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Paradise Lost: Astronomy, Scepticism, Perspective

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A thesis submitted in partial fulfillment of the requirements for the degree in Doctor of Philosophy

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PARADISE LOST: ASTRONOMY, SCEPTICISM, PERSPECTIVE

(Thesis format: Monograph)

By

Yanxiang Wu

Graduate Program in Comparative Literature

A thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

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Abstract

Recent breakthroughs in Milton studies have demonstrated that the cosmological frame of *Paradise Lost* is not the Ptolemaic cosmos but most likely the infinite multiverse, and critics were wrong to think that Milton had chosen the geocentric model to accommodate his Christian epic. My thesis builds on this new understanding of Milton's cosmology and re-examines three interpretational problems in *Paradise Lost*. Two of them are from the astronomical dialogue in book eight: God's derisive laughter at astronomers who endeavor to "save appearances" and Raphael's admonishment to Adam that he "be lowly wise." The third concerns a group of Milton's epic similes with added human perspectives. The most famous is the careful ploughman simile in book four. My general argument is that Milton's epistemological scepticism, rooted in his infinitist cosmology, is our key to understand all three interpretational problems. In this thesis I connect Milton to Nicholas of Cusa and Michel de Montaigne, but distinguish him from Francis Bacon.

The body of the thesis includes four chapters. Chapter one places Raphael's astronomical talk in the context of early modern debates between sceptics and realists on the nature of astronomy as a science that "saves appearances." Chapter two shows that Cusanus is our best guide to understand Milton's epistemological scepticism. Chapter three reads Raphael's "be lowly wise" as a well-deliberated solution to the problem between reason and faith in Milton's time. Chapter four interprets the epic similes with added human beings in light of Milton's own discussion of similitude in the *Art of Logic*.

Keywords:

Milton, Cusanus, Montaigne, Francis Bacon, saving the appearances, astronomy, perspective, cosmology, epistemological scepticism, anti-intellectualism, infinity, knowledge, reason, faith, God, Raphael, Satan, Adam, be lowly wise, Miltonic simile

Acknowledgements

This thesis is written under the joint supervision of Professors John Leonard and Laurence de Looze, two of the most inspiring and beloved teachers here at Western. Laurence has given me the vista of western culture and literature required of a comparatist. It was reading Montaigne in one of his classes that I first caught a glimpse of the unlikely affinity between the essayist and John Milton. John has not only taught me everything about Milton, he has also participated in all crucial developments of my argument with steadfast courtesy and rare scholarly discernment. I have benefited immensely from his rich, deep, and encyclopedic understanding of Milton's prose and poetry. Both John and Laurence have sustained invariable faith in my work throughout the lengthy, arduous writing process: "what in me is dark / Illumine, what is low raise and support." They have greatly raised my standards of writing and inculcated in me noble intellectual aspirations. They are scholars, mentors, and friends to me all at the same time.

Here at Western, my sincere thanks go to Professor M. J. Kidnie, who taught me Renaissance drama and read my thesis with breathtaking acumen, and Professor John Nassichuk, who suggested useful secondary materials and pointed out possible routes for future research.

Outside Western, I owe special intellectual debt to Professor Dennis Danielson, whose *Paradise Lost and the Cosmological Revolution* came out timely when I was writing my first chapter, which, together with John's *Faithful Labourers*, saved me a formidable amount of work and lighted the road ahead for me.

Sylvia Kontra, the comparative literature program assistant, has provided most needed help in administrative affairs. Other teachers, friends and colleagues who endear my memories of Canada include: Professor Aara Suksi, Professor Randall Pogorzelski, Shasha Li, Kyoungsoo Hwang, Nina McQuown, Rahel Nega, Mehraneh Ebrahimi Eshratabadi, and Amir.

My deepest gratitude goes to my parents and sister, who were with me summer and winter.

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Chapter 1 “To Save Appearances”

Adam inquires concerning celestial motions, is doubtfully answered, and exhorted to search rather things more worthy of knowledge.

– *Paradise Lost*, Book VIII, the Argument

Raphael’s doubtful answer to Adam’s astronomical inquiries troubles us in three ways. First of all, his attitude towards astronomy is at odds with our cherished modern belief in the freedom of intellectual and scientific inquiries. It also seems to go against Milton’s own advocacy for such belief in his prose. Raphael not only ends with the exhortation that Adam “be lowly wise” and direct his attention to what concerns him and his life on Earth instead of things in the heavens, he also begins his answer with derision of astronomers, who are “perhaps to move / [God’s] laughter at their quaint opinions wide, / Hereafter, