at the level of the word or the level of sound, characterizes the sixteenth-century. This debate is widespread, but can be usefully located first within the debates on the value of rhetoric and then traced through a series of social dialogues on the nature and utility of language. This paradigm will shift dramatically in the direction of the conventionality of language in the seventeenth century. On rhetoric and its contested status from the Italian Renaissance onward, see Wayne Rebhorn, Emperor of Men’s Minds: Literature and the Renaissance Discourse of Rhetoric (Ithaca: Cornell University Press, 1995). For an excellent overview of early modern theories of language, including its instability, see James Bono, The Word of God and the Languages of Man (Madison: University of Wisconsin Press, 1995).

⁸ In addition to their arguments on behalf of creation both men incorporate more familiar functions for their writing technologies. Sidney’s poetry and Dee’s math make things “better than nature” or they pull back the “veil of nature.” With these gestures toward improvement and discovery, Sidney’s and Dee’s writing function within a common neo-Platonic discovery trope, which concedes that knowledge “lay hid to the world,” but is nevertheless accessible (Dee *Monas* 93). These kinds of revelatory tropes suggest that with enough effort and time man can uncover the knowledge of an ideal world, of which the fallen world was but a corrupted image, thus providing a path to its return.⁸ The classic source of the corrupted image argument is in book ten of the *Republic*, where Socrates discusses with Glaucon the ways in which a mirror, like a painting or a poem, only reproduces “appearances” and hence cannot be considered to offer true knowledge. Plato, Republic, Plato: Collected Dialogues, eds. Edith Hamilton and Huntington Cairns (New Haven: Princeton University Press, 1961).

⁹ Sidney, Defence 223, 235.

arguing that poetry possesses the capacity to create such forms as “never were in nature” Sidney’s model insisted that creation rather than mere recovery was the point. As I suggested in the introduction, to the extent that he did so, he put forth an epistemological model radically distinct from that generally accepted as the dominant epistemology of the English Renaissance.

Poetry, however, was not the only early modern creative technology to expand epistemological horizons. Alchemical creation offered early modern practitioners a re-combinatorial art that broke down material creation into constituent parts and created anew from those constituents. Alchemists attempted to produce a perfected form of natural things, one that went far beyond the miming of external appearances.¹⁰ As we will see, in this attempt to perfect nature the alchemist demonstrates the perfecting impulse seen in Sidney’s more mimetic poetic modes; altering the “deep structure” of nature, both the poet and the alchemist attempted to improve upon nature in some sense.¹¹ But the alchemist in some ways had more in common with the rhetorician than with Sidney’s ideal poet. Alchemical transmutation and rhetorical production both are fundamentally transformative practices; rhetoric “transforms” the “mental condition” of the auditor and the alchemist transmutes metals and mixes essences. While they operate on different kinds of media – the mental and the metal – both alchemy and rhetoric were practices that, for some, reformed knowledge and developed the

¹⁰ William Newman, Promethean Ambitions (Chicago: University of Chicago Press, 2004) 32-3.

¹¹ Newman 33.

ethics of the individual.¹² Most importantly (and this is what distinguishes alchemical and rhetorical practice most from Sidney's ideal poetic practice) both alchemy and rhetoric drew on a stock of materials already present. The alchemist did not create his metals, minerals, and fluids; they were isolated, reformed, and separated and then re-created into new or improved forms. The *topoi*, or places, of rhetoric, likewise, were well-established categories and figures that the rhetorician selected and ordered in the processes of *inventio* and then *dispositio*. Even in the case of Erasmus, who argued that there was simply too much in early modern life that was new relative to ancient Rome for anyone to actually imitate Cicero's style, the rhetorician uses what has been "devoured through long and varied reading," thus offering a recombined argument through refining and transmutational practices imagined as digestion, transference, and birth by Erasmus.¹³ While both alchemy and rhetoric offer production that may be new in arrangement, unlike Sidney's poet who creates "anew," the alchemist and rhetorician begin their work with that which already exists.

¹² Tara Nummedal argues that rather than a singular "alchemy" we should attend to the "alchemies" of the early modern period, noting that not all alchemists were invested in an *alchemica mystica* that was most closely aligned with metaphysical change for the practitioner. In this respect alchemy is again like rhetoric, the value of which was a point of major contention in the early modern period. Tara Nummedal, *Alchemy and Authority in the Holy Roman Empire* (Chicago: University of Chicago Press, 2007) 14.

¹³ Desiderius Erasmus, *Ciceronianus*, trans. Wayne Rebhorn, *Renaissance Debates on Rhetoric* (Ithaca: Cornell University Press, 2000) 68. The birthing tropes in alchemy are characterized by this reworking – the homunculus is created from isolated materials already at hand in the material world, not created entirely new.

The “Right” Poet

According to Sidney, the best creative poetry was not mimetic, and he uses the *Defence* to develop a theory of poetic meaning that fractures at the point of reference, splintering the referential discourses central to denotative language off from the creative discourses concerned with envisioning new possibilities and new worlds. In order to make this argument, Sidney contrasts the poetic mode to other prevalent modes of the late sixteenth-century.¹⁴ Unlike poetry, the astronomer’s work, which “set down what order nature hath taken,” the geometrician’s quantities, the musician’s “times . . . which by nature agree,” the rhetorician’s and grammarian’s proof and persuasion, and the physician’s measure of “the nature of man’s body” all posit a strong connection between sign and material referent, anchoring their truth claims with reference to the material world.¹⁵ In this respect, I suggest that such writing is “extensive.” As discussed in the introduction, extension may include the Platonic sense of mimesis as report or truthful account of the material, where

¹⁴ Sidney follows Aristotle’s approach, though he differentiates not just between the historian/politician and the poet, but also among natural philosophy, theology, moral philosophy, and many other genres. In chapter 25 of his *Poetics*, Aristotle defends poetry against the critique of inaccuracy or fictionalization, and in doing so makes an explicit distinction between political, historical, and poetic genres of writing. For Aristotle, this distinction in genre allows him to assert his theory of poetic probable impossibility: “a probable impossibility is to be preferred to a thing improbable and yet possible” (Aristotle 77). Sidney’s strong contrast between mimetic modes and a creative poetic mode to be discussed in full in this chapter suggests that Michael McKeon’s characterization of early modern commentary on Aristotle’s *Poetics* as read through “the spectacles of empirical epistemology” and a consequent struggle between *vraisemblance* and historicity is in need of some revision. Michael McKeon, *The Origins of the English Novel* (Baltimore: John’s Hopkins Press, 1987) 54.

¹⁵ Sidney, *Defence* 216.

reproduction mirrors reality as it is.¹⁶ Extension, as we have seen, may also refer to a restricted Aristotelian sense of mimesis wherein language faithfully simulates phenomena. According to Aristotle, the poet or dramatist's function is to "express the universal," imitating not what has happened but the "sort of thing that a certain kind of person will say or do probably or necessarily."¹⁷ Aristotle's statement on poetic possibility is constrained by the notion of probability or that which is possible "by virtue of being in themselves inevitable or probable."¹⁸ The issue of probability arises for Aristotle in order to distinguish between the historian's interest in particularity and the poet's in universals; the historian tells of "things that have been" while the poet "imitates actions" to tell of what "may be." As an imitation of what is permissible within the bounds of nature – "credibility" is Aristotle's synonym for possibility – such poetry remains extensive. While as different in degree as the certain syllogism is from the enthymeme, Aristotle's connection between signifier and a signified that, as Roland Barthes put it, "the public believes possible," is of a class with other extensive writing.¹⁹ In contrast to Sidney's vision of poetic possibility, Aristotelian mimesis retains a stronger

¹⁶ For Plato this mirroring is one only of "appearance" not "reality and the truth" because the mimetic arts are only able to reproduce contingent qualities and not essences. Socrates' statement in book X of the *Republic* is that mimesis of this sort "is an imitation of a phantasm" and consequently produces no true knowledge. Plato, *Republic* 823.

¹⁷ Aristotle, *Poetics* 54 (1451b).

¹⁸ Aristotle, *Poetics* 54 (1451b). Aristotle's definition of probability is further grounded in the actual by the location of this argument which follows his discussion of the unity of action and magnitude, both of which are cast in terms of behavior as experienced by men.

¹⁹ Roland Barthes, "The Old Rhetoric: an aide-mémoire," trans. Richard Howard, *The Semiotic Challenge* (New York: Hill and Wang, 1988) 22.

connection between reference and an “actual,” if generalized, referent.

Consequently, while, as we will see, Sidney’s language echoes that of Aristotle’s, the theory of meaning that he develops through his defense of poetry will take poetry’s function beyond extension into the possible worlds of intension.

Indeed, for Sidney, the point of poesis was the creation of intensional worlds, of works in which language referred not to the actual world, but to the poetically created possible world. Whereas extensive meaning can be evaluated through the testimony or evidence of the material world, such intensive meaning cannot be evaluated in the same manner. Writing the possible in the intensive mode entails purely mental creation, a kind of stipulation rather than discovery, and the veracity of such writing is subject only to systems or regulations imposed by the writer and reader. As Sidney put it in a letter to his brother, it is “enough” that what is figured by poetry “might be so.”²⁰ The early modern academic traditions of rhetoric, grammar, and logic, along with the emerging practices of natural science and medicine, largely used an extensional mode of communication to detail information about problems and phenomena. Even when this was done using abstracted concepts, as in the case of metaphysical logic, theology, or Aristotelian poetry, it expressed a phenomena or a problem perceived to be part of creation. By contrast, creative poetry, as theorized and practiced by Sidney, writes alternative possibilities into creation. Sidney used writing to explore relationships, operations, and even

²⁰ Sidney, Miscellaneous 291-94.

worlds that do not exist except in the pages of texts.²¹ As we will see, the material existence of poetic subjects notwithstanding, such poetry was eminently useful for Sidney. The critical difference lay not in the value of extensional vs. intensional writing, but in the way that language worked in each instance. Sidney's creative poetry was (perhaps uniquely for the late sixteenth-century) a poetry wherein signs created referents to which they referred.

Sidney's characterization of astronomical writing as setting down the order of nature suggests that extensive meaning depends upon a referent that can be experienced, what modern philosophers call the "actual." The nature of the experience might vary, measuring the stars and their motions might be a different order of verification from the measurement of the body. Nevertheless, since both are in some sense materially present and their behavior empirically observable, however imperfectly, a reader has some basis on which to evaluate the kinds of information conveyed by extensive writing.²² Consequently, such texts with their

²¹ Henry Turner refers to Sidney's poesy (different than poetry) as "a mode of generating knowledge about the natural and social world...it is a representational way of coming to knowledge; it gives a provisional form to action so that it may be analyzed according to available systems of thought and then modified as necessary"(89). I agree with Turner that poetry functions for Sidney as a kind of proposition or provisional statement, and with his argument that Sidney sees poetry as a product related to the material objects of other kinds of *vates*. Where I depart from Turner is in insisting on the three-part taxonomy of poetry and its importance as Sidney's way of defining poetic writing as of a different kind from other modes of writing. In this claim, I argue, lies the "what" of Sidney's poetic making – what the poet makes is *not* replication, as it is for other artisanal modes emphasized by Turner, but a new creation in language.

²² See Dear's excellent discussion of the claims of astronomical writing in *Revolutionizing* 40-44 and 65-79. Dear points to Osiander's preface to Copernicus' *De Revolutionibus* as an example of the willingness to use a model that accurately described motion without providing information about underlying causes. In so far as such writing insisted upon correct description it remains extensive. Osiander's suggestion that such "hypotheses need not be true nor even probable" however raises

observable subject matter do not require difficult abstraction in order to understand; the reader can compare his/her observations with those of the text and judge the quality of the writing based on their experience.²³ For Sidney, the subject of extensive writing was nothing other than creation, which he referred to as, simply, “nature.” Even the metaphysician, who, according to Sidney uses “second and abstract notions” in order to “build upon the depth of nature,” produces knowledge written in an extensive mode.²⁴ The poet, on the other hand, “disdaining to be tied to any such subjection,” grows “another nature” in order to offer a representation of what “might be.”²⁵ The poet, unconcerned with representation of nature as it is or representation shaped by natural organizing principles, produces something very different from the extensional writing of both the astronomer and the metaphysician.

The purely creative element of Sidnean poetics has been obscured, in part, by Sidney’s mimetic definition of poetry in the *Defence*, one that has seemed to locate his poetics firmly within an extensive tradition. Generations of scholars have quoted

questions about the status of “imagination” in the process of extensive computation and observation (quoted in Dear 43).

²³ There are at least two different modes of this extensive writing that are worth distinguishing here. While Bacon and others would insist on a kind of objective empiricism that eschewed the “fictions” produced by received or learned paradigms, there nevertheless remained an interpretive model that worked to match observation and material testimony to either religious doctrine (as in the challenge to the heliocentric universe) or that sought to reaffirm analogical relationships (microcosm/macrocosm).

²⁴ Sidney, *Defence* 216.

²⁵ Sidney, *Defence* 21, 216. In a letter to his brother Robert Sidney, Sidney remarks of the poetic subjects that “perchance they were not so, yet it is enough that they might be so” (Sidney, *Miscellaneous* 293).

the following passage as evidence of Sidney's belief in poesy as a mimetic and extensive practice:²⁶

Poesy therefore is an art of imitation, for so Aristotle termeth it in the word mimesis – that is to say, a representing, counterfeiting, or figuring forth – to speak metaphorically, a speaking picture – with this end, to teach and delight.²⁷

Ut pictura poesis, the speaking picture, was a common trope for the description of lively rhetorical production, whether on stage or on the page. Sidney's reference to it early on in the *Defence* situated his poetics within a rhetorical genealogy that included the referential traditions of mimetic literary production and natural philosophy. Nevertheless, Sidney does not simply adopt Aristotle's poetic theory as his own, as critics commonly assume. In responding to the Platonic critique of poetry's failure to produce knowledge, Sidney uses Aristotelian mimetic poetry as *part* of a poetic taxonomy that extends beyond Aristotelian poetry to argue that the poet creates in order to know. In fact, Sidney details no less than three general kinds of "poesy" in the *Defence*, and it is this overlooked division which is crucial to understanding how Sidney's poetics not only refutes Plato's critique but also differs

²⁶ On Sidney's argument as Aristotelian see J. E. Spingarn, *Literary Criticism in the Renaissance*, 2nd ed. (New York 1924) 268, and Kenneth O. Myrick, *Sir Philip Sidney as a Literary Craftsman* (Cambridge, Mass., 1935). Henry Turner likewise quotes this section, though his analysis argues for a larger role for Aristotle's *Nicomachean Ethics* in Sidney's poetic theory (Turner 84-90).

²⁷ Sidney, *Defence* 217.

radically from Aristotelian mimesis and the larger category of extensive writing of which it is part.²⁸

The first two kinds of poesy are those that “imitate the unconceivable excellencies of God” and those that “deal with matters philosophical.”²⁹ Sidney includes within the first category the psalms, songs, and hymns, texts that emphasize devotional themes and that are designed as a comforting reminder of, as he says, the “never-leaving goodness” of the creator.³⁰ Such poetry was doubly mimetic, offering both a formal representation of the essence of divine “goodness” and an aesthetic mimicry of man’s engagement with the divine essence in times of need. Göran Sörbom reminds us that in earliest usage the Greek terms for mimesis referred to the activity of imitating behavior, but by the time of Aristotle included miming both the “contingent qualities” and the formal expression of the essence of

²⁸ A.C. Hamilton’s 1957 article, “Sidney’s Idea of the ‘Right Poet,’” *Comparative Literature*, Vol. 9, No 1 (1957): 51-59, makes a similar argument about Sidney’s distinctions between kinds of poetry. Hamilton observes that Sidney allows “Plato’s attack on poetry to be directed against the first two kinds of poets, and then formulates a third kind which Plato would not recognize [. . .] In this way, he may absorb Plato [. . .] while going beyond him” (53).

²⁹ Sidney, *Defence* 217.

³⁰ As he did throughout the *Defense*, Sidney re-presented conventional celebrations of poetry, depending in many ways upon the authority of its long history within rhetoric, while also distinguishing his poetics from the traditional modes. The Psalms argument evoked biblical authority by introducing David’s Psalms to demonstrate the “reasonableness” of the etymology. Further, Sidney noted that “great learned men, both ancient and modern” would testify to the reasonableness of Sidney’s identification of the psalms as poetry. As a first step, this strategy allowed Sidney to invoke the Christian morality associated with the Psalms and to displace the virtue of the first poetic form onto the classical tradition. In many ways this was a classic Neoplatonic strategy, but Sidney’s strategy went beyond the bounds of a familiar Neoplatonism in order to synthesize a novel creative poetics.

the subject.³¹ While the debates about natural language raged fiercely in the seventeenth-century, sixteenth-century Neoplatonic theories generally held that words were themselves mimetic, revealing something significant, essential even, about their referents.³² This is especially true for words accompanied by rhythm and sound, as are the psalms, songs and hymns according to Sidney. The psalms are “fully written in metre,” suggesting that the rhythm of the texts is essential to both the “end and working” of the devotional poems, and David is said to awaken his musical instruments to accompany and amplify the power of the divine poems. The formal and performative musicality of the psalms mimes the *ethos* of the divine subject. Harmony, a fit rhythm, and pleasing sounds represent the essence of “goodness;” form represents the ineffable.³³

While the harmonies of musical accompaniment suggest the divine, the language works sonically in a more complicated fashion. Sidney’s depiction of the morally corrupted mortal body in his translation of Psalm XXXVIII is a particularly good example of language expressing the dynamic *ethos* of the narrator: “My wounds putrefy and stink / in the sink / Of my filthy folly laid; / Earthly do I bow

³¹ Göran Sörbom, *Mimesis and Art* (Sweden: Scandinavia University Books, 1966); I am using Sörbom’s formulation of ethical and aesthetic mimesis as separate but related semantic functions throughout this section.

³² Plato’s *Cratylus* is the classical source text, in which a theory of the origins and function of language is detailed. On the debates about language in the early modern period, and this topic in particular, see James Bono, *The Word of God and the Languages of Man* (Madison: University of Wisconsin Press, 1995) and Umberto Eco, *The Search for the Perfect Language*, trans. James Fentress, (Cambridge: Blackwell, 1995).

³³ Sörbom 173-190.

and crook / with a look / Still in mourning cheer arrayed.”³⁴ Figured as a kind of moral plague, the corruptive power of sin is exemplified by “putrify,” the disease produced by such corruption is stinking and filthy, and the mortal nature of sin is tied firmly to the earth as the narrator bows and crooks. Consonance (and a sibilant/fricative pairing) of ‘s’ and ‘f’ drives the first several lines of the poem slinking across the figured ground, suggesting the slipperiness of both rotting flesh and the slide into sin. The verse turns sharply with the ‘k’ consonance of “crook” and “look,” imitating the difficult turn toward divine contemplation while mired in such a mess. This turn also functions as a break, marking the refreshing absence of such muck once the narrator returns to divine contemplation. The language reproduces the more contingent signs of divine presence, tracing the effect of “goodness” on the personal perspective of the narrator. Consequently the psalms are ethically mimetic in two different respects: the psalm represents the order and harmony of the divine, and its language figures the ethical transformation wrought upon the narrator as he considers the goodness of God.

The psalms are also, as Sörbom might say, “aesthetically mimetic;” Sidney highlights the use of the figure of *prosopopeia* (personification), a fundamentally

³⁴ Philip Sidney, “Psalm XXXVII” *Sir Philip Sidney: The Major Works*, ed. Katherine Duncan-Jones (Oxford: Oxford University Press, 2002) 277; Sidney is known to have translated many of the psalms, a project his sister completed after his death. For more on what is known as the Sidney-Pembroke Psalter, see Ramie Targoff, *Common Prayer: The Language of Public Devotion in Early Modern England* (Chicago: University of Chicago Press, 2001). Also see Seth Weiner, “The Quantitative Poems and the Psalm Translation,” *Sir Philip Sidney: 1586 and the Creation of a Legend*, eds J. A. van Dorsten, Dominic Baker-Smith, Arthur F. Kinney, Sir Thomas Browne Instituut, (New York: Brill Archive, 1986) 193-220.

mimetic figure based on the verbal or written mimicry of personal perspective, action, and speech.³⁵ Such aesthetic mimeticism, as opposed to the ethical mimeticism of form, enlivens the Christian individual's struggle with faith and the trials of mortal life.³⁶ Well known in the early modern period, such aesthetic mimeticism was described by Puttenham as "counterfait in personation."³⁷ In Psalm XIII Sidney's verse impersonates an emotionally distressed narrator pleading with an absent God: "How long, O Lord, shall I forgotten be? / What? Ever? / How long wilt thou thy hidden face from me / Dissever? [...] Behold me, Lord! Let to thy hearing creep / My crying."³⁸ The apostrophic exclamation enacts a calling out to God, the pathos of which is enhanced by brief exclamatory questions (What? Ever?) representing the staccato of despair.³⁹ Despair turns to anger as the narrator addresses God again, but this time in the imperative (Behold me, Lord!), demanding that he be seen. But the verse impersonation is not just an image of despair; it is again an example of the change wrought by God's coming (or perpetual presence). In the case of Psalm XIII that coming/presence appears not in a literal materialization of God before the narrator, but in the psychological shift of narrator. Having demanded that God intervene to prevent further suffering and the success of

³⁵ As he did throughout the *Defense*, Sidney re-presented conventional celebrations of poetry, depending in many ways upon the authority of its long history within rhetoric, while also distinguishing his "best" form of poetry.

³⁶ Sidney, *Defence* 215.

³⁷ George Puttenham, *The Arte of English Poesie: Contrived into three Bookes: The first of Poets and Poesie, the second of Proportion, the third of Ornament by George Puttenham* (London: 1589).

³⁸ Sidney, *Miscellaneous* 275.

³⁹ Sidney, *Miscellaneous* 275.

“troubulous” foes, the narrator capitulates, turns away from his demands, and reasserts faith: “ No, no, I trust in thee, and joy in thy / Great pity; / Still therefore of thy graces shall be my / Song’s ditty.”⁴⁰ The narrator rejects the lament that has given shape to the psalm and announces a recommitment to faith and trust, his words and rhythm calmer this time. The “still” of the final line pair hangs as a kind of close to the reassertion of trust, expressing quietude at the same time that it initiates the continuation of a commitment to singing of God’s grace rather than his absence. And it is here, on this quieter and more resolved note that the psalm ends, God’s graces returned as the object and subject of devotional poetry.

Together the ethical and aesthetic mimeticism of the psalms “imitate the unconceivable excellencies of God,” according to Sidney, and enable the use of such poetry for comfort and consolation, reminding the reader of the action of God’s grace as it imitates the effect of its presence in human life. For Sidney, the reading of such poetry is in the service not only of knowledge of the creator, but also as an “incomparable lantern in this fleshy darkness of ours.”⁴¹ That is, in the service of self-knowledge, which Sidney praised as incomparable in a letter to Hubert Languet.⁴² Doubly mimetic, divine poetry figures the essence of divine “goodness” of God and it imitates the effects of that grace in the experience of men; for Sidney and his contemporaries the divine, as an actual if incomprehensible presence, was

⁴⁰ Sidney, Miscellaneous 275.

⁴¹ Sidney, Major Works 288.

⁴² Sidney, Major Works 282.

something that could be formally represented and its effect impersonated in poetry. Divine poetry was a fundamentally extensive form.

In so far as divine poetry is extensive it is poetry as a “mode of knowing through formal representation,” as Henry Turner has suggested, and Sidney’s second kind of poetry, which “deals with matters philosophical,” is equally so.⁴³ Philosophical matters encompass the moral, natural, astronomical, and philosophical poetic texts, the contents of which were “wrapped within the fold of the proposed subject, and take not the course of...invention.”⁴⁴ Non-inventive and “wrapped in the fold” of nature, the poetry of the astronomer, the geometrician, the physician, etc. is also extensive. Sidney cites Marcus Manilius, the first century astronomer, as a practitioner of this second kind of poetry. Manilius’ *Astronomica*, a didactic poem in five books, was popular during the early modern period, appearing both in Latin and English editions, including an edition by Joseph Scaliger published in 1579 and an English translation by John Dryden in 1684.⁴⁵ In the poem Manilius brings “down / in verse from Heaven” astronomical and astrological knowledge. The heavens, once obscure, “kinder to the Curious grows, / And courts in Verse, it’s Treasure to disclose.”⁴⁶ Poet and reader “Rise / We then through yielding Aire, and

⁴³ Turner 83; Sidney, *Defence* 217.

⁴⁴ Sidney, *Defence* 217-8.

⁴⁵ Translations include Sherbourne (1675), Creech (1697) and Dryden (1684). On Scaliger’s edition see Anthony Grafton, *Joseph Scaliger: A Study in the History of Classical Scholarship. Volume I: Textual Criticism and Exegesis* (Oxford: Oxford University Press, 1983) 180-226.

⁴⁶ Marcus Manilius, *The sphere of Marcus Manilius made an English poem with annotations and an astronomical appendix by Edward Sherburne, Esquire*, trans. Edward Sherburne (London: 1675) 2.

mount the Skies, / There live and range; Learn all the Signs, and prove / How in their adverse Course the Planets move.” While Manilius figures an imaginative ascent into the heavens, the rhetoric of discovery is central to his understanding of the work of the poet and poem: “we will sound / The hidden Entrails of this ample Round, / Enquire how Stars Creatures beget and sway.”⁴⁷ Bringing together traditions of poetic authority and new experimental authority, Manilius incorporates both the trope of an inspired poet, since it is “from Heaven it self our Verse descends,” and the authority of observational testimony.⁴⁸ Throughout the poem, knowledge is largely encoded as sensory experience; poet and reader ascend into the heavens to learn “signs” and “sound” hidden depths in order to “prove” planetary motion. The faculty of sight is particularly essential in the poem and observed phenomena, such as the crescent moon, are explicated by the astronomical principles: “round is the Moon to sight, / And with a swelling Body barrs the Light; / Hence never wholly Lucid is her Ball, / When the Sun's Beams on it obliquely fall.”⁴⁹ According to Sidney’s taxonomy, the didactic or “philosophic” poetry of Manilius and other moral theorists, natural philosophers, and mathematicians succeed in the dictum to teach and delight. However, since such practitioners depend on reference to observed phenomena in order to accomplish their goal of dealing with issues/problems that obtain in the world, they were not “right poets.” In fact, Sidney

⁴⁷ Manilius 2.

⁴⁸ Manilius 11.

⁴⁹ Manilius 16.

left it up to the “Grammarians” to determine whether such writers were poets at all.⁵⁰ While metaphysical poetry often required the acceptance of textual testimony in place of the kind of material evidence available to an astronomer like Manilius, both of Sidney’s first two kinds of poetry could be subject to an assessment of the evidence and both spoke largely to phenomenological concerns.

Sidney, musing over the serendipity of English’s appropriation of the Greek rather than Roman term for poet, observes that the “Greeks call him a ‘poet’ [. . .] it cometh of this word *poiein*, which is, to make.”⁵¹ Rather than offer “a partial allegation” of poetic creation, Sidney contrasts *poiein* to the “scope of other sciences,” thereby differentiating his poetry from more derivative forms.⁵² While Turner has correctly observed that Sidney offers a theory of poetic epistemology that emphasizes knowledge through form, and that his poetics has a strongly ethical valence, he, like others, has missed the contrast that Sidney draws between divine and philosophic poetry and his right poetry. Unlike the first two forms, which are in some sense “iconic” as Gabriel Harvey suggests, thereby offering a mimetic representation of the physical and metaphysical “actual,” Sidney’s third form operates in a very different manner.⁵³ Discussed at some length above, arts such as

⁵⁰ Sidney, Defence 218.

⁵¹ Sidney, Defence 215.

⁵² Sidney, Defence 215.

⁵³ See Turner 26-37 and 83. Turner relies heavily on C.S. Peirce’s signifying triad of icon, index, and symbol to theorize the modes of meaning represented in dramatic and poetic theory, as well as in geometry. For Peirce, the icon is the most mimetic of the three semiotic forms: “. . . I had observed that the most frequently useful division of signs is by trichotomy into firstly Likenesses, or, as I prefer to say, Icons, which serve to represent their objects only in so far as they resemble them in

astronomy, geometry, natural and moral philosophy are “delivered to man,” which take “the works of nature for [their] principal object, without which they could not consist, and on which they so depend, as they become actors and players, as it were, of what nature will have set forth.”⁵⁴ Sidney defines his poetry in contrast to the derivative and mimetic arts that are tied to nature, as that which is “not enclosed within the narrow warrant of [Nature’s] gifts.”⁵⁵

The warrant given to “right” poetry is not that of nature but of the wit and judgment of the poet himself. Of his third and right kind of poet Sidney remarks:

these third be they which most properly do imitate to teach and delight, and to imitate borrow nothing of what is, hath been, or shall be; but range, only reined with learned discretion, into the divine consideration of what may be and should be.⁵⁶

Only judgment, what Sidney calls “learned discretion,” limits the poet’s creative power, and this in order to ensure that poetry creates meaningful possibilities.

“Right” poetry need not constrain itself to that which exists in the folds of nature or gains expression in religious texts. In Sidney’s use of the conditional “may” and “should,” fine ethical discriminations are being made. Rather than a pre-determined

themselves...” in “A Sketch of Logical Critics,” Peirce Edition Project, Institute for American Thought at Indiana University, 2008. 12 April 2009.
<http://www.iupui.edu/~peirce/ep/ep2/ep2app/ep2app1.htm> (EP 2:460-4611). While Turner’s use of Peirce is illuminating in the case of the first two of Sidney’s poetic modes, I find it less relevant in the third where the notion of extensive meaning, whether through icon, index, or symbol, is not as useful.

⁵⁴ Sidney, Defence 215-16.

⁵⁵ Sidney, Defence 216.

⁵⁶ Sidney, Defence 218.

or prophetic “shall” or the historical “hath,” both of which are markers of a mimetic mode, Sidney uses conditionality to suggest that the poet can craft an image of what is desired rather than what already exists. Suggesting a poet/divine parallel with the phrase “Divine consideration,” Sidney argues not that the poet reproduces the “poetical part of the Scripture” (the first form), but rather the poet with “the force of a divine breath,” creates and considers possibilities not yet seen. Sidney argues that the poet is capable of writing beyond experience, capable of animating any number of possible worlds. John McIntyre and others assert that Sidney’s initial poetic form, a Christian Neoplatonic poetry such as the psalms, requires us to read this final form as similarly Neoplatonic. However, as has been discussed, Sidney separated this third sort of poetry from the derivative creation implied by a Neoplatonic theory of meaning.⁵⁷ As A.C. Hamilton noted long ago, Sidney clearly distinguishes both the devotional and material inspiration of the first two forms from the inventive inspiration of his “right poetry.” “Only the right poet is properly inspired,” argues Hamilton, “not in the Platonic sense of inspiration as that suppression of intellect by which he is akin to the lunatic, but in the Christian sense of ‘breathing into by which he is “lifted up with the vigour of his own invention.””⁵⁸ Sidney’s often overlooked third form is propositional in Carnap’s sense, offering only what may or should be, and is a kind of writing that teeters dangerously on the brink of heresy as it figures

⁵⁷ John P. McIntyre, “Sidney’s ‘Golden World,’” *Comparative Literature*, Vol. 14, No. 4. (1962). Kenneth Myrick, on the other hand, argues that Sidney has clearly rejected the Platonic theory of inspired poesis (Myrick 204).

⁵⁸ Hamilton 53. See the full article for Hamilton’s discussion of Sidney’s sources, in particular argument against Myrick’s assertion that Sidney’s “ideas are Scaliger’s.” See also Myrick.

unrealized possibilities. Sidney's poet takes his own "idea" or "fore-conceit," and "having no law but wit" creates a new poetic of possibilities.⁵⁹ While not "real" in the sense of being part of natural (actual in modern philosophic terms) creation, Sidney clearly believes that poetic creations are epistemologically useful; poets offer the "perfect picture," one far more effective than the "wordish description" offered by the philosophers. In Sidney's opinion, poetry is capable of offering knowledge about possibility in a way no other mode of writing can.⁶⁰

The "Right" Poet Creates

Two points are essential in understanding the third, "right" kind of poetry theorized by Sidney: first, that this poetry represents the "nonactual possible" and is not concerned with reference to an extra-textual "actual" or real world; second, that in so far as the poet represents the possible, Sidney argues that this representation is itself a form of generation, creation, or making. Sidney has to reformulate and reassert throughout the *Defence* his argument about the inventive capabilities of the poet. Distinguishing the imitative faculty (used by the first two types of poets as well as painters) from that of the creative faculty of the poet he observes:

the skill of each artificer standeth in that *idea* or fore-conceit of the work, and not in the work itself. And that the poet hath that *idea* is manifest, by delivering them forth in such excellency as he had imagined them. Which delivering forth also is not wholly imaginative, as we are wont to say by them that build castles in the air; but so far substantially it worketh, not only to make a Cyrus which had been but a particular excellency as nature might have done, but to bestow a

⁵⁹ Sidney, *Defence* 218-9.

⁶⁰ Sidney, *Defence* 222.

Cyrus upon the world to make many Cyruses, if they will learn aright why and how that maker made him.⁶¹

This passage has been read as support for a Platonic interpretation of Sidney's poetic theory, but these readings are countered by Sidney's insistence on the manifest possession of the "idea."⁶² Like God who contains the ideas of creation entirely within himself, matter and idea outside of God being impossible, the poet "hath" the idea; it does not reside in the material or metaphysical world. The "artificer," who is imitative, merely represents the idea or fore-conceit behind the particular instance. In the case of the imitative artist there is a clear reference to Platonic ideal forms or in the worst cases to simply imitating contingent qualities. But the poetic idea is the possession of the poet; he does not observe or take the idea in/from the material or metaphysical world. In asserting possession Sidney argues that the idea is the unique creation of the poet. As such, the representation of that idea in language has the same relationship to that unique idea as the referential poem or painting had to a Christianized Platonic ideal form. If this form is mimetic at all, it is so only in the original sense of copying an action and that action here is divine creation. Whereas for Aristotle and Plato the poet imitates in order to make, for Sidney the relationship is inverted; the poet makes in order to imitate.⁶³ The nature of such mimesis is fundamentally different from that seen in the extensional

⁶¹ Sidney, *Defence* 193-200.

⁶² Many scholars have read this passage this way; examples include Turner and McIntyre.

⁶³ Hamilton's discussion at 56-7 prompted this formulation.

mode as represented by divine and philosophic poetry. The poet's creative act mimes the divine creative act but there is no sense in which the poet's work – the words written – can be read as having an empirical verifiability. Sidney's right poetry is an example of what Ruth Ronen describes as classic intensional writing in which the "universe of discourse construct[s] its own world of referents."⁶⁴

To the extent that Sidney maintained that poetry is a creative production, he extended poetic creation further than his contemporaries, for whom suggesting that poetry was *like* creation was not unusual. The rhetorical figures of *enargia* (detailed visual description) and *energia* (an energetic or lively expression) both suggested the ability of the poet to make his subject life-like. Sidney, like George Puttenham, went beyond mere liveliness to suggest that the poet was as the Greek name suggested a *poiein*, a "maker."⁶⁵ For Puttenham and Sidney alike the work of the poet was directly compared to the creative work of God:

Such as (by way of resemblance and reverently) we may say of God, who without any travail to his divine imagination made all the world of nought, nor also by any pattern or mould, as the Platonics with their Ideas do fantastically suppose. Even so the very poet makes and contrives out of his own brain both the verse and matter of his poem, and not by any foreign copy or example. . . ⁶⁶

⁶⁴ Ronen 28.

⁶⁵ Puttenham 191. See Elizabeth Spiller, Science, Reading, and Renaissance Literature: The Art of Making Knowledge, 1580-1670 (Cambridge: Cambridge University Press, 2004) for more on "making."

⁶⁶ Puttenham 191-2. A similar sense of the poet as maker was found in the work of J.C. Scaliger, one of Sidney's many purported sources. Among the most influential of the older source studies is J. E. Spingarn's Literary Criticism in the Renaissance (New York: Columbia University Press, 1899). Brian Vickers' English Renaissance Literary Criticism (Oxford: Oxford University Press, 1999) is a helpful collection of source texts.

Puttenham needs to qualify his claim by asserting its analogical status (resemblance) and his own piety because claiming a creative power equivalent to God's implied irreverence at the very least. Methodological imitation was undoubtedly a popular practice; Erasmus eschews mere imitation of Ciceronian style but applauds the imitation of the Ciceronean method in his *Ciceronianus*. And, as I suggested in my introduction, later in the seventeenth-century it will be precisely this emphasis on method rather than form or style that will be the basis of the Baconian revision of Renaissance epistemology. Emulating method was a fully accepted pedagogical practice, especially the kind of aesthetic mimesis discussed earlier in the case of the psalms and described by Puttenham as "counterfait in personation." The focus in such creation was always on the emulation of the effect of God *in* man, not the creation of man or world by God. Music, in its harmonious form, might mime the order of divine creation but this was also a formal expression of the ineffability of God's divinity – music could trace the forms but it could not create with the word, as God had done. To suggest that the poet could also harness the method of a divine creator or of nature was a dangerous appropriation of power. However, it could be carefully couched as following the method of what had already been accomplished and it was often given the analogical, and therefore subordinate status seen in Puttenham's description. Sidney was less restrained in his approach; he dispenses with qualifications and offered a fully articulated theory of poetry as creation, a kind of creation that could be learned by any reader.

It was not just an appropriation of creative power that made generative poetry dangerous. Sidney's suggestion that the poet can represent that which is in some sense unreal carries with it a suggestion of epistemological disturbance. Like Mamillius, King Leontes' son in *The Winters Tale*, who is himself a sign that "dost make possible things not so held," Sidney's poetry engenders possibility and a concomitant disruptive knowledge.⁶⁷ Signifying poetry, like the (mis) signifying boy, transforms what was not previously held to be possible into possibilities that demand consideration. Mamillius is a kind of indexical sign to Leontes, misconstrued as evidence that his wife Hermione has been unfaithful to her husband, suggesting a possibility that the audience knows is in fact not the case. In this respect Manilius, as a sign, is different from the positive possibility (what "should" be) suggested by Sidnean creative poetry. Yet, poetry and the son share the ability to signify nonactual possibilities and in so doing to bring knowledge of unrealized possibility to the fore. Through this creation of the knowledge of possibility, poetry "substantially worketh," according to Sidney.⁶⁸ Poetry that animates possibility is not mere distraction or entertainment according to Sidney; it is a way to know. In the case of Leontes and his reading of his son, such work has tragic consequences since the "knowledge" it produces is false, but for Sidney the work of creative writing is envisioned in a far more positive light.

⁶⁷ William Shakespeare, *A Winter's Tale*, *The Norton Shakespeare*, gen. ed. Stephen Greenblatt (New York: W. W. Norton and Company) 1.2.319.

⁶⁸ Sidney, *Defence* 216-70.

According to Sidney, all poetry, including the extensive forms, has the essential power of poetry to “delight.” The pleasure of poetry is not the defining feature of “right poetry,” but the characteristics of how the right poet teaches and what he teaches are fundamentally different from extensive poetry. Sidney acknowledges the value of extensive poetry and agrees with Aristotle that poetry has the power to make a monstrous nature beautiful and is therefore useful in the advancement of a personal and public ethic. As with the psalms, reminders of the traces of a generous God in deadly or despair-inducing situations, poetic renditions of horrible cruel battles and natural monsters could function as reminders of the virtues of courtesy, liberality, and courage.⁶⁹ But ultimately the disciplines associated with a more extensive mode of communication merely use the “masking raiment of poesy,” and “so steal to see the form of goodness.”⁷⁰ The images of a theft of the form of goodness returns us to the earlier discussion of a formal and ethical mimeticism, and in Sidney’s formulation there are again ethical distinctions made. Masking a lack in the “far-fet maxims” of philosophical and other extensional discourse, the forms of poetry may be employed, but only to see the “form” of goodness, not its essence. By merely using a mask of poetry to generate readerly delight such writing has the right form but lacks the creative content; consequently

⁶⁹ “Truly, I have known men that even with reading Amadis de Gaule...have found their hearts moved to the exercise of courtesy, liberality, and especially courage” (Sidney, Defence 227).

⁷⁰ Sidney, Defence 227.

it may teach and delight, but what it teaches is fundamentally derivative and therefore such poetry cannot offer the best knowledge.⁷¹

In contrast, Sidney eschews reliance on ideal forms, experience, or a governing mathematical order – the underpinnings of those far-fetched maxims.⁷² The right poet delights with a style at once more independent and familiar. “Homely and familiar,” the poet persuades with the “sweet food of sweetly uttered knowledge” rather than coming with “figurative speeches or cunning insinuations.”⁷³ Sidney rejects a learned style that he considers dependent and affirms a liberal creation that he figures as more personal, pleasing, and persuasive. Extensive poems are works in sciences that ultimately are, for Sidney, “serving sciences” that “have each a private end in themselves.”⁷⁴ Sidney derisively calls the poets writing such work “actors and players...of what nature will have set forth.”⁷⁵ The poet, on the other hand, extends beyond the “limits of man’s own little word” (responding directly perhaps to Socrates’ critique in the *Timaeus*), and “make(s) to imitate” rather than imitating to make.⁷⁶ Which is to say that, unlike his servile peers

⁷¹ Sidney’s word choice here echoes the critiques of poetry to which the *Defence* responds, but it is carefully contained in a subset of poetry, thus diffusing the criticism.

⁷² The belief in a governing mathematical order was the inheritance of Neoplatonism from the Pythagorean perspective and it transformed the broad category of the Platonic ideal into a set of five Platonic solids and a set of geometric relationships.

⁷³ Sidney, *Defence* 228.

⁷⁴ Sidney, *Defence* 219.

⁷⁵ Sidney, *Defence* 216.

⁷⁶ Sidney, *Defence* 218.

who merely imitate forms created, the poet imitates the creative act and creates “another nature.”

Sidney’s rhetoric of servitude makes it clear that he considers other written work as subordinate – both to nature and to the higher powers of poetic creation. The poet, who approximates god in creative capacity, is deftly brought back down to earth, so to speak, by Sidney’s claim that this creation is of a homely and more familiar sort. Recasting the poet as a kind of artisan pulls him back, in effect, from that dangerous precipice of heresy. The same motivation led Puttenham to make poetic creation a subordinate analogue to divine creation. Sidney differs from Puttenham, however, because he retains a productive power for the poet, which he recodes as humble. Sidnean poetry is an art that produces *something* rather than the sciences to which it is compared, which look good but seem to produce nothing. In serving a “private end” such extensive poetry sets down only what nature allows, thus fulfilling an externally determined design embedded in the discipline itself and consequently such work produces nothing new. Further, such non-productive work potentially leads readers and its poets astray. In pursuing the subject of these serving sciences writers are liable to “fall in a ditch,” be “blind,” or to write with a “crooked heart.”⁷⁷ There is nothing in such imitative, non-productive work that

⁷⁷ Sidney, Defence 219.

ensures either “well-doing” or “well-knowing,” which for Sidney are the twin ends of all knowledge.⁷⁸

Unlike “wholly imaginative” writing or the writing in the “serving sciences,” right poetry offers operational knowledge and imaginative knowledge “of an ethical quality.”⁷⁹ Operational knowledge, which Peter Dear has demonstrated gained prestige in the later half of the sixteenth-century, is at its most basic knowledge of how something is done (as opposed to knowing that something is or is not the case).⁸⁰ Following a trend that favored the transformation of philosophic knowledge into a philosophic knowledge of the practical, Sidney emphasizes the operational nature of poetic epistemology. The poet is a “workman,” a “maker.” The work-text of the poet is doubly operational in that it produces the possible and it teaches how to write the possible. So in the case of the poet who makes the best possible man, Cyrus, the poet produces Cyrus and “bestow[s]” this Cyrus to the world in order to “make many Cyruses, if they will learn aright why and how that maker made him.”⁸¹ Cyrus, as possibility that nature “might have done” but did not (a nonactual possible), is produced by the text. The poet gives this text “to the world,” and they in turn may produce many other such nonactual possibles given that they use the poetic text as a guide for poetic creation.

⁷⁸Sidney, *Defence* 219.

⁷⁹ Quoted in Myrick 222. See Turner 88-113 for discussion of the ethical nature of Sidney’s *Defence*.

⁸⁰ Dear, *Revolutionizing* 44-46 and 49-61.

⁸¹ Sidney, *Defence* 217.

While poetic knowledge is operational knowledge, it is also philosophic knowledge. From the poem the reader is able to learn not only how the poet made his possible Cyrus – the operational aspect of the poem – but also *why* he made this possibility. In that “why” is Sidney’s gesture to the *ethos* of creation – unlike in divine creation, motivations are available to the reader. Beyond operational knowledge, the poem is not a pattern in the mechanical sense; the poem is a guide to the act of creation and its causes. In offering philosophic knowledge of poetic creation, Sidney imagines poetry to offer a representation of an ethical imagination. While all writing should teach and delight according to Sidney, the uniquely philosophic and operational epistemology of poetry, which brings together both the “why” and the “how,” allows the poet to teach and delight in the highest forms.

In collapsing Sidney’s poetic taxonomy into an argument on behalf of a single form, scholars have emphasized what might be described as a vehicular aspect (in the sense of poetry as the honey that coats dull or otherwise unpleasant bits of knowledge) of Sidney’s poetic theory and have often collapsed his poetry with verse composition.⁸² However, in the case of Sidney’s third, intensional form of poetry it is not really possible to separate a knowledge bearing content from the poetic form. According to Sidney, in the case of philosophic and metaphysical poetry (his first two forms) this is not the case. Such work can, as we’ve seen, take the garb of poetry while not embodying poetic creation.

⁸² The dicta to “teach and delight” floats to the top of what is sometimes a serpentine argument about the nature of poetry and its functions.

Right poetry on the other hand is a fully integrated art. In learning how and why a poet-maker creates, the reader has to attend to the interaction of form and content. Poetry was not, according to Sidney, dependent upon rhyme or meter. As discussed, this separation freed poetic language from the formal referentiality assumed by theories of harmony and proportion. In the course of making this argument, Sidney relied heavily on his notion of the poet as a maker. He makes a strong distinction between the poet-maker and the “swarme” of versifiers who do not deserve the moniker ‘Poet.’⁸³ As George Puttenham did in his *Art of English Poesie*, Sidney asserted that the best poet created his own form and content: the poet created “both the verse and matter of his poem, and not by any foreine copie or example.” While Puttenham’s treatise made verse important to poetic creation, Sidney went to great lengths in the *Defense* to make the case that “poetry” is not limited to verse or even to metrical writing.⁸⁴ While “the greatest part of Poets have apparelled their poetical inventions in that numbrous kind of writing which is called verse: indeed but apparelled, verse being but an ornament and no cause to

⁸³ In keeping with a common rhetorical trope in *Defense* literature of the period, Sidney acknowledges that bad practitioners exist but he asserts that this situation need not taint what should be a reputable and valued practice.

⁸⁴ Aristotle similarly separated versifying or metrical writing from poetry, though he defines poetry in terms of content unlike Sidney who allows a variety of topics and emphasized the social and epistemological function as the defining characteristic. “People do, indeed, add the word ‘maker’ or ‘poet’ to the name of the metre, and speak of elegiac poets, or epic (that is, hexametre) poets, as if it were not the imitation that makes the poet, but the verse that entitles them all to the name. Even when a treatise on medicine or natural science is brought out in verse, the name of poet is by custom given to the author; and yet Homer and Empedocles have nothing in common but the metre, so that it would be right to call the one poet, the other physicist rather than poet” (Aristotle, *Poetics* 45). As Hutton notes, Aristotle is conscious of his own break with the Greek tradition wherein all verse texts were poetry (81, note 1.1).

Poetry.”⁸⁵ Sidney adumbrated several instances of prose poetry to demonstrate his point.⁸⁶ He also clearly associated meter, and its implied harmonies, with a referential mode of language. Other poets had seen fit to clothe their ideas in verse because “as in matter they passed all in all, so in manner.”⁸⁷ These poets chose verse because it too refers to the material situations being related; the meter of the poem is another (formal) register of the referential language characteristic of Sidney’s first two forms of poetry. Sidney’s poetry by contrast was intensional and, consequently, had no formal correlates in a material or metaphysical actual. Rather it was the generative power that characterized this poetry for Sidney; “it is not rhyming and versing that maketh a Poet[...] But it is that feigning notable images of virtues, vices, or what else, with that delightful teaching which must be the right describing note to know a Poet by.”⁸⁸ “Feigning notable images” and “delightful teaching” were the central attributes of poetic writing for Sidney. This liberation from form is essential to the establishment of a non-referential theory of poetic language, since it divorced poetry from even the underlying ordering harmonies of the universe. Poetic language was now free to create, both in content and form, new worlds, persons, and situations.

⁸⁵ Sidney, Defence 218.

⁸⁶ Sidney, Defence 218-9.

⁸⁷ Sidney, Defence 219.

⁸⁸ Sidney, Defence 219. Sidney is skeptical of Scaliger’s assertion that poetry and verse were inseparable, but mentions it to acknowledge the value of verse and meter for memory. In doing so he further asserts the centrality of the epistemological function of poetry (869-905).

This liberated poetry was not self-satisfying however; it existed for and was deployed with a purpose. Sidnean poets

make to imitate, and imitate both to delight and teach; and delight, to move men to take that goodness in hand, which without delight they would fly as from a stranger; and teach, to make them know that goodness whereunto they are moved.⁸⁹

Creative poetics were to be characterized by a deep commitment to pedagogical practices, civic participation, and the ethical power of literary language to drive men to action. While these elements have been variously recognized in scholarship on Sidney, the tendency has remained to understand this model of poesis through a post-Renaissance lens. The social and ethical dimension is subsumed within a vision of inspirational frenzy at work in Sidney's poetic theory that is more evocative of Romantic poetic theory than it is of Sidney's own practice. Turner, for example, argues that the *Defense* "produces the possibility of 'scientific' knowledge by exemplifying an epistemology that seventeenth-century practitioners will need to *reject* in order to define their method."⁹⁰ This epistemology, according to Turner, is one of (poetic) truth through revelation, "as an activity that is pleasurable in and of itself and thus as an activity that at some level remains non-useful and non-productive, an ecstasy of inventive frenzy."⁹¹ Positioning Sidney as an advocate for a divinely inspired poetic tradition allows scholars to set him up as the oppositional

⁸⁹ Sidney, *Defence* 218.

⁹⁰ Turner 35.

⁹¹ Turner 35-6.

figure to rational, scientific discourse, much as Turner does.⁹² It also positions Sidnean poetics within a Kantian aesthetic tradition that occludes Sidney's innovation in creative poetry and its relationship to a theory of literary language as useful, indeed as critical, to knowledge and ethical development. In overlooking Sidney's taxonomy of poetic forms, scholars miss the ways in which Sidney's theory of poetry exceeds those of either the Aristotelian or Neoplatonic tradition.

While an inspired tradition dating back to classical Roman theory existed in the early modern period, Sidney was not the avatar of an inspired, frenetic epistemology, but rather of a mode of productive inventiveness.⁹³ Sidney envisions this ideal as perfectly rational and substantial *work* (poetry "substantially worketh"), which has very real social power in addition to its pleasures. As Sidney argues, the "material point of poetry" is to "draw the mind more effectually than any other art doth."⁹⁴ And in the ambiguity of "draw the mind," which asks if poetry attracts or compels the mind, or figures the mind, lies the crux of Sidney's poetry as ethical creation. In many respects Sidney imagines that poetry drives the mind (and

⁹² Turner's analysis of Sidney's poesy and its relationship to what he calls "practical imagination" runs counter to this characterization, which appears in the my introduction. Turner is correct, I think, in suggesting that Sidney's poetic making was a kind of experiment or a set of "artificially constructed conditions in which knowledge might be produced" (109). Though I would argue for a developing recognition and use of the intensional or propositional mode in writing as an approach to knowledge, rather than connecting Sidney's written productions to experiments of a more material sort, if for no other reason than to highlight the emergence of a mode of writing and exploring that operated very differently from the extensional mode that underwrote much of the 17th century writing around experiment and observation.

⁹³ As Katherine Duncan-Jones and Jan Van Dorsten have noted, Sidney departed from many of his contemporaries in refuting a poetics of divine inspiration, and focused instead on an interpretation of poetry as the formal representation of ideas. See Miscellaneous p204 n109 and p188 n76.

⁹⁴ Sidney, Defence 228.

consequently the person) to action; poetic representation “stirreth and instructeth the mind” and “inflameth the mind with desire to be worthy.”⁹⁵ Poetry delights, wins, and moves the mind according to Sidney, and in this argument Sidney relies perhaps most heavily on an Aristotelian concept of knowledge wherein it is not “*gnosis* but *praxis* [that] must be the fruit. And how *praxis* can be, without being moved to practice, is no hard matter to consider.”⁹⁶ Knowledge in itself cannot be the final outcome of study; it must be practice, and it was the job of the form of poetry to move men to practice.

While drawing the mind, and the man, to action was a central goal for Sidney, there is also a clear sense that in order to “draw” his readers, the poet must be able to produce a compelling intensional world.⁹⁷ The poet makes to educate; in making new textual worlds, people, and scenarios, the poet offers both the ability to see how alternative worlds operate, thus offering a model for change or new action, and a model for further new creation. This knowledge of the how and why of authorial creation is what then “move[s] men to take that goodness in hand.” While servile knowledge systems “have a private end in themselves,” poetry, as an “architektonike” knowledge, informs with the counsel of a mode of creation that

⁹⁵ Sidney, Defence 231.

⁹⁶ Sidney, Defence 226.

⁹⁷ Turner suggests that Sidney’s poetry is “a productive art like saddle-making, shipbuilding, carpentry, or shoemaking . . .” (Turner 89). While I agree with Turner that Sidney does theorize poetry as productive, it is decidedly *not* productive of material objects, such the saddle or shoe, but rather of textually created possibilities and worlds.

offers access to both method and motivation.⁹⁸ Sidney did not posit poetry as an orgy of inspired joy; he argued for the power of the word to create and inspire.

Like the poet-maker theorized in the *Defence*, Sidney wrote poetry that modelled the how and why of poetic creation. In sonnet 50 of *Astrophil and Stella*⁹⁹ Sidney figures the failure of the extensive mode while demonstrating the knowledge produced by the intensive:

Stella, the fulnes cannot staied be
Of hidden thoughts, within my panting brest:
But they doe swell and struggle forth of me,
Till that in words thy figure be exprest;
And yet as soone as they thus formed be,
According to my Lord Loues owne behest,
With sad eyes I their weake proportion see
To portract what within this world is blest.
So that I cannot chuse but write my minde,
And cannot chuse but put out that I write,
While those poore babes their death in birth doe find;
And now my penne these lynes had dashed quite,
But that they stop his furie from the same:
Because their fore-front beares sweet Stellas name.¹⁰⁰

The speaker is caught in the trope of love-generated inspiration. Thoughts are imbued with their own agency -- they swell and struggle to release themselves from the poet/speaker -- and the pregnant narrator labors to “express” the figure of Stella.

⁹⁸ Sidney, *Defence* 314, 231, and 316. Sidney glosses this as “the knowledge of man’s self, in the ethic and politic consideration, with the end of well-doing and not of well-knowing only.” Duncan-Jones cites the Liddell and Scott Greek Lexicon definition, “the master-art or science which prescribes to all beneath it.”

⁹⁹ This famous sonnet sequence was published posthumously in a defective edition in 1591 by Thomas Newman and included, in an authoritative version, in the 1598 folio of the *Arcadia*.

¹⁰⁰ Philip Sidney, *Astrophil and Stella*, *Sir Philip Sidney: The Major Works*, ed. Katherine Duncan-Jones (Oxford: Oxford University Press, 1989) 153-212.

But the compulsion or the “behest” of “Lord” love is not enough to ensure that this “figure” accurately depicts the material Stella. The narrator compares the written figure with his beloved, providing himself with the sad judgment that language is in “weake proportion” to the observed reality. Rather than produce a lively picture of the woman he loves, extensively, the poet finds himself the parent of a stillborn semiotics – his poem doesn’t *mean* in the way he intended – it falls short. Sidney cleverly utilizes the form of the Petrarchan sonnet to express the failure of the extensive mode and to invest that failure with significant pathos. Using the emotive force of the scorned lover to elevate the emotional appeal, Sidney vigorously argues the inadequacies of poetic language that attempts to express the materially “real.” The lament that extensive language cannot be but a “weake proportion” takes on the drive of a lover’s thwarted desire, as well as that of parental generation. As such, Sidney moves the cool and rational insistence on the meaning and power of language as it appears in his *Defence* into an amorous context, where it takes shape as the raging frustration of a man in love. The disappointment over the gap between representation and its material referent thereby appears not as a tepid intellectual difficulty but as the despair wrought by the death of a poem/child. What is so remarkable about this move is its doubleness. For whereas Sidney generates a poet-speaker whose non-generative poetics fail him, Sidney as author succeeds; his creative poetry defines itself against the mimetic natural poetry of the sonnet’s speaker.

In contrast to the doomed extensive poet who appears in *Astrophil and Stella*, Sidney's "right poets," like good painters, do not counterfeit that which is "set before them" -- that is, they do not "portract what within this world is best."¹⁰¹ Continuing the hierarchization of poetic types, Sidney argues that right poets create "fittest" possibilities by "borrow[ing] nothing of what is, hath been, or shall be."¹⁰² Again we hear ethical discrimination in Sidney's language; eschewing the action and character of the past, the present, and a pre-determined future, Sidney's right poet writes out of a creative ethos. Unlike a *vates*, or Roman divine poet, who functions as a "diviner, foreseer, or prophet," the right poet rejects a prophetic perspective that depends upon a divine will of some sort, and instead "bringeth only his own stuff, and doth not learn a conceit out of matter, but maketh matter for a conceit."¹⁰³ Henry Turner, among many others, has read the *vates* etymology as support for an inspired poetics, misreading Sidney's hierarchization as a kind of jumbled collection of appeals to authority on behalf of poetry.¹⁰⁴ Sidney observes that the Romans believed the chance encounter with the "heart-ravishing knowledge" of poetics could signal "following fortunes," but such "vain and godless superstition" only "*seem* to have some divine force," meaning that they, like other distortions, offer only the appearance of power. Real divine poetry, exemplified in the *Defence* by the Psalms, offers a heart-ravishing knowledge of a decidedly Christian sort. But all of this sets

¹⁰¹ Sidney, *Astrophil and Stella* 172.

¹⁰² Sidney, *Defence* 218.

¹⁰³ Sidney, *Defence* 232 and 214.

¹⁰⁴ Turner 35.

up Sidney's distinction between divine poetry, which we have already seen is a doubly mimetic poetry, and "right" poetry that utterly rejects an inspired or otherwise mimetic approach to poesis.

According to Sidney, "the poet bringeth only his own stuff, and doth not learn a conceit out of matter, but maketh matter for a conceit."¹⁰⁵ Utilizing an intensive poetic form the poet creates new worlds. While Astrophil's (sonnet 50's presumed speaker) poetry may offer comfort through its lament and inspiration through its stylistic choices, it ultimately falls short of figuring the fittest possibilities, and, consequently, of offering the best knowledge. Sidney's poetry on the other hand does not. As himself a "right poet," Sidney ranges throughout the sonnet sequence in an array of lover's complaints, offering a lively and engaging figure of what may come of such Petrarchan adoration and lament.¹⁰⁶ Sidney creates and animates a lover who tries to capture his beloved in an extensional poetics, thus offering a negative example of what "may be," at the same time that Sidney's poetry functions as an example of what poetry "should be." Unlike the Greek poets who fail to animate Socrates' ideal city, Sidney successfully animates Astrophil and the reader learns through the speaker's failures the pitfalls of referential poetry. The sonnet, as the performance of a creative poetics and a critique of extensive poetics, succeeds in teaching the reader the very theory of poetry articulated by Sidney in the *Defence*.

¹⁰⁵ Sidney, *Defence* 232.

¹⁰⁶ Sidney's poet "range(s), only reined with learned discretion, into the divine consideration of what be and should be" (Sidney, *Defence* 218).

Chapter Two: John Dee A Scribbling, Thinking Mathematician

John Dee was among the sixteenth-century England's foremost mathematicians. He was the mathematical tutor to both Philip and Robert Sidney, as well as to Queen Elizabeth, and in addition to his own research at his residence at Mortlake he frequently received young gentlemen in order to tutor them in mathematics.¹ He was working during an era in which a strong interest in theoretical mathematics drove the explosive rate of innovation in both form and scope of early modern mathematics. Surprisingly, perhaps, many considered the abstraction and creativity of mathematics to be equally if not more valuable than the liberal arts of the trivium for ethical education. Dee is, in his participation in this argument, part of a long lineage of mathematicians, beginning at least with the early fifteenth-century theologian Nicholas of Cusa, and including early sixteenth-century Italian mathematician Nicolo Tartaglia, and the English mathematicians Robert Recorde and Thomas Harriot, who argue that "unlike natural philosophers who 'examine things clothed,' mathematicians examine them 'bare of any visible matter.'"² However, according to Dee, mathematics was a tool not just for lifting the veil of nature but also for representing that which does not exist. His *Mathematical Preface* and the *Monas Heiroglyphica* in particular offer views of math as a creative

¹ On Dee's life and his mathematical pre-eminence, see William Sherman, *John Dee: The Politics of Reading and Writing in the English Renaissance* (Amherst: University of Massachusetts Press, 1997) and Charlotte Fell Smith, *John Dee: 1527-1608* (Charlottesville, Va: Ibis, 2004).

² Reiss, *Knowledge* 146.

technology, as the organizing principle (a kind of origin and grammar) for a figural semiotics, and as a point of entry into knowledge. As with Sidney, who did not abandon an Aristotelian model of poesis in the articulation of his “right poetry,” Dee could not avoid having his mathematics embroiled in operational and extensive modes, which were put to use in a wide variety of increasingly popular mathematical practices at the time. Nor was Dee free from the sense shared by Pythagoreans that mathematics was a tool for revealing the underlying order of the created universe. This is a messy story and Dee’s barely emerging sense of creation through math and his explorations of intensive modes of meaning are only part of his broad interest in mathematics. Nevertheless, an interest in math that can represent what is non-existent, what is only possible and not yet actualized, is present throughout his thought. And it is to creative math and the context in which Dee was writing that we now turn.

In the mid- to late sixteenth-century mathematical, texts like the *Monas* and the Billingsley/Dee edition of the *Elements* began to merge the two dominant branches of mathematics in early modern Europe, arithmetic and geometry. The two had been rigidly separated in classical Greek mathematics and in the university curricula of medieval Europe.³ While, as we will see in Chapter Three, this synthetic

³ Carla Mazzio also notes the significance of the shift in the Billingsley edition away from the geometric point and toward the abstract concept of number, a concept previously reserved for arithmetic texts. This is particularly important because it moves the focus of the text away from the material considerations associated with the point toward the abstracted notions of number – hence making this a text concerned with a non-referential form. Mazzio, Carla “The Three Dimensional Self: Geometry, Melancholy, and Drama” *Arts of Calculation*, ed. David Glimp and Michelle Warren (New York: Palgrave Macmillan, 2004) 44 and 49-50. For more on this trend in the early modern period

creation of a new mathematical tradition is only reaching completion with Descartes' work in the 1630's or so, we can see new ideas about the possibilities of mathematics even in Dee's revision of meaning as mathematical and in his image of a liberated practitioner.⁴ One consequence of the merging of arithmetic with geometry was a new sense of the "productive complexity of geometry," along with a focus on the distinction between extensional and intensional mathematics. Extensional mathematics denote entities such as weight, length, or height measured in the material world, whereas intensional mathematics represent more abstracted geometrical concepts that model how things work rather than detailing particulars.⁵ This distinction between a math of the world and a math of the mind differed from the classical distinctions between geometry and arithmetic (and later, algebra), realigning mathematics not in terms of number and magnitude, but in terms of its subject/object of consideration.⁶ In addition to the creation of a set of synthetic mathematic practices that transformed what math looked like and could do, new affective registers were integrated into mathematical rhetoric. As Carla Mazzio has observed, the early modern period was a time when "geometry as well as arithmetic was a fertile ground for new articulations of affect and the complexity of social

see, Antoni Mallet, "Renaissance notions of number and magnitude," *Historia Mathematica* 33 (2006) 63–81, particularly p79 and 80.

⁴ While Edward W. Strong suggests that the "metaphysical mathematics" of Dee and others does not figure in the development of mathematics in the subsequent century, this claim has been ably historicized and refuted by Lorraine Daston and David Sepkowski. David Sepkowski, *Nominalism and Constructivism in Seventeenth-Century Mathematical Philosophy* (New York: Routledge, 2007) 6.

⁵ Florian Cajori traces much of the long history of this change in terms of innovations in notation; see Florian Cajori, *The History of Mathematical Notation* (New York: Dover Publications, 1997).

⁶ Mazzio 40.

interaction.”⁷ Mathematics was becoming a complicated set of practices and the writing technologies and production of meaning began to take on more of the nuance and semiotic weight that we are accustomed to attributing to linguistic discourse.

Within this rapidly changing context, Dee was not particularly innovative mathematically - much of what he wrote about mathematics in general and geometry in particular had been written by the innovators of the fourteenth, fifteenth, and sixteenth centuries. He did not create new theorems, a new number theory, or resolve long unsolved mathematic problems. Instead, his innovation consists largely in his sense of how math creates meaning and what that meaning can do. In the case of the *Monas*, Dee makes the startling claim that mathematics, in particular geometry, is the semantic foundation of alphabetic language – that it is the relationships of lines, points, and circles that gives even the letter its sense of meaning. The geometric foundation outlined in the *Monas* likewise imparts meaning to figures previously read as alchemical symbols. In both instances, Dee posits an unrecognized ultimate layer of mathematic meaning, which he argues produces the more conventional (alphabetic or alchemical/symbolic) familiar to his readers. This project was not particularly successful, however, and Dee refigured his project in the *Preface* as a synthesis of a departicularized or abstract geometry and an applied

⁷ Mazzio 45, see also pgs 50-52 for a concise account of the affective expressivity of Euclid’s geometry. Accompanying this shift was a new interest in these hybridized mathematics and a broad concern for the application of mathematics alongside theoretical development, and in this respect the mathematics of the early modern period had much in common with contemporary natural philosophy practices.

geometry into “a larger intellectual formation – mathesis.”⁸ While Dee’s *Monas* was largely abandoned, its insights appear in his description of this “mathesis” and provide it with its creative power.

Dee was neither alone nor first in arguing on behalf of the creative power of math. According to the Treviso Arithmetic, an anonymous Pythagorean text from the 15th century, “All things which have existed since the beginning of time have owed their origin to number. Furthermore, such as now exist are subject to its laws, and therefore in all domains of knowledge this Practica is necessary.”⁹ As mentioned before, the belief in an underlying mathematical order, a divine number, weight, and measure, was a Pythagorean commonplace. Like Sidney’s divine poetry, the Pythagorean commonplace was ultimately rooted in an already actualized creation; as we will see, Dee’s mathematics will take that additional step of speaking of the non-existent. Recorde, a highly influential mathematician of the early sixteenth-century, echoed the Pythagorean sentiment and expanded further: Number is “the ground of all men’s [sic] affairs, in that without it no tale can be told, no communication without it can be continued.”¹⁰ For Recorde, number not only governed creation, it also governed all communication. Consequently, not only did the fabric of the natural world owe its order to number, as in Pythagoreanism, but the social fabric of human society and man’s ability to tell stories depended upon

⁸ Turner 61.

⁹ Frank J. Swetz, *Capitalism and the New Math of the 15th Century* (Peru, Ill: Open Court, 1987) 2.

¹⁰ Robert Recorde, “A Dialogue between the Master and the Scholar: Teaching the Art and use of Arithmetick with Pen,” *The Declaration of the Profit of Arithmeticke* (London: 1557); quoted in Swertz 14.

number. Recorde suggests that the Pythagorean insight extends to communication. It is a move that created an even tighter harmony between word and thing. Dee will take up a model very like Recordes' in his defense of mathematics, but he will also argue that through representation of the non-existent, mathematics articulates "such things as would farre excel mans minde."¹¹

Dee's predecessors also expressed an early sense of numeration (counting or representing with numerals) as creative. Discussing the set of natural numbers (1,2,3,4,5,6,7,8,9,0) the Treviso author asserts, "of these the first figure, "i," is not called a number but the source of number."¹² The character 'i' or 1 signifies to the early modern audience the generation of all number and consequently the origin of all order in the natural world.¹³ The generative power of number goes beyond the original creation of '1'. The set of natural numbers did not begin with zero; it ended with the familiar 0, which is "called ciphers or 'nulla', i.e. the figure of nothing. As nothing, the cipher had no value itself, although when combined with others it increases their value."¹⁴ As Shakespeare knew when he wrote *Henry V*, cipher was an instrument for increase. In the Prologue to the play, the Chorus exhorts the audience to picture not just one man on stage representing the full armies fighting on the fields of France, but that

¹¹ Swertz 16.

¹² Swertz 3. Note that early typesetters frequently did not have a numeral one so used the lower case 'i' for the number one.

¹³ This is especially true for a Pythagorean, though Neoplatonic practitioners also incorporated this tenet into their world-view.

¹⁴ Swertz 3. For more on "0" as a signifier and the history of its use see Brian Rotman, Signifying Nothing: The Semiotics of Zero (Stanford: Stanford University Press, 1993).

[. . .] a crooked figure may
Attest in little place a million,
And let us, ciphers to this great accompt,
On your imaginary forces work.¹⁵

On the early modern stage the cipher of the audience's imagination can "into a thousand parts divide one man" and from one actor-soldier create 10, 100, or 1000.¹⁶ The cipher, or zero, was not itself a number, it was a tool for increasing the value of the natural set of numbers. By writing a zero after any of the ordinal numbers a mathematical author (or a playwright and his audience) was able to take "nothing" and with it create new meaning – one becomes ten, five becomes fifty in a process that might have seemed almost dangerously powerful.¹⁷

The arithmetic operations of the extraordinarily popular mathematic pedagogical texts allowed the practitioner to create in ways that went beyond the generative power of numeration.¹⁸ According to the Treviso

Addition has the word *and*,
Subtraction has the word *from*,
Multiplication has the word *times*,

¹⁵ William Shakespeare, *The Life of Henry the Fifth*, *The Norton Shakespeare*, gen. ed. Stephen Greenblatt (New York: W. W. Norton and Company) Prol.15-18.

¹⁶ Shakespeare Prol. 24. As Travis Williams has noted, "medieval and early modern mathematics redefined "in front of" to mean "to the right." Thus, six soldiers become sixty by inserting a zero "in front of" the 6. This redefinition of a preposition was the result of the importation of Hindu-Arabic numeration, in which place-value notation builds up numbers right-to-left and then reads them left-to-right.

¹⁷ Consider also including the reading of the "rich place" cipher as a way of understanding the complexity of cipher as something that could have differential value.

¹⁸ Known as *libri d'abbaco* in Italy where they were first published these texts were prolific and popular both on the continent and in England. See Swertz. One example can attest to the popularity of such texts: Robert Recorde's *The Grounde of Artes* (1540) was reprinted over fifty times in nearly a hundred and sixty years.

Division has the word *in*.¹⁹

By combining the operand (and, in, from, or times) and two or more numbers the mathematician could perform any of the four operations listed. As the author noted, “each operation gives rise to a different number.”²⁰ The reader now possessed the tools to create not just a set of limited results, but also the power of a combinatorial mathematical grammar that could produce an infinite set of results.²¹ The word – whether a verb, preposition, or conjunction -- when paired with any number of numerals, determined the kind of creation: “we thus see how the different operations with their *distinctive words* lead to different results.”²² Arithmetic then had a long history as a technology of creation; it was a tool that not only allowed practitioners the ability to count or measure what lay before them, it empowered them to use a simple restricted grammar to create thousands from (but also with – in the sense of adding zeros) nothing and to “operate” number by dividing, multiplying, adding, and subtracting their way to an infinite variety of results.²³

Dee inherited a mathematical world in which the mathematical text offered direct experience of the power of the word in conjunction with the power of the number. Not only were words and numbers powerful together, their operations

¹⁹ Swertz 14.

²⁰ Swertz 5.

²¹ This may only produce three unique answers in some cases, e.g. the example in the text using 2 where the additive and multiplicative operations both produce 4.

²² Swertz 5, emphasis mine.

²³ For an excellent treatment of the way mathematic equations and proofs operate like rhetorical argument see Brian Rotman, “Toward a Semiotics of Mathematics,” *Semiotica* 72-1 (1988) 1-35.

allow each new practitioner a new sense of simultaneous truths.²⁴ With arithmetic any two real numbers can be chosen and the pair operated upon in at least four unique ways.²⁵ Because the continuum of real numbers is infinite there is a simultaneous possibility of an infinite set of combinations within the arithmetic method. Consequently, these texts suggest different outcomes were not only possible, but also equally valid despite their radical difference. Division and addition operations signalled by “ $48/2$ ” and “ $48+2$ ” produce very different results, but both are equally valid. As ways of “operating” number addition, subtraction, multiplication, and division produce what Leibniz would later call “compossible” outcomes – non-identical, non-negating simultaneous possibility.²⁶ The operations of simple arithmetic had wide ramifications for early modern knowledge. As Aristotle’s discussion of the infinite in the *Physics* and elsewhere suggests, the mere fact that to any number, no matter how large, $+1$ is always possible means that infinity must exist in some important sense. To deny infinity, and thus the truth of addition’s operand “and,” according to Aristotle would have “many impossible

²⁴ While classical authors recognized the functions described here, the saturation of early modern mathematical knowledge was relatively low. As a result, the semantic and epistemological implications were encountered as “new” by an ever-growing readership. On the history of mathematical education in early modern England see E. G. R. Taylor, *The Mathematical Practitioners of Tudor and Stuart England* (Cambridge: Cambridge University Press, 1954). For the European contexts, see Natalie Zemon Davis, “Mathematicians in the Sixteenth-Century French Academies: Some Further Evidence,” *Renaissance News*, Vol. 11, No. 1 (Spring, 1958) 3-10, as well as *Science & Education, special issue on Science Teaching in Early Modern Europe* (vol. 15 (2006), nos. 2,3,4).

²⁵ In some cases, this might only produce three unique answers - as it the case of $4+1=5$, $4-1=3$, $4*1=4$, and $4/1=4$.

²⁶ As we will see in the later seventeenth century, a mode of knowledge, such as mathematics was, that allowed for simultaneously valid if radically different results from related operations would be a critical tool for some in the attempt to resolve religious and political factionalism into a harmonious but not integrated whole.

consequences.”²⁷ Such consequences, like a beginning and end to time and indivisible lines (a logical impossibility given the definition of a line and a point), were serious issues for both how early modern individuals understood the created world, but also for their metaphysical theories. Arithmetic as a logical system mandated that the plus-one operation always be possible, and the very fact of this possibility required early modern thinkers to grapple with the possibility of a real infinity. For theologians the task initiated by this mathematical “truth” was to understand how infinity was possible within a doctrine of creation that would require God to exist *outside* of something that by definition seemed to have no boundaries and therefore no possibility of an exterior where the creator might exist.

A Figural Mathematics in the *Monas Hieroglyphica*

Dee’s theory of creative mathematical writing appeared first in the 1564 *Monas Hieroglyphica*. As Deborah Harkness has noted, the *Monas* shared with the later *Mathematical Preface* an interest in exploring the suitability of mathematics as *the* universal science (or “architechtonike” as Sidney put it for poetry).²⁸ While a text like the *Mathematical Preface* can be read as concerned with practical applications, reading the *Monas* as a practical or pragmatic text is to read it against the grain of tradition, and perhaps even common sense. The text is difficult, at times frustratingly obscure, particularly in its insistence on a graphic representational

²⁷ The same is true for divisibility and its operand ‘in’. This was a problem of particular interest for atomists and monadists in the Middle Ages and early modern period, for whom a doctrine of infinite divisibility was not permissible.

²⁸ Deborah Harkness, *John Dee’s Conversations with Angels* (Cambridge: Cambridge University Press, 1999) 62.

mode described as “hieroglyphic,” which depends heavily on a hybrid of alchemical symbology and Dee’s sense that there is a mystical grammar of geometric relationships. Designating the writing as hieroglyphic was clearly meant to evoke the antiquarian admiration of ancient hieroglyphic writing, considered through much of the early modern period to be of divine origin and to express truths lost to the Englishman cut off from his linguistic roots.²⁹ Thus, Dee, from the very outset of the text, began detailing what would have been to contemporary humanists a familiar genealogy for his cryptic new language. At the same time that Dee evokes connotations of antique authority and linguistic purity with such a genealogy, he also invokes the exclusivity of hieroglyphic knowledge, which was the particular privilege of the initiate and therefore beyond the comprehension of the vulgar multitudes. The *Monas* trades on its privileged obscurity, often thwarting the modern reader’s attempts to understand how the figures generate their many layers of meaning, some of which are decidedly allegorical. This has led to a situation where few literary theorists dare to tackle the *Monas* and even fewer would consider it a text concerned with a non-esoteric use of representational technologies, linguistic, figural, mathematic, or otherwise.³⁰

²⁹ See James Bono, *The Word of God and the Languages of Man* (Madison: University of Wisconsin Press, 1995) and Umberto Eco, *The Search for the Perfect Language*, trans. James Fentress, (Cambridge: Blackwell, 1995) for more on the ways in which early modern philosophers of language frequently figured contemporary language to be cut off from either Hebraic or some other Adamic first language.

³⁰ While they are not primarily concerned with the mathematical nature of the *Monas*, both Eco and Bono observe that it is a “geometrically generated form.” Bono also cites Michael T. Walton’s “John Dee’s *Monas Heiroglyphica*: Geometrica Cabala,” *Ambix* 23 (1976): 116-23.

But Dee's text is not unique as an early modern text that explicitly utilizes a visual semiotics. As Johanna Drucker has noted, there is a great deal of writing in the early modern period that capitalized on the interest in the written artefact while also confounding a conventional linguistic semiosis. Such figural writing "gains a certain power through its ability to provide legitimacy" while also exercising a "power of fascination in the cryptically illegible condition of the glyph."³¹ Like heraldry or emblems, Dee's "hieroglyphic" mathematical figures depend on both the mainstream authority of the printed text/written word and the ability of highly condensed visual meaning to drive interest.³² In Dee's work readerly interest and technological power converge not just in the meaningful figure, but also specifically in the *mathematically* meaningful figure. Consequently, Dee's text argues for a new epistemological value for texts that can be deciphered as mathematic.³³

A Mathematical Text?

Despite the recognition by historians that Dee was considered one of the brightest mathematical minds of his time, hailed as a genius even by the notable French mathematician Peter Ramus, scholars have often read his corpus through the lens of his alchemical or metaphysical pursuits, paying considerably less attention to

³¹ Johanna Drucker, Figuring the Word: Essays on Books, Writing, and Visual Poetics (New York: Granary Books, 1998) 63.

³² For more on figural semiotics in the early modern period, see Peter M. Daly and John Manning eds, Aspects of Renaissance and Baroque Symbol Theory, 1500-1700 (New York: AMS Press 1999); Erwin Panofsky, Meaning in the Visual Arts (Harmondsworth: Penguin, 1993) 51-82; W. J. T. Mitchell, Iconology: Image, Text, Ideology (Chicago: The University of Chicago Press, 1986).

³³ Eco observes that a new kind of reading characterizes the kabbalistic revision of older texts, thus remaking the canon by reading it differently. Dee's mathematical "kabbalah" will do the same but through a mathematized interpretation.

the mathematic arguments in the text.³⁴ Indeed one of the many challenges of reading the *Monas* is to understand how to approach the text as a mathematical text. Like the popular *libri d'abbaco* texts, it is written in the rhetorical style, theorems are presented in prose, and the text is a slight quarto that fits easily in the hand, suggesting ready use in daily activities. The figures themselves appear more as hieroglyphs or alchemical symbols than as the familiar geometrical figures or the arithmetic computations seen in other texts, including the Euclidean text of 1570.³⁵



Figure 1. To the right is a traditional Euclidian diagram, and to the left, the glyph from the third theorem in the *Monas*. Typically the figure to the left is associated more with alchemical symbology than with mathematical figurality as would be the case for the image on the right.

According to Athanasius Kircher, the seventeenth-century Jesuit German polymath who utilizes Dee's text extensively in his own writing, the "hieroglyph"

³⁴ Taylor 18. It is worth noting that despite Dee's prominence during his own era, he was excluded entirely from Cajori's monumental *History of Mathematics*. On Dee's *Monas* as alchemical see Federico Cavallaro, "The Alchemical Significance of John Dee's *Monas Hieroglyphica*," *John Dee: Interdisciplinary Studies in Renaissance Thought*, ed. Stephen Clucas (Netherlands: Springer, 2006) and Harkness.

³⁵ There is no doubt that the *Monas* is also an alchemical text; my point here is to emphasize the mathematical nature of the text so that it can be seen from another angle.

makes meaning through a structural analogy between the sign and signified.

Hieroglyphs are “*nota significativa* of mysteries [. . .] it is the nature of a symbol to lead our minds, *by means of certain similarities*, to the understanding of things vastly different from those offered by our senses.”³⁶ For Kircher, the alchemical is also the hieroglyphic, and the symbol makes sense only by certain structural analogies, which he believes expresses a hidden order. But even Kircher acknowledges the mathematical structure as expressed by Dee when he imports the glyph into the third theorem of his *Oedipus Aegyptiacus* in a revised version. In this version (see figure 2.), Kircher adds not only the alchemical symbols out of which the figure is “built,” but also represents the geometrical shapes as if they are on a coordinate axis and includes points as one would in a geometric diagram.

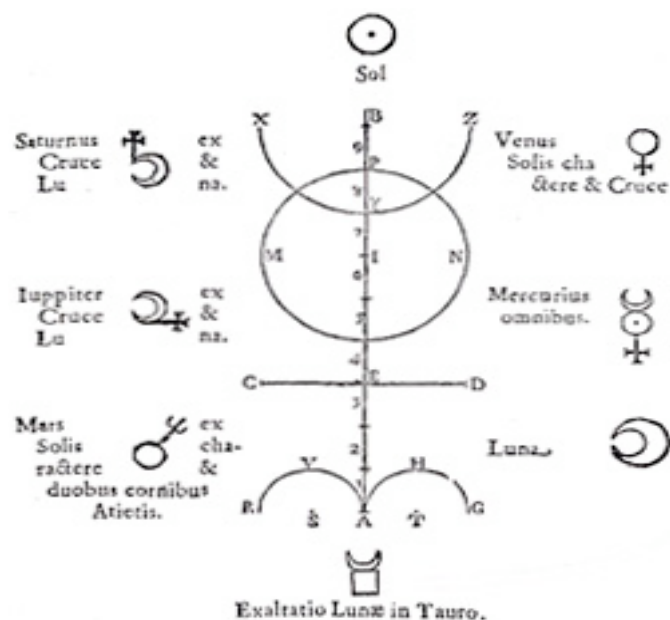


Figure 2. Kircher's revision of Dee's Monad.

³⁶ Quoted in Eco 154; emphasis mine.

While Dee's images are alchemical in many ways, utilizing alchemical figures that conventionally represent the sun, moon, or other astronomical bodies, he argues that they make meaning through a grammar of mathematical relationship. As Eco correctly observes, Dee's theory of meaning is based on geometric entities, such as the circle and straight line, all of which derive from the fundamental mathematic object, the point. While the symbols *connote* various alchemical principles, this is *not* the basis of their meaning for Dee. Dee begins by noting that the "rectilinear cross" (see Figure 1.) that makes up the body of the figure above for example "signifies" as "four straight lines including four right angles."³⁷ Eco ably walks us through Dee's dense explication, which I paraphrase here: a circle and semi-circle are supported by intersecting lines (in the relationship of an inverted cross – the intersection off center toward the base) which represents both the ternary (3) principle – two straight lines which intersect plus their points of intersection (2+1) – and the quaternary (4) principle – the four right angles formed at the intersections of the two lines (1+1+1+1). The sum of the ternary and quaternary principles provides a seven-fold principle, and "Dee goes on to squeeze a further eight-fold principle from the diagram," and then develops a ten-fold principle through another process of addition.³⁸ As Eco observes: "by such a manipulatory vertigo Dee then derives the

³⁷ John Dee, *Monas Hieroglyphica* (Antwerp 1564), trans. C. H. Josten, *Ambix*, Vol. 12 Nos 2 and 3: 157 (12). Citations of the *Monas* refer to the Josten translation found in *Ambix*. Where available, page numbers for the original Latin edition, *Monas hieroglyphica Ioannis Dee* (Antuerpiae: G. Siluius, 1564), are given parenthetically.

³⁸ Eco 187.

four composite elements (heat and cold, wet and dry) as well as other astrological revelations. From here, through twenty four theorems, Dee makes his image undergo a variety of rotations, decompositions, inversions, and permutations” in order to derive an entire cosmology of information – all from the mathematical relationships and/or arithmetic operations.³⁹

Like the simplest of geometric figures, the straight line, Dee argues that the hieroglyphic figure is “produced by the flowing of a point.⁴⁰” Consequently, for Dee, both the geometric line and his more complicated figures are the effect of the motion of point, and thus are themselves mathematic.⁴¹ As a mathematical object the monadic figure is composed of “signifying elements” “produced by the continuous fall of drops becoming a flow (if we consider drops to be like mathematical points).”⁴² With this, Dee transforms the act of writing into itself a mathematical practice. The creation of a new glyph by putting ink to paper, the gesture of the writer, and taking a single point of ink and extending it into a “flow” *is* mathematical practice. It is important to observe that Dee argues for an inversion of the process of interpretation and composition suggested by alchemical reading and writing more generally. It is in the points of intersection, the angles of incidence, and

³⁹ Eco 187.

⁴⁰ Dee, Monas 159.

⁴¹ The point is itself a mathematical entity and the concept of motion is one understood as movement over time, both of which are quantifiable concepts. For a different treatment of the mathematics of the point, see Jess Edward’s “Points Mean Prizes: How Early Modern Mathematics Hedged its Bets between Idealism and the World,” in Claire Jowitt and Diane Watt, eds The Arts of Seventeenth-Century Science: Representations of the Natural World in European and North American Culture (Aldershot, UK: Ashgate, 2002) 43-57.

⁴² Dee, Monas 159 (13).

processes such as addition that Dee finds meaning, including those that are the familiar alchemical interpretations. The geometry of the figure is how it makes alchemical meaning. The manipulatory “vertigo” of which Eco speaks is intense and consistent in the text; it is almost as if Dee is performing a spinning interpretational dance for us. This spinning, dizzying quality to the text, I believe, is at least partly responsible for the tendency to read the text as primarily alchemical. When confronted with the rapid spinning up (up from the point into the elaborate alchemical or hieroglyphic symbol) of Dee’s meanings, a reader might (quite reasonably) seek refuge in the relative stability (and given the complexity of alchemical symbology, it is relative indeed) of symbolic readings that offer the sun, moon, and mercury rather than a dizzying plenitude of mathematics.

As if this vertigo were not enough, Dee’s *Monas* is further complicated by the author’s connection of his mathematical figures to the cabalistic tradition, a move that positions Dee’s text as a revision not only of alchemical meaning, but of cabalistic and alphabetic meaning as well. The text, according to Dee, is a “true Kabbalah [. . .] more divine than grammar itself.” “Kabbalah” (one of many variant spellings, both early modern and modern), according to Harold Bloom, who is himself following the pre-eminent cabala scholar Gershom Scholem, is a “theory of rhetoric.”⁴³ For Dee, the *Monas* offers a rhetoric that is the art of using geometric

⁴³ Harold Bloom, *Kabbalah and Criticism* (New York: The Seabury Press, 1975) 18. A discussion of the history of cabala appears in Chapter Four. Scholem notes that “kabbalah became a catchword in Renaissance and Baroque theosophical and occult circles for the oldest and highest mythical wisdom.” Gershom Scholem *Alchemy and Kabbalah*, trans. Klaus Ottmann (Conneticut: Springer Publications, 2006) 10. “Cabala” has many variant spellings, including the form used by Dee,

relationships, like those discussed above, in order to teach and persuade (just as rhetoric is the art of using language to teach and persuade). These relationships express not the *nomen*, or name, of things, but rather, the direct interpretation “of things as they are in themselves.”⁴⁴ Consequently, according to Dee, for whom meaning is always geometric, the essence of all things *is* geometric. This is the case even when using alphabetic language, since Dee’s *Monas* generates the letters by means of its mathematical machine. In the dedication, Dee ask the grammarians who read his work to acknowledge that his text can produce “the form of the letters, their position and place in the alphabetic order, and the relations between them.”⁴⁵ Alphabetic language, according to Dee, was the technology of the vulgar who failed to recognize the abstracted truths expressed by letters: “the shapes of all those [letters] (which are disposed by a wonderful and most wise artifice) are derived from points, straight lines and the circumferences of circles.”⁴⁶ For Dee the alphabet, like his hieroglyphic figures, is based on mathematical relationships and can function as a mathematical cabala.⁴⁷ Like the apparently alchemical symbols, alphabetic letters are constructed by the flow of point into geometric shapes. For Kircher, the symbol makes meaning through a series of vague “similarities” to hidden truths, whereas Dee’s occult knowledge is defined as geometric knowledge.

“cabbala,” and that by Bloom and Scholem, “kabbalah,” except for in direct quotes the form “cabala” will be used throughout.

⁴⁴ Eco 188.

⁴⁵ Dee, *Monas* 100.

⁴⁶ Dee, *Monas* 127.

⁴⁷ According to Dee, the vulgar masses have misappropriated the set of figures known as letters, corrupting them and limiting their use in a perfect semiotic system.

Once possessed, such knowledge enables the practitioner not only to decipher the languages that already exist, but also, like Dee, to construct new expressive figures and letters. Calling this Dee's "geometrical poesis," Turner notes that Dee's text teaches the reader "how to use his knowledge in an effective way by means of the imagination, which is itself [. . .] a technical organ."⁴⁸

Not only do the images make meaning mathematically, the text shares much with the many other mathematical handbooks published during the late sixteenth-century. Proceeding like the progressive postulates of the handbooks (and like the Euclidean text discussed later), Dee's theorems build upon previous statements, mimicking the sequence of texts that build from simple proofs through to more complicated or compound demonstrations. The title of the *Monas Heiroglyphica* itself marks the text as mathematical as well. The Greek term "monas" is a familiar one in Pythagorean mathematics used to denote a unit (thus echoing the concept of point).⁴⁹ In the *Mathematical Preface*, Dee differentiates this from a traditional or theosophic concept of unity, making it clear that, for him, the term "monas" is primarily a mathematical term.⁵⁰ The glyphs that are the foci of the text are created with strict geometric entities (the line, the point, the curve, etc.) and are created

⁴⁸ Turner 66.

⁴⁹ "Monas" Henry George Liddell and Robert Scott, *A Greek-English Lexicon* (Oxford: Clarendon Press, 1940).

⁵⁰ In "Of Mathematical things," where Dee delineates the difference between number and magnitude there is a marginal note that reads: "Note the word Unit to express the Greke Monas, and not Unity as we have all, commonly, till now, used." Euclid. *Elements of Geometry*, trans. Henry Billingsley (London: 1570) 1r.

according to a theory of numerical relation. Admittedly, in many respects, Dee's geometric signs refer to actuality – they express hidden, but already present truths.

However, in so far as the geometric shapes not only express mathematical relationships, but also “are given a narrative,” they begin to function as a generative language.⁵¹ In the *Monas* the shapes do not simply appear, as the reader works through the narrative author and reader collaboratively construct the shapes; Theorem XXIII, for example, contains elaborate instructions for the construction of a new expression (or figure) with the mathematical grammar of the *Monas*. What is foregrounded in the narrative of construction is the absolute priority of mathematical relationship in the development of the meaning of each figure, including compound figures wherein each element must be in strict numerical proportion to the rest of the figures.⁵² But the nature of that proportion was not pre-determined, thus allowing Dee's students the possibility of creating new figures that represented new relationships, which were themselves expressions of previously unknown, perhaps even “non-existent,” realities. As an interpretive tool, the *Monas* mapped the mechanism by which all of the signifying traditions of the early modern philosophy of language, symbology – alchemical and otherwise, hieroglyphics, cabala, and alphabetic language -- could be reinterpreted mathematically.

⁵¹ Kenneth J. Knoespel, “The Narrative Matter of Mathematics: John Dee's Preface to the *Elements* of Euclid of Megara (1570),” *Philological Quarterly* 66 (1987) 41; also quoted in Mazzio 53.

⁵² Dee, *Monas* 104. Josten makes a similar observation in his preface. C.H. Josten, preface, “*Monas Hieroglyphica*” (Antwerp 1564) *Ambix* Vol 12 Nos 2 and 3: 84-6.

Additionally, Dee's sign, the monad, was just one example of a point flowing into a figure, and Dee encourages his students to take the method offered by the *Monas*, to begin with a point and allow new meaning to "flow." Dee believes that his cabala is "capable of *inventing* new arts and sciences."⁵³ In the very first theorem of the text Dee calls on the line and the circle as foundations for his figures, noting that they represent both what is "non-existent as well as latent in the folds of Nature"⁵⁴ and his figures have what he calls a "generative influence."⁵⁵ Dee's belief in the generative power of a mathematical semiotics is most clear in his diaries of his conversations with angels. In one journal entry Dee wrote that the angel Raphael warned Dee that if he did not take the precaution not to speak the mathematically informed language of the angels as he transcribed he would "both write and work all at ones [sic]: which mans nature cannot perform."⁵⁶ Dee's "active" mathematical language as it appeared in the angel conversations was a powerful (and dangerously) creative language.⁵⁷ Dee understands his mathematical "real cabbala" as that which articulates what is *and*, like Sidney with his poetry, what could or should be. In addition to a real cabala capable of revealing information about the divine order, Dee imagines a *creative* cabala, a creative mathematical semiotics.

⁵³ Dee, *Monas* 154 (11).

⁵⁴ Dee, *Monas* 155 (12).

⁵⁵ Dee, *Monas* 156 (12).

⁵⁶ Dee is quoted in Harkness 178.

⁵⁷ In some instances this generation was figured as a kind of childbirth. In one conversation the angels told Dee that 'each letter of each angel's name could bring forth a "daughter," and each daughter's name could bring forth another daughter (Harkness 181). In others it was a sort of whole cloth creative power, which Dee and other Christian cabalists, including Agrippa, believed gave practitioners "a knowledge of the natural world and," in Stephen A. McKnight's words, "an operative power" (as quoted in Harkness 194).

So Dee's text was mathematical. And yet, unlike Dee's *Monas*, most mathematical texts eschewed complicated allusions and purposively opaque meaning. Faced with the difficulties and roadblocks put in place by Dee in his attempt to subsume all signifying under his new system, we might be tempted to interpret much of what Dee does throughout the *Monas* as symbolism, developing a semiotics based on iconic or symbolic figures (rather than mathematic figures), many of which are derived from alchemical texts, thus allowing us to read Dee's text with an alchemical key. If instead we read Dee's text as a challenge to the primacy of alphabetic signs through new invented signs, then we develop, as I have done, a clearer sense of how Dee's invented geometric figures sought to go beyond the capacity of natural language to articulate comprehensive meaning.⁵⁸ As C. H. Josten, the first translator of the *Monas*, noted in 1964, Dee's central tenet is that the "monas" or the point is *constitutive* of number and language – even meaning itself. The geometric relationships expressed by the flowing of the point give meaning to number and letter. This is quite a turn from an interpretation of number as the conventional sign of two or three things, or of alphabetic language as somehow reflective of the nature it describes. Unlike nominalist and constructivist theories of the sixteenth-century, which held that language and number signified by convention alone, all representations are expressions of an ordering and reordering of mathematical relationships for Dee. Consequently, the monas, and figures like it, upend the linguistic order and locate all meaning in the foundations of mathematics.

⁵⁸ Johanna Drucker has done something similar with her analysis of the work of a group of graphic artists in the 1940's known as "Lettrists" (69).

This revolution in meaning does not also include, despite the “vertigo” produced by the text, limited or difficult application. Dee begins the *Monas* with a conventional pair of claims about universal applicability and ease of use:

the *Monas Hieroglyphica* will rectify the concepts of the grammarians. Admiring arithmeticians will be taught a new notion of number. The geometers will find their science insufficiently established. Those using or making instruments – the musicians, the astronomers, and the opticians – will realize that their labours have become obsolete, when they learn how the doctrine of the *Monas* performs the work of their instruments itself.⁵⁹

The *Monas* encompasses, explains, and improves all language, as we have seen, *and* it also does so for all of the mathematic practical arts. It also has spiritual application:

The cabbalists will be made to realize that their art is universal, not confined to the language of the Jews, and that there is, besides the common and vulgar cabbalistic interpretation of the spoken and written word, another “real” cabbala, exemplified by the *Monas*, a divine gift, which explores the whole of Creation by new arts and methods⁶⁰

Mathematics, as embodied in the *Monas*, is also an instrument for a kind of transcendent transformation of the soul of the practitioner. Dee positions the *Monas* as an instrument that will outperform the most innovative tools in practical and theoretical early modern inquiry, while also promising remarkable transformations of the soul (and of knowledge)– all through mathematics. For Dee, the *Monas*

⁵⁹Dee, *Monas* 100.

⁶⁰Dee, *Monas* 100.

supplants all current technologies and offers a single elegant approach to knowledge about the material and metaphysical. Further, it “speaks” in all of the current notational systems, because it produces them. The *Monas* is a text/practice fluent in all of the alphabet languages, whether spoken or written, as well as in the numerical languages of mathematics, optics, astronomy, and music. Dee’s *Monas* is a tool with universal significance and a kind of *ur*-notation that both encompasses and surpasses other written forms.

While there is no escaping the theoretical quality of Dee’s text, it is pertinent to our understanding of the social role of a generative math to consider the ways in which Dee draws upon common tropes of utility and then restructures them to emphasize the kind of ethical or intellectual practical knowledge that the *Monas* could produce. Theorem I states: “It is by the straight line and the circle that the first and most simple example and representation of all things may be demonstrated, whether such things be either non-existent or merely hidden under Nature’s veils.”⁶¹ As Dee suggests, mathematical entities such as the line or circle can operate in both the extensional and intensional modes; they are extensive in so far as they represent things that are hidden under the veil of nature (a kind of Neoplatonic discovery trope), but they are also intensive because figures can demonstrate things which are “non-existent.” In Dee’s words they are part of a “hieroglyphic” system of meaning that figures the possible with “an underlying clarity and strength,” which

⁶¹ Dee, *Monas* 120.

he describes as “mathematical.”⁶² As we have seen, hieroglyphics were not purely mimetic for Dee who refigured their semiotic operation as that of mathematical relationships. Like the earlier arithmetic texts in which the operands were part of a mathematical combinatorial grammar, for Dee semiosis occurs through the combination of geometric figures; meaning is built up by the relationship of a set of selected figures, almost like a grammar of proportion.⁶³ Like Sidney’s second form of poetry (philosophic), which reveals things previously hidden, the *Monas* peers through the veil of nature – it reveals. It also, however, like “real” Sidnean poetics, represents the “non-existent;” it creates new meanings through the set of mathematical relationships presented in a figure or series of figures.

Where Sidney’s poetry was a decidedly linguistic instrument, Dee’s mathematical semiotics is silent; it teaches “without words,” expressing what language cannot.⁶⁴ Celebrating the non-linguistic semiosis of his system, Dee poses this rhetorical question to King Maximillian in the preface:

Or is it not rare, I ask, that the common astronomical symbols of the planets (instead of being dead, dumb, or, up to the present hour at least, quasi-barbaric signs) should have become characters imbued with immortal life and should now be able to express their especial meanings most eloquently in any tongue and to any nation?⁶⁵

⁶² Dee, *Monas* 122.

⁶³ Theorem xxiii contains elaborate instructions for the mathematical construction of the symbol of the monad, each part of which has to be of a size that is in strict numerical proportion to the size of every other part (104).

⁶⁴ Dee, *Monas* 135 (7).

⁶⁵ Dee, *Monas* 122.

Dee's figures, previously "common astronomical symbols," are no longer arbitrary marks representing the planets (the common alchemical reading). Dee, full of wonder, sees them transformed into living eloquent statements when their mathematical relationships are visible. As he endlessly reiterates, these eloquent statements are made legible by reading mathematically and offer universal knowledge. While he asserts that the "especial meaning" of these mathematical statements can be translated into any language for any nation, Dee offers no such translation, leaving the figures to make meaning only as figures. For all the panlingualism toted in the text, Dee's figures must remain figures because the mathematical relationships cannot be expressed in prose without losing the critical compression of time achieved in the figure.⁶⁶ In Theorem XXIII Dee is more explicit about the manner in which the image communicates: "many things may be deduced from the diagrams which, it is preferable, should be studied silently rather than divulged openly in words." The figure resists translation into language, is silent, and is an altogether different mode of communication. In part, this was due to the risk that language could have broadcast what for Dee was highly privileged knowledge.⁶⁷ Unlike "teaching in words" or narration, which would unfold linearly, the figure expresses a compressed meaning that cannot "be contained within the fixed economy of language."⁶⁸ Dee lets the "affective presence" of the figure remain intact,

⁶⁶ Eco notes this non-translatable feature of the figural as well (Eco 154).

⁶⁷ Sherman notes that men like Dee needed to keep some of this as proprietary knowledge in order to sustain a tutoring career.

⁶⁸ Drucker 25.

preserving a “seductive energy” built from mathematical relationships.⁶⁹ As with other invented signs and the rhetoric of mathematical text books in general, Dee’s figures are meant to appear as if they were “formed in accord with a logic which seems to promise a universe of sense” – to produce assent in the reader that this in fact certain and complete meaning.⁷⁰

Dee’s *Monas* is a transformative text, in which Dee offers a theory of geometric foundation to all representation. He takes this argument to its conclusion and offers the reader a means to language creation – if you have an understanding of the geometry that creates the meaning, you can use the geometry to create new meaning. This geometric method subsumes all other semiotic models, according to Dee, thereby taking the Pythagorean commonplace that number is the underlying order of the universe and extending it to be the underlying order for the representation of the universe. In so doing, Dee believes he accomplishes the Neoplatonic ideal – there is a perfect correspondence between representation and thing. What is only barely accounted for in Dee’s text is the creative production that this enables. In the *Monas*, mathematic writing, the flowing of the point, creates geometric figures. As James Bono points out, because of the perfect correspondence the “geometric, hieroglyphic symbol double(s) as both thing and message.”⁷¹ Dee’s

⁶⁹ Drucker 25.

⁷⁰ Drucker 69. On the semiotics of mathematical figures see Kay L. O’Halloran, *Mathematical Discourse: Language, Symbolism, and Visual Images* (New York: Continuum, 2005) 129-157. O’Halloran discusses in detail the way that figures produce the response in the reader of intuitive understanding. See also J. L. Lemke “Mathematics in the Middle: Picture, Gesture, Sign, and Word” <http://wwwpersonal.umich.edu/~jaylemke/papers/myrdene.htm> (no date).

⁷¹ Bono 203.

mathematic languages reveal real essences because there is a perfect *identity* between sign and signified. For Dee, number, and its mathematic sciences, are the “alphabet of Nature” used by God. Consequently, and as the angelic warning to Dee implies, to speak mathematically is to create as God had done, an art too powerful for man.

A More Proper Mathematics

While Dee had thought that the figures of the *Monas* would produce new knowledge, by 1570 he was frustrated with the disordered vision of nature that these alchemical-geometric hybrid figures produced.⁷² He turned again to mathematics as a “reordering principle,” and began developing what he calls his “ravishing” mathematics.⁷³ To this end he worked extensively on a new edition of Euclid’s *Elements of Geometry*. The Billingsley/Dee edition, as it is known, was the first English translation of the classic pedagogical text and it included extensive

⁷² Harkness 64.

⁷³ According to Antoni Malet and others, this mathematics is typical of Neoplatonist and Hermetic perspective. The Hermetic perspective, however, was in tension with an early modern mathematization of nature as posited by Edmund Husserl, and consequently should not be collapsed into the Neoplatonic perspective. Husserl suggested that “for Platonism, the real had a more or less perfect methexis [participation] in the ideal. This afforded ancient geometry possibilities of a primitive application to reality. [But] through Galileo’s mathematization of nature, nature itself is idealized under the guidance of the new mathematics; nature itself becomes ... a mathematical manifold.” In many ways this was not an innovation of Galileo but of Pythagoreanism more broadly, though post-Galilean mathematics does differ in many ways from the mystically inflected Pythagorean theories. Pythagoreanism posits a mathematical order, whose principals of proportion and the continuum also govern the order of the real. Where Platonism posits ideal forms, Pythagoreanism posits only mathematical forms that manifest in a variety of ways in the material world. Hermeticism, by contrast, does not necessarily posit mathematical order as the governing order of all creation. Instead it allows for the allegorical operations of alchemy that depend more fully on Platonic forms and identities than on strict mathematical relationships. Dee’s mathematical semiotics, both in the “Preface” and in the *Monas*, generates meaning through a system of strictly mathematical relationships and is, therefore, more correctly characterized as Pythagorean than hermetic. Antoni Malet, “Mathematics and Mathematization in the Seventeenth Century,” Studies in History and Philosophy of Science, Vol. 22, 1991: 673-8. Edmund Husserl, The Crisis of European Sciences and Transcendental Phenomenology (Evanston: Northwestern University Press, 1970).

annotations by Dee, in addition to his landmark preface. A seminal text in the theory of creative mathematical writing, the *Mathematicall Preface* codified an understanding of “Thynges Mathematicall” as intermediary entities between the realm of the natural and the supernatural. Previously in the *Monas* these intermediary mathematical things appeared as a geometrically meaningful figural language which is a “real cabbala” “capable of inventing new arts and sciences.”⁷⁴

The *Preface* is a theoretical treatise that defended the study of mathematics and positioned it as a creative practice with important ethical implications. Like a Sidnean poet who “borrow[s] nothing of what is, hath been, or shall be; but range[s], only reined with learned discretion,” Dee’s mathematician created with “free” number. This free number cannot “be tyed to any place, and “abyde[s] no bondage.”⁷⁵ The rhetoric of the liberated scribbling mathematician was not simply good salesmanship by Dee; it partook of the burgeoning excitement around new forms of mathematics that emerged in the sixteenth century and the way in which such mathematics enabled practitioners. For Dee, mathematics offered not just

⁷⁴ Dee utilized a tripartite conceptualization of the universe, where things were either supernatural, natural, or the intermediary, mathematical. This intermediate category partook of the abstract perfection of the supernatural while relating to the natural without falling victim to corruption. For more on this see the mathematical Preface, especially the first 10 pages. For a detailed discussion of the many influences on Dee’s mathematical thought see Josten 84-6.

⁷⁵ John Dee, “Mathematicall Preface,” The elements of geometrie of the most auncient philosopher Euclide of Megara. Faithfully (now first) translated into the Englishe tounge, by H. Billingsley, citizen of London. Whereunto are annexed certaine scholies, annotations, and inuentions, of the best mathematiciens, both of time past, and in this our age. With a very fruitfull præface made by M. I. Dee, specifying the chiefe mathematicall scie[n]ces, what they are, and wherunto commodious: where, also, are disclosed certaine new secrets mathematicall and mechanicall, vntill these our daies, greatly missed. (London: John Day, 1570) A1r-A2v; also quoted in Mazzio. This edition, which is part of the Folger Shakespeare Library, is the one cited throughout. Other editions in the collections of Brown University, The Claremont Colleges, and the Huntington Library were consulted in the course of research.

operational knowledge – knowledge of how to measure, move, or make things – it also offered man the ability to ascend to knowledge or the contemplation of things divine and to participate in the active mathematical creation known as “numberyng,” common to both man and God.

Mathematical handbooks that detailed how and to what ends mathematics could be “operated” were popular amongst merchant and other commercial classes, and by the 1560’s when Dee was writing his *Mathematical Preface* his audience was in many ways already steeped in a creative math.⁷⁶ Despite circulating in an environment that much recent historiography has suggested encouraged more pragmatic and referential practices -- mathematical handbooks were and are often associated with the applied mathematical arts -- many early modern rhetorical-style mathematical handbooks insist on a more abstract mode of knowledge. Rather than dealing with the referential/extensive mathematics of mensuration and exchange, these mathematical authors discuss operations of “abstract numbers or those having no reference to money, measure, or weight.”⁷⁷ At the same time that Sidnean poetics suggest that the author can use a natural and poetic language to produce a

⁷⁶While both Sidney and Dee inherited audiences well-versed in the poetic and mathematical traditions of the past, Dee entered into wide circulation with the publication of his *Mathematicall Preface*. In some ways this makes the context for Dee’s work different from that of Sidney, whose manuscript text did not circulate to the general populace until its posthumous publication.

⁷⁷ Swertz 6. A similar recognition of the abstract, non-referential, or imaginary nature of mathematical writing is seen in Girolamo Cardan’s contemporary treatment of imaginary roots. In his *Ars Magna* (1545), Cardan addressed the use of roots of negative numbers, which though “imaginary” (*incruciacionibus*) nevertheless allow for the solution of an apparently otherwise unsolvable problem. Cardan is explicit that this is a case where a method dependent upon a fictive number allows for the solution of an abstract problem that may or may not have real world applications. Cardan himself calls the nuances of arithmetic that make this solution possible a useless subtlety. See David Eugene Smith, *A Sourcebook in Mathematics* (New York: Dover Publications, 1984) 202.

variety of possibilities, early modern mathematical handbooks make explicit the generative power of numeration and arithmetic operations, and suggest that the mathematical writer can create using a number of equally valid methods.

Dee's *Preface*: authority, authorship and a creative mathematics

Dee, like many early modern authors, considered authority to be an essential textual problem. Dee's goal in the *Preface* was not only to defend mathematics, as Sidney had done for poetry, but also to define the field. The *Monas* had begun this "field-defining" work, but it was left to the preface to "give the field of mathematics a new coherence and legitimacy," and to make this argument to "gentlemen such as Sidney in particular."⁷⁸ For Dee's vision of mathematics and its creative and epistemological value to be taken seriously, the Billingsley/Dee edition had to carefully negotiate the boundary between Dee's claims to authority, and the authority conferred upon Euclid and the putatively Euclidean text. Early modern texts of all sorts were peppered with references to classical authorities and sages from antiquity and the medieval period. In the case of Euclid's *Elements*, the sources of authority were manifold even before Dee wrote his preface. As Dale Billingsley (not to be confused with the Henry Billingsley who translated Euclid in the sixteenth-century and for whom Dee wrote his preface) notes, the form of mathematical text itself generated one kind of authority: "the Euclidean argument unfolds with an inexorable logic" from the smallest possible assumption to what appears to be a fully empirically demonstrable set of geometric conclusions. Each of

⁷⁸ Turner 101. Turner explicitly argues that Dee's "mathesis" is the analog to Sidney's poesis.

the sixteen books within the *Elements* follows a basic format wherein books, theorems, and propositions are laid out in a hierarchy of information that depends upon the preceding concepts and their validity to begin each new demonstration.⁷⁹

Within each proposition there is a clear conceptual and visual demarcation between the statement of the proposition, its construction, and its demonstration. Proposition, construction, and demonstration are all identified in the margins and are visually separated by white space on the page. The proposition is block indented and in italics, marking it visually almost as a kind of title for the section. The construction is heralded by a decorative initial capital, demarcating the beginning of the important narrative work. Within the visual space of the demonstration, there is often a geometric diagram, or in some cases a pop-up diagram (a hand-pasted insert that when folded “pops up” into a three dimensional geometric shape) inserted by Dee. These diagrams break into the flow of the text, becoming an integral part of the reader’s experience of the demonstration, their eye moving between narrative description and visual representation. As the reader moves through individual theorems, s/he is presented with the proposition and through the act of reading the construction participates in the building of the proof. With the problem thus collaboratively constructed by reader and author, as the demonstration begins the work of moving between diagram and narrative further incorporates the reader into the work of the proof; this effect is heightened in the cases where pop-up diagrams

⁷⁹ As Dee himself notes in a preface to the 14th book of the *Elements*, books 14-16 were spuriously attributed to Euclid sometime in the long history of the text. Dee asserts that his colleagues considered the texts to have likely been authored by Apollonius and likely inserted into the text by Hypsicles. For Dee’s statements on this see the preface to Book 14, p. 416 (PPiij).

exist, because they require the reader to fold, pull, and move the paper in order to literally build the geometric representation of the theorem at hand. This formal structure guaranteed the work's authority by locating some of that authority in the reader himself, as each individual argument, and then the entire work by virtue of its cumulative structure, are "newly proven and validated in every individual's recapitulation of the Euclidean argument."⁸⁰

The name "Euclid" carried a second form of authority, which was produced through an amalgam of historical attributions, including the shift in the early history of the text to attribute the text to Euclid of Megara rather than Euclid of Alexandria. This shift spuriously associated the text distantly with Aristotle and Plato.⁸¹ Like the *libri d'abbaco*, vernacular editions of Euclid, beginning with Niccolo Tartagli's first Italian vernacular edition (1543), asserted a third, practical form of authority to supplement the philosophic authority. Tartagli's Euclid was designed for the popular market and the note to the reader made a practical rather than disciplinary justification for the text. The post-Tartagli Euclidean text commonly asserted that arithmetic knowledge would be useful in all of the mathematical disciplines, beginning with the theoretical practices of the quadrivium (arithmetic, geometry, astronomy, and music) but also including geography, perspective, optics, weights, and measures, architecture, and judicial astrology.⁸² Henry Billingsley's English

⁸⁰Dale B. Billingsley, "Authority" in Early Editions of Euclid's Elements," Fifteenth-Century Studies Vol 20 (1993) 1.

⁸¹ Billingsley 2-3.

⁸² Billingsley 7-8.

edition, not only prefaced but heavily annotated by Dee, was “a zenith (or nadir) of practicality by its inclusion of printed cut-outs, the folding and gluing of which the editor carefully explained in order to provide concrete demonstrations of the theorems in solid geometry that had so exercised the abstract abilities of medieval thinkers.”⁸³ As the modern Billingsley observes, the vernacular editions enjoyed such popularity on account of the “demonstrable force, and practical application they afforded.”⁸⁴ While the Billingsley/Dee edition traded on these qualities, there was also a significant rhetorical shift in authority produced through Dee’s preface to the text. To a remarkable extent Dee resituated much of the authority, and hence value of the text, in his own mediating preface and in his authorial function.⁸⁵

Poetic Authority

Dee, like Sidney, pairs conventional and practical applicability (in extensive modes) with his new theories of mathematic meaning, and his opening story in the *Preface* both situates authority in Dee’s persona while aligning what may appear as conventional mathematics with more abstract intellectual practice. Dee opens with a story about an encounter of would-be students with Platonic teaching. “Sundry times,” Dee writes, Plato

⁸³ Billingsley 7-8.

⁸⁴ Billingsley 8.

⁸⁵ Malet has also observed the degree to which Dee’s preface is both innovative and synthetic: “Dee’s philosophical viewpoint allows him not only to overcome any opposition between Platonizing geometrical contemplations and engineering practice, or between Boethius’s numerology and commercial arithmetic and algebra, but also to integrate all of them in a single enterprise.” With the notable exception of Malet’s work, it seems that few scholars have noted that the main conceptual innovations we find in the Billingsley/Dee edition of Euclid are largely those produced by Dee’s philosophical views and articulated through the *Mathematical Preface* and his annotations of the main text. Antoni Mallet, “Renaissance notions of number and magnitude,” *Historia Mathematica* 33 (2006) 63–81, particularly pages 79 and 80.

(besides his ordinary Scholers) was visited of a certaine kinde of men, allured by the noble fame of Plato, and the great commendation of hys profound and profitable doctrine. But when such Hearers, after long harkening to him, perceaued, that the drift of his discourses issued out, to conclude, this Vnum, Bonum, and Ens, to be Spirituall, Infinite, AEternall, Omnipotent, and Nothyng beyng alledged or expressed How, worldly goods: how, worldly dignitie: how, health, Stregth or Iustines of body: nor yet the meanes, how a meruelous sensible and bodyly blysse and felicitie hereafter, might be atteyned: Straightway, the fantasies of those hearers, were dampt: their opinion of Plato, was clene chaunged: yea his doctrine was by them despised: and his schole, no more of them visited. Which thing, his Scholer, Aristotle, narrowly considering, founde the cause therof, to be, For that they had no forwarnyng and information, in generall, whereto his doctrine tended. For, so, might they haue had occasion, either to haue forborne his schole hauntyng: (if they, then, had misliked his cope and purpose) or constantly to haue continued therein: to their full satisfaction: if such finall scope and intent, had ben to their desire. Wherefore, Aristotle, euer, after that, vsed in brief, to forewarne his owne Scholers and hearers, both of what matter, and also to what ende, he tooke in hand to speake, or teach.⁸⁶

Dee's introductory story places an emphasis on the instructive purpose of the prefatory genre. If Plato had only offered "forwarnyng and information" that day his new students would have understood the aims, goals, and methods of his approach. The preface, that all-important first encounter, prevents the deflating of fantasy, the decline in prestige, and the consequent disavowal of the art at hand. Aristotle's assumption in the story is that if the men had known the direction of Platonic doctrine, that is, "what matter and also to what end" (an echo is heard here of Sidney's "how" and "why"), they might have remained to "their full satisfaction." At

⁸⁶ Dee, Preface 37.

the very least, they would not have come to his door eager and enthusiastic only to leave under a cloud of disappointment.

The anecdote justifies the genre of the preface. It also introduces Dee the author, bringing his persona into the narrative fabric of the *Elements* and positioning his voice as the supplement that Plato never had. It allows Dee to address the “certain kind of man,” whom Dee subtly derides with his rhetorical finger pointing, as if to say, “you know, *those* men who don’t see the value in Plato.” The reader meets Dee through the *Preface*, and the author acknowledges that his reader is no fool -- they, unlike the men who turned away from Plato, knew the value of their teacher Euclid. The *Preface* not only introduces Dee, it also articulates his promise to outdo both Plato and Euclid by offering a vision of the larger goal of mathematical understanding, thus extending beyond the *Elements*. The preface speaks precisely to the material and worldly efficacy of mathematics; it addresses the material concerns of “*those* men” who had walked away from a rich source of knowledge in search of more tangible tools. Like the *libri d’abbaco* style handbooks and Recorde’s pedagogical text, Dee’s text allows a material utility for mathematics. At the same time, however, like the *Treviso*, Dee also defends the intellectual pursuit of mathematics as abstract and creative – an early, perhaps only still incipient, notion of intensional mathematics. Through the use of the Platonic anecdote, Dee ensures that he and his reader share a better understanding of the kind of knowledge offered by Euclid’s text – a kind of material applicability seemingly absent from Platonic doctrine in the anecdote (the men walk away after all). At the same time, Dee is arguing that the broader scope of mathematics and its real value

lie not in material application but in knowledge of objects of knowledge known as the “spiritual,” the “infinite,” and the “non-existent.”⁸⁷ In holding these two visions of utility, one material and the other not, Dee’s preface is a particularly complex articulation of the tensions between the intellectual prestige of abstract knowledge and the importance of material utility.⁸⁸

Dee’s Platonic anecdote may seem to set the stage for the very kind of philosophical preface that Sidney judged insufficient for generating desire, but in fact, it satisfies the strict dicta to both teach and delight. According to Sidney, “The Philosopher sheweth you the way, hee informeth you of the particularities, as well of the tediousnes of the way, as of the pleasant lodging you shall haue when your iourney is ended, as of the manyby-turnings that may diuert you from your way. But this is to no man but to him that will read him, and read him with attentiuie studious painfulness.”⁸⁹ Sidney finds the argumentative map, like Dee’s “forwarnyng and information” boring and distracting. But more than that, such writing fails to satisfy the criteria of “right poetry,” as that which drives ethical action as the end of knowledge; a goal similarly demonstrated in Dee’s desire to engage the “free desire to doe well.” Dee, like Sidney, argues that the test should leave the reader “moved to

⁸⁷ I am inclined to think that the three are not all the same in Dee’s thought, though his association with Platonic thought certainly makes this easy explanation attractive. When Dee states that math can reveal what lies behind the veil *or* the non-existent I read that “or” as suggesting an alternate rather than a restatement or expansion of “what lies behind the veil.”

⁸⁸ In the case of the preface it is tempting to suggest that the emphasis on material application trumps Dee’s usual elitist tendencies. I’m not sure however that it isn’t more the case that the text deftly speaks in two directions and that the rhetorics of exclusion and utility do not converge differentially according to audience.

⁸⁹ Dee, Preface 37-8.

doe that which wee know...moved with desire to knowe.”⁹⁰ The ethical drive, and consequently the desire to learn, should be activated not through reference to philosophical or metaphysical conceits, with overly detailed accounts of intellectual paths, or with bold stories of past deeds. Rather, it should be activated through the creative vision of the poet, who

dooth not only show the way, but giueth so sweete a prospect into the way, as will intice any man to enter into it. Nay, he dooth as if your iourney should lye through a fayre Vineyard, at the first giue you a cluster of Grapes: that full of that taste, you may long to passe further. He beginneth not with obscure definitions, which must blur the margent with interpretations, and load the memory with doubtfulness: but hee commeth to you with words set in delightfull proportion, either accompanied with, or prepared for the well inchaunting skill of Musicke; and with a tale forsooth he commeth vnto you: with a tale which holdeth children from play, and old men from the chimney corner. And pretending no more, doth intende the winning of the mind from wickednesse to vertue.⁹¹

These conceits -- that the poet whets the appetite of the neophyte in order to tempt him to further inquiry and practice; that the poet must not overburden the student; that he must entertain and please if he is to educate -- are exactly what structure Dee’s powerful introduction to Euclid.

After Aristotle’s epiphany that the men might have been well served by a prefatory description of Platonic teaching, we might expect that Dee would have offered just such a philosophical preface. While Aristotle suggests that this might offer the men the enticement to bear through the “many by-turnings” to their full

⁹⁰ Dee, Preface 38.

⁹¹ Dee, Preface 38-9.

satisfaction, Dee suggests that such enticement is really for “him that will read him,” that is, the already convinced student. Rather than preface this first English edition of Euclidean geometry with a map of the mathematical “by-turnings” of the nearly 1000 page text, Dee opens his preface with the Platonic anecdote, using the story itself as a poetic instrument, one that allows Dee to develop a rapport with his audience, to set up a kind of pedagogical intimacy that assures the reader that Dee wrote this preface out of concern for them. The story introduces Dee to his reader at the same time as it introduces the student to an argument about the value of learning and the potential hazards of privileging material knowledge. It opens a treatise on the value of mathematics not with bold statements about the value of numbers, demonstration, or mensuration, but with a delightful anecdote about misguided priorities and the obligations of the teacher to the student.

Dee appropriates and transforms the frame of the Platonic encounter, creating a story that allows him to narrate his own perspective. Like Sidnean sonnets that create a besotted Astrophil in order to teach the reader “how” and “why” extensive poetry fails, Dee uses the anecdote, the bumbling Plato and foolish material-minded men, to demonstrate why a preface is necessary in the first place. Rather than use the anecdote to focus the reader’s attention on the philosophical value of mathematics, thereby calling on the authority of Plato’s reputation to claim that the reader should work through equally burdensome and esoteric mathematical thought, Dee addresses the issue of satisfaction. In Billingsley’s epistle to the reader, he notes that while mathematics is of the utmost value to the mind and manners of men, many who seek “as much as they can, sparing no paines, [are]

yet frustrate [d] of their intent, by no meanes attaining to that which they seeke.”⁹²

Billingsley sets up the reader in a position analogous to the dissatisfied men in the encounter with Plato: they seek but are frustrated in their attempt. With his *Preface*, Dee rescues them.

While one objective of the preface is to lay out the larger project of the book, to rescue the potentially wayward reader with a “certaine forewarning and Praeface, whose content shalbe, that mighty, most pleasunt, and frutefull *Mathematicall Tree*,” Dee’s preface does not simply “forewarn” his readers. The full preface in fact offers “a lesson long enough,” one that fully satisfies the reader’s need for mathematical knowledge, teaching not only “why” math but also “how” with math.⁹³ This lesson was indeed long at sixty full pages, with an additional Ramistic diagram of the ‘Mathematical Tree’ offering another foldout page of explication. Dee offers full definitions of each of the varieties of math, including, but certainly not limited to, several forms of arithmetic, geometry, algebra, fractional and irrational operations, surveying, mensuration, conversion, and interest computation. Rather than simply utilizing prose narrative as might be expected in a prefatory text, the *Preface* is written in the rhetorical style of the popular *libri d’abbaco* texts, complete with example problems and their rhetorical solutions.⁹⁴ It has the full marginal

⁹² Dee, *Preface* A2r and A2v.

⁹³ Dee, *Preface* A5r.

⁹⁴ Three forms are identified in mathematical text books, the first is known as ‘rhetorical’ and is characterized by example problems and theorems presented entirely in prose, with no use of equations or computations. The second, known as “syncopated,” mixes the use of number in equations or sample solutions, and may involve limited use of mathematical symbols like “x” for the

apparatus of a main-body text as well, including citations, manica to highlight important points, and other marginal markers and topical notes. As a fully realized treatise, Dee asserts that the astute student may gain all that he needs from his preface, thus rendering Billingsley's translation of Euclid redundant. Within the narrative frame of the platonic anecdote that opened the preface, Dee's strategies eliminate the need for the great sage whose teaching the preface presumably introduces. In a statement wherein one cannot help but hear a kind of Miltonic ambition ("things unattempted yet in prose or rhyme"), Dee positions his text as an historical achievement: "forasmuch as this enterprise is so great, that to this our tyme, it never was (to my knowledge) by any achieved."⁹⁵ Dee wrests the authority away from both Euclid and his modern translator and firmly locates it in the persona of Dee as author. The history of the publication of the text bears witness to the effectiveness of Dee's strategy; the *Preface* was reprinted alone or with truncated versions of the Euclidean text well into the seventeenth-century including editions nearly a century later in 1651 and 1661. Today the *Preface* is the only part of the Billingsley edition available in modern print and digital editions. Consequently, Dee's *Preface* became, as Sidney's *Defense* did in the field of poetics, a seminal theoretical text.

unknown quantity. The third, familiar in modern texts, is known as 'symbolic' and presents problems, formulas, and equations with figures, mathematical symbols, and numbers.

⁹⁵ Dee, *Preface* i. Dee makes a similar claim in the *Monas Hieroglyphica*, "...My gift is endowed with rareness also in so far as, from first to last, it is woven together by a manner of writing in which up to the present day, as far as I have been able to hear or to gather from the [literary] monuments of our forefathers, no work has ever been composed." Dee, *Monas* 122.

The *Mathematical Preface* is presented as a text sufficient in itself, so much so that when Captain Thomas Rudd, chief engineer to King Charles I, published his own edition of Euclid's *Elements* along with Dee's *Mathematical Preface* in 1651 he wrote that Dee's text deserved "perpetual commendations" and was "so large in the explanation and use of all the parts thereof so that in it you may discern the whole Body of the Mathematicks."⁹⁶ But Dee did not limit his authorial take-over to the text of the *Preface*. The body of the Euclid text is everywhere infiltrated by the mind and voice of John Dee in the form of at least sixty additions.⁹⁷ Dee makes extensive marginal annotations to the copy text, he includes several notes or "advertisements" that close individual books of the Euclidean text, he offers glosses, justifications, and histories of the language of the text, and he creates new corollaries and problems for his reader. The voice of Dee, present in the "I" used so frequently in these additions, stands in marked contrast to the absence of personal presence in the Euclidean text. Dee is the only person present with the reader. As in the *Preface*, there is a sense that a personal relationship exists between the reader and Dee, one that is designed to ensure not only that the reader learns geometry, but also that he learns a mathematical practice and theory that extends far beyond material application into the realm of the non-existent. Late in the twelfth book Dee defends his additions: "My entent in additions is not to amend Euclides Method (which needeth little

⁹⁶ Thomas Rudd, *The first VI Books In a compendious form contracted and Demonstrated. Whereunto is added, the Mathematicall Preface of Mr. John Dee* (London: Printed by Robert and William Leybourn for Richard Tomlins and Robert Boydell, 1651) A2v.

⁹⁷ Bert Hansen details the nature and number of the additions in his review of the modern Debus edition in *Isis*, 68.2 (1977) 23.

adding or non at all). But my desire is somewhat to furnish you, *toward a more general art Mathematical then Euclides Elements* (remaining in the terms in which they are written) can sufficiently help you unto.” Dee wants to furnish the reader with a more general art which will enable the reader not only to “practice things” but to “invent” as well.⁹⁸

Beyond authority...creating with math

In the *Preface* mathematics is lauded as the instrument used in the “distinct creation of all creatures in their distinct partes, properties, natures, and virtues” and that “by order, and most absolute number, brought, from *Nothing*, to the *Formalitie* of their being and state.”⁹⁹ While it was clearly the divine creator who had accomplished this first act of generative numbering, Dee’s *Preface* argues that powerful mathematics are also available to the mortal. In astrological applications mathematics were powerful for their predictive capabilities. True, mathematics can lift the veil; “*By Numbers, a way is had, to the searchying out, and understanding of every thyng.*”¹⁰⁰ Number here is less a way of denoting quantity or magnitude, and more a tool, “a way,” for discovery - for both the “searching out” and the subsequent “understanding.” Like the rhetorical *topoi*, or places, wherein an individual might “find” the appropriate components of an argument and then order the parts so as to facilitate understanding, mathematics offers number as a tool for discovery and cognition.

⁹⁸ Dee, *Elements* 371r.

⁹⁹ Dee, *Preface* *iir, emphasis original.

¹⁰⁰ Dee, *Preface* *iiv.

In contrast to this revelatory method of discovery, a creative math, the mathematical faculty of "*Number Numbyring*," is held in common by the Creator, angels, and men according to Dee. This stands in contrast to a math of discovery. At the same time it is also distinguishes mathematical man from the lower beasts who participate in the mathematical order of the universe only as "number numbered."¹⁰¹ Man, God, and the angels possess the power of the present, active, and continuous "numbering." Divine "numbering" is reserved as primary creation; man, nevertheless, is offered the possibility that through math he may "be led upward, by degrees...toward the conceiving of *Numbers*." In using the active form "conceiving," Dee carries over the power of the present active continuous verb "numbering," conflating the action of conception with that of numeration, suggesting that man too can create with number. This is not conception *qua* contemplation or comprehension of the mathematical order of the created universe; it is an active act of creation - of number numbering. This mathematical conception generates new forms rather than simply describing what has already been created by God. As Dee observes, man should not suppose that "any thyng created, Corporall or Spiritual, to support, conteyne, or represent those Numbers imagined."¹⁰² Like Sidney's liberal and creative poet, Dee imagines men engaged in mathematical creation that goes beyond the scope of referential language to create things that did not yet exist.

¹⁰¹ Dee, Preface *iir.

¹⁰² Dee, Preface *iiv.

Clearly, according to Dee, man can be an active agent who creates with number. While Dee goes on to enumerate at length the material applications of mathematics and the many referential mathematics available for measuring, counting, and trading, his focus is on celebrating an abstract, non-referential mathematics. Arithmeticians, Logicians, and Reckoners “imagine” fractions into being and create new modes of understanding with them. Even geometry, the mathematics of the *Monas*, is refigured to have both a practical, extensive mode and an abstract, theoretical mode. “[F]lat and plaine” geometry is used for land measurement and the “perfect Sciences of Lines, Plaines, and Solides,” according to Dee. However, Euclides’ *Elements* suggests a “more ample” geometry. Rather than expand the definition of geometry, Dee proposes “an other name” for the “mathematical science of Magnitudes [which] regardeth neither clod, nor turff: neither hill, nor dale: *neither earth nor heaven* but is absolute *Megethologia*.”¹⁰³ This other mathematics of magnitude works by “invisible lines” to express the “incomprehensible.” Dee’s “megethologia” is his monas in my opinion. A few lines later he argues, “megethologicall contemplations” can “trayne our imaginations [...] to apprehend by sure doctrine demonstrative things Intellectual, Spirituall, [and] aeternall.” And Dee is able to “prove and testify that the literall text [...] requires more skill in numbers and magnitudes then (*sic*) commonly the expositors have uttered.” He refrains from further expanding on this idea, but assures his reader that

¹⁰³ This is Dee’s neologism, which does not seem to have been very popular. *The Oxford English Dictionary* only cites the adjectival form and then only cites this text.

“if I be duely asked, my answer is ready.” That answer was the geometric language-generating *Monas*.

Dee’s mathematics in the *Preface* is deeply tied to Neoplatonic essences or forms, and in that sense they remain extensive – referring to hidden truths that produce the sensible world. That said, I believe that in quietly invoking the mathematical underpinnings of language and referring to the “megethologicall contemplations” of the *Monas*, Dee opens the door to a mathematics that goes beyond abstraction to tentatively offer the first glimmers of an intensional mathematics. The form of the mathematical text that follows the *Preface*, wherein the emphasis on an abstract mathematics is total, further attests to this movement. The inscription of an icosahedron inside of an octahedron, (441r) or the nature of the relationship of a dodecahedron to an isocaheron (425r) was not justified by finding material corollaries (as other editors of Euclid would do).¹⁰⁴ There are numerous treatments of complicated solids, multiple curvatures, and other mathematical structures and relationships with no concern for the “reality” of those figures.¹⁰⁵ Dee asserts repeatedly that knowledge will be had along with pleasure,

¹⁰⁴ Modernized examples of the images presented in the Euclidean text, an icosahedron inside of an octahedron, and the dual relationship of a dodecahedron to an isocaheron (<http://www.kjmaclean.com/Geometry/Dodecahedron.html>). The relationship of the later is “dual” because they can be transformed one into the other by substitution. The dodecahedron has twelve pentagonal faces and a total of twenty vertices, each of which is a vertex of three of the faces. If you put a point at the centre of each face and join together those on adjoining faces, you get twenty equilateral triangle faces, and each vertex is a vertex of five faces - in other words, you get an icosahedron; the reverse is also true.

¹⁰⁵ This is in contrast to the kinds of images used in mechanical, optical, or other material mathematic handbooks and treatises that made extensive use of material situations and referential diagrams to elucidate various propositions or operations. Examples include the illustrations from Descartes’ *Optics* that clearly place the mathematical solution within the context of material life.

but there is no evidence of a concern that this mathematics be referential. The lack of material correlates was so complete in fact that, as we have noted, Dee creates “pop-ups,” providing detailed descriptions of how to make paper models from scratch. Such creation is evidence *not* of the ability to model geometrical shapes found in nature, rather, it attests to the absolute absence of “real” models to which the student can turn. The student of Dee’s text is not studying geometric figures that can be found in nature. With math man can create and represent things not yet seen in nature and Dee imagines his students mute with rapture over these figures that did not exist.

Chapter Three: Cartesian possibility in a symbolic mathematics and a poetic mechanics

John Dee did not fully differentiate intensional mathematics from the “abstract” mathematics that drew on material forms to create “mental entities that can be grasped by the intellect but not found in nature.”¹ For Dee, a creative mathematics could be either abstract or intensional. According to Douglas Jesseph, abstract mathematics is almost universally accepted by the seventeenth century, suggesting that, if others followed Dee’s model, creative mathematics – possibility writing mathematics – may have been pervasive in the period. If this is the case, modern scholarship has neglected to make note of it. Much of the history of science and literary work on mathematics focuses on extensional modes of mathematics – that is on “applied” or “mixed mathematics.” Henry Turner’s work on the spatial geometric arts and their relationship to drama or Peter Dear’s work on the physico-mathematics of Galileo are two examples of this tendency, excellent in their analysis but largely concerned with what we might call the applied mathematical arts.² Left out of these analyses are the mathematic and poetic language theories I have been discussing. Semantic theories that prioritized the creative constructs of the writer, that saw important value in the knowledge produced by creative constructs, and

¹ From Aquinas’ commentary on Boethius’ Expositio super librum Boethii de Trinitate (c. 1261), quoted in Douglas Jesseph, Berkeley’s Philosophy of Mathematics (Chicago: University of Chicago Press, 1993) 11.

² Henry S. Turner, The English Renaissance Stage (Oxford: Oxford University Press, 2006). Peter Dear, Discipline and Experience: The Mathematical Way in the Scientific Revolution (Chicago: University of Chicago Press, 1995) and Revolutionizing the Sciences: European Knowledge and its Ambitions, 1500-1700 (Princeton: Princeton University Press, 2001).

which rejected the kind of connection between the word and the world with which we have become so familiar.

Clearly, there was a deep concern amongst some early modern thinkers over the crisis presented by ambiguous language and the new social and intellectual value of certainty. For many, such as the English perfect language theorists Francis Lodowyck, John Wilkins, and George Delgarno, the value of mathematical writing lay in what they believed was the power of mathematics to communicate without ambiguity. For René Descartes, however, part of the value of mathematics was its ability to write about possibility in dimensions that far exceeded what previous technologies had been able to accomplish. At the same time, Descartes found that poetic possibility was absolutely essential to the dissemination of his ideas about mechanics and the creation of worlds.

Descartes famously claimed that the grammar of geometric equations proceeds with such certainty and clarity that it would be the model for his new rational method. But such praise was based on the structure of mathematical proof, the “certainty and *self-evidence* of its reasonings.”³ Descartes was quite taken with the logical process by which mathematicians move from one proof to another, the evident links between individual elements. For Descartes, however, the powers of a symbolic analysis went far beyond the ways in which the ordered process of proof could produce certainty. William Leybourn, a seventeenth-century mathematician

³ Emphasis mine; Descartes The Philosophical Writings of Descartes, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch, 3 Vols, (Cambridge: Cambridge University Press, 1985) 1.114. Hereafter cited as “CSM” with volume and page number.

and land surveyor, exhorted his readers to indulge in the “second creation” afforded by mathematical recreation, but did the seventeenth century share Dee’s and Sidney’s belief that possibility could be modelled, indeed even created, through either mathematic or poetic writing?⁴

An “Imaginary” Mathematics

The *abstractio formae*, the peculiar mathematical mental entities discussed by Aquinas, if not universally believed in by all, were clearly alive and well in the seventeenth-century. In 1616 the Jesuit mathematician Christopher Clavius claimed, “mathematical disciplines treat of things which are considered apart from all sensible matter.”⁵ Thomas Hobbes, in nominalist fashion, asserted of mathematics that the “Lines and Figures from which we reason are drawn and described by ourselves.”⁶ For Hobbes, both words and geometrical figures were the conventional creation of man, linked to mental ideas rather than to the material world. Consequently, he considered geometry to be a demonstrable science (something Aristotelians would refute) in part *because* it dealt with entities created in the mind

⁴William Leybourn, Pleasure with Profit: Consisting of Recreations of Divers Kinds, viz numerical, geometrical, mechanical, statical, astronomical, horometrical, cryptographical, magnetical, automatical, chymical, and historical (London: 1649).

⁵ Christopher Clavius, Opera Mathematica (Vols. 1-3 printed by R. Eltz, 1611; v. 4-5 by J. Volmar, 1612) 1.5. An English translation is available, along with a microform of an original edition, at <http://mathematics.library.nd.edu/clavius/>, trans. John Blanton (South Bend: University Libraries of Notre Dame, 2005).

⁶ Thomas Hobbes, Six Lessons to the Professor of the Mathematiques one of Geometry, the other of Astronomy in the Chaires set up by the Noble and learned Sir Henry Savile in the University of Oxford (London: 1656) A2v-A3r. This was in contrast to the study of natural creation: “But because of Natural Bodies we know not the Construction, but seek it from the Effects, there lyes no demonstration of what the Causes be we seek for, but only what they may be.” For more on Hobbes’ theory of language see Quentin Skinner, Reason and Rhetoric in the Philosophy of Hobbes (Cambridge: Cambridge University Press, 1997).

of man. Isaac Barrow, the Lucasian professor of mathematics at Cambridge, lectured in the 1660's on magnitude and multitude as entities "separated or abstracted from all specific matter, material circumstances and accidents," and noted that geometry did not assume "the heavens, or the earth, or the sea," nor any body therein as its object of study.⁷ Seventeenth-century mathematics clearly led the way in the exploration of a non-mimetic mode of knowledge production and expression.

While the idea that mathematical writing could refer to something other than extensible or material entities in the world was broadly accepted, as Jesseph suggests, mathematical writing was often criticized for not expressing something *real*. John Wallis, the Savilian professor of Geometry at Oxford during the mid-seventeenth century, defended the apparent imaginary status of mathematical objects by stating that mathematicians do not

[. . .] suppose or affirm that lines, surfaces or mathematical bodies exist without physical body...The mathematician does not deny that his lines, surfaces, and figures are in a physical body, but those are only attended to and contemplated while the physical body is not considered. Abstraction is one thing, negation is another...therefore, mathematical objects exist, or *can exist* and are not wholly imaginary, but rather real.⁸

For Wallis, the abstract figures of geometry (given his discussion of "lines," "surfaces," and figures") are real because they've been abstracted from real "physical" bodies. As abstractions, mathematical objects either already do exist or

⁷ Isaac Barrow, Lectioes Mathematicae (London: 1683) 1:29 and 1:32; quoted in Jesseph 15.

⁸ John Wallis, Mathesis Universalis (London: 1693-99) 1:21; emphasis mine. Wallis is also quoted in Jesseph 16.

can exist somewhere, though Wallis does not say where exactly. Mathematicians do not negate the reality of extensible objects; they simply ignore everything but the numerical value of that extension. Those same numerical values can represent objects that do exist, as well as those that “*can exist*,” abstraction, then, extends to the articulation of the possible.⁹ I am tempted to hear in Wallis’ statements that the mathematician does “not affirm” an echo of Sidney’s assertion that the creative poet “nothing affirms” and to read Wallis’ statements here as evidence of a theory of mathematics as generative expression, bringing “forth such things as were never in nature,” or describing things “non-existent.”¹⁰ It is almost as if Wallis suggests that if the mathematic objects do not innately exist as ideas in the mind, then the writing of mathematic abstractions can introduce such to the reader. But such a reading is based on just a sliver of a possibility in that “can exist.” As in the case of both Sidney and Dee, however, if there is an emerging sense of the intensional mode in Wallis, it is in tension with a dominant mimetic mode in Wallis’ work. For Sidney and Dee this was an occult or discovery- oriented mimeticism, for Wallis and his peers it is an

⁹ Though this is not part of the explicit debate in the early modern period around abstract mathematics, Phillip David and Reuben Hersh quite rightly point out that abstraction entails “some degree of falsification.” Philip David and Reuben Hersh, Descartes’ Dream (New York: Dover Publications, 2005) 281. This falsification in Aristotelian and Platonic models is characterized by the ability to extract an essence or idea from particulars. In the work of Leibniz such a model is rejected in favor of an absolute identity between the particular and its intension, such that the unique instance is preserved at the expense of a more general comprehension of like instances.

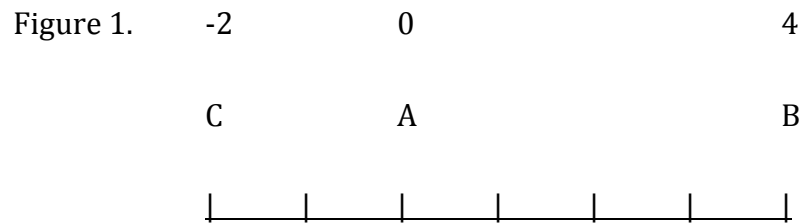
¹⁰ Historian Amir Alexander would resist such a reading by pointing to moments where Wallis sounds more like a proponent of the Baconian experiential mode by asserting that the highest form of knowledge is acquired by “tasting and seeing.” These statements however appear in Wallis’s *Truth Tried*, a treatise on the nature of knowledge and its relationship to faith and the divine, where sensory perception describes an immaterial spiritual experience, where taste is a “spiritual tast” and “experimentall knowledge” describes divine revelation.¹⁰ Wallis’ tasting and seeing need not involve the tongue and eyes, but it must be knowledge so compelling that “it seems not in the power of the Will to reject.” For Wallis then, the vocabulary of sensation served as a metaphor for intellectual compulsion, knowledge so persuasive that the human will was incapable of denying its truth.

abstracted mimeticism that begins in the actual but can leave considerations of the material behind.

While the mathematician does not bring the material object into consideration, he might, as Wallis did, need to make recourse to the material world in order to justify his use of these peculiar abstract mental objects. While his own mathematical practice did not depend on experimental knowledge, Wallis made judicious use of experiment in his refutation of the critique that theoretical mathematics was “imaginary.” In his treatise on algebra, for example, he defends so-called “imaginary numbers,” negative numbers and their square roots, against the claim that they are a logical impossibility with an experiential analogy. Wallis begins by acknowledging that it seems logically impossible that *any* quantity can be negative “since it is not possible that any magnitude can be less than nothing, or any number fewer than none... And though, as to the bare Algebraick Notation, it import a Quantity less than nothing: Yet, when it comes to physical application, it denotes a real quantity.”¹¹ Wallis is trying to argue that the set of numbers that seem to defy logic by appearing (especially in a numerical scale) to be less than zero can in fact be real. Wallis uses an example out of everyday experience to further explicate – if you were to start at point A and move to some point B, that would constitute the line AB, and while A would be your point of origin, and may therefore be designated zero in terms of distance travelled, it is possible for you to walk backward (Wallis’ word is

¹¹ D. E. Smith, History of Mathematics, Vol. II (New York: Dover Publications. 1958) 46.

“retreated”) from B *past* A to some point C (see Figure 1). If A was zero and you had gone in the other direction beyond A, you have made negative progress.



Ultimately what Wallis describes is a relational mathematics, where the point of origin, zero (0), is considered an arbitrary point in space, rather than an absolute value. This enables the reader to envision a relative space in which negative numbers are in fact possible. It is this vision of walking backward through space that overwrites the apparent logical absurdities of imaginary numbers - what the abstraction “-2” represents is not something less than zero, that is logically impossible; instead it represents regressive motion. Experience counters a semantic and logical problem – the problem that by definition nothing can be less than zero because zero *is* nothing. While the pure numerical value of a negative number may seem semantically impossible, what Wallis’ example illustrates is that the value can nevertheless have meaning, that “-2” is practically possible. In refuting his critics Wallis redefines the abstract numerical sign in terms of relative motion.

Importantly, however, he does not address the issue of whether or not negative numbers *as such* are imaginary. Instead he posits that “-2” can be understood to refer to a possible backward motion – it is a proposition for which extensible testimony is available (the walking back past the point of origin). Once the number is reconfigured as relative motion, the ability to operate on the number, as in the

case of finding a square root (also a problematic “imaginary” number, becomes logically possible as well). As such, the sign “-2” has an intension, one with a possible corresponding extension as detailed by Wallis. It may be that Wallis’ use of the experiential analogy is secondary to his conception of the negative numbers as intensional propositions - that is, as an abstract idea that need not have a material correlate – yet it also seems that the defense of the negative number here depends upon a possible material correlate, even if it is a contrivance.

Intension in Cartesian Geometry

Ultimately, it was not the English mathematicians who fully formulated a mathematics capable of representing the non-actual possible rather than the empirically verifiable. René Descartes, writing in the first half of the seventeenth-century in France, accomplished that task. Descartes’ treatise on geometry, *Geometry*, was published along with the *Optics* and the *Meteorology* in 1637 and prefaced by the famous *Discourse on Method for Rightly Directing One’s Reason and Search for the Truth in the Sciences*.¹² While the *Optics* and the *Meteorology* are concerned with the application of Cartesian mathematics to two practical disciplines, the *Geometry* is a more theoretical text that details Descartes’ take on the form and process of a new analytic geometry. Therein Descartes demonstrates a

¹² Hereafter referred to as the *Discourse*. René Descartes, The Discourse on Method, The Philosophical Writings of Descartes, trans. John Cottingham, Robert Stoothoff, and Dugald Murdoch, 3 Vols. (Cambridge: Cambridge University Press, 1985). See also Discourse on Method, Optics, Geometry, and Meteorology, trans. Paul Olscamp (New York: Hackett Publishing, 2001).

new symbolic algebraic approach to geometrical problems, one that finally accomplishes a mathematics of the possible.¹³

The *Geometry* opens with a demonstration wherein the mathematician chooses lines “arbitrarily” in order to come up with an equation for finding the proportional line. The heading, “Of Problems that Can Be Constructed Using Only Circles and Straight Lines,” announces to the reader that this mathematical method does not begin with a material problem: these are problems to be *constructed* rather than problems to be solved, and constructed with no reference to the material.¹⁴ Descartes elsewhere echoes the by now familiar refrain on abstract mathematics: “it is with questions of order and measure” that mathematics deals and “it is irrelevant whether the measure in question involves numbers, shapes, stars, sounds, or any other object whatever.”¹⁵ He also makes it clear that his mathematics is not merely the abstraction suggested in Augustine’s *abstractio formae*, but a second order abstraction: “Arithmeticians usually represent individual magnitudes by means of several units or by some number, whereas . . . we are abstracting just as much from numbers as . . . from geometrical figures . . . or from any matter whatever.”¹⁶ While a

¹³ Though my discussion is restricted to two problems presented in the *Geometry*, and leaves out the example of polynomial equations, they offer yet another example of the intensional mode in mathematics.

¹⁴ René Descartes, *The Geometry, Discourse on Method, Optics, Geometry, and Meteorology*, trans. Paul Olscamp (New York: Hackett Publishing, 2001) 177. This is the edition cited used in all citations of *The Geometry*.

¹⁵ René Descartes, *Oeuvres de Descartes*, 2nd edition, eds. Charles Adam and Paul Tannery, 11 vols. (Paris, 1974 – 86) X.378. Hereafter cited as “AT” with volume and page numbers.

¹⁶ Descartes, AT X.455. Quoted in Peter Schouls, *Descartes and the Possibility of Science* (Ithaca: Cornell University Press, 2000) 120. Descartes describes this as a movement “from sparks of truth to

familiar trope, the Cartesian model of abstraction goes further than we've yet seen. The "new geometry" abstracts not only from the material world, but also from numbers and geometrical figures themselves (which are already abstractions) in order to produce symbolic equations. It is in this move that Cartesian symbolism moves significantly beyond its predecessors, allowing it to represent possible mathematical entities not tied to material existence. While the symbolic equation is first generated by abstraction of this second order, the use, as we will see, of this new notational method will take Descartes far beyond what could conceivably be abstracted and into the representation of what, in a three dimensional world, simply cannot exist.

Descartes describes the creation of the symbolic equation in a manner that makes it clear that this is an intensional mode of expression; the creation of a problem and the determination of an abstracted relationship are primary:

[. . .] if we wish to solve some problem, we should first of all consider it solved, and give names to all the lines – the unknown ones as well as the others – which seem necessary in order to construct it.¹⁷

Working in a discursive mode that sets up a compact between the reader and writer (moving between "je" and "on" in the French), Descartes lays out a common desideratum that his method will address. Articulated in a subjunctive mood that defers locating the objective in a particular problem, "if we wish to solve a problem,"

the glow of possibility." René Descartes, Descartes' Natural Philosophy, ed. Stephen Gaukroger (London: Routledge, 2000) 510.

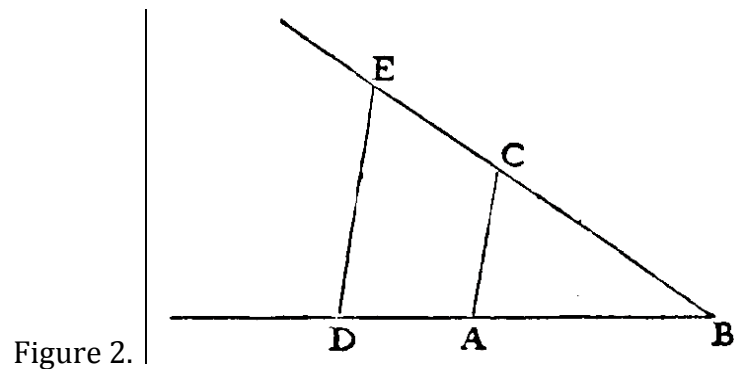
¹⁷ Descartes, Geometry 179.

the text gives no sense of a particular kind of problem – only that a solution is desired. The context, of course, along with the reference to “lines,” suggests that we are looking for a geometric solution, and yet, as we will see, that is far from what we get in the end. The solution-desire is met with a surprising supposition – solving a problem is easily done; we need only consider to ourselves the possibility that the solution is already found. This non-actual but possible proposition frees us to do what God enabled Adam was able to do: to name. So with the desire for a solution in hand, we propose that the solution is already there and we begin naming constituent lines.

The problem chosen by Descartes is a fairly rudimentary one – finding the length of a line using only two triangles that share angles and the length of one side, also known as a similar triangles problem. The desideratum remains abstract, the reader is given no sense for why he or she might want to find the length of the side of similar triangles, and no practical applications are supplied. The problem exists simply to be solved and the solution is imagined as already supplied. Consequently, one begins to feel as if this might just be a game, playful mathematics, but Descartes’ text is not like the many recreational math texts of the period: he has an agenda. The solution imagined by Descartes depends on understanding the relationships between the lines and angles, on knowing that triangles that share angles are proportional to one another in all respects. While the solution, one that has been known for generations prior to the publication of the *Geometry*, is geometric in nature, drawing a figure is not what Descartes ultimately has in mind here. Descartes imagines a solution that is symbolic rather than figural; rather than a

simple exercise or pleasing diversion, the example is an occasion to display the power of his new symbolic and algebraic method.

Very early on in the treatise Descartes offers figure 2 below:



graphically representing the relationship between two numbers and their product as a relation among line lengths (proportional triangles). In this instance Descartes tells us that the segment AB is a unit length, or one, and DE is drawn parallel to AC. In this figure the relationship of BE to BD is the same as that of BC to BA,¹⁸ which means that we know that BE is equal to BD times BC.¹⁹ This is one way of representing similar triangles; triangle BDE is similar to triangle ABC in that they have the same angles; their line lengths are different but proportional given the shared angle B. In order to solve this problem, one might take a particular triangle, measure out the lengths and find, say, the length of BE.²⁰

¹⁸ Because angle B is common to both triangles and the lengths DE and AC are parallel.

¹⁹ Represented another way: If $BE:BD = BC:BA$, that is, $BE/BD = BC/BA$, and BA is the unit length (1), then $BE \cdot 1 = BC \cdot BD$; that is, BE is the product of BC and BD.

²⁰ See footnote 35.

Descartes, however, isn't interested in a particular instance of this problem, nor does he care about finding a particular length – he has set up this problem in order to demonstrate that the relationship expressed in the figure can also be expressed symbolically. Instead of “naming” lines according to their end points (a model that depends upon a geometric representation where end points exist), Descartes suggests that by naming the length of BD ‘a’ and the length BC ‘b’ we can express this relationship as $x = ab$. This is a significant, if slightly peculiar, moment, peculiar because Descartes introduces the symbolic representation not to solve the problem of the similar triangles, but to demonstrate the equivalency of *modes* of solutions. Accordingly, he continues not by finding the value of the missing line length, but by transitioning rapidly to a second problem, the solution for which expresses relationships of products and cube roots between one line from the triangle, and a line from another figure also offered in the text. The peculiarity lies in the quick elision of the difference between solving a relatively simple problem of proportions to one of a slightly higher order of difficulty. It is, nevertheless, a momentous move in two ways. First, in his rapid transition to the second problem, Descartes deftly demonstrates the broad applicability of his symbolic method (not only does it work with similar triangles, but also with other problems that were previously solved geometrically). Second, and more importantly from a semantic point of view, Descartes demonstrates that the symbolic equation is not merely analogous to the geometrical relationship between the line lengths that is presented in the diagram reproduced above, but is an *alternative* expression of what is figured.

Arguing as he does that this transfer of meaning from the figural form to the equational form is without semantic loss has several consequences. It refigures the work that is needed to achieve the geometric solution. Rather than see the equation as a translation of the figures which fill the pages of the *Geometry*, Descartes argues that with his new method “one has no need so to trace these lines on paper, and it suffices to designate them by certain letters, one for each.”²¹ One may dispense with the drawing of geometric shapes and now represent the problem (*not* the shapes) in an entirely symbolic expression.²² This is, essentially, liberation from two- and three-dimensional figuring. As Paulo Mancuso has observed, prior to Descartes work, “the multiplication of two lines is interpreted as an area, and the multiplication of three lines gives rise to a volume (think here of $\text{Area} = \text{Length} \times \text{Width}$ and $\text{Volume} = L \times W \times H$, both of which are expressions of line relationships).²³ The problem that Descartes solves with his symbolic notation is how to talk about line relationships that obtain between more than three lines. Given that people were accustomed to thinking about line relationships in terms of dimensions, the new symbolic designation is important because it now allows a complex range of operations on the symbolic expression that cannot be represented graphically, which in a very real sense cannot be actualized with the technology available to the early modern writer. Because they are capable of representing

²¹ Descartes, *Geometry* 178.

²² At this point one wonders why Descartes did not point out that it is a far more challenging to represent the relationships amongst cubes with a figure, whereas the simpler triangle and curve figures used to orient the reader at the outset can be readily drawn,

²³ See Paolo Mancuso’s excellent discussion of this in *Philosophy of Mathematics and Mathematical Practice in the Seventeenth Century* (Oxford: Oxford University Press, 1996) 64-69.

relationships beyond those possible in the two-and three-dimensional models made possible by classic geometry, Descartes' symbolic equations are capable of overcoming nothing less than the problem of dimensionality.

Descartes recognized that what the *Geometry* offers in its analytic symbolism is not a set of theorems for the solution of specific problems, but an expression of the structure of mathematical relationships and a method for expressing these relationships in symbolic form. He moves quickly from the similar triangle example into a discussion of what is known as Pappus' problem in order to further demonstrate the ability of his symbolic mathematics to express the possibility of multiple dimensions.²⁴ According to Descartes, Pappus' problem is a problem that the ancients have never been able to solve: given that a single line may participate in an infinite number of other unique lines as a point, how can we describe multiple lines, the position of the point, and the geometric relationships of those lines? As Descartes describes it, Pappus is attempting to find "loci not presently known" – the point where a single line intersects or "participates" in four or more lines. For Pappus, Euclid, and Appolonius before him, what is at stake is the ability to understand and describe the lines that must, by definition, be possible but that ancient mathematics cannot describe.²⁵ However strong the logical imperative that such lines are real may be, to classical mathematicians "it is not clear what they

²⁴ Pappus of Alexandria, a Greek mathematician, wrote a compendium of classical mathematics known as the *Collection*, as well as commentary on Euclid's *Elements*.

²⁵ Mancuso 68.

[these “lines”] are, nor what their properties are.”²⁶ The indeterminate nature of these “lines” becomes an ever-greater difficulty as the complexity of the problem increases. When the problem reaches beyond three lines it requires a semantics capable of expressing pluri-dimensionality beyond the third order, and thus, the ancients reached the limits of what the figural can represent, “since there is no figure of more than three dimensions.”²⁷ Essentially, the ancients ran up against the limits of the figural or of geometric and figural technology. When working with three or more lines, this problem involves lines and relationships between lines that may be impossible to render two-dimensionally.

Descartes loved nothing more than a problem deemed too difficult to answer, one as yet unsolved by the great minds of antiquity. While a certain showmanship is at work here, this problem is of a kind with his earlier demonstration in that it is an occasion for something other than the solution of the problem.²⁸ Working out such problems offers him the “occasion to try and discover whether, through [his] method, [he] can go as far” as the ancients had done, and, perhaps, to demonstrate his ability to go farther.²⁹ With early modern geometry, the problem is fairly simple when a maximum of five lines is involved; there, as Descartes notes, “through simple geometry...through the use of ruler and compasses alone” the problem may be

²⁶ Descartes, Geometry 183.

²⁷ Descartes, Geometry 183.

²⁸ In fact, while Descartes argues that he has finally solved the problem, he has only done so for particular instances.

²⁹ Descartes, Geometry 185.

solved.³⁰ Descartes walks through the uses of conic sections, curved lines, and the symbolic equation to solve increasingly more complex iterations of the problem, ultimately accomplishing the solutions that had evaded the ancients.³¹

The reader is offered figure 3 below, which represents a figure that might be used in the solution of the lower-order problems:

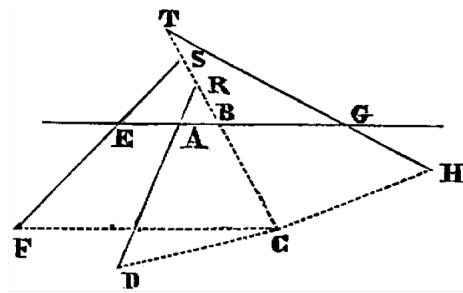


Figure 3.

His ability to solve this old problem, to make meaning from this complicated figure, is so assured that when the solution is “found” (recall that solutions for Descartes are always first proposed rather than found), Descartes can barely get himself to write it out because he “is already bored by writing so much about it.”³² As before, he begins the solution of the problem by assuming the problem solved, and dispenses with the “confusion of all these lines.”³³ His first step is to rename the lines using symbolic letter values, and then he works through the symbolic expressions of the relationships between the lines in the figure. A short page later Descartes triumphantly announces “thus you can see that *no matter how many lines*

³⁰ Descartes, Geometry 185.

³¹ Descartes, *Geometry* 186.

³² Descartes, Geometry 186.

³³ Descartes, Geometry 186.

given in position we may have, all the lines drawn above...can be expressed.”³⁴ Not only can the lines presented in the two dimensional figure be expressed, but figures in an infinite number of dimensions can be expressed through the symbolic equation.³⁵ Further, the symbolic expression will allow the practitioner to take “an infinite number of different values” in order to find “an infinite number of different points.”³⁶ The symbolic equation may be manipulated “in every imaginable fashion,” and the geometer is now able to discover an infinite amount of knowledge about the lines at hand. Whereas for the ancients the nature of the lines (beyond their logical possibility) was unknown, Descartes has offered a way to know not just something, but everything about such lines. The classical mathematicians who wrote “so many big books” lacked the elegant and concise Cartesian method for symbolic expression of mathematical relationships and instead “only gathered together those propositions they had stumbled upon.”³⁷ Rather than deal with particular instances, Cartesian mathematics has an infinite capacity to create information about not just what can be drawn by the compass and ruler in two or three dimensions, but in dimensions possible but otherwise unknown in the material world; it is able to express the vast possibilities of mathematical systems.

³⁴ Descartes, Geometry 187-8, emphasis mine.

³⁵ The values of x and y can have “only as many dimensions as there are lines” but this extends in the paragraph beyond the third dimension “on to infinity” (188), later he explicitly discusses fourth and sixth dimensionality (189).

³⁶ Descartes, Geometry 188 and 189.

³⁷ Descartes, Geometry 182.

As the *Geometry* continues, what Descartes demonstrates is the ability to solve problems of four dimensions, five dimensions, and beyond. As he says, his new method will allow for the resolution of problems “with any number of lines,” or an infinite number of dimensions.³⁸ Freed from the two- and three-dimensional signifying of classical geometry, and even the fourth and fifth dimensionality made possible by conic sections etc., Cartesian geometry is capable of using a symbolic language to represent as many non-actual but possible dimensions as there are ordinal numbers. The point that comes across clearly is that the written work of the geometer need not be that of specific figural expressions, it can now be accomplished symbolically. It is worth noting that the highly economical symbolic equation does not simply represent a single figure in a new form; it is an expression of all of the non-actual possibilities with the properties expressed by that relationship. In this sense it is, perhaps, the notation of intension *par excellence*. This is a major shift in the ability of writing technology to represent the range of the possible. No longer limited by what can be drawn, the geometer can represent, and, in so doing, call into being, a whole new range of possibilities.³⁹ Beginning with the triangle and proportional line lengths as the occasion to demonstrate his new symbolic method, Descartes offers his readers the ability to express not only an

³⁸ Descartes, *Geometry* 184.

³⁹ Note that the ability of mathematics to represent the non-existent does not necessarily make it a universal science since there remains the possibility of constructing a problem that cannot be solved through the geometric equations being discussed, or, as Descartes puts it, “the construction of the problem is impossible.”

abstraction of what is, or what can be drawn, but an infinite range of mathematical possibilities that were previously un-writeable.

The conversation with Burman

Descartes did not simply stumble upon a mode of meaning in mathematics; he was explicit in his pursuit of the ability to articulate the non-actual possible. In the spring of 1648, Descartes had a long conversation with the Dutch scholar Frans Burman in which Descartes explicitly recognized the ability of mathematical representation to express the possible.⁴⁰ In the report of their conversation Burman indicates that he was confounded that Descartes has asserted that his mere ability to imagine and write about the triangle is *evidence* that, “even if perhaps no such figure exists, or has ever existed,” the triangle is nevertheless somehow real.⁴¹ Burman counters with the example of the chimera, incredulous that the French philosopher would say that this creature is anything other than a “fictitious entity.”⁴² Descartes’ response outlines precisely the definition of a compound intension – that is, the development of a complicated but nevertheless rigorous possibility. “Everything in a chimera that can be clearly and distinctly conceived is a true entity.”⁴³ Using the famous Cartesian method of working down to clear and distinct ideas and building forward from those certain foundations, Descartes suggests that if the parts of the chimera can be resolved as clear and distinct, then

⁴⁰ Burman recorded the details of this conversation in a lengthy transcription.

⁴¹ Descartes, CSM 3.343.

⁴² Descartes, CSM 3.343.

⁴³ Descartes, CSM 3.343.

there is nothing about the compound of those certain ideas that suggests it cannot be possible; “it is not fictitious...this object has a true and real nature.”⁴⁴ The object is just as real as the objects with which physics deals, says Descartes, “the only difference is that physics considers its object not just as a true and real entity, but also as something actually and specifically existing.”⁴⁵ Mathematics, like the poetry that produced the chimera, “considers its object merely as possible, i.e. as something which does not actually exist in space but is capable of so doing.”⁴⁶ In both the *Geometry* and in his correspondence with Burman, Descartes expresses a clear sense that the possible is something that can be represented in mathematic writing. And yet, while the possible can be represented mathematically, nowhere does Descartes restrict possibility to mathematic writing. Indeed, according to Descartes, the possible can also be created in prose, as we will see shortly. The category of the “fictitious” for Descartes remains as a logically “false conception,” but the intensional expression and its ability to represent what is non-actual but possible has been established. Where in Sidney, “learned discretion” determined the difference between an articulation of the non-existent but possible and the impossible, for Descartes it is his method and its resolution of clear and distinct ideas that makes judging that boundary possible. For Descartes the ability of mathematics to model the possible is essential for knowledge, but he admitted that

⁴⁴ Descartes, CSM 3.343.

⁴⁵ Descartes, CSM 3.343.

⁴⁶ Descartes, CSM 3.343.

it was not the only, and perhaps not even the best, language in which to create the possible.

The possibility of God and the possible triangle: a quick digression

Cartesian intensional mathematics represents a transformative disconnection of mathematical expression from reference to the material world without a loss of epistemological meaningfulness. Such mathematics are intensional in the same way that Sidnean poetry and Dee's mathematics were intensional –they represent the non-actual possible. These innovations allow Descartes to solve problems in an infinite number of dimensions. In addition to their value for mathematic writing, Descartes' intensional mathematics supplements his proof of the existence of God, who, like the non-sensible mathematical objects dealt with elsewhere, is real even if non-sensible.

The triangle, according to Descartes is real and certain, its nature determined in the act of writing; no matter that it does not exist. In the Fifth Meditation he observes: "countless ideas of things which even though they may not exist anywhere outside of me still cannot be called nothing."⁴⁷ And the same is true for the triangle: "I imagine a triangle, even if perhaps no such figure exists, or has ever existed, anywhere outside of my thought, there is still a determinate nature...of the triangle."⁴⁸ The next move Descartes makes in the meditation is to use the mere fact that he can produce the clear idea of the possible triangle to enable a proof of God;

⁴⁷ Descartes, CSM 2.44.

⁴⁸ Descartes, CSM 2.44-5.

he asks: “is this [the non-existent reality of the triangle] not a possible basis for another argument to prove the existence of God”?⁴⁹ For Descartes the idea of God is just as clear and certain as that of the triangle. As he puts it “even if it turned out that not everything on which I had meditated in these past days is true, I ought still to regard the existence of God as having at least the same level of certainty as I have hitherto attributed to the truths of mathematics.”⁵⁰ Descartes goes on to grapple with the difference between the triangle and God – namely that while the triangle need not exist for it to be real and to be talked about, God needs to be both possible and existent.⁵¹ This brief consideration of the *Meditations* suggests that for Descartes, at least, the ability to talk meaningfully about the non-actual possible in

⁴⁹ Descartes, CSM 2.45. In the original it reads: “je puis tirer de ma pensée l’idée de quelque chose,” suggesting that “produce” operates in the sense of draw out; Descartes can draw out of his thoughts/mind the idea of the triangle. The ontological argument made here and elsewhere is, as many have observed, circular – the idea of God/triangle proves the existence of God/triangle, whose existence produces the idea of God/triangle. In the case of the proof of God, the triangle analogy does not hold up at the crucial point of existence. Throughout his corpus Descartes asserts that the triangle does not have to exist actually in order for it to be real, in part because the idea of it, and his ability to write it, is sufficient to constitute reality. In the case of God, things are not so easy since God cannot exist simply in the mind and text, he must exist actually.

⁵⁰ Descartes, CSM 2.45.

⁵¹ Descartes argues that God is essentially a special case, the only one in which existence is an essential part of how we think and talk about God. Given that Descartes can no more think about God as non-existent than he can think of a triangle without three sides or three angles, he is willing to say that he is not “free” to consider “God without existence.” So like the triangle that is real in so far as it is defined in terms of its angles, lines, etc, God is real in so far as he is defined in terms of a perfect existence. Descartes insists that an absolute causal relationship exists between the presence of a mental conception and the reality of an ontological correlate in the case of God in the Third Meditation as well (CSM 2.20). For a discussion of this problem in the context of seventeenth-century thought, see Stephen Fallon’s summary in *Milton among the philosophers* (Ithaca: Cornell University Press, 1991) 22-3.

mathematics is directly related to his ability to talk about the existence and nature of God.⁵²

A mathematician creating in language

In the *Discourse*, which prefaced the collected essays that included the *Geometry*, Descartes laid out the process by which he became convinced that clear and distinct ideas were both desirable and achievable. It includes some of his most famous statements on the value of mathematics in his system, many of which have been taken to mean that the Cartesian method must depend both on mathematical operations and mathematical certainty *tout court*. Early on Descartes notes: he “was particularly pleased with Mathematics, because of the certitude and clarity of its grounds.”⁵³ In the Second Part, Descartes goes beyond his early observations that mathematics is “subtile” and “useful” to posit the simple and easy chains of reasoning used by geometers as the basis for his new rational method.⁵⁴ This new method based on geometrical proofs also “contains everything which gives certainty to the rules of arithmetic,” giving a kind of mathematical guarantee that Cartesian “intuitions” (clear and distinct ideas) can produce useful and certain knowledge. It would seem, and indeed many have argued, that a mathematized method was

⁵² The triangle analogy appears often in Descartes’ work, including in a proof of the infinite divisibility of matter. See William R. Shea, The Magic of Numbers and Motion (Canton: Science History Publications, 1991) 258.

⁵³ Descartes, Discourse 8. All subsequent citations refer to the Olscamp edition.

⁵⁴ Descartes, Discourse 16-17.

among the most important legacies of Cartesian thought.⁵⁵ Mathematics certainly figures prominently in both the *Discourse* and the essays. And, as we have seen, Descartes ushered in a new mathematic symbolism capable of creating and representing the possible; nevertheless, Descartes was not simply an advocate of mathematical possibility.

Early in the First Part of the *Discourse*, Descartes defines the genre(s) of his prose essay. Turning away from the reading of his essay as a programmatic scientific treatise, in part to avoid the blame of missing some important methodological element, he asserts that “since I am proposing only this work as, so to speak, a history (*une histoire*) – or if you prefer, a fable (*une fable*)” it can be “useful to some without being harmful to any.”⁵⁶ Rather than style his essay a pedagogical text that will delineate the rules of his new method, Descartes equivocates, backing away from a strong argument in support of the Cartesian method, instead offering the essay only as a proposition.⁵⁷ While “proposition” seems to evoke the provisional and the “so to speak” seems to slide past the difficulty of method with metaphor, I do not believe that Descartes simply meant to appear reticent here. Rather he has complicated the generic identity of the *Discourse* in order to point to a primary problem for him -- the use of narrative possibility in

⁵⁵ For a counterpoint that focuses on the relative absence of mathematics in Descartes’ method see Doren A. Recher, “Mathematical Demonstration and Deduction in Descartes’ Early Methodological and Scientific Writings,” *Journal of the History of Philosophy* 31.2 (1993): 223-244.

⁵⁶ Descartes, *Discourse* 5-6.

⁵⁷ Cottingham, Stoothoff, and Murdoch translate the passage: “I am presenting this work only as a history, or if you prefer, a fable...” (112). The original French reads “Mais, ne *proposant* cet écrit que comme une histoire, ou, si vous l’aimez mieux, [so « if you prefer » would be better] que comme une fable...” Consequently, I use the Olscamp translation, preserving the verb *proposer* as ‘to propose.’

the production of knowledge. The proposition is a troublesome genre. The term refers in multiple directions beyond those just suggested by the equivocating rhetoric. In one sense the essay can be read as “something proposed for discussion or solution; a problem, a riddle; a parable,” and indeed Descartes’ use of the term “fable” to define his essay would seem to encourage this reading. At the same time, however, given the text’s mathematical and logical emphasis, it is difficult not to read “proposition” in the sense in which it appears in the Dee/Billingsley edition of Euclid, that is, as a formal statement of a truth to be demonstrated (a theorem) or an operation to be performed (a problem). Finally, and perhaps most literally (and literarily) a proposition is not unlike the introductory part of a literary work in which the subject is set forth.⁵⁸ This last reading is in keeping with Descartes’ letter to Mersenne in which he observed that the *Discourse* was something like a “preface” or “notice on method.”⁵⁹

As a history or a fable, the essay is decidedly narrative. As Berel Lang and others have noted, Descartes’ essay on method is autobiographical, so much so that he even considered a different title for the essay, one that would have spoken more directly to this aspect of its genre, “The History of My Mind (*l’esprit*).”⁶⁰ Descartes

⁵⁸ “Proposition n^{1a-1c}” *The Oxford English Dictionary* 2nd ed. 1989. OED Online. Oxford University Press. 10 Apr. 2009 <http://dictionary.oed.com/cgi/entry/50190281>.

⁵⁹ Descartes, CSM 3.53; the letter is dated 27 February 1637. Thus the discourse “proposed” in the sense that it prefaces the three practical essays, but also in the sense that it is a problem that needs to be worked out. Consequently part of the solution is narrative and the problem lies in the debate over the moral and political status of narratives that write the possible (intensional narratives).

⁶⁰ Berel Lang, “Descartes in Meditation and Method,” *Plato, Time, and Education: Essays in Honor of Robert S. Brumbaugh*, ed. Robert Sherrick Brumbaugh and Brian Patrick Hendley (New York: State University of New York Press, 1988) 16. See also Descartes’ correspondence with Mersenne wherein he discusses the alternate title.

recounts the process by which he came to suspect received intellectual traditions (largely scholastic), how he expelled all that was not certain in his mind, and then the process by which he had gone on to develop new understanding. As autobiography it unfolds in narrative time and the use of the first-person and the past tense deflects interjection, interruption, and refutation.⁶¹ Clearly, the *Discourse* is more than just the autobiographical narrative of his intellectual development, one intended simply to recount his story without additional purpose, especially given its function as an introduction to the three other texts. But the text can also be read as a mathematical proposition, in which full narrative time is reduced and only the clear and distinct ideas linked together in something like the geometers chains remain. This allows the text to focus on a single problem and to present a multifaceted solution. As a preface the *Discourse* discusses, rather than teaches, its subject, the Cartesian method, which is then practiced or implemented in the *Optics*, *Geometry*, and *Meteorology*, where he emphasizes the practical rather than theoretical nature of the method.⁶² The subsequent essays demonstrate how the Cartesian method might illuminate old problems and offer new insight into the operations of the early modern world. As we saw in the case of the *Geometry* this practice yielded new innovations in symbolic representation and opened the door for the mathematical representation of possibilities, possibilities previously beyond the grasp of other

⁶¹ See Lang for more on the use of autobiographical narrative as a strategy that forces the reader to defer all objections until the essay's conclusion.

⁶² In a letter dated February 27 1637, Descartes wrote to Mersenne that he titled the essay *The Discourse on Method* rather than the *Treatise on Method* "in order to show that I do not intend to teach the method but only to discuss it" (Descartes, CSM 3.53).

notational practices. But it is in narrative, in history and fable, that the *Discourse* is presented, and it is narrative that lies at the heart of the problem that the *Discourse* proposes to solve.

The World

If narrative possibility is a significant element of the *Discourse*, it is absolutely essential to the one Cartesian text that might be properly called fiction: *The World*. Descartes wrote to Mersenne in April of 1634 to explain why he had not yet shared his philosophical writings with the Minim mathematician. Citing, as he did in multiple letters from that year, the prosecution of Galileo for heresy for his 1632 *Dialogue Concerning the Two Chief World Systems*, Descartes decided to suppress what he had thus far written. The decision was based not on a belief that he was wrong, or on his own reticence to act as an instructor for others, but in his belief that he could not adequately defend his ideas against a Church inquisition.⁶³ “I must tell you,” he wrote, “that all the things I explained in my treatise, which included the doctrine of the movement of the earth, were so interdependent that it is enough to discover that one of them is false to know that all the arguments I was using are unsound. Though I thought they were based on very certain and evident proofs, I would not wish, for anything in the world, to maintain them against the authority of the Church.”⁶⁴ Descartes was not equivocating on the value of his philosophic writing, but he had fully adopted a defensive rhetoric designed to protect him from

⁶³ See the February 1634 letter to Mersenne for an example of Descartes discussing his reticence to instruct. Descartes, CSM 3.41-2.

⁶⁴ Descartes, CSM 3.42.

charges of heresy. He recognizes that the interdependencies of his own argument are such that a single false proposition would render the entire philosophical work invalid. Consequently, he is unwilling to risk placing his work before the scrutiny of the public and the church, which if it revealed a single error would destroy the carefully linked chains of reasoning. He preferred, as he said, to live “unseen,” to “keep quiet” about his own work. This meant taking a rigid stance with respect to Galileo’s work, the results of which he categorically denied in the same letter, and a rapid sequestering of his own ideas. Yet, the conclusions about the motion of the earth were not considered to be any “less probable” according to the clearly shaken philosopher who hopes that one day his own work “may yet see the light of day.”⁶⁵ Part of what disturbed Descartes about the Galileo affair was the challenge to hypothetical thought and writing, the rejection by the Church of the provisional status of the possible. As Descartes observed, the Church accused Galileo of having “pretended he put forward his view only hypothetically,” and the charge of heresy consequently seemed to Descartes to “forbid even the use of this hypothesis.”⁶⁶

The texts that Descartes was too shaken to send to Father Mersenne were *The World or Treatise on Light (Le Monde de M. Descartes ou le Traité de la Lumière)* and the companion essay the *Treatise on Man (L’Homme de René Descartes)*. The two were composed in French between 1629 and 1633, and they were separately

⁶⁵ Descartes, CSM 3.43-44.

⁶⁶ Descartes, CSM 3.43.

published posthumously in 1664.⁶⁷ Both texts, and Descartes' fear concerning their publication, haunt the *Discourse*. *The Treatise on Light* emerges in Part Five of the *Discourse*, a kind of narrative eruption within this history of Descartes' thought. Worried about both debate and moral censure, he recounts not wanting to bring what was discussed in the *World* "too much into the open."⁶⁸ In order to be "free to say what I thought...without having either to follow or refute the accepted opinions of the learned," Descartes reports that he "left our world behind...to speak solely of what would happen in a new world." Dismissing an epistemological and ideological context cluttered by the demands of ancient learning and piety, Descartes, as he himself testifies, adopted an intensional, world-constructing mode for *The World*. This world is constructed as a closed system, one in which indubitable laws of nature (mechanics) "are such that, even if God created many worlds, there could not be any in which they failed to be observed."⁶⁹ A divinely authorized discursive (rather than mathematical) form and imaginative, or fictional, mode of knowledge re-emerge in Descartes' *Discourse*, which is likewise positioned as a "fable," placing

⁶⁷ For more on the publication history, including a Latin translation of *L'Homme*, which appeared in 1662, see Descartes, CSM 3.79. While the title of the first section, as published alone in 1664, was *Le Monde de Mr. Descartes ou le Traité de la Lumière* (*The World of Mr. Descartes or the Treatise on Light*), this text reads simply as a treatise on light. Consequently, I follow Gaukroger in order to distinguish among the individual treatises that make up *The World*. Gaukroger calls the unified text *The World* and the individual treatises *The Treatise on Light* and *The Treatise on Man* in order to distinguish between the complete, though lost, text and the individual sections. For an excellent discussion of the events that may have precipitated the writing of *The World*, see Paul S. MacDonald, "Descartes: the lost episodes," *Journal of the History of Philosophy* 40.4 (2002): 437-60.

⁶⁸ Descartes, CSM 2.132.

⁶⁹ Descartes, CSM 2.132.

the problem of narrative possibility at the center of his preface for the essays on mathematical practice.⁷⁰

Descartes, ambitious as always, had resolved to “explain all the phenomena of nature” with *The World*.⁷¹ He believed he had found “a way of unfolding all my thoughts which some will find satisfying and with which others will have no cause to disagree.”⁷² According to Sylvie Romanowski, *The World*, though suppressed, “occupies a crucial position in Cartesian writing in that it marks the introduction of discourse into his production, and as such prepares the way for the later philosophical works.”⁷³ In addition to introducing a rhetorically produced discursive relationship between reader and author (Romanowski points to Descartes’ use of “vous” (you) and “je” (I) in this text), *The World* also introduces possible worlds or intensional fiction as an epistemologically useful mode.⁷⁴ While we are accustomed to referring to Descartes’ “unfolding” in terms of the kind of mathematical precision advocated in the *Discourse*, examples from *The World* suggest there is something about poetic fiction and its ability to communicate or explicate the non-actual possible that should play a greater role in our understanding of Cartesian unfolding.

⁷⁰ Descartes, CSM 2.112.

⁷¹ Descartes, CSM 3.7.

⁷² Descartes, CSM 3.7-8.

⁷³ Sylvie Romanowski, “Descartes: From Science to Discourse,” *Yale French Studies* 49 (1974): 101.

⁷⁴ Romanowski 102. It is important to note that while from a modern perspective *The World* is clearly fiction, Descartes would not have used that term to describe the text. “Fiction” for Descartes denoted an intellectually unhelpful imaginative construct that did not live up to the standards for clear and distinct demonstration.

The World presents a number of challenges when approached as a single text. Suppressed in Descartes lifetime by the author, when the material was finally published, it was as two separate incomplete treatises (they do not fully conclude and the second includes reference to some intervening material), and a third text mentioned by Descartes and known as the *Treatise on Metaphysics* was never published and is now lost.⁷⁵ While he suppressed the complete treatise, Descartes cannibalized the text for parts of the *Meteors* and *Dioptrics*, and he discusses the text in the *Discourse*.⁷⁶ *The Treatise on Light* ends rather abruptly, though whether this is intentional or the result of a loss is unclear. Nor is it clear if the *Treatise on Metaphysics* would have intervened between *Light* and *Man*, or followed *Man* (although the later is suggested by the text itself). At any rate, today the text does not read as an integrated narrative.⁷⁷ Nevertheless, the two texts do preserve the fictional frame of *The World*, which, interestingly, is itself only introduced after five opening chapters on the nature of motion and light.⁷⁸

The Treatise on Light offers in fifteen chapters “an account of light,” which aims to *suggest* to the reader that there may be a “difference between the sensation

⁷⁵ Stephen Gaukroger, Introduction, *The World and Other Writings*, ed. Stephen Gaukroger (Cambridge: Cambridge University Press, 1998) xxix. According to Cottingham, et. al. there are two missing chapters that would come between the two extant texts. They do not specify the nature of those texts, do they suggest that the treatise on the soul that Descartes mentions in the *Treatise on Man* was ever written (CSM 1.79-80).

⁷⁶ Gaukroger vii.

⁷⁷ Descartes’ suggests in both *Man* and the *Discourse* that the section on the “rational soul” was to follow the *Treatise on Man*; this, however, would not account for what is perceptibly missing between the *Treatise on Light* and the *Treatise on Man*.

⁷⁸ Again I follow Gaukroger’s usage which distinguishes between the extant texts and the text of which they seems only to be a part remaining. It is, however, contrary to the usage of some scholars, such as Shea, who refer to the text exclusively as unified.

that we have of it [light], that is, the idea that we form of it in our imagination through the intermediary of our eyes, and what it is in the objects [e.g. the sun] that produces the sensation in us.”⁷⁹ The suggestive, rather than declarative, tone taken by Descartes is woven throughout the treatise, functioning as a kind of hypothetical framework that allows Descartes the epistemological and moral latitude to make his rather remarkable propositions. He does not “promise to set out exact demonstrations” but wants, rather, only “to raise a doubt” about the nature of light.⁸⁰ Descartes “hopes” that this doubt will, in turn, lead his readers to entertain the supposedly innocuous possibility that light is in fact motion, and that motion can explain the creation of the world.⁸¹

Descartes begins with an analogy between natural language and the natural signs of the experiential world. Descartes argues:

as you know, the fact that words bear no resemblance to the things they signify does not prevent them from causing us to conceive of those things [. . .] Now if words, which signify something to which they bear no resemblance, why could not nature also have established some sign which would make us have a sensation of light, even if that sign had in it nothing that resembled this sensation?⁸²

⁷⁹ René Descartes, *The World and Other Writings*, ed. Stephen Gaukroger (Cambridge: Cambridge University Press, 1998) 3; Descartes proposes that light is the “sign” of “a centrifugal effect of its [the sun’s] axial rotation” viii. See Shea (251-277) for a detailed account of motion in the two treatises.

⁸⁰ Descartes, *World* 32 and 6.

⁸¹ For an excellent overview of how doubt works in Descartes’ writing, see John Cottingham, *Descartes* (Boston: Blackwell Publishing, 1986) 29-35.

⁸² Descartes, *World* 3-4.

According to Descartes, the phenomena of nature function like conventional language, depending on predetermined signifying conventions to link sign to referent. Light, like words, simply signifies something else -- motion.⁸³ The analogy depends on a set of nested assumptions. First, that Descartes' readers will accept the radical conventionality of human language – a by no means settled issue in the first part of the seventeenth-century. This assumption is based in what Romanowski has called Descartes' theory of motivated natural signs, which is itself based in Descartes' acceptance of the postulate of universal harmony and the consequence that a necessary correspondence exists between knowledge and language.⁸⁴ In the case of nature, the divinely made (motivated) signs reveal the nature of creation. Problems arise for Descartes between his early work, where man must seek to read the signs of nature through experience, and his later work, where sensation is disavowed as deceptive. This tension is present already in the *Treatise on Light*. Descartes argues that light *is a sign of motion, not light itself*, and this argument depends on his ability to disrupt our “commonsense” sensation of light perception. At the same time that he works to produce doubt about sensation, the premise of his use of the “fable” is that the analogy between the fictional world and the real world can only produce knowledge if experience suggests that the analogy works. Beyond that, Descartes' theory of language is, from a modern perspective, sloppy. In this instance, light is a conventional sign, but moments later light is indexical (or

⁸³ Descartes, World 7-8.

⁸⁴ Romanowski 97.

symptomatic) like the “laughter and tears” that signify joy or pain.⁸⁵ Nevertheless, both the index and the conventional sign trouble the common interpretation of nature as a legible text by placing interpretation firmly at the center of understanding. Descartes couples this revision of the book of nature trope with his argument regarding the deceptiveness of the senses to argue that a fictional physico-mechanical heuristic is necessary to properly read natural signs.

Light as the sign or index of motion occupies the first five chapters of the treatise. While not yet a fictional tale, in keeping with his understated goal, provisional language and the idiom of imagination feature throughout the opening five chapters; Descartes and his readers can “readily [...] imagine to ourselves” that light and all other sensations are really just motion – there’s nothing “incredible” in that.⁸⁶ At the close of chapter five, however, Descartes introduces a new form to match the discursive provisionality of the early sections of the treatise:

Many other things remain for me to explain here, and for my own part I would be happy to add a number of other arguments to make my opinions more plausible. But so as to make this long discourse less boring for you, I want to wrap up part of it in the guise of a fable, in the course of which I hope the truth will not fail to manifest itself sufficiently clearly, and that this will be no less pleasing for you than if I were to set it forth wholly naked.⁸⁷

⁸⁵ Indexical in the sense developed by C.S. Pierce. Indices always point, reference, or suggest something else. “A sundial or a clock indicates the time of day . . . A rap on the door is an index . . . Anything which focuses the attention is an index” (Peirce 109). Furthermore, Peirce outlined three types of index: tracks, symptoms, and designations (Johansen 2002, 32). Gaukroger, however, expresses discomfort with the argument that there is a conventional or mental interpretation of natural signs in Descartes’ work (4).

⁸⁶ Descartes, World 20 and 9.

⁸⁷ Descartes, World 21; on the discursive form of the first five chapters of the *Treatise on Light* see Romanowski 99-105.

Rather than supplying additional evidence to increase the “plausibility” of his thesis, Descartes has proposed a more pleasant and, in his view, equally compelling, fictional narrative. As in the *Discourse*, which would follow four years later, this fable is meant to be “useful to some without being harmful to any.”⁸⁸ The utility of the fable is its ability “not to explain the things that are *in fact in the actual world*,” but to allow Descartes to “make up...a world in which there is nothing that the dullest minds cannot conceive.”⁸⁹ While creation may not have happened in the “old world” in the way that Descartes imagines for his mechanical world, nevertheless, “since everything [...] here can be imagined distinctly, it is certain that [...] God can create everything we imagine.”⁹⁰ Descartes has set up a poetic world just as intensional as the triangle and the chimera he discussed with Burman.

The ability to write the possible is thus of central concern to Descartes; his world *is* a possible but non-actual world, and one that will provide clear and useful knowledge. Descartes believes that the clarity of the argument is unmitigated by its presentation as fable: via the fable the “truth will not fail to manifest itself sufficiently clearly.” While his may be a possible world only, Descartes believes that useful knowledge can be derived from this “fable.” And as was the case with mathematic possible worlds, the clarity and rigor derive from the fable’s nature as closed and coherent system, one capable of demonstration “independent from

⁸⁸ Descartes, CSM 1.112.

⁸⁹ Descartes, World 24.

⁹⁰ Descartes, World 24.

experience.”⁹¹ However much the narrative is carefully circumscribed by the principles of inclusion and exclusion laid out in the first five chapters, Descartes insists on its analogical operations throughout the text. And in so doing makes the case for the value of the fable – as a model it can “provide an explanation of the true nature of things.”⁹² Using “assumptions which are agreed to be false” allows Descartes to leave biblical creation unchallenged, while still having the opportunity to provide “a much better explanation of the nature [of creation] than if we merely described things as they are now.”⁹³ While the clarity and rigor of the possible world are internally constituted, the ability of the fiction to operate as an explanation of reality depends upon agreement between the fiction and “experience.”⁹⁴ Descartes’ intentional prose operates analogically, nevertheless it remains a possible world rather than a mimetic image of “things as they are now.” The fictionality of possible worlds is not a merely pleasurable detour for Descartes – the kind of mental recreation figured by other writers of the period. For Descartes, fiction is the most clear and distinct mode for the presentation of a world for which it is not “possible to think up any alternative” that is “simpler, or easier to understand, or even more probable.”⁹⁵

⁹¹ Cottingham, Descartes 90.

⁹² Descartes, CSM 1.255-6.

⁹³ Descartes, CSM 1.256.

⁹⁴ Descartes, CSM 1.257.

⁹⁵ Descartes, CSM 1.257.

At the same time, however, this fable is to render the truth “no less pleasing” than if “wholly naked.” In contrast to the “false sciences” of alchemy, astrology, and cabbalism, which were important for Dee (and Cavendish, as we will see shortly), Descartes’ mechanical fiction does not, he argues, deceive or trick its readers.⁹⁶ At the same time that the fiction allows Descartes to both avoid offense and offer the most compelling model of the way the world works, it also, according to his metaphor, dresses the naked mechanist philosophy that lies beneath. While the discursive and provisional nature of the treatise may prepare a reader for a foray into fiction, the sudden arrival of the fictional remove (this is *not* our world we are talking about after all) at the close of the fifth chapter is a somewhat jarring shift, though not completely out of character. A reader familiar with Descartes’ work in the 1620s and 1630s recognizes the characteristic impatience that Descartes exhibits when writing the details or applications of his various hypotheses. That he turns to fabulation is not unique but it is, nevertheless, abrupt. And, in the end, the dressing of his mechanical creation theories feels as though it is an ill-fitting suit, somehow not enough to cover the naked philosophy at work underneath.

The question of what Descartes’ fable-frame does for him, especially given his dismissal of fable and the fictitious elsewhere, is not easily answered. For Stephen Fallon, the fiction is “itself a fiction,” one that is a “strategic evasion” rather than a genuine deployment of the intensional mode.⁹⁷ For Shea, who treats *The*

⁹⁶ Descartes, CSM 1.115; also noted in Paul S. MacDonald, “Descartes: the lost episodes,” Journal of the History of Philosophy 40.4 (2002) 12.

⁹⁷ Stephen Fallon, Milton Among the Philosophers (Ithaca: Cornell University Press, 1991) 29.

World in a chapter that features only one mention of its fiction, it seems to be a non-issue with the text to be read in much the same way as the philosophical treatises.⁹⁸ Where Fallon feels the fiction to be mere evasion, Romanowski reads the fiction as both the “maximum fulfilment of the discursive form taken early on in the text and as a kind of trap for Descartes, who has created a fiction of a world that can “never prove anything about the real one” -- for her, the closed nature of the possible world makes it impossible for Descartes’ strategy of analogy to function at all.⁹⁹ But if we think about it in terms of intensional, world-producing discourse, along the lines of Descartes’ pluri-dimensional mathematics and his chimera-like triangle, then we can see that the poetic world, unlike the fictions that Descartes dismisses, functions as something real even if non-existent. And we see this in the quotation offered earlier about Descartes’ mechanical world as one that does not exist as does the “actual world.” Instead, this mechanical world, just like the chimera and the triangle that were built on “clear and distinct ideas,” is possible; it is “imagined distinctly” with a rigor that assures that it is *not* an “impossible” world, but a possible world that God has the power to call into material being. It is the “construction of a new cosmogony, by words, right in front of the reader” and its value lies in the ability of the divine to bring that word-world into material being.¹⁰⁰ Consequently, we cannot

⁹⁸ Shea 268.

⁹⁹ Romanowski 106.

¹⁰⁰ Romanowski 108. Despite her insightful reading, Romanowski misses the way in which the possible world with its rhetorical bridges offers the kind of insight argued by Descartes. Rather than reading him as “trapped” by his fiction, I see the text as a collaborative construction by author and reader of a new world and its inhabitants, and a simultaneous consideration of the insight that such construction may offer us about the origins of the world from which we read.

simply dismiss his use of fiction as mere evasion, nor can we simply ignore it. As a kind of thought experiment into the way that things may work in a world where God starts not with Genesis, but with motion, the fable of *The World* depends upon the epistemological utility of the possibility that creation can happen as he hypothesizes it and then the dialectic of understanding that moves between that possible world and its analogue, the real world.

In order to build this possible world, Descartes asks his readers to allow their thoughts “to wander beyond this world [Earth] to view another, wholly new, world, which I call forth in imaginary spaces before it.”¹⁰¹ Though “called forth” by Descartes’ writing, he does not invent these “imaginary spaces.” Rather, the spaces in which his new world will emerge were “invented” by philosophers, according to Descartes, who is referencing the theological debate over the finitude of creation and the reality of a plurality of worlds in the created universe.¹⁰² As Descartes sets up his fable, there is a clear sense of anxiety that creation of his mechanical possible world in an infinite imaginary space might lead to a sense of destabilization in the reader. Queen Christiana of Sweden was such a reader, afraid that an infinite universe would “abolish man’s special place in the world.”¹⁰³ Consequently, he provides a limit for his readers, to keep infinitude from “impeding and hampering” their imaginative thought.¹⁰⁴ Rather than “go all the way,” and induce a cognitive

¹⁰¹ Descartes, *World* 21.

¹⁰² Descartes, *World* 21; on plurality of worlds see note 41 on that same page.

¹⁰³ From correspondence quoted in Shea 260.

¹⁰⁴ Descartes, *World* 21.

vertigo, readers are encouraged to go only “far enough to lose sight of all the creatures that God made.”¹⁰⁵ Leaving behind the known created world, Descartes and his readers stop “in some definite place” where God has created enough matter “anew” to fill up this imaginary space.¹⁰⁶ With such assertions Descartes is constantly reassuring his reader that there is nothing theologically dangerous in his possible world scenario, but further assurance is also forthcoming. He continues: “and in order that there be nothing in this assumption [about infinite space] that you find objectionable, let us not allow our imagination to extend as far as it could, but purposely confine it to a determinate space” while still allowing that “what God has created extends indefinitely.”¹⁰⁷ This restriction is not one of creation, as the note on God’s creation makes clear. Rather, it is one that “limits the actions of our mind” rather than the “works of God.”¹⁰⁸ Thus, Descartes “rein[s] in his imagination” and that of his reader.¹⁰⁹ The restriction also introduces the distinction between indefinite limit, which limits the actions of the mind, and infinity. The distinction, which Descartes claims to have invented, allows him to maintain that God’s powers are infinite, but to contain the creative power of the human mind to something slightly lower, the indefinite.¹¹⁰ This allows for expansive creation while avoiding the heresy of claiming a power of creation just like that of God. And it

¹⁰⁵ Descartes, World 21.

¹⁰⁶ Thereby avoiding the suggestion of an imaginary void.

¹⁰⁷ Descartes, World 22.

¹⁰⁸ Descartes, World 22.

¹⁰⁹ Shea 260.

¹¹⁰ Descartes, CSM 3.140; from a letter to Mersenne dated Nov 13 1639.

should be noted that while Descartes' "fable" may appear to be his creation, he constantly affirms that God would be the agent of this creation, were it real.¹¹¹

The anxiety of the narrative frame, both its insistence on non-actual possibility and on God's primary agency in creation, for all its foregrounding in Chapter Six, falls quickly away as the text progresses. It appears, after seven intervening chapters, only briefly at the end of Chapter Thirteen and then again at the beginning of Chapter Fifteen and does not return to the *Treatise on Light* after that. The brief moments in these two chapters illustrate the degree to which the fable offers only the most diaphanous of coverings for the "naked" philosophical work of the treatise. Having demonstrated the nature of light and its perceptible motion that is exerted from the sun on the eye of the observer, Descartes closes the chapter observing that "now one must know that the men of this new world will be of such a nature that, when their eyes are pushed in this fashion, they have a sensation very similar to that which we have of light."¹¹² With seven intervening chapters that offer in rigorous detail the nature of light and the sensation of visible light, the reader is, in effect, reintroduced to a lost narrative thread with this observation. While readers can easily slip into reading identity between the eyes, nerves, and motions described and their own, the close of the chapter reasserts that this identity is merely a similitude.

Descartes' opening to Chapter Fifteen produces a similar effect:

¹¹¹ Descartes, *World* 23.

¹¹² Descartes, *World* 62.

[h]aving thus explained the nature and properties of the action I have taken to be light, I also need to explain how, by its means, the inhabitants of the planet I have assumed to be like the Earth can see the face of their heaven to be just like that of ours.¹¹³

The possible men of the new possible world see not only light just as we do, they also see the heavens as we do; it is a sly analogy that both insists on similitude rather than identity *and* posits an identical location in time and space given that the heavens can only be “just like” ours from a point of view identical to ours.

Romanowski notes several other features that similarly elide the difference between Descartes’ fictional world and the real world. His identification of planets and comets, suns and stars, all serve “the essential purpose of connecting the two universes [. . .] thus natural conventional language is pressed into a connotative function to guide the reader back into the known world.”¹¹⁴

With the text in a partial state, we cannot know how the fable may have functioned in the missing text, nor do we know if it may have wrapped up the somewhat abruptly ending *Treatise on Light*. We can, however, see the similarly thin but importantly analogical way that it operates in the *Treatise on Man* with which *The World* ends.¹¹⁵ The treatise begins by talking about the possible men of his possible world. “These men,” Descartes states, “will be composed, as we are, of a soul and a body” thereby constituting “men resembling us.”¹¹⁶ The futurity

¹¹³ Descartes, *World* 67.

¹¹⁴ Romanowski 107.

¹¹⁵ While the *Treatise on Man* includes reference to a missing treatise on the “rational soul,” that would seem to follow *Man* and close the *World*, it is the opinion of many editors of Descartes’ work that *Man* was meant to be the final text.

¹¹⁶ Descartes, *World* 99.

expressed here is in accord with Descartes' previous indication that this world may be possible, but has not yet, in fact, been created. In contrast to the *Treatise on Light*, where the few references to the inhabitants of the new world are to "men," the *Treatise on Man* quickly substitutes "machines made of earth" for "men."¹¹⁷ These mechanical men, who are like automata, clocks, and other man-made machines, are far superior given that it is God's greater "ingenuity," not man's, which will make them.¹¹⁸

As in the previously discussed treatise, the narrative frame frequently operates by analogy, closing the rhetorical distance created by Descartes' new use of the term "machine" for his possible men.¹¹⁹ Their blood is like our blood and as regards the flow of blood through the valves of the heart, "the arrangement of certain little doors or valves which the anatomists have noticed in several places along the veins is enough to convince you that the same happens in us."¹²⁰ Yet the rhetorical distance created by the narrative frame and the use of the term "machine" is largely lost as Descartes begins to talk about the details of particular organs. The heart is not discussed as the machine's heart, simply as a heart, as are all of the other organs. Consequently, it is very hard not to read his discussion as referring to the human heart that feeds the human brain by way of human arteries. This collapsing effect is exacerbated by the infrequency with which Descartes returns to

¹¹⁷ Descartes, *World* 99.

¹¹⁸ Descartes, *World* 99.

¹¹⁹ See also Jonathan Sawday's *Engines of the Imagination: Renaissance culture and the rise of the machine* (New York: Routledge, 2007) 251-2 and 286 for more on Descartes use of the machine-men.

¹²⁰ Descartes, *World* 103.

the fictional frame by way of reminders that this is a possible machine he is talking about. Though not as pronounced an absence as in the *Treatise in Light*, the frame is often disappears as a point of reference for five or more pages, and up to as many as fifteen. The absence of the fictional frame is marked, and its return is often just as jarring as its first introduction in Chapter Five of the *Treatise on Light*.

Descartes went to great lengths to explain to Burman that his mathematic entities were more than just “fictions,” that they were real by virtue of the possibility of their existence. His poetic creation, in ways not seen in the discussions of mathematics, makes constant connections between that which does exist and the possible entities of his machine-world. The unfolding of the narrative, especially in *Man*, frequently collapses distinctions between human anatomy and that of the mechanically created machine-men. Nevertheless, Descartes seems to have carefully crafted a poetic world, which, despite its many linkages to the material world, is an alternate possible world. Though Descartes suppressed the text, the possible world created therein persisted as an available piece of evidence in support of his theories of motion and the operation of the human body printed in his lifetime.

In so far as both mathematics and poesie (or “fable”) are ways to write the possible for Descartes, his work synthesizes the theoretical work of both Sidney and Dee. While an intensional mathematics was not yet fully differentiated from abstract, and therefore mimetic, mathematics in the work of Dee, by using symbolic equations and other mathematical entities that are explicitly acknowledged to not reference material being Descartes fully distinguishes his mathematics from abstractionist modes. While we may not be able to say that following Dee

intensional mathematics was pervasive, it is reasonable, given the popularity and wide dissemination of Cartesian mathematics to say that such was the case after the 1630s. At the same time, Cartesian mechanics was first fully articulated in a fable that Descartes was “too much in love” with to fully suppress, despite the decision to not publish *The World*.¹²¹ Descartes’ affection for *The World* led him to refer to the text, and its possible world capable of certain demonstration, repeatedly in his subsequent work. While the poetic possibility of the world would not be seen until after his death, its intellectual value was everywhere alluded to during Descartes’ lifetime. Consequently, in the Cartesian corpus we have a, perhaps unique, example of the intensional mode in natural and mathematic language.

¹²¹ CSM 3.28; see also Descartes’ extensive correspondence with Martin Mersenne in the early 1630s for more on the composition of *The World*.

Chapter Four: “A sufficient School to study in,” Margaret Cavendish’s poetic natural philosophy

Margaret Cavendish spent her life exploring the many forms appropriate to a natural philosophy based on her belief in the infinite variety of nature. Throughout her extensive corpus she searches for the modes of knowledge production and communication appropriate to her sense of the provisional and partial nature of knowledge. In the course of this search she argues that an intensive poetic mode, what she calls the “romancicall,” is the ideal mode for understanding, because it allows for the production of multiple possible worlds. Even as she asserts that poetic philosophic inquiry is ideal, Cavendish carefully assigns mathematic explorations of the possible to divinity alone. Philip Sidney defended poetry as a technology of the possible, and John Dee did the same for mathematics. René Descartes greatly expanded the scope of possibility modelled by mathematics, and, at the same time, depended upon poetry to represent a possible world created by a single mechanical event. Cavendish, who was tutored in mathematics and who extensively engaged with natural philosophers such as Hobbes, Descartes, and others, rejected math as an appropriate tool for *human* inquiry and instead advocated for a purely poetic approach to the possible.

This chapter focuses on Cavendish’s late prose narrative *The Description of a New World, Called the Blazing World* (1666 and 1668), while also considering a wide

range of her other prose and poetic texts.¹ I will also discuss the *Observations on Experimental Philosophy*, which was published along with the *Blazing World* in both the 1666 and 1668 editions.² As Cavendish suggests, these two texts are as distinct, in conventional generic terms, as “two worlds at the end of their poles.”³ Her *Observations* is written as a philosophical treatise, often in the form of a refutation, and the *Blazing World* is an imaginative prose fiction evocative of later novelistic forms. While the formal disparity is significant, the two texts, nevertheless, are part of Cavendish’s consistent effort to write in a propositional mode characteristic of intensive poesis.⁴ In addition to the *Observations* and *Blazing World*, I also discuss her *Philosophical Letters* (1664).⁵ I read these three texts together because they are the final form of Cavendish’s long-developing natural philosophy. Subsequently, Cavendish published only the historical biography of her husband, *The Life of The Thrice Noble, High, and Puissant Prince William Cavendish, Duke, Marquess and Earl of Newcastle* (1667) and the *Plays Never Before Printed* (1668) before her death in 1673. Because each of these texts extends or refines ideas found in her earlier prose and poetic texts, I will be touching briefly on much

¹ Margaret Cavendish, *The Description of a New World, Called the Blazing World*, ed. Kate Lilley (New York: Penguin Classics, 1992). The modern edition will be used for all citations though several first editions have also been consulted in the course of research.

² Margaret Cavendish, *Observations upon Experimental Philosophy* (London 1666). The first edition is cited throughout because my research was done using this edition. Eileen O’Neill has an excellent modern edition out at this time (Cambridge: Cambridge University Press, 2001).

³ Cavendish *Blazing* 124.

⁴ See my introduction for a full discussion of this term.

⁵ Margaret Cavendish, *Philosophical Letters: or, Modest Reflections Upon Some Opinions in Natural Philosophy, Maintained by Several Famous and Learned Authors of This Age, Expressed by Way of Letters* (London: 1664).

of the Cavendish corpus in the course of this chapter, though *Blazing World*, *Observations*, and *Philosophical Letters* will remain its central focus.⁶ Missing from my analysis is Cavendish's extensive body of dramatic work, which would raise considerable formal issues beyond the scope of this chapter.

On Methods: Reading Natural Philosophy

One challenge a reader of Cavendish's works faces is the nature of her project, which as much epistemological as it is literary. In some cases, Cavendish's concern is with knowledge of politics and a politics of knowledge, as Susan James has observed.⁷ Most often, however, Cavendish is concerned with what we now refer to as "natural philosophy," a rather broad category that, as Peter Dear puts it, refers "to systematic knowledge of all aspects of the physical world, including living things [. . .], as God's creation."⁸ Like her male contemporary natural philosophers, Cavendish seeks to discover the forms and modes that would best convey the

⁶ I am not discussing Cavendish's extensive dramatic work because the rhetorical strategies in these three texts marks out the boundaries of inclusion and exclusion reproduced in this chapter. Additionally, significant formal issues that would be introduced by the inclusion of her dramatic works that would extend the scope of this chapter beyond reasonable boundaries. None of which is to say that her dramatic work does not engage with several of the major issues discussed in this chapter. On Cavendish's use of drama in philosophic inquiry see: John Shanahan, "From Drama to Science: Margaret Cavendish as Vanishing Mediator," *Literature Compass* 5 (2008); Emma L. E. Rees, *Margaret Cavendish: Gender, Genre, and Exile* (Manchester: Manchester University Press, 2004): 166-185; Annette Kramer, "'Thus by the Musick of a Ladyes Tongue': Margaret Cavendish's Dramatic Innovations in Women's Education," *Women's History Review* 2.1 (1993): 57-80; and Martha Straznicky, "Reading the Stage: Margaret Cavendish and Commonwealth Closet Drama," *Criticism* 37.3 (Summer 1995): 355-90; and Sophie Tomlinson, "'My Brain the Stage': Margaret Cavendish and the Fantasy of Female Performance," *Women, Texts, and Histories* (London: Routledge, 1992): 134-163.

⁷ Susan James, *Margaret Cavendish: Political Writings* (Cambridge: Cambridge University Press, 2003).

⁸ Peter Dear, *Revolutionizing the Science: European Knowledge and Its Ambitions, 1500-1700* (Princeton: Princeton University Press, 2001) 199.

breadth of her understanding of natural knowledge and of its limits. A major difference between Cavendish and the men with whom she engages, however, is Cavendish's belief in the absolute variability of nature. Because of her commitment to this variability, Cavendish's natural philosophy was in some ways an anti-systematic system.

This philosophical commitment is also manifested as formal diversity in her corpus; the variety of Cavendish's writing is a direct product of her belief in the variability of nature and her attempts to represent such variation. While this includes some magnificent literary writing – compelling poetry, engaging imaginative fiction, and vibrant drama – Cavendish is not interested in producing what she thought of as the “idle fictions” of literary discourse.⁹ In this sense, she is very much like Descartes who distinguished between imaginative *The World* and misleading “fiction.” For Cavendish, imaginative texts such as the *Blazing World* are “a voluntary creation or production of the mind,” which, as an “effect” of reason, search out “rational probabilities.”¹⁰ As such, for Cavendish, imaginative writing operates on a continuum with other philosophic modes of writing rather than opposing them. At the same time, Cavendish considers the epistemological value of such imaginative writing to distinguish it from “fiction.” My focus on the intensional mode in her natural philosophy allows for a reading of this continuum as such,

⁹ This was Sir Thomas Browne's formulation of the literary and is characteristic of numerous critiques of fancy, romance, and imaginative fiction throughout the seventeenth-century. Sir Thomas Browne, *Pseudodoxia Epidemica* (London 1646) I.ix.37.

¹⁰ Cavendish, *Blazing* 123.

revealing the diversity of Cavendish's work as the formal embodiment of her belief that all knowledge is provisional knowledge. If diversity of form is an index of the provisionality of knowledge, as I suggest it is for Cavendish, then the hierarchy of genres dissolves and a plenitude of equivalent forms takes its place. Further, reading for intensional modes makes clear that Cavendish's category of romance can be considered a sub-genre of Sidney's "right" poetry in so far as such poetry is the representation of the "non-actual possible." For Cavendish, romance *qua* poetry is epistemologically equivalent to other forms of writing. Because in Cavendish's system the diversity of nature, its "irregular" forms, forecloses the possibility of systematic or certain knowledge, even writing that is extensional and refers to actualized instances is always only a statement about that particular actualized possibility and *not* a representation of an underlying order or cause. Accordingly, poetry and the philosophic essay are modes of writing along a continuum of possibility, extending from the non-actual possible to the actualized possible, rather than operating as oppositional kinds. As a result, Cavendish's theory of knowledge and its communication suggest that we read texts like the *Blazing World* and *Observations* as worlds at two ends of *one* pole, rather than as worlds at the far end of opposing spectra.

As I suggest, Cavendish's work engages primarily with questions of knowledge, and in the case of *Blazing World*, with the knowledge that alternative worlds offer. Nevertheless, scholars have regularly read her work as explicitly (and

primarily) proto-feminist and/or as utopian.¹¹ Mary Baine Campbell reminds us of the difference between “world-making” texts and utopian texts: utopian texts are not “really version[s] of ‘other worlds’” but are, instead, idealized and often moralizing revisions of the world as it is.¹² I agree with Campbell’s decision to take Cavendish’s claim that the *Blazing World* is a “new world . . . of my own creating” to be an effective rhetorical distancing from the more mimetic mode used in utopian fictions.¹³ The other tendency to set Cavendish off from her contemporaries as a proto-feminist writer is partially the result of the way we continue to privilege gender when reading women’s natural philosophy writing. As Deborah Boyle has observed this has resulted in readings of Cavendish that fall into three groups: arguments that her early poems present an alternative, female way of knowing; arguments that such an alternative epistemology occurs in the *Blazing*

¹¹ Such scholarship has focused largely on the *Blazing World*, often neglecting completely the connections between this text and texts such as the *Observations* and *Philosophical Letters*. As utopian see: Rachel Trubowitz, “The Reenchantment of Utopia and the Female Monarchical Self: Margaret Cavendish’s *Blazing World*,” *Tulsa Studies in Women’s Literature*, vol. 11 (1992): 229-246 or Marina Leslie “Gender, Genre, and the Utopian Body in Margaret Cavendish’s *Blazing World*,” *Utopian Studies* 7.1 (1996): 6-24. See also Line Cottegnies and Nancy Weitz, eds, *Authorial Conquests: Essays on Genre in the Writings of Margaret Cavendish* (Madison: Fairleigh Dickinson University Press, 2003) 9-10; Kate Lilley “Blazing Worlds: Seventeenth-Century Women’s Utopian Writing” *Women, Texts, Histories*, ed. Clare Brant and Diane Purkiss (New York: Routledge, 1992). Criticism such as Catherine Gallagher’s “Embracing the Absolute” focuses on the fashioning of female subjectivity through literary production. Rosemary Kegl does an excellent job of considering the larger philosophical project of Cavendish; her argument nevertheless turns on a feminist interpretation that I question. Catherine Gallagher, “Embracing the Absolute: The Politics of the Female Subject in Seventeenth-Century England,” *Genders*, vol. 1 1988: 24-39. Rosemary Kegl, “‘The World I Have Made’: Margaret Cavendish, Feminism, and the *Blazing World*,” *Feminist Readings of Early Modern Culture: Emerging Subjects*, ed. Valerie Traub, M. Lindsay Kaplan, and Dymphna Callaghan (Cambridge: Cambridge University Press, 1996).

¹² Mary Baine Campbell, *Wonder and Science: Imagining Worlds in Early Modern Europe* (Ithaca: Cornell University Press, 2004) 202-3.

¹³ Cavendish, *Blazing* 124.

World; and arguments that her philosophy was driven by explicitly feminist concerns.¹⁴ What is explicitly and implicitly asserted in such criticism is that Cavendish's style, the variety of her corpus, and her use of imaginative figures and scenarios are a decidedly *female* approach to knowledge. Such arguments fail to recognize the continuity in formal strategies between Cavendish and her male interlocutors, their shared interests in magical, fanciful, and creative technologies, and the common attempt to learn by writing the "non-existent" into being.¹⁵ Further, readings that argue that Cavendish explicitly posits a feminine mode of writing fail to recognize that Cavendish did not encode her epistemology of variance as feminist or, for that matter, unique to women; it was just right in her opinion.

At the same time, scholarship that reads Cavendish's work primarily as literature *rather than* natural philosophy risks reducing Cavendish's serious scientific thought to mere fancy, much as early history of science considered alchemy a mystical rather than philosophic science. While work by Boyle, J.B. Sokol,

¹⁴ Deborah Boyle, "Margaret Cavendish's Nonfeminist Natural Philosophy," *Configurations*, (2004) 12 and 196.

¹⁵ Cavendish's male contemporaries were no less fanciful in their natural philosophy. John Baptiste van Helmont is heralded as the father of modern chemistry, the magical and providential narrative of his writing sublimated into the unavoidable detritus of early scientific investigation. The alchemical explorations of scientists like John Dee, Robert Boyle, Gabriel Harvey, or Isaac Newton have been recently recovered not as imaginative or fanciful, but as an important epistemological and theological context for the development of our modern sciences. Dee's stunning mathematics are informed by his interest in occult sciences, Harvey's accounts of apparitions detract nothing from his insights still offered the first insights into our modern circulatory sciences, and Newton's impact on physics and mathematics are no less celebrated for his interest in alchemy. On Harvey's interest in the occult see Mordechai Feingold, "The occult tradition in the English universities of the Renaissance: a reassessment," *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Oxford: Oxford University Press, 1986). On John Dee see, Deborah Harkness, *John Dee's Conversation with Angels: Cabala, Alchemy, and the End of Nature* (Cambridge: Cambridge University Press, 2006).

Susan James, Stephen Clucas, and Eileen O'Neill has done a great deal to illuminate Cavendish's participation in the natural philosophy debates of the seventeenth-century, this tendency remains.¹⁶ Such work recodes the difficulty in reading Cavendish's natural philosophy as a speciously literary and feminist strategy, rather than as an interpretational problem encountered when reading much early modern natural philosophy.¹⁷ Further complicating this trend is the repeated evocation of negative evaluations of Cavendish's work by literary luminaries like Virginia Woolf, a move that denies Cavendish's literary merit while others assert this is her only value. Efforts to situate Cavendish's work within a private, feminine literary economy make the implicit, and sometimes explicit, argument that Cavendish's work was a private enterprise unread by the major natural philosophers and therefore unimportant to a history of natural philosophic thought. Cavendish, it would seem, is too literary to be scientific, but not literary enough to be good, and her work so obscure that none of it matters anyway. Her

¹⁶ Stephen Clucas, "The Atomism of the Cavendish Circle: A Reappraisal," *Seventeenth Century* 9:2 (1994): 247–273; B.J. Sokol, "Margaret Cavendish's Poems And Fancies and Thomas Harriot's Treatise on Infinity," *A Princely Brave Woman*, ed. Stephen Clucas (New York: Ashgate, 2003); Susan James, "The Philosophical Innovations of Margaret Cavendish," *British Journal for the History of Philosophy* 7:2 (1999): 219–244; Eve Keller, "Producing Petty Gods: Margaret Cavendish's Critique of Experimental Science," *English Literary History*, vol. 64, no. 2 (Summer 1997): 447–71; Eileen O'Neill, Introduction, *Observations upon Experimental Philosophy*, ed. Eileen O'Neill (Cambridge: Cambridge University Press, 2001); Sarah Hutton, "In Dialogue with Thomas Hobbes: Margaret Cavendish's Natural Philosophy," *Women's Writing* 4:3 (1997): 421–432; see also Doyle's suggestions in footnote 2.

¹⁷ While an ever-expanding interest in the intersections between literature and science have eased this tendency in the last decade, it remains the case that Cavendish is largely read as a literary author and that major "scientific" works, such as the *Philosophical Letters*, have not been made available in modern editions.

work has suffered from a neat triple death, and more often than not at the hands of people who are arguing for the value of studying her work. What we see, however, when we do take seriously Cavendish's many forays into natural philosophy is a clear and relatively consistent vitalist theory of nature that entails an absolute variety within creation, an equally consistent theory of language and the ethics of the pursuit of knowledge, a focused engagement with the major male theorists of her era, and a unique glimpse into the ways in which the poetic creation of the possible interacts with the content of natural philosophy.

Sense, reason, and the diversity of knowledge

Cavendish develops her vitalist theory through discussions of the interaction of "sense and reason" and of the place of these twinned faculties in her epistemology. At least since her 1655 *Worlds Olio*, Cavendish had been working with her theory of sense and reason. The twinned faculties appear in her 1656 *Nature's Pictures* as the authority for her philosophical opinions and the bulwark against "false conceptions."¹⁸ Such false conceptions are precisely the kind of errors made by contemporaries whose opinions, according to Cavendish, masquerade as truths discovered by experiment or education.¹⁹ Cavendish's appeal to sense and reason may have been in part pragmatic. As a daughter of minor nobility, she received a

¹⁸ Margaret Cavendish, *Nature's Pictures* (London: Printed for J. Martin and J. Allestrye, 1656) 313.

¹⁹ Cavendish's use of opinion to describe her work is an essential part of her theory of the indeterminacy of human knowledge. Early in her career 'opinion' appears not as a positive recognition of the limits of human knowledge, but as a rhetorical marker of the failure of her contemporaries to recognize the limits on their own powers of intellection and their misguided reliance on instruments other than sense and reason.

standard education for an elite woman of the seventeenth-century.²⁰ She was taught how to read and write, do needlepoint, sing, dance, and play the lute. She admits in her writings that she was not formally educated in the sciences, and it appears that what she did know she learned from her husband, his mathematician brother, Charles Cavendish, or through her own reading.

Despite a lack of formal scientific education, Cavendish's writing from the very earliest displays a familiarity with a corpuscular or atomic theory, a mechanistic view of nature, and, in the second phase of her career, a well-informed and systematic vitalist materialism coupled with a deep belief in the boundedness of human understanding. The two most recent commentators on Cavendish's vitalist natural philosophy and her attack on the mechanistic worldview link her to what John Rogers, in *The Matter of Revolution*, calls "the Vitalist Movement" of the 1650s in England.²¹ Proponents of vitalism, inspired by Paracelsian natural philosophy, envision a spiritualized and living matter, which possess the attributes of self-movement and internalized freedom. Rogers argues that Cavendish learned about vitalism "through her connections with the physician Walter Charleton and her reading of John Milton" and that she likely became acquainted with Paracelsian philosophy while in France, where her husband also patronized the chemical

²⁰ Margaret Lucas was the eighth daughter of Sir Thomas Lucas and his wife Elizabeth.

²¹ John Rogers, *The Matter of Revolution: Science, Poetry, and Politics in the Age of Milton* (Ithaca: Cornell University Press, 1996). On Cavendish's vitalism see Lisa T. Sarasohn, "Leviathan and the Lady: Cavendish's Critique of Hobbes in the *Philosophical Letters*," *Authorial Conquests: Essays on Genre in the Writings of Margaret Cavendish*, ed. Line Cottegnies and Nancy Weitz (Madison: Fairleigh Dickinson University Press, 2003) and Jay Stevenson, "The Mechanist-Vitalist Soul of Margaret Cavendish," *Studies in English Literature* 1500-1900 36.3 (Summer 1996): 527-43.

physician William Davison, and even wrote chemical recipes himself.²²

Sokol has also demonstrated that despite her protestations that she had not learned the arts of her contemporaries, Cavendish also possessed an advanced understanding of Thomas Harriot's work on infinity as a mathematic construct.²³

Nature, in all of its variety, educates man's native "sense and reason," but not by means of an experimental mode characterized by the instrumental science of Robert Hooke or Francis Bacon, which Cavendish critiqued. Knowledge, rather, is sought through a natural capacity present throughout rational creation. In Cavendish's model all of nature – people, plants, animals, rocks, etc. – are created of self-moving matter. This self-moving matter is itself rational and sensitive, and consequently all of creation is invested with the twinned capabilities of "sense and reason." Neither term was prior to the other for Cavendish, nor could they be considered to function distinctly. Instead, "sense and reason" are a paired faculty that enables all of creation to understand nature's diversity. As she says in the prefatory material for the *Observations*, "my ground is Sense and Reason, that is, I make self-moving matter, which is sensitive and rational, the onely cause and principle of all natural effects."²⁴ These "natural effects" include all thought and knowledge, which are themselves natural effects of the self-moving matter of the mind. Cavendish distinguishes her knowledge project from that of many of her

²² Sarasohn 47-8.

²³ See Sokol.

²⁴ Cavendish, *Observations* xxvi.

contemporaries by insisting that sense and reason are the central faculties of knowledge. In so far as sense and reason are only able to access the probable or possible, Cavendish insists that her project is fundamentally different from contemporary attempts to acquire certain knowledge; absolute truth is utterly inaccessible according to Cavendish. For her, the provisional status of knowledge is a consequence of the diversity of knowledge. She argues, “no particular knowledge can be perfect, by reason knowledge is dividable, as well as composable; nay to speak properly, nature herself cannot boast of any perfection.”²⁵ Knowledge, like all of nature, consists of a plenitude of “irregular motions,” and the individual perspective is utterly incapable of capturing and synthesizing that plenty into a single whole “Truth.”²⁶ This irregularity in nature is not a fault, as it is in narratives of a fallen nature fragmented and fractured by sin.²⁷ Instead, Cavendish acknowledges and celebrates such diversity; for her, variety is the positive result of the self-active principle in all of creation and she is perfectly at home with the idea that irregular nature means that knowledge about the natural world is necessarily uncertain and incomplete.²⁸ For Cavendish, the appropriate response to the

²⁵ Cavendish, *Blazing* 48.

²⁶ Cavendish, *Blazing* 48.

²⁷ On Cavendish’s celebration of irregularity and the ways in which this constitutes a feminist defense see Angus Fletcher, “The Irregular Aesthetic of the *Blazing World*,” *Studies in English Literature* 47, 1 (Winter 2007): 123-141.

²⁸ In Boyle, Glanville, and Charleton, amongst others, an acknowledgement that certainty was impossible was part of a new emphasis on the probable rather than the certain. While Cavendish is part of this “probability movement,” her emphasis on natural sense and reason leads her to deprecate the experimental method as the mode for accessing probability. Experimentalism and a search for “hidden causes” make fools of men, whose methods ensure that they “will never attain to the honour of being Natural Philosophers” (*Philosophical Letters* iv.xxvii). Instead Cavendish

celebrated diversity or “speciousness” of nature is to become a student of that diversity: “wherefore I bend myself to study nature, and though it is too specious to be known, yet she is so free as to teach, for every straw, or grain of dust is a natural tutor, to instruct my sense and reason, and every particular rational creature, is a sufficient School to study in.”²⁹ The individual instance, rather than the systematic abstraction or experience, is sufficient for Cavendish.

Cavendish’s argument on behalf of native ability is certainly a defense against claims that women were incapable of rigorous intellectual inquiry, but it is also a methodological argument, which positions native right and natural method as superior to the misguided use of instruments and a humanistic tradition of textual authority: “Our Natural Philosophers, who by their extracted, or rather distracted arguments, confound both Divinity and Natural Philosophy, Sense and Reason, Nature and Art, so much as in time we shall have rather a Chaos, then a well-order’d Universe by their doctrine.”³⁰ Humanistic methods with their emphasis on logical categories and derivative readings “made too many nice distinctions,” in her opinion, and “do but make a confusion in natural knowledg, setting a mans brain on

advocates for the use of native sense and reason to produce right knowledge, “though we are all but guessers, yet he that brings the most probable and rational arguments does come nearer to the truth than those whose ground is only fancy without reason” (*Observations* 269). On the topic of probability in the seventeenth-century see Barbara Shapiro, *Probability and Certainty in Seventeenth-Century England: A Study of the Relationships Between Science, Religion, History, Law and Literature* (Princeton University Press, 1983) and Henry G. van Leeuwen, *The Problem of Certainty in English Thought 1630-1690* (New Jersey: Springer, 1970).

²⁹ Margaret Cavendish, *The World’s Olio* (London: J. Martin and J. Allestrye, 1655) 45.

³⁰ Cavendish, *Observations* xi.

the rack.”³¹ Rigid methodologies, instruments, and books are devices her peers use to disorder nature and produce “distracted” arguments; arguments more enamoured of their own methods than focused on understanding creation.

Cavendish’s vitalist theory not only shapes her model of cognition, it also provides the limiting factor on human knowledge. While many “modern and ancient philosophers...endeavor to go beyond sense and reason, which makes them commit absurdities,” Cavendish is clear that “no corporeal creature can go beyond sense and reason.”³² The implication is, of course, that man, as a “corporeal creature,” should not seek knowledge beyond the limits of “sense and reason.” Arts and instruments that attempt to go beyond these abilities are “apt to delude sense, and...[are] not able to discover the interior natural motions of any part or creature of Nature.” Cavendish further questions the ability of such instruments to “represent...the exterior shapes and motions so exactly, as naturally they are; for Art doth more easily alter then inform.”³³ To seek to go beyond the natural capabilities of sense and reason is not only misguided, it is the sign of a moral corruption. As the creations of an infinite and omnipotent God, nature and natural effects are not “to be ingloriously discoursed of by vain and ambitious men, whose foolish pride and presumption drowns their Natural Judgment and Reason.”³⁴ A return to a less encumbered and more natural philosophic inquiry is Cavendish’s goal; to do

³¹ Cavendish, *Philosophical Letters* iii.i.

³² Cavendish, *Blazing* 60.

³³ Cavendish, *Philosophical Letters* iii.i.

³⁴ Cavendish, *Philosophical Letters* iv.xxxii.

otherwise is to transgress the boundaries of appropriate knowledge. As we will see, the consequence of Cavendish's theory of the diversity of knowledge is an insistence on a propositional mode not only for the "right" poet, as in Sidney, but also for a "right" philosophy.

Mathematic language in a poetic world

As a project not concerned with the literary as such but with the appropriate modes for knowledge production, Cavendish's work tackles not only knowledge in alphabetic language but also the languages of mathematics. The *Blazing World* opens with a traveling young lady kidnapped by an amorous merchant. Heaven, displeased at the theft, transports the boat, lady, merchant, and boatmen to and through the North Pole. The men all freeze to death while the lady, virtuous and beautiful, emerges alive in the boat at the pole of another world. Through a series of events the lady is discovered, transported to the center kingdom, and elevated to the role of Empress, thus giving her rule over an Edenic world. The discussion of mathematics is embedded in a long sequence of interviews between the Empress and the intellectuals of her domain, gentlemen virtuosi who are figured as animal-men, bear-men, bird-men, etc. As the narrator tells us, the Empress, having "received several intelligences" from the previous interviews with anatomists and Galenic physicians, is now ready to engage in a different kind of discourse.

In this scene, Cavendish works through the relationship between mathematics and rhetoric. The Empress sends for her "spider-men, which were her mathematicians, the lice-men, who were her geometricians, and the magpie-, parrot-

and jackdaw-men, who were her orators and logicians.”³⁵ The grouping of these intellectuals together, mathematicians with logicians and orators, instantly invokes the Ramist knowledge paradigm.³⁶ For a Ramist, mathematical practices are incorporated into the trivium, the foundation of all university learning in early modern Europe, which traditionally is composed of rhetoric, logic, and grammar. One consequence of the Ramist revision of the trivium is the establishment of a methodological equivalency between logic and mathematical demonstration.³⁷ Mathematics, no longer one of the four lower arts, skyrockets in prestige, becoming a mode of knowledge discovery. In calling for the mathematicians, the geometers, and the logicians and orators together, the Empress unites mathematics and dialectic, thus performing the ramistic realignment. Nevertheless, the inclusion of mathematics as a viable mode of intellectual investigation akin to classical logic and rhetoric is not Cavendish’s goal. As we will see, she rearranges the hierarchy of rhetoric and math in order to bring mathematics into her discussion of language and knowledge. Ultimately, she will refigure math as a divine language inappropriate for human knowledge. Nevertheless, in incorporating mathematics within a discussion of the technologies for knowledge production, Cavendish, like Dee and Descartes before her, situates mathematics within the sphere of intensional writing rather than as an instrument of extensional description

³⁵ Cavendish, *Blazing* 159.

³⁶ On Ramus and Ramism in England see Walter Ong, *Ramus: Method and the decay of dialogue* (Chicago: University of Chicago Press, 2004) (first published in 1958 by Harvard).

³⁷ Arithmetic and geometry are represented by different kinds of animal men in the scene but are often considered together.

Not only does Cavendish group mathematics together with the prestigious practices of the trivium, she explicitly separates these from extensive natural philosophic inquiry. The practices that Cavendish marks as “experimental” in the text, those of astronomy, medicine, anatomy, chemistry etc., are formally segmented from logic and mathematics by the separation of scenes in the narrative. The distinction between logical and mathematical demonstration and more material practices was a hallmark of Ramist thought, and this distinction is also in line with Cavendish’s critique of experimental science elsewhere in her corpus. In the *Observations*, Cavendish characterizes Hooke’s microscope and Boyles’ experiments as “deluding” and asserts that such practices produce “Fallacies, rather than Discoveries of Truth.”³⁸ A language of experimental report marks the interviews of the experimental philosophers, as does the passivity of the Empress as she receives observations, reports, and studies. By contrast, the scene where she deals with logic and mathematics uses the language of “art” -- the art of disputing, the art of oration, the art of logic, and the mathematical arts.³⁹ As Spiller has argued, early modern natural philosophers share a “central understanding of art as the basis for *producing* knowledge.”⁴⁰ The rhetoric of observation and experience, so dominant in the preceding interviews, is markedly absent from these discussions. What is more, the activity of the auditor, the Empress, changes. Where she received reports before, she

³⁸ Cavendish, *Observations* 3Ar.

³⁹ Cavendish, *Blazing* 145 and 150.

⁴⁰ Elizabeth Spiller, *Science, Reading, and Renaissance Literature: The Art of Making Knowledge, 1580-1670* (Cambridge: Cambridge University Press, 2004) 2.

now learns methodologies; the logic and mathematical professionals all demonstrate their methods, the lice-men geometers figure in real time, the logicians perform the art of disputing, and the mathematicians attempt the squaring of the circle. The difference between the “world-describing” activities of observation and experiment and the “world-making” activities is dramatized here as the initial passivity and later activity of the Empress.

The difference between the Empress’ passive receipt of observation and results and her more active engagement in methodological arts should not suggest that Cavendish’s romantic text is simply celebrating the powers of classical logic and emerging mathematical forms of discovery – her argument is more complicated than that. The narrator indicates that the spider-men are the mathematicians and that they practice mathematics because their “characters are so abstruse and intricate.”⁴¹ The spider-men are appropriate as mathematical practitioners because their nature, abstruse (remote and difficult) and intricate is like that of mathematics, which is, by implication, also abstruse and intricate. Cavendish’s characterization of certain mathematical practices and theories as difficult, intricate, and obscure echoes Descartes’ critique of classical theoretical mathematics, what he called the “old analysis” in his *Discourse on Method* and a practice of nearly “no use.”⁴² Although he goes on to use geometry as a model for his own method, as we have

⁴¹ Cavendish, *Blazing* 159.

⁴² René Descartes, *The Discourse on Method*, Paul J. Olscamp, ed. (New York: Hackett Publishing, 2001) 15.

seen, he complains that figural analysis is limited to the “consideration of figures that it cannot exercise the mind without greatly tiring the imagination.”⁴³ As I have argued in the previous chapter, Descartes’ symbolic equations are designed to work around this very difficulty in “figuring.” This critique of analysis would have been familiar to Cavendish who spent considerable time reading and thinking about the Cartesian method. While Cavendish’s Empress clearly engages through the “arts” of the Ramistic trivium, Cavendish also critiques these arts for excessive difficulty through her characterizations of their practitioners.

Where Descartes was able to clear away the confusing lines of geometric figures, Cavendish’s Empress finds herself “confounded” despite her “ready wit.”⁴⁴ The table the mathematicians present to the Empress brims with an abundance of figures. The narrator describes it as: “full of mathematical points, lines, and figures of all sorts of squares, circles, triangles, and the like.”⁴⁵ The mathematical table is construed here as so abundantly full and varied that even the narrator cannot fully enumerate its copiousness. He can only gesture at it with the comprehensive but imprecise phrase “figures of all sorts.” The narrator’s lexicon is exhausted by the description, and the reader’s imagination is left to contend with the never-ending possibilities of the phrase “the like,” which both ends and extends the image. The Empress closes her interview with the men saying, “there is so much to learn in your

⁴³ Descartes 15.

⁴⁴ Cavendish, *Blazing* 159.

⁴⁵ Cavendish, *Blazing* 159.

art [. . .] that I can neither spare the time [. . .] nor if I could, do I think I should ever be able to understand your imaginary points, lines and figures.”⁴⁶ Like the narrator, the Empress expresses a sense of exhaustion. Where Descartes dispenses with the exhausting mess and replaces it with the elegant concision of the symbolic equation, Cavendish’s Empress employs an alternate solution – she dismisses the men. As they leave, the Empress reiterates her admiration for the spider-men mathematicians; they are excellent teachers, as well as being valuable as “informers of spirits,” and it is in this spirit of education that the value of mathematics lies for Cavendish.⁴⁷

As a successful female ruler, and the protagonist of the narrative, the Empress’ opinion carries significant weight in the text. Consequently, I am inclined to read her opinion as a positive endorsement by Cavendish. That said, we need not rely on the Empress alone in this matter. The narrator observes, approvingly, that the mathematician’s communication with the supernatural is the reason for their abstruse nature.⁴⁸ With this observation the Empress’ earlier confusion is recast as the result of an encounter with the supernatural, not the mathematical *per se*. What seemed a fault of mathematics – that it was “imaginary” in the sense evoked by critics of mathematics who assert it produces useless fancies or troublesome chimeras – becomes instead a sign of transcendent value. At the close of this scene

⁴⁶ Cavendish, *Blazing* 159.

⁴⁷ Cavendish, *Blazing* 159.

⁴⁸ Cavendish, *Blazing* 159.

the Empress defines the “imaginary” quality of the objects of mathematical study: “they are non-beings.”⁴⁹ Elsewhere in the text the Empress encounters other “non-beings,” referred to as the Spirits, or intellectuals who distinguish between a natural, material knowledge and their own immaterial and therefore supernatural knowledge.⁵⁰ During their interviews, the spirits assert repeatedly that a supernatural knowledge exists, which, as they say, “is a far better knowledge.”⁵¹ Cavendish’s refiguring of the “imaginary” by defining it in terms of positive “non-being” transforms the mathematical figures from something that taxes the imagination into the more easily understood (if harder to comprehend) category of supernatural signification. As such, for Cavendish, there is no reason to develop an alternative mode of representation, as Descartes had done. What seemed to be an effect of the over-abundance of figures in mathematics is rearticulated as a metaphysical problem; the Empress (and presumably the narrator) cannot get their mortal heads around the supernatural element of this mathematics. What the Empress cannot understand is re-categorized as divine knowledge, illegible because it is beyond normal human wit. As noted earlier, for Cavendish, only those who are vain and ambitious will seek to reach beyond human sense and reason.

⁴⁹ Cavendish, *Blazing* 159.

⁵⁰ In the final book of the *Leviathan*, Hobbes suggests that the scripture supports the existence of “subtile and Invisible” spirits that are distinct from daemons and specters (664). Thomas Hobbes, *Leviathan*, ed. C.B Macpherson (New York: Penguin Books, 1985).

⁵¹ Cavendish, *Blazing* 169.

Cabala and World-Making

After the interviews with her various scientists, the Empress turns to a discussion of knowledge *systems*, and, in particular, systems represented in cabbala. Literally meaning “receiving,” *cabbala*, is a Jewish intellectual tradition dating from at least twelfth century Spain.⁵² Concerned with the study and interpretation of the Scriptures as a means of coming to a greater understanding of God, cabbalistic interpretation began first as an oral tradition practiced by a few learned men. As a reading practice and an interpretive or hermeneutic technology, cabala is at once practice and theory. As we will see, Cavendish refigures the alpha-numeric hermeneutic of cabala into a new model of poetic production of knowledge. Before this transformation occurs in the text, Cavendish stages a lengthy conversation about the nature and value of what she calls, “the Jews cabbala,” which the Empress has requested be given her. Cavendish uses this discussion to further develop her ideas of the relationship of alphabetic language and mathematical notation, as well as the knowledge the two are capable of producing. Through the dialogue between the Empress and the spirit men, Cavendish stages the rejection of the “Jewish cabbala” in favor of a poetic or romantic cabala instead.

Cabala and cabalistic theory have a long and varied tradition, and it is important to specify the restricted use of the term cabala referred to here. Within the *Blazing World* “cabbala” refers to a very restricted set of cabalistic practices,

⁵² See the discussion of cabala in Chapter 2. As in that chapter I will be using the spelling “cabala” except in direct quotation.

which were very popular during the early modern period and known also as Gematria. Gematria works on the premise that the letters of the alphabet can also be used as numbers, and therefore words and phrases acquire distinctive numerical values. Many of the early modern English writers who were interested in cabala were most familiar with the reduced form of it as a numerical translation of alphabetical language. During the Restoration the concept of cabala had undergone a rapid multiplication in denotative and connotative meanings. The repeated appearance of cabala in popular literature attests to the popularity of the term and likely results from several concurrent contexts, including the rise in antiquarian and early linguistic study amongst learned men in England, a greater engagement of the public in scientific and mathematical exploration and its character, and increased interest in secret codes and ciphers during the civil war and the Restoration. Cavendish uses the precise phrase “Jews Cabbala” to make clear her intention to invoke the Gematric cabbalistic tradition. Nevertheless, the presence of other cabalas in the text, a spiritual cabala, a philosophical cabala, etc., expands the frame of reference for her critique. Consequently, Cavendish’s refiguring of the poetico-romantic cabala as the only useful hermeneutic is a critique not only of the Jewish alpha-numeric interpretive mode associated with symbolic code and private scholarly knowledge, but also of the many interpretive schemes known as cabala which were suggestive of political or supernatural knowledge.⁵³

⁵³ For more on this see Johnson 23-5 and Allison Coudert, The Impact of the Kabbalah in the Seventeenth Century (Leiden, 1999).

Cabala is first introduced in the narrative of the *Blazing World* during another set of interviews, those between the Empress and the “immaterial Spirits” whom, as the only creatures to possess knowledge across worlds, are themselves embodiments of divine or supernatural knowledge.⁵⁴ The Empress begins the interview by asking the Sprits about her home world and among her very first questions is “Whether there were none that had found out yet the Jews Cabbala?” The Spirits answer that “Several have endeavoured it...but those that came nearest (although themselves denied it) were one Dr. Dee, and one Edward Kelly.” They conclude that “they proved at last but meer Cheats; and were described by one of their own Country-men, a famous Poet, named Ben Johnson, in a Play call'd, The Alchymist.” This negative assessment suggests that, for Cavendish, the pursuit of a systematic key to knowledge, as in the case of Dee’s “real kabbalah” that would subsume all other knowledge, was fundamentally flawed. To attempt to produce total knowledge, as we have seen, is a “cheat” in Cavendish’s opinion and, as an attempt to reach beyond human sense and reason, will, presumably, always be “denied” to men.

⁵⁴ Brandie Seigfried argues that “by dramatizing the essentially performative aspects of matter as elaborated by Severnius (who she identifies as the cabbalistic writer who Cavendish draws upon), Cavendish sets the stage for a theory of energy and matter that derives its metaphorical clout from cabalistic sources yet situates the particulars firmly within contemporary arguments about the natural world” (61). Brandie Seigfried, “Anecdotal and Cabbalistic Forms in *Observations upon Experimental Philosophy*,” *Authorial Conquests: Essays on Genre in the Writings of Margaret Cavendish*, eds Line Cottegnies and Nancy Weitz (Madison: Fairleigh Dickinson University Press, 2003) 60-72.

Further questioning by the Empress prompt the spirits to describe the Jewish cabala as “partly Traditional, partly a Scriptural, partly Literal, partly Metaphorical,” it is a work which requires “a great wit and strong faith” and it does not depend on reason. The spirits insist upon a distinction that is near and dear to Cavendish’s heart and which we saw at work in her earlier consideration of the mathematics of the spider-men, that between divine knowledge and natural knowledge. The spirits assert that natural philosophers cannot be cabalists; only “Mystical or Divine Philosophers” have access to that divine knowledge of cabala, which is beyond “Sense and Reason.” While the spirit-men clearly are attempting to dissuade the Empress from her pursuit of a cabala, she persists. In response to the Empress’ question, “whether the Jews Cabbala or any other, consist in Numbers?” the spirits answered that numbers were not suitable for the cabala and would ruin it. While cabala and Gematria in the early modern context are inextricably tied up in numerate practices, the spirits work hard in the conversation to dissociate supposedly mystical numerical qualities from cabalistic practice. They assert that there is “No other mystery [in numbers] . . . but reckoning or counting; for Numbers are onely marks of remembrance.” The interview continues with a series of questions on the claims of cabbalists regarding individual numbers – the divinity of the number seven, the harmony of number six, etc.-- all points which the spirits refute. Frustrated with her persistence, they tell the Empress that “Cabbalists have nothing else to do but to trouble their heads with such useless Fancies; for naturally there is no such thing as prime or all in Numbers; nor is there any other mystery in

Numbers, but what Man's fancy makes." According to the spirits, despite the common association of numerate practices and cabalistic interpretation, cabala and numbers are not equivalent and there is nothing supernatural expressed through numbers, certainly not of the sort that the cabalists have claimed.

For all their effort to demystify numbers, as the interview continues the spirits do allow some mystery to numbers. They argue, "the onely mystery of Numbers concerning the Creation of the World, is, that as Numbers do multiply, so does the World. The Empress asks, "how far Numbers do multiply?" And the spirits answer that they multiple to infinity. This surprises the Empress who retorts that the "infinite cannot be reckoned, nor number'd." To which the spirits respond that this quality reflects the infinite nature of God's creation, which as "an Infinite action, as proceeding from an Infinite Power, could not rest upon a finite Number." The interview concludes with cabala and number separated and the mystical expressive power of individual number refuted. Nevertheless, the system of enumeration, of arithmetic multiplication, is a mirror of sorts for the infinite quality of creation.

Throughout the interview with the logicians and mathematicians, Cavendish asserts that the spider-men can practice an imaginary or metaphysical mathematics beyond the grasp of the mortal mind. Later, in the interview with the immaterial spirits, she counters the contemporary claims of a numerically based cabalistic practice that asserted that mystical knowledge was both expressed by and contained within numbers. While the Empress' commitment to creating her own cabala leaves the powerful epistemological utility of cabala in place, it is a radically

different kind of practice from that of Cavendish's contemporaries. At the same time, Cavendish does not simply dispose of a sense of mysticism in number; she firmly resituates it as a methodological correspondence. Numbers themselves are not mystical, but arithmetic operations such as multiplication and the concept of infinity take important places as reflective of the boundlessness of divine creation. Individual marks do not express divine knowledge, mathematical writing will not reveal new discoveries about the natural world, but as a method might in fact offer us important insights. In keeping with her corpus-wide insistence upon the division between divine knowledge and natural philosophy, Cavendish defines mathematics as an art that cannot illuminate the natural world; it can only reflect the order and magnitude of the divine world.

Because, as Cavendish has it, the "Jews Cabbala" is beyond sense and reason, it is rejected for use in the *Blazing World*. Instead a poetic cabala is employed, which emphasizes creation rather than a decoding of the already created. In her search for an appropriate cabala, the Empress runs through a comprehensive generic list, including a "philosophical" cabala, a moral cabala, and a political cabala, each of which is ultimately rejected. In a peculiar kind of negative amplification, the scene turns out to be a scheme that builds up to a climatic definition of the proper form of cabala or instrument of knowledge, one that elicits a positive response from the Empress' companion in her adventure, a character simply referred to as the "Duchess," which functions to incorporate Cavendish's persona into her fictional text. The cabala that the Empress settles on and that the author-as-Duchess

approves is a “poetical or romancicall cabbala.”⁵⁵ With a poetic or romantic cabala the Empress and Duchess are free to “use metaphors, allegories, similitudes, etc., and to interpret them as [they] please.”⁵⁶ It is to this final kind of cabbala that the Empress finally turns. The Empress and Duchess alike are enabled to create new worlds out of the poetic cabala. They will have the complete knowledge of these new worlds, of the sort that is unavailable (properly so according to Cavendish) to the mortal inhabiting the divinely created world. Surprised to hear that she can create her own world out of things “neither seen nor experienced...things, that *do not in fact exist*,” the Empress incredulously replies, “can any Mortal be a Creator?”⁵⁷ The spirits are definitive in their answer and as a full articulation of poesis it is worth quoting at length:

Yes...for every human Creature can create an Immaterial World fully inhabited by Immaterial Creatures, and populous of Immaterial subjects, such as we are, and all this within the compass of the head or scull; nay not onely so, but he may create a World of what fashion and Government he will, and give the Creatures thereof such motions, figures, forms, colours, perceptions, &c. as he pleases, and make Whirl-pools, Lights, Pressures, and Reactions, &c. as he thinks best...also he may alter that World as often as he pleases, or change it from a Natural World, to an Artificial; he may make a World of Ideas, a World of Atoms, a World of Lights, or whatsoever his Fancy leads him to.⁵⁸

⁵⁵ Cavendish, *Blazing* 169.

⁵⁶ Cavendish, *Blazing* 169.

⁵⁷ Cavendish, *Blazing* 170. Within this scene reference is made to Lucian of Samosata’s *True History* (~100 A.D.), which has created an alternate world that is in disrepair but nevertheless functions as an example of poetic creation.

⁵⁸ Cavendish, *Blazing* 170.

Any individual can create, and the Empress' question makes it clear that such a world is populated and shaped by the figures and forms of the author's desires.

What is particularly fascinating about Cavendish's sense of the value of intensive writing – poetic creation – is its clear genealogy in her theory of the fragmented nature of human knowledge. Echoing Cavendish in the *Philosophical Opinions* and *Philosophical Letters*, the spirits point out, "you can enjoy no more of a material world than a particular Creature is able to enjoy, which is but a small part." In the *Philosophical Letters* the sense that knowledge is always partial is not due to limits on experience but to the diverse motions of reason itself: "Reason, as it is the chiefest and purest degree of animate matter, works variously and in divers motions, by which it produces various and divers effects, which are several perceptions, as conception, imagination, fancy, memory, remembrance, understanding, judgement, knowledge, and all the passions, with many more."⁵⁹ Additionally, it is the effect of the innate diversity of nature itself: "for though Matter is one and the same in its Nature, and never changes, yet the motions are various, which motions are the several actions of one and the same Natural Matter; and this is the cause of so many several Creatures."⁶⁰ In the *Observations*, Cavendish links the diversity in human knowledge to the diversity in the natural world directly, "if there be such variety of several knowledges, not onely in one Creature, but in one sort of

⁵⁹ Cavendish, *Philosophical Letters* x.i.

⁶⁰ Cavendish, *Blazing* 163.

sense; to wit, the exterior senses of one humane Creature; what may there be in all the parts of Nature?"⁶¹ Cavendish believes that, in both the natural world and man's experience thereof, there is infinite variety and an inherently partial quality. What the spirits of the *Blazing World* suggest is that to rule over a material world is to accept this limit on mortal knowledge. To create a poetic world however allows for all of the privileges of the creator, including determination and perfect knowledge of the entire system. "Why should you desire to be Empress of a material world," ask the spirits, "when as by creating a World within your self, you may enjoy all both in whole and in parts, without controule or opposition; and may make that World as you please, and alter it when you please, and enjoy as much pleasure and delight as a World can afford you?"⁶²

A word on "romance"

In the *Blazing World* the kind of commentary upon the work of other natural philosophers that Brandie Sigfried and Elizabeth Spiller have noted in the *Observations* is transformed from the epistolary form into a novel-like romance.⁶³ This generic transformation is itself an explicit argument on behalf of the romantic genre as a way of knowing. As such, Cavendish's self-described "romanticall" text is a remarkable exploration of the power of imaginative literature to produce valuable knowledge through the exploration of possibility. As with her other texts, the

⁶¹ Cavendish, *Observations* vii.

⁶² Cavendish, *Blazing* 5.

⁶³ For more on particular instances in which this occurs see Seigfreid, particularly 69-71.

Blazing World is actively engaged in conversation with major contemporary natural philosophy texts. However, Cavendish's designation of the text as a romance and its obvious deployment of many strategies of the early modern romance genre have troubled the reception of the text as a work of natural philosophy. The fantastic journey to a textually created world has clear connections with other travel and utopian fictions of the period.⁶⁴ Nevertheless, the emphasis that has been placed on this aspect of a highly complex text has occluded both her development of a theory of signs (one that deals with both mathematics and alphabetic language) and her continued participation in debates about forms of knowledge proper to man and those proper to divine and mystical knowledge.

Within the romantic prose of the *Blazing World*, Cavendish creates a space within which she can safely consider and communicate the nature of a wide variety of knowledge practices. At the same time, she makes a strong case for the use of the intensional mode of writing as a means of understanding the power and function of knowledge systems like philosophy, experimental science, and mathematics. Her advocacy of the intensional mode, with its representation not of what is, but what is possible, addresses what she sees as the natural limit on mortal knowledge. Like the *Philosophical Letters*, which both performs and explicitly advocates on behalf of commentary as a way of knowing, *Blazing World* is a romance that defends the poetic creations of romance. Cavendish figures forth an entire world populated by

⁶⁴ See my earlier note on Campbell's distinction between world-making texts, such as *Blazing*, and utopian fictions.

people, ideas, and events forged in her mind – accomplishing as did Sidney the task of the poet who takes her own “idea” or “fore-conceit,” and “having no law but wit,” creates new poetic possibilities.⁶⁵ As Spiller has noted, Cavendish’s vitalist theory entails a positive and active role for the imagination, which could “pattern out” new knowledge properly in accord with the diversity of nature.⁶⁶ Consequently, the text forged in the mind, the world-making text, is just as, if not more, epistemologically valuable as any extensional text produced after observation of the world.

Cavendish had established her own sense of what the “romancicall” genre entailed many years prior to the publication of the *Blazing World*. In her 1656 *Nature’s Pictures* she defines romance for her readers:

As for those Tales I name Romancicall, I would not have my Readers think I writ them, either to please or to make foolish whinig Lovers, for it is a humor of all humors, I have an aversion to; but my endeavour is to express the sweetness of Vertue, and the Graces, and to dress and adorn them in the best expressions I can, as being one of their servants, that do unfeignedly, unwearidly, industriously, and faithfully wait upon them.⁶⁷

Cavendish’s definition of romance distinguishes it clearly from a “bad” romance genre that she considers highly affective and devoid of knowledge (and therefore politically and epistemologically destabilizing). For her, romance is an expression of

⁶⁵ Philip Sidney, *The Defence of Poesy*, *Sir Philip Sidney: The Major Works*, ed. Katherine Duncan-Jones (Oxford: Oxford University Press, 2002) 218-9.

⁶⁶ Spiller 149.

⁶⁷ Cavendish, *Nature’s Pictures* 377.

ethics, the “virtues and graces,” meant to compel the reader with “sweetness” and “the best expressions.” Such writing is the unstinting labor of devotion to virtue and grace, from which the authoress never tires.⁶⁸ In the case of the *Blazing World* virtue and grace are modelled not in a mimetic or idealized vision of *this* world, but in an altogether new world. While Cavendish’s characterization of romance is perhaps conventional in its form – romance as an amatory genre concerned first and foremost with the moral development of the hero and/or reader – Cavendish refigures this devotion to make it devotion to “Reason and Sense” rather than the Petrarchan devotion to the beloved. This devotional position is one that entails a physical disgust for the saccharine literature of love, which, in her opinion, serves no ethical or epistemological end. Cavendish’s aversion is so great that she tells us that upon accidentally beginning to read a “bad” romance, she “straight thr[e]w it from [herself], as an unprofitable study, which neither instructs, directs, nor delights.” Cavendish incorporates a Sidnean poetic ethic as the defining feature of her romance, which should “beget Chast thoughts, nourish love of Vertue...increase civility...encourage noble Industry, crown, merit, instruct Life; and recreate Time...Likewise to admonish, instruct, direct, and perswade to that which is good and best.”⁶⁹ Cavendish’s language here is instructive. Romance is generative; it

⁶⁸ Cavendish understood knowledge and its various modes of communication to be central to the peaceful state. Her critique of natural philosophy and experimental science thus is a critique of the disruption of the state by bad knowledge or bad method. Practitioners of such “disturb also divinity and policy, religion and laws, and by that means draw an utter ruin and destruction upon both the church and state” (*Blazing* 49).

⁶⁹ Cavendish, *Nature’s Pictures* C2v.

“begets” and it maintains (“nourish,” “encourage”) the good that it creates. For Cavendish, the purpose of this creation is clear – to guide the civic and moral life of the reader through pleasing tales. Writing that falls short of the poetic/romantic bar of “benefit[ing] the life” and “delight[ing] the minde of my Readers” would not be worth the effort of creation in Cavendish’s opinion. If she wrote “bad” romances, she protests that she “would never suffer them to be printed...Likewise if I could think that any of my writings should create Amorous thought in idle brains, I would make blotts instead of letters.” Cavendish’s extensive publication history, which includes sixteen original texts and several revised editions, is testimony to her belief that she was not a writer of bad romance.

Hobbes and language

While the divine creator may have created with number, Cavendish’s mortal creator is constrained to make her new world in words. In the conversation with the spirits about number, the human use of mathematical notation is completely demystified. As the spirits say, there is “no other mystery [in numbers]... but reckoning or counting; for Numbers are onely marks of remembrance.” The phrase “marks of remembrance” is itself a mark of Cavendish’s engagement with Hobbes’ theory of signs and the function of language, particularly as articulated in the *Leviathan* (1651).⁷⁰ Like Descartes, Cavendish considers thought to be prior to language and she often positions Hobbes in the contrary position. For Cavendish, discourse, as an operation of reason, is not the same as speech: “by discourse, I do

⁷⁰ Thomas Hobbes, *Leviathan*, ed. C.B. Macpherson (New York: Penguin, 1985).

not mean speech, but an arguing of the mind, or a rational enquiry into the causes of natural effects; for discourse is as much as reasoning with ourselves; which may very well be done without speech or language.”⁷¹ In the *Philosophical Letters*, Cavendish engages Hobbes directly, arguing that while speech may in fact aid the memory (as marks of remembrance) “yet it doth not always, for all other Animals have Memory without the help of speech...wherefore though Words are useful to the mind, and so to the memory, yet both can be without them....”⁷²

Cavendish’s reply in the *Philosophical Letters* suggests that she has read Hobbes to say that the memory *needs* language in order to operate, though he has simply stated that, as “Markes, or Notes of Remembrance,” language can relieve the writer of the need to repeat the “labour” already performed.”⁷³

That number becomes the notational practice described as “but the markes of Remembrance” in *Blazing World* is significant. If mathematics is represented in the natural philosophy interviews as a bewildering plenitude that can only be understood as the mode of divine knowledge, number in the material world is merely the helpmeet of the mind. Of course, this reading takes the spirits’ ventriloquism of Hobbes as refuted by Cavendish. The issue is far more complicated if we take this Hobbesian remark in the spirit in which Hobbes wrote and in which Cavendish’s response suggests she read. To do so would situate the “marks of

⁷¹ Cavendish, *Observations* 14.

⁷² Cavendish, *Philosophical Letters* iv.xxvii.

⁷³ Hobbes argues that words and numbers register thought and “discharges our mentall reckoning...and delivers us from all labour of the mind, saving the first”(104).

remembrance” as important not just for the memory, but also for higher order cognition. Further, for Hobbes such “marks” function within a rational system that puts imagination and memory along a cognitive continuum.⁷⁴ We have seen that in Cavendish’s theory reason and memory do not require language at all, but do her spirit men suggest that numbers, as “marks of remembrance,” might be necessary to memory and/or reason?

At this point I am inclined to say no. Cavendish uses the *Philosophical Letters* to clear out room in the mind for thought before language, and this includes making a space for mathematical thought without language, something Hobbes explicitly says is impossible. While Hobbes uses reckoning, arithmetic computation using number, as the foundational trope for reason (“ratio [is] the faculty of Reckoning in all other things”), Cavendish directly refutes this position. In her opinion, “Reckoning is not Reason it self, but onely an effect or action of Reason.”⁷⁵ Just as “Sense and Reason” creates words, it also creates the operation of reckoning. It would not seem then that number is essential to either sense or reason. Clearly Cavendish does not consider the operation of reason to be like that of reckoning. Her insistence that mathematical thought can happen outside of language suggests that she is intent on demonstrating that thought is possible without the conventional mess known as “voluntary signes,” mathematical or otherwise.

⁷⁴ Hobbes 89-94.

⁷⁵ Cavendish, *Philosophical Letters* iv.

On the other hand, Cavendish does reserve a special function for signs such as number. The spirits elsewhere position number as an expression of the variety and limitlessness of divine creation. Recall their observation that, “the onely mystery of Numbers concerning the Creation of the World, is, that as Numbers do multiply, so does the World,” and that this quality reflects God’s “Infinite action.”⁷⁶ Given Cavendish’s integration of her theory of infinite natural diversity into her entire system, it would seem that numbers are not only instrumental but a kind of notational expression of the divine infinite. Numbers, however, are not the only things that multiply infinitely in Cavendish’s system. Worlds, specifically those created poetically, seem to proliferate as easily as multiplying numbers. The Duchess announces to the spirits, “I’ll take your advice, and reject and despise all the Worlds without me, and create a World of my own.”⁷⁷ In a neat appropriation of the Christian trope of inward consolation and *contemptio mundi*, the character of the Duchess relinquishes her “ambitious desire” for fame and conquest of a material world (or worlds as the case may be) and the attendant horrors of the battlefield.⁷⁸ However, rather than reject the world in order to focus on the inner experience of the divine or imagining this as an internal war with the forces of human sin, the Duchess determines to become her own god and create worlds within.⁷⁹ The

⁷⁶ Cavendish, *Blazing* 171.

⁷⁷ Cavendish, *Blazing* 186.

⁷⁸ Cavendish, *Blazing* 186; see 182-9 for a discussion of the difficulty of rule and knowledge in the created world.

⁷⁹ Campbell makes a similar observation about the creation of a world within in Cavendish at 202-213.

Empress, always of a mind with the Duchess, also quickly acknowledges her “power to create,” and notes that “then I shall be Mistress of two Worlds, one within, and the other without me.”⁸⁰ The two women then turn their attention, separately, to a peaceable imaginative creation that does not require the sacrifice of “life, reputation and tranquillity.”⁸¹

The right method of world-making

In the course of the world-making process, the Empress attempts to follow one of a variety of scholastic and antique methodologies, each time finding her work confounded by the failings that Cavendish has discussed at length in other works. For example, when trying out a Thalian method (Thales of Miletus, a pre-Socratic Greek philosopher), the Duchess becomes “so much troubled with Dæmons, that they would not suffer her to take her own will, but forced her to obey their orders and commands.”⁸² In *Observations* Cavendish offers a point-by-point refutation of Thales, asserting that his philosophy transforms nature into a contradiction, at once full of demons and ensouled by God, and also a finite and contained entity that is yet infinitely divisible.⁸³ Several other methodologies, including Pythagorean, Platonic, and Epicurean, are considered for the poetic cabala, all with equally dismal results.

⁸⁰ Cavendish, *Blazing* 186.

⁸¹ Cavendish, *Blazing* 185.

⁸² Cavendish, *Blazing* 186.

⁸³ Cavendish, *Observations* 250-251.

Cavendish's scenes of abortive creation simultaneously represent the failure of other epistemological approaches and suggest the ethical and personal consequences of such failure. With each attempt the Duchess and Empress begin creation rather than simply "patterning out" blueprints for worlds to be created. The rejection of a system means that the author must destroy those first incipient fruits of creation. With each rejection the search for a method of creation in language begins to take on more serious consequences, for in order to avoid cluttering creation with still-born worlds the authors must abort the project entirely. Contrasted to the material threats, discomforts, and costs faced by monarchs in the natural world, language creation may not lead to bloodied fields. Nevertheless, creation of new worlds is not a low stakes game. And the risks are not only to the partially created worlds, but also to the space in which they are created; they are a real danger to the mind of the author/creator which may become disordered or dissolve if the process goes awry.⁸⁴

Faced with such danger, the Duchess finally resolves to create a world truly of her own: "when the Duchess saw that no patterns would do her any good in the framing of her World; she was resolved to make a World of her own Invention, and this World was composed of sensitive and rational self-moving Matter."⁸⁵ The Duchess has struck upon Cavendish's own method. In her preface to the *Blazing World*, Cavendish says she has "made a world of my own," a "voluntary creation or

⁸⁴ Cavendish, *Blazing* 75.

⁸⁵ Cavendish, *Blazing* 75-6.

production of the mind.”⁸⁶ While this is a work of “fancy” according to the preface, she notes that fancy is as rational as philosophy in its matter though different because it need not “be really existent.” Cavendish insists throughout her corpus on a continuum wherein intensive and extensive writing are both products of sense and reason but have a different actualized status. Consequently, the non-existence of her world, or the worlds written by the Duchess and Empress, has no bearing here on its epistemological value.

In the course of the *Blazing World*, Cavendish refutes the mysticism that Pythagoreans invest in number, remaining committed to her conception of nature as containing only one principle – that of “self-moving” and “infinite” matter. Number and its ethical theory, harmony, may be regular parts of nature, but they are “not the cause of any orderly productions.”⁸⁷ For Cavendish there can be no mathematical order, no single mystic unit, and no governing order that directs the self-moving matter of nature. Because there is no discoverable mathematical order, math cannot be a tool for understanding the world. At the same time, there is a clear argument on behalf of a divine use of mathematical language, but this is restricted firmly to knowledge that is beyond mortal sense and reason. Mathematics thus dispatched as an appropriate tool for human knowledge, Cavendish defends human intellection and the productive power of natural language as the right instruments of inquiry. And yet, creation in language is not without its risks, as we have seen in the near

⁸⁶ Cavendish, *Blazing* 6 and 5.

⁸⁷ Cavendish, *Observations* 257.

swoons and disorders of the mind of the Duchess. When guided by her own sense and reason, however, the Duchess produces a world “so curious and full of variety; so well ordered and wisely governed, that it cannot possibly be expressed by words, nor the delight and pleasure which the Duchess took in making this world of her own.”⁸⁸ Though created in language, for the Duchess the value – the “order,” wisdom, and delight – of this world exceeds expression in language. The world created in language in some sense transcends language. In contrast, the natural language modes of other natural philosophers torture the mind, place intellection in danger, and produce stillborn worlds. An intensive poetic mode based on the native powers of sense and reason, however, offers a means to peaceful, productive, insightful, and delightful creation.

⁸⁸ Cavendish, Blazing 75.

Coda: Paradise Lost and the Possible

Discussing John Milton's theodicy, William Kerrigan argues that seventeenth-century Puritans did not ask about God's justice as one might sum the angles of a triangle.¹ He is right in so far as theological questions are rarely as instrumental as the summing of angles for determining planetary motion, light refraction, or the trajectory of a canon ball (to say nothing of basic arithmetic practice). Kerrigan's point suggests, however, a separation between theological and mathematic questions – understanding God's justice cannot be as simple as the summing of the angles of a triangle. As I have argued throughout this project, both math and poetry can write the possible; they are technologies of imagination and discovery, even as they remain technologies for description of the sensible or occult. In opposing theology and the "summing" up of a triangle, Kerrigan suggests that Milton, and other seventeenth-century Puritans, did not have the luxury of asking theological questions as if they were empirical questions, they could not use extensional modes for theological purposes. If this was indeed the case, then Kerrigan's Puritans are a departure from previous approaches to theological knowledge in which the study of the "book of nature," the lifting of the veil, was a legitimate approach to understanding the divine and divine creation.

Kerrigan's easy division between Milton's theological poem and mathematics does not account for the kind of theorizing of the divine that we have seen at work

¹ William Kerrigan, "Milton's Place in Intellectual History," Cambridge Companion to Milton, ed. Dennis Danielson (Cambridge: Cambridge University Press, 1999) 260.

in Descartes' and Cavendish's exploration of the nature and value of mathematics. While abstract entities such as triangles were contested as fictitious concepts, in the hands of Descartes, they were part of a comprehensive (both mathematic and poetic) system of representation of the possible that had significant theological consequences. For Cavendish, mathematics was a divine technology, and though beyond the proper scope of human knowledge, it had clear generative capability. Neither Cavendish nor Descartes viewed mathematics as purely empirical or extensional, and both used the occasion of mathematic practice to theorize the nature of God, his modes of representation, and their connection to the language(s) of man.

With such precedents at hand, it seemed plausible that John Milton -- the Puritan Kerrigan was really talking about -- might present a similar departure from the easy division between mathematics and theodicy. Milton was not explicitly interested in mathematics, he left behind no mathematical treatises, and his mention of the need to be educated in mathematic practices is extraordinarily brief in *Of Education*. Milton may have had an interest in cabala, and therefore a kind of mathematical interpretation of language, but the evidence for this is scanty and a satisfactory argument about how that interest might be located in a text such as *Paradise Lost* remains to be made.² The question remained -- does *Paradise Lost* fit

² William Brennan has suggested that Robert Fludd is a possible source for Milton, particularly for sections of Book V. If Brennan is right, then there may be an interesting cabalistic influence, but I remain somewhat unconvinced. See Brennan, "Robert Fludd as a Possible Source for *Paradise Lost*, V. 469–470" *Milton Quarterly* Volume 15.3 (2007): 95 – 97. Philip Beitchman argues that the

into the story told here about the development of two different modes of intensional writing? Is his poetry intensional? Does his work engage with a mathematics of possibility?

For Descartes, mathematics and the intensional mode resolved the crisis precipitated by the deceptive senses. They allowed him to reason in and through texts alone, eschewing the problem of the material world until he saw fit to return for comparative purposes. Cavendish, who was far more amenable to the input of the senses, but whose enthusiasm for possible worlds perhaps surpassed that of Descartes, suggests to her readers that they may all “create worlds of their own.” She models her own theological, philosophical, and political question-asking in her self-created world. The intensional mode enabled Descartes and Cavendish to ask a variety of ideological and epistemological questions from a new perspective. With their examples at hand, a reader may ask if the multiple narratives of the fall, from the intertwined perspectives of Satan and the narrator, and Raphael’s account in Book VI, work analogously to the Cartesian equation by offering multiple, non-identical “answers” to the question of “what happened” between Satan and God. Perhaps the presence of multiple perspectives, which seem initially like Cavendish’s theory of partial knowledge, are evidence of the intensional mode at work. Perhaps

characterization of evil in *Paradise Lost* is influenced by Gnostic cabala, which is a largely non-mathematic approach to cabalistic thought. Philip Beitchman, *Alchemy of the Word: Cabala of the Renaissance* (New York: State University of New York Press, 1998). For a discussion of other literary authors influenced by cabala see: John S. Mebane, *Renaissance Magic and the Return of the Golden Age: The Occult Tradition and Marlowe, Jonson, and Shakespeare* (Lincoln: University of Nebraska Press, 1992).

Milton used the intensional mode in his mission to justify the ways of god to man, thus asking theological questions in a mode also used by Descartes in his mathematics and mechanics.

Careful study of Milton's corpus has convinced me, however, that while the tradition of Milton criticism has long celebrated his poetry as creative in the same sense that Sidney advocated, the intensional mode used by Sidney, Dee, Descartes, and Cavendish was not the mode deployed by Milton in writing *Paradise Lost*. Instead, Milton depended on prophetic and historical models much more akin to the extensive poetry that Sidney described as divine poetry than to his "right" poetry. This prophetic model depends on inspiration and advocates re-creation and restoration. In this respect, *Paradise Lost* utilizes a mimetic mode, rather than exemplifying novel (non-mimetic) creation. While it is possible that work such as the mortality data reviewed and theorized by John Graunt in his *Natural and Political Observation on the Bills of Mortality* (London 1662) is the mathematical analogue to the historical fictions of *Paradise Lost*, this suggests that it is the mimetic mode that connects Miltonic poetry and mathematical representation. While math and poetry may intersect in this way, the intensive mode central to this project does not dominate Milton's poetic justification of the ways of God to men.³ Yet, that is not to suggest that the intensional mode is not represented *Paradise Lost*. In fact, it is the mode deployed by Satan. Ultimately, the poem rejects Satan's use of this mode, not

³ Consider Mary Poovey's argument about the genres found in such texts in her Genres of the Credit Economy (Chicago: Chicago University Press, 2008).

necessarily because possible worlds should not be explored, but because the hermeneutics upon which Satan's use of intensions is founded are flawed.

History, prophecy, and non-creation

Prophecy and Christian history are the modes central to *Paradise Lost* and throughout Milton's extensive corpus. In *Paradise Regained*, Jesus is emphatic that the classical forms, including epic, are far beneath the genre of prophecy, which better teaches "What makes a nation happy and keeps it so / What ruins kingdoms and lays cities flat."⁴ Prophetic history best teaches readers in matters of church and state. In many ways, Milton's use of history and prophecy is part of a larger English Puritan interest in a millenarian and apocalyptic perspective. A perspective informed by what Janel Mueller has described as a "rediscovered interdependence of received prophecy and lived history."⁵ For millenarian writers, the prophetic mode depended upon history as the image of the present and the recent past. Historical narratives indirectly represent the present.⁶ As George Hamilton has observed, for Milton, the view of the present offered by prophetic history is rather bleak. His is a diagnosis of a diseased and broken nation and church, which needed to recognize its failures before it could manifest the promised future: "Milton's

⁴ John Milton, *Paradise Regained*, *John Milton: A Critical Edition of the Major Works*, eds. Stephen Orgel and Jonathan Goldberg (Oxford: Oxford University Press, 1991) IV.363-4.

⁵ Janel Mueller, "Embodying glory: the apocalyptic strain in Milton's *Of Reformation*," *Politics, Poetics, and Hermeneutics in Milton's Prose*, eds. David Loewenstein and James Grantham Turner (Cambridge: Cambridge University Press, 1990) 9.

⁶ Gary Hamilton observes that Milton deploys an "act of indirection" to put history in the service of a critique of the present or future. Gary D. Hamilton, "The History of Britain and its Restoration Audience," *Politics, Poetics, and Hermeneutics in Milton's Prose*, eds. David Loewenstein and James Grantham Turner (Cambridge: Cambridge University Press, 1990): 242-255.

vision of history presents no happy endings; there are only repetitions of failure.”⁷

According to Milton, whose prophecy was not celebratory, reformation of the English nation-state and church required a clear-eyed view of past failures. An appropriately open spirit of ongoing learning and understanding must accompany this historical view. If all of these criteria were met, history offered a way of understanding the path of reformation that would lead to the apocalyptic moment.

Paradise Lost is a specialized historical poem, dealing with divine or occult history -- a history that lies beyond mortal sight both in terms of time and, in the non-terrestrial scenes, of place. In fact, Milton’s narrator is at pains to emphasize the inspired and revealed nature of the work; in the sense that this history is inspired or received, it is prophetic. According to the narrator, the poem is like the prophecies of Phineus, Thamyris, Maeonides, and Tiresias, the “prophets of old” to whom the narrator compares himself. The work of such prophets is, as described in Milton’s *Second Defense*, to “show the arcane purposes of heaven to us.”⁸ Echoing this, the purpose of *Paradise Lost*, “to justify the ways of God to men.” This prophetic poem is unconcerned with the foretelling of future events, focusing instead on the discovery and communication of those things “invisible to mortal sight.”

Milton’s careful crafting of history, which illuminates a pattern of failure in order to teach, has been interpreted by some as the *same* kind of free-ranging

⁷ Hamilton 246-7.

⁸ John Milton, *The Works of John Milton*, ed. Frank Patterson (New York: Columbia University Press, 1931-38) 80; David Scott Kastan observes the same in his footnote 36 on page 80; see also John Milton, *Paradise Lost*, ed. David Scott Kastan (Indianapolis: Hackett Publishing, 2005).

creation theorized by Sidney and found in the work of Dee, Descartes, and Cavendish.⁹ If this were the case it would be reasonable to assume that the universe of *Paradise Lost* is of a kind with Descartes' mechanical world and Cavendish's blazing world, that the representation of the creation of Milton's world was also written in the intensive mode, though perhaps in ways that are harder to see. But as Campbell reminds us, possible worlds are *other worlds*, ones that do not exert the same kind of "pressure on readers to alter their own worlds."¹⁰ With his use of the prophetic mode throughout his corpus, Milton is deeply invested in the alteration of *his* world; he is not interested in the production of *other worlds* for purposes of education or entertainment. As vital and powerful as the world of *Paradise Lost* is, this critical distinction should not be overlooked. Milton *remade* the world for his readers to see – a creative act to be sure -- but not the same as the creative acts we have seen emerging in Sidney and Dee and more fully developed in Descartes and Cavendish. In insisting on remaking or reforming his world, Milton is, instead, harkening back to the same conventions to which Sidney and Dee were tied but from which they were beginning to depart. Milton's creation is not a representation of what does not yet exist, but rather, a representation of what already has been.

⁹ J.M. Evans considers *Paradise Lost* a remarkably unified text that is at "once both imitative and creative" a text that "is distinguished not by its indebtedness but by its profound originality." J. Martin Evans, *Milton's Imperial Epic: Paradise Lost and the Discourse of Colonialism*, (Ithaca: Cornell University Press, 1995) 220-1. Similar kinds of claims regarding a creative can be found in Lewalski's work as well. My distinction between intensive modes and the mimetic mode should not be taken as a comment on the debate regarding Milton's originality.

¹⁰ Mary Baine Campbell, *Wonder and Science: Imagining Worlds in Early Modern Europe* (Ithaca: Cornell University Press, 2004) 12 and 14-15.

Arguing for a creative mode in Milton's work, scholars often cite his discussion in the *Animadversions* of preachers who "procreate a number of faithful men, making a kind of creation like to Gods, by infusing his spirit and likeness into them."¹¹ Most often the creation clause is offered without the surrounding clauses, allowing echoes with Puttenham, for example, to resonate strongly. This statement on the invigorating power of the preacher is taken as evidence that Milton held, as did Puttenham, Scaliger, and Tasso, that poetic creation is at least *like* divine creation, if not in fact the same thing.¹² But a careful comparison of Milton's poetic theory to that of Tasso reveals differences, and a further comparison to Sidnean poetic theory demonstrates how far Milton's prophet-poet is from Sidney's "right" poet. Tasso, celebrating the infinite variety within a monist universe, argues that the poet, like the "Supreme Artificier" can "form a poem," which "as in a little world . . . contains so great a variety of matters" and "nonetheless [is] one in form and soul."¹³ Tasso's poet, like God, creates a unified whole wherein "nothing is missing [and] yet nothing is there that does not serve for necessity or ornament."¹⁴ In accomplishing this rather paradoxical abundant economy, which suggests a plenitude (nothing is missing) that is non-superfluous, the "art of composing a poem resembles the plan

¹¹ John Milton, *Animadversions, The Prose Works of John Milton* (Philadelphia: John W. Moore, 1847) Vol. 1., 09 April 2009 <<http://oll.libertyfund.org/title/1209/78022>>.

¹² Scaliger suggested of epic that it modeled the "idea of things...just as they might be taken from nature itself," only more perfect (qtd in Lewalski, 5).

¹³ Quoted in Joseph Anthony Wittreich, Jr., *Visionary Poetics: Milton's tradition and his legacy* (San Marino, Ca: Huntington Library, 1979) 12.

¹⁴ Wittreich 12.

of the universe.”¹⁵ In so far as Tasso is arguing on behalf of a similitude between divine creation and poetic creation, he is arguing for a shared ethos of creation, one wherein plenitude and economy are in a perfect balance.

While Barbara Lewalski and others have pointed to the heterocosmic quality of *Paradise Lost*, one that accomplishes economic plenitude, Milton’s *claim* operates differently from that of Tasso.¹⁶ Rather than arguing that there is a similar form to the creation of the world by God and his preachers, Milton’s similitude derives from an infusion of vitality into men. Preachers are not imagined to create linguistic *worlds* that mime divine creation. Instead, they “infuse” the “spirit” and the “likeness” of God into *men*. Echoing Genesis 2.7, wherein “the Lord God formed a human being from the dust of the ground and breathed into his nostrils the breath of life, so that he became a living creature,” this is a vitalization trope, rather than a similitude. Likewise, the account of the creation of man in *Paradise Lost* is distinct from the creation of Earth and the heavens, and is figured as a vitalization of Adam: “He formed thee...dust of the ground, and in thy nostrils breathed / The breath of life...and thou becam’st a living soul.”¹⁷ The words of the preacher, and if we are to follow some, by analogy, those of the poet infuse the divine spirit into creation. The

¹⁵ Wittreich 12.

¹⁶ Lewalski discusses this in the context of the epic genre: “epic as a heterocosm or compendium of subjects, forms, and styles” (4). See also Regina Schwartz’s analysis of *De Doctrina Christiana* where she describes this method as one of cramming a text full with proof texts. Regina M. Schwartz, “Citation, Authority, and De Doctrina Christiana,” *Politics, Poetics, and Hermeneutics in Milton’s Prose*, eds. David Loewenstein and James Turner (Cambridge: Cambridge University Press, 1990).

¹⁷ Milton, *Paradise Lost* VII.524-528.

kind of creation that is “like to Gods” is a spiritual creation grounded (literally in the dust of created man) in the material world. While *Paradise Lost* may accomplish the kind of world-creation figured by Tasso, Milton’s concern, at the very least in *Animadversions*, is with the ability of language to infuse creation with spirit, not to create in the sense of creating a world, and certainly not in the sense of creating a non-actual possible world.

Even if we took the vitalization of men to function as a microcosmic analogue to the creation of worlds, Tasso’s creation is one of ethical mimesis, as discussed with respect to Sidney in Chapter One; a mimicry of the *form* of creation rather than the objects of creation, which remains mimetic. As in Sidney’s second form of poetry, divine poetry, mimeticism may operate at the level of form or content, or both. While divine poetry may be great poetry, according to Sidney’s model it fails to live up to the standard of “right” poetry or intensive poetry, which disdains reference to a metaphysical or physical “actual.” Though such poetry, especially when prophetic, may “engage” the future, as James Grantham Turner has argued, the apocalyptic future of Milton’s poetry is a future that corrects a failed past. Consequently, Milton’s poem addresses already envisioned or created futures rather than a future possibility not previously imagined.

What is more, in so far as Milton’s prophetic writings serve to correct, that is to act as “medical cures and [to] deplore the backsliding of once Godly nations,” his

work depends upon rather than denying worldly reference.¹⁸ Milton's historical representations work, as described in *Of Prelatical Episcopacy*, to "recall" people and to "reduce them to their firm stations under the standard of the Gospell."¹⁹ The trope of medical cures depends upon an identified "disease" located in the actual, whether the physical actual of a national or religious collective, or the metaphysical actual of the fallen individual. Likewise, the trope of recall, and its many siblings in reformed teachings, begins with a chain of reference that depends on the actual rather than the non-actual possible. The critical difference between the restorative or corrective mode and the intensive mode is ultimately one of reference. Milton's God creates a world that "answers" to his own "idea," and his work, in particular that of *Paradise Lost*, answers a divine idea communicated to the poet and a past that has already been accomplished.²⁰

Milton's work, then, is an "exploration of the way things *are*."²¹ While Milton is committed to an exploration of what *is*, and therefore not invested and perhaps is even antagonistic to discussions of what "may be," his poetic mode is not one of

¹⁸ James Grantham Turner, "The Poetics of Engagement," *Politics, Poetics, and Hermeneutics in Milton's Prose*, eds. David Loewenstein and James Grantham Turner (Cambridge: Cambridge University Press, 1990) 9.

¹⁹ John Milton, *Of Prelatical Episcopacy*, *John Milton, The Prose Works of John Milton*, Vol. 1 (Philadelphia: John W. Moore, 1847) 09 April 2009. <http://oll.libertyfund.org/title/1209/78006>.

²⁰ Turner suggests a model of "expulsive creation" whereby exclusion and inclusion are determining devices in a kind of historical-prophetic creation. Turner's model is provocative and useful, but as he himself notes, such prophetic work partakes of "the highest plane of *inspiration*" and is not, therefore, the same as intensive creation (270).

²¹ Fallon 15, emphasis mine.

uncomplicated mimesis.²² Given Milton's monism and animist materialism, his exploration of the way things are is necessarily provisional.²³ As Stephen Fallon has observed, atomist theory was not empirically falsifiable, or for that matter, empirically verifiable, given that the atomic level is beyond ocular proof. What is more, a system that takes all corporeal substance as animate, self-active, and free is a system that is fundamentally indeterminate.²⁴ Where free action is possible, the ability to predict systematic behavior is a function of a degree of freedom.

Consequently, in Milton's exploration of the way things are interpretation yields neither totalizing systematic answers, nor a static mimetic mode. Instead, Milton emphasizes that the exploration of what is must be an ongoing process of "puzzling out" a provisional model that is constantly changing in response to further reading and interpretation.²⁵

Intension and Satan

While *Paradise Lost* as a whole is not written in an intensive mode, possible worlds do make an appearance, first in the imaginations of a falling/fallen angel and then later in God's divine acts of creation – where intension and its world creating

²² One might wonder what such a mode looks like; perhaps the blazon is that ideal example.

²³ Fallon 80.

²⁴ Fallon 81.

²⁵ Edwards 95; this notion of a puzzling or process-based hermeneutics will be taken up in greater detail later. See also Michael Lieb, *Theological Milton: Diet, Discourse, and Heresy in the Miltonic Canon* (Pittsburgh: Duquesne University Press, 2006). Lieb argues, as does Edwards, that Milton's works encourage "text[s] to open up, to entertain the possibility of contrary views" (64). With "a play of dialectic" "Milton creates a world in which one may never rest content with the simple assertion of doctrinal principles. Rather, one must contend with the proof-texts, interpret them, and understand what they disclose on their own terms" (69). See also Stanley Fish's argument on this topic in *Surprised by Sin* (Cambridge, MA: Harvard University Press, 1967).

capacity is legitimate. The poem begins with Satan and the rest of the rebel angels lying on a lake of fire in Hell, having been expunged from Heaven by God via the Son. According to our narrator, Satan “trusted to have equaled the most high, / If he opposed, and with ambitious aim / Against the throne and monarchy of God / Raised impious war in Heaven.”²⁶ Here and elsewhere we learn that Satan believes in the possibility that his power equals that of God and that he can emerge as the new ruler of Heaven out from under what he sees as the bonds of hateful tyranny. Asking “What if...[we] can cast off this yoke” – the yoke being subjection to God’s new Son – Satan responds that the answer is that the angels are “equally free,” equally strong, and equally ordained to govern rather than serve. He is convinced, and he convinces his compatriots, that they are born to rule rather than subjection.²⁷ And in that first “what if” intensive discourse is introduced. Proposing their equality in all matters, Satan suggests that they can make the possibility of free reign a reality.

In Books 1 and 2, Satan and the rest of the fallen angels “put to proof” God’s “high supremacy,” and engage God in what Satan calls a “dubious battle on the plains of Heaven.”²⁸ “Dubious” works here to argue that the outcome was not certain, i.e. that winning was possible, in Satan’s eyes, rather than to suggest that his trust in his supremacy was misguided as the poetic line encourages us to

²⁶ Milton, Paradise Lost I.40-43.

²⁷ Milton, Paradise Lost V.785-6.

²⁸ Milton, Paradise Lost I.132, I.104.

understand. So one-third of heaven put Satan's belief in the possibility of his and their supremacy to the test. The narrator, ever ready to counter Satan's possible world rhetoric, observes "Him the almighty power / Hurled headlong flaming from the ethereal sky," so much for the possibility of equaling God.²⁹ The narrative voice often functions as a counterpoint to Satan's "vain imaginations," measuring out time and space in order to make the actual failure of the angels more real than the possibility of success advocated by Satan. Where Satan proposes possibility, the narrator measures out the "nine times the space that measures day and night" that the fallen angels lay upon the lake in hell.³⁰ Such measurement places angelic time within the frame of human time, and thus performs the analogizing that happens throughout the poem as the narrator works to find a way to relate the history of what seems to be ineffable. The place of containment is likewise measured to be as far from Heaven as "from the center thrice to the utmost pole."³¹ While such measuring works in an extensional or mimetic mode to fix the location of the fallen and the duration of their fall, we note that a peculiar indeterminacy remains in the latter example. Thrice the center to the utmost pole reads like a narrative expression of the multiplication of a concrete radial length, but an equation of what? The Earth? The Heavens? The circle that such a radius would describe and,

²⁹ Milton, *Paradise Lost* I.44-5.

³⁰ Milton, *Paradise Lost* I.50.

³¹ Milton, *Paradise Lost* I.74.

consequently, its triple, remain unspecified. Information is missing; the narrator has only produced the *effect* of the realism produced in a mimetic mode.

While the effect of realism remains just that, the experience of failed possibility seems all too real according to Beelzebub. Lying with his compatriots on a lake of fire, he now believes God to “be of force...almighty since no less than such could have o’erpowered such force as ours.”³² Now able to “see,” Beelzebub “rue[s]” the failed experiment of Satan’s possible world. As far as he is concerned, they put a possible world in which Satanic power equals that of God to the test, and the proof of its failure lies all around them – literally, since they all lie prone on a burning lake in hell. Importantly, Beelzebub’s change in perspective is characterized as one of necessity. He now “of force” believes in God’s supremacy. “Of force” signals not only the power of God’s military might, but also the now logical necessity produced by the evidence of the experiment; it is now logically certain that God is supreme. The proposition of Satan’s power to overcome God remains a semantic possibility, but no longer obtains, in Beelzebub’s view, as a real possibility; the exercise of the challenge seems to Beelzebub to have determined what is *real*.

The fallen angels, as amenable as they were to the possibility that they could overcome God, had left the possibility of failure relatively unthought. That unthought of outcome now lies before them. Given Milton’s argument in *Of Education* that understanding could only be founded on sensible things, one might

³² Milton, *Paradise Lost* 1.144.

expect that the all-too-sensible proof of an adamantine door, a lake of fire, and burning welts from thunderbolts will have convinced the rebel angels of their inequality.³³ And there is a short, very short moment where this seems to be the case. Less than 100 lines into the poem, Satan recognizes the distance that he has fallen, “so much the stronger proved / (God) with his thunder; and till then, who knew / The force of those dire arms?”³⁴ But the moment is short and Satan casts the “force” which compelled Beelzebub to accept a new reality in a different guise. No longer denoting both logical necessity and martial strength, the force of “dire arms” decouples the experience of defeat from a logically necessary conclusion. With this change, Satan, unlike Beelzebub, can turn away from the evidence of God’s supremacy into the first of a series of new propositions – beginning with the following: “What though the field is lost, / All is not lost.” With “successful hope” – that is, a persistent hope of success, Satan resolves to eschew all of that sensible data and to reside in possibility. As he suggests, always marking his hoped for states with propositional (conditional) phrases, he suggests - that “perhaps” the fallen angels “shall grieve” God and that “perhaps” God “hath spent his shafts” and that it is possible that an opening for resistance still exists.³⁵

³³ Milton, *Major Works* 227.

³⁴ Milton, *Paradise Lost* I.92-4.

³⁵ For more on Satan’s persuasive prowess in this scene see Diana Trevino Benet, “Hell, Satan, and the New Politician,” *Literary Milton: Text, Pretext, Context*, ed. Diana Trevino Benet (Pittsburgh: Duquesne University Press, 1994) 91-113; and John M. Steadman “Pandaemonium and deliberative oratory,” *Neophilologus* Vol. 48(1): 159-176.

Thus armed with successful hope, Satan turns to his fellow fallen angels with yet another proposition. His compatriots are in dire straights, described as thickly bestrewn “floating carcasses...” who “abject and lost lay...under amazement of their hideous change.”³⁶ Nevertheless, Satan exhorts them to accept an alternative possibility to the all-too-sensible actual state of affairs:

[. . .] Princes, potentates,
 warriors: the flower of Heaven once yours, now lost,
 If such astonishment as this can seize
 eternal spirits; or have ye chosen this place
 after the toil of battle to repose
 your wearied virtue for the ease you find
 to slumber here as in the vales of Heaven?
 Or in this abject posture have ye sworn
 to adore the conqueror, who now beholds
 cherub and seraph rolling in the flood
 With scattered arms and ensigns, till anon
 His swift pursuers from Heaven gates discern
 The advantage and, descending tread us down
 Thus drooping [...] Awake, arise, or be forever fallen.³⁷

It is a passage that, as generations of commentators have noted, rings out – a bright call across a dark and painful moment. Choose, Satan insists, to reject the astonishment that proves that the flowers of heaven are forever lost, choose to not adore a conqueror who may very well destroy you. Awake, Satan calls out, and choose not to be fallen. The suggestion of a choice, the very idea that an alternative or set of alternatives exist amongst which they can choose is strong enough that the

³⁶ Milton, Paradise Lost I.310 and I.314.

³⁷ Milton, Paradise Lost I.314-330.

heretofore fallen angels “heard...were abashed,” and “up they sprung.”³⁸ The power of choice is enough to resurrect angels prone upon a lake of fire. They are encouraged to arise again as a “numberless collection” of “bad angels” ready to believe in possibility.

Satan, though “racked with deep despair” and pain, insists throughout the first two books on the power of possibility and the reality of outcomes alternate to the one currently inhabited. Faced with the suggestion that maybe they were destined to fulfill God’s will even in falling, Satan responds with a different possibility: “...If then his providence/ Out of our evil seek to bring forth good, our labor must pervert that end /And out of good still to find means of evil...”³⁹ Satan proposes a world wherein providence, or God’s foreknowledge of a fortunate creation following the satanic rebellion is faulty. We know that for Milton, as argued in *Of Christian Doctrine*, divine providence in no way imposes necessity on the future, the “very notion of “bondage of the will” would be deemed anathema by Milton.”⁴⁰ While the concept of predestination exists in Milton’s theological writings, it is not a determining concept. Unlike in strict predestinarian thought, for Milton the reprobate (or in this case what are now the rebel angels) are not “appointed” to God’s anger. They assume that “bad eminence” as the result of their own free

³⁸ Milton, *Paradise Lost* I.331.

³⁹ Milton, *Paradise Lost* I.163-4.

⁴⁰ Lieb 76 and 292-3 n59; As Evans notes: “Raleigh had examined this question in his *History of the World* (1614) and come to the conclusion that ‘this prescience of God (as it is prescience only) is not the cause of anything futurely succeeding: neither doth God’s foreknowledge impose any necessity, or bind” book one ch I section 12 (qtd in Evans 238).

will.⁴¹ Accordingly, for Milton it is possible that the future is not determined. And yet, the reader educated in the doctrine of the fortunate fall – both the tradition in Christian hymns and in Aquinas' discussion in the *Summa Theologica* – is aware of a tension here.⁴² For the reader the fall is already accomplished. Good, in the form of Christian redemption and the person of the Son, has already been wrought from what are, in the narrative, Satan's future actions. But for Satan in this already past present, the possibility remains of subverting God's providence.

Satan remains obstinate in his insistence that possibility may one day become his triumphant reality. Recalling that intensional language in some sense creates or calls into being the non-actual possible in the act of writing, we find Milton offering a rather remarkable literalization of the creative power of intensions in Book Two. In the very moment in which Satan speaks and thinks of his new possible world of conquest, he brings into being a more material possibility: Sin. The articulation of the possibility of Satan's supreme power produces, literally, a woman who embodies endless trouble. Here is her recollection of the moment:

In Heaven, when at the assembly and, in sight
Of all the seraphim, with thee combined
In bold conspiracy against Heaven's King,
All on a sudden miserable pain
Surprised thee, dim thine eyes, and dizzy swum
In darkness, till on the left side opening wide,
Likest to thee in shape and countenance bright,

⁴¹ Leib 78; see also on this topic Maurice Kelley's discussion of Milton and Arminianism in the introduction to the *Complete Prose Works* 6:74-86.

⁴² See also Arthur Lovejoy, "The Paradox of the Fall in *Paradise Lost*," *English Literary History* IV (1937): 161-79.

Then shining heavenly fair, a goddess armed
Out of thy head I sprung⁴³

While Sin describes herself as a fair goddess, she, as readers already know, has been transformed into an “excrable shape,” a woman-serpent who is beset by incestuous rape-begotten hounds that eat her continually from the inside out.⁴⁴ Indeed, we learn sometime later that Heaven’s whole host “recoiled afraid” at her birth, holding her to be a dangerous portent.⁴⁵ Only with time and “attractive graces” did she win favor in Heaven. So while Milton offers his readers a vision of linguistic creation, it is qualified by conditions of pain (Satan conceives her in “miserable pain”), danger, and monstrosity.

God and Intensional Creation

Throughout the poem Satan wants to use language as God does, as an instrument of immediate creation, calling possibility into reality. But Satan’s attempts always fall short of the divine linguistic creation figured by Milton. God accomplishes the creation of the earth in Book 7 with a remarkable integration of the powers of both language and measure. The “king of glory” departs from his to “create new worlds.”⁴⁶ God looks out over the vast abyss of chaos, a place “without dimension,” a no-place of pure possibility where “length, breadth, height, time and

⁴³ Milton, *Paradise Lost* II.749-758.

⁴⁴ Milton, *Paradise Lost* II.681.

⁴⁵ Milton, *Paradise Lost* II.759.

⁴⁶ Milton, *Paradise Lost* VII.208-9.

place are all lost.”⁴⁷ And like Sidney’s poet whose poetry answers only his own “foreconceit,” God creates a new world “answering his great idea.”⁴⁸ Out from the “dark, wasteful, wild” God’s omnific, that is all-creating, word carves order. The trope of carving is accomplished with a rather remarkable convergence of mathematic and literary intension: God takes “golden compasses” and with “One foot centered and the other turned / Round through the vast profundity” turns the compass as he says “Thus far extend, thus far thy bounds, / This be thy just circumference, O World.”⁴⁹ Thus, mathematical measuring as enacted by the explicit swing of the free leg of the compass. In practice the swing of a compass leg works both to describe and create a two-dimensional circle. Like Descartes’ triangles, which need not have had a previous existence outside of their inscription in order to be “real,” the compass-drawn circle comes into being as it is being inscribed. The circle-cum-sphere-cum-world however is called into being by the simultaneous work of God’s hand and his speech. With the declaration “thus far extend...” the world as such comes immediately into being and is hailed in that last apostrophic clause (O World) as a completed project.

Satan’s rather meager attempts to assert self-determination, to make his possible alternatives reality, pale when compared to the creative power of God, which occupies the better part of Book Seven. “Choose, or be forever fallen” was the

⁴⁷ Milton, *Paradise Lost* II.893-4.

⁴⁸ Milton, *Paradise Lost* VII.557.

⁴⁹ Milton, *Paradise Lost* VII.225-231.

call to the angels prone on the lake of fire, but it might have been the call of conscience that stopped Satan's "dire attempt" momentarily at the beginning of Book Four.⁵⁰ As he readies to "begin his dire attempt," Satan finds himself overwhelmed with the "remembrance" of all that he has lost.⁵¹ In an apostrophic call to Adam, we expect to hear Adam accused, but instead hear Satan's self-accusation. The narrator asserts that "conscience wakes despair," and the reader can clearly track that awakening of despair. Satan acknowledges his error: "pride and worse ambition threw me down," God "deserved no such return," and "his good / Upbraided none; nor was his service hard."⁵² And then his language slides into a register of despair with a subject-less apostrophe, "O had his powerful destiny ordained / Me some inferior angel." With the subsequent series of rhetorical and self-prosecutorial questions, Satan expresses his despairing sense that irreparable harm has been done. And, more importantly, that it was, in some sense, inevitable:

O had this powerful destiny ordained
 Me some inferior angel, I had stood
 then happy; no unbounded hope had raised
 ambition. Yet why not?; [...]

⁵⁰ Milton, Paradise Lost IV.15.

⁵¹ According to Milton this kind of moment is made possible only by the recognition of the existence of God. "No one would refrain from sin because he felt ashamed of it or feared the law, if the voice of Conscience or right reason did not speak from time to time in the heart of every man, reminding him....a God does exist" [qtd in Lieb 65 – Complete Prose Works (Yale Press) volume 8 pg 132]. In the Augustinian tradition this was figured not as a moment of guilt but one of envy: "But after that proud and therefore envious angell...preferring to rule with a kind of pomp of empire rather than to be another's subject, fell from the spiritual Paradise, and essaying to insinuate his persuasive guile into the mind of man, whose unfallen condition provoked him *to envy now that himself was fallen*." J.M. Evans, Paradise Lost and the Genesis Tradition (Oxford: Clarendon Press, 1968) 95.

⁵² See Evans 223-229 for an excellent discussion of Milton's decision to incorporate envy of Christ as part of the reason for Satan's rebellion.

Hadst thou the same free will and power to stand?
 Thou hadst [...]
 Whom hast thou...to accuse,
 but Heaven's free love dealt equally to all? ⁵³

While Satan's first apostrophe identifies Adam as its subject, the trajectory of the following lines quickly leaves the subject of Adam behind and the second apostrophe is a subject-less call in despair over Satan "destiny ordained." As before, Satan insists on a fixed interpretation; he accepts the error of his previous actions but with a desperate call for a different "destiny ordained," Satan shifts culpability onto "Heaven's free love." It is a twisted logic that leads Satan from a remembrance and recognition of the cause of his fall into the accusation that God's love is "accursed, since love or hate, / To me alike, it deal eternal woe."⁵⁴ Reading his own "free will to stand" as an already "accursed" position, Satan misunderstands the nature of free will and insists upon a reading of it as a "destiny ordained," one in which he would have fallen whether through his own aspirations or through those of "some other power" to whom, even as an "inferior angle, he inevitably would have been "drawn."⁵⁵ This fixed (mis)interpretation of his fall as determined regardless of his station in heaven is that which Satan will "choose freely" to resist.⁵⁶ Rather than seeing that he can "choose [redemption through God's grace], or be forever fallen," Satan has walked himself through a tortured chain of reasoning that culminates in

⁵³ Milton, *Paradise Lost* IV.58-68.

⁵⁴ Milton, *Paradise Lost* IV.68-9.

⁵⁵ Milton, *Paradise Lost* IV.63.

⁵⁶ Milton, *Paradise Lost* IV.73.

his being always already fallen, as pre-ordained to fall, and here he asserts his ability to thwart this misconstrued predestination, as in the moment in which he determines to subvert God's perpetual grace, Satan's insistence upon the possibility of resistance depends upon an initial fixed reading.

The scene is doubly peculiar for the way that Satan's earlier attempts at self-determination "Like a devilish engine back recoils / Upon himself."⁵⁷ The recoil transforms his liberating claims into ones of enclosure, and for the first time Satan allows himself to entertain the possibility so long occluded – the possibility that he may choose to be something other than be forever fallen. As countless commentators have noted, the possibility of redemption is rejected and Satan chooses instead to remain in place – in the sense of in his role as the rebel angel instead of inhabiting an intensional space. Satan, upon entering the garden, finds himself beset with doubt:

[...] Horror and doubt distract
His troubled thoughts and from the bottom stir
The hell within him, for within him hell
He brings, and round about him, nor from hell
One step no more than from himself can fly
By change of place⁵⁸

What was liberating in Satan's voice in Book One, "a mind not to be changed by place or time," has been both structurally (it now closes the segment) and semantically

⁵⁷ Milton, Paradise Lost IV.17.

⁵⁸ Milton, Paradise Lost IV.18-23.

inverted by the narrator: "No more than from himself can fly / By change of place [. . .]."⁵⁹ At the core of both passages is a line that depends upon a rhetorical figure that reorders a rather simple clause, making use of a secondary echoing figure, epanalepsis⁶⁰: "Can make a *heaven of hell, a hell of heaven*;" "the *hell within him, for within him hell*." In the former, Satan's ordering of the antimetabole works to celebrate the determining power of an internal state and to reject what has been lost.⁶¹ The placement of "heaven" at either end of the epanalepsis encases hell within heaven and thus emphasizes the more pleasant location. In the later line, the reordering is more complicated but it has inverted the position of hell in the previous example, using the echo to amplify the now negative entrapment figured by the narrator. Where Satan's amplification works to contain hell within a positive, and self-determined heavenly state, the narrator's later reconstruction literally traps Satan, as the referent for "him" within the confines of hell. Internal states of affairs determine the experience of time and place in both instances, but the later instance devalorizes what held off despair for Satan immediately after the fall into hell. What was a source of resistance is now the condition of despair.

⁵⁹ Milton, *Paradise Lost* I.253 and IV.23-4.

⁶⁰ Repetition of the same word or clause after intervening matter. More strictly, repetition at the end of a line, phrase, or clause of the word or words that occurred at the beginning of the same line, phrase, or clause. 03 April 2009 <http://humanities.byu.edu/rhetoric/Silva.htm>

⁶¹ A rhetorical figure in which a repetition of words, in successive clauses, in reverse grammatical order. While this figure is sometimes known as chiasmus, although that figure is proper only to inverted grammatical structures, not inverted words. 03 April 2009 <http://humanities.byu.edu/rhetoric/Silva.htm>.

A remarkable teaching exchange between the angel Raphael and Adam offers us an alternative vision of Satan's persistent chase after possibility. After Raphael has related the battle in Heaven, Adam asks about astronomy, echoing the Copernican debate about planetary movement. Raphael's response chides Adam: if he is "reckoning right," he may contemplate nature but Raphael advises Adam not to be too inquisitive in asking: "What if the sun be the center of the world?" "What if the earth does move?" "What if the moon reflects the earth?" "What if there is life on the moon?" For nearly one hundred lines he mimes intensional inquiries Adam might make, and then he exhorts Adam to firmly reject the intensional mode he has just beautifully modelled. Instead Adam should be "lowly wise...think only what concerns thee and thy being; / Dream not of other worlds."⁶²

With Raphael's injunction the pursuit of possibility beyond the ken of human experience is denied. The non-actual possible should not be the concern of human beings according to the angelic messenger; instead they should focus on what they, as mortal in a material world, can experience. Raphael's position here is suggestive not of a disdain for science *per se* but of a rejection of propositional thought. I began with the distinction made by Kerrigan between theological questions and the summing of the angles of a triangle, and suggested that this difference was more complicated than it first appears. What I read behind Raphael's argument is that, for Milton, the difference between theodicy and mathematical objects lies not between

⁶² Milton, *Paradise Lost* VIII.173-5; this has a clear echo with Romans 12.16 "do not be haughty in mind, but associate with the lowly. Do not be wise in your own estimation."

questions of divine justice and empirical questions, but between possibility figuring intension and its dangers and the world-imaging work in which he engages.

An interpretive failure

Karen Edwards' suggestion that for Milton error is equated with fixed, interpretation is helpful in making sense of Milton's rejection of Satan's intensional mode.⁶³ At the same time, it offers us a way to theorize where an epistemology of possibility may work for Milton. To read once, according to Milton, whether in the "book of nature," the Bible, or the narratives of history, without re-reading, reflecting, and revising interpretation is to misread. Thus far the mimetic and intensional modes have been placed in a heuristically useful opposition. But in the case of *Paradise Lost*, that heuristic fails to account for the complicated relationship between possibility and provisional knowledge. Milton argues on behalf of a perpetually dynamic and a process-oriented approach to knowledge. Satan fails because his "inadequate hermeneutics" -- his repeated mis-readings of his situation-- foregrounds the "static over the dynamic, fixity over process."⁶⁴ Edwards is interested in modes of reading, not in possible worlds. But her insights offer a way to interpret Milton's rejection of Satan's possible worlds not as a rejection of possibility itself. As I have been arguing, part of Satan's error is his insistence on the intensional mode, his constant determination to manifest possibilities other than those that obtain as the actual. Positing or accepting a fixed view of reality, which

⁶³ Karen Edwards, *Milton and the Natural World: Science and Poetry in *Paradise Lost** (Cambridge: Cambridge University Press, 2000) 95.

⁶⁴ Edwards 95.

Satan does repeatedly in his assessments of God's intent and action, is just the first step in Satan's error. With fixed interpretations in place, Satan then insists on alternative possibilities to the fixed actual. Not only does he misread reality, Satan's entire epistemology of resistance depends on his construal of his misreadings as accurate representations of a static reality. He assumes that God determined his rebellion and that the creation of the world and man to take the place of the fallen host was pre-determined, and it is against these pre-determined "realities" that he positions himself. Where Milton in a number of instances insists on the primacy of ongoing experience and the provisionality of knowledge, particularly knowledge of the sensible world, Satan takes what others "too well" see and feel as accurate and stable interpretations of the actual. Satan does not reject the evidence of experience as much as he refutes the power of the present to determine the future, even the very immediate future. Defeat in heaven is read as an index of God's martial strength but does not entail, as a logical consequence for Satan, the elimination of the possibility of future success. While it may seem paradoxical to align Satan's intensional discourse with an interpretation of the world as determined, it is precisely this commitment to fixed interpretation, rather than a dynamic, process based interpretation, that enables his oppositional rhetoric of possibility.

The "idolatrous reader," like Satan, subjects "heavenly truth" to "ignominious bondage," thus fixing truth in an unfit manner.⁶⁵ It is this "bound" truth that Satan

⁶⁵ Edwards 95.

repeatedly rejects in favor of a falsely opposed alternate possibility. Failing to see the fundamental flexibility built into “fit” interpretation, Satan can only imagine resistance through opposition. Several examples will bring this phenomenon in clear relief and suggest a complex relationship among prophecy, providence, necessity and possibility. While the intensional discourse of Satan is deprecated in the poem, the epistemology of possibility is not. In the first conversation between Beelzebub and Satan in book one. Satan turns to Beelzebub who lay “weltering” by his side, and voices his surprise at their defeat and his “successful hope” that “all is not lost.”⁶⁶ Beelzebub is not quite as confident as his “vaunting” chief; “too well” he sees, feels, and understands the “proof” of God’s supremacy.⁶⁷ With such recognition/interpretation in mind, Beelzebub offers a vision of the future: “What if he our conqueror.../ Have left us this our spirit and strength entire / Strongly to suffer and support our pains / That we may so suffice his vengeful ire / Or do him mightier service as his thralls.”⁶⁸ Satan’s response clearly reiterates his compatriot’s interpretation that they have been spared to serve God’s greater design; God “out of our evil seek[s] to bring forth good.”⁶⁹ Failing to re-read and review, to engage in an ongoing interpretation of their situation, Satan and Beelzebub both choose to assert and accept a providential narrative. That failure is likely to be missed by an inattentive reader, perhaps even readily accepted by the Christian reader educated

⁶⁶ Milton, Paradise Lost I.120.

⁶⁷ Milton, Paradise Lost I.134.

⁶⁸ Milton, Paradise Lost I.143-148.

⁶⁹ Milton, Paradise Lost I.163.

in the doctrine of the fortunate fall. It is in defiance of this unquestioned interpretation that Satan then insists that the ultimate end, “to bring forth good,” can be subverted by their determination to “pervert that end.”

In the poem “On the Morning of Christ’s Nativity,” Milton describes a “holy song” that if it “enwrap our fancy long / Time will run back....” And “Truth and Justice then / Will down return to men.” *Paradise Lost* is that song. In many ways the notion of time running back is critical to understanding how Milton’s approach to knowledge and its right forms differs from that of Descartes. For Milton, the forward looking propositional discourse of Satan is always reaching beyond, challenging divine providence, putting “phantasms” and “vain imaginations” of what may be before what is. The project of the Miltonic poet is not that of the Sidnean right poet who disdains all worldly input and ranges free within his own mind.⁷⁰ That ranging free within his own mind is precisely what makes all places a hell to Satan – “which way I fly is hell, myself am hell.”⁷¹ The Miltonic poet makes time run back, as he says, and in that effort lies a commitment to an epistemology and politics of return and recovery. Descartes, on the other hand, made mathematics a tool for representing the non-actual possible in remarkable new ways. The success of his mathematics offered him a new way of understanding God, and a new way of understanding creation. Descartes used the intensional mode to figure whole other worlds and in

⁷⁰ Campbell characterizes Milton’s rejection of a possible worlds approach in “On the Morning...” as a “sweeping expulsion,” aligning it firmly with the taint of original sin and suggesting an analogous vigor in Milton’s rejection of the intensional mode to that of God’s expulsion of Adam and Eve in *Paradise Lost* (74).

⁷¹ Milton, *Paradise Lost* IV.75.

so doing rejected the notion of recovery in favor of previously un-thought, indeed un-writeable possibilities. Sidney, Dee, Descartes, and Cavendish offered a variety of genres and languages with which to write alternate possibilities, to bring those possibilities into being in some important sense where we can think with them, inhabit them, and see where they go. But Milton suggests that we “interrupt the sweet life” when we trouble ourselves with possible worlds. Satan’s lament – which way I fly is hell, myself am hell – has a haunting resonance; it registers a tension between a Miltonic project of recovery and the loss of possibility for Satan by the end of the poem.

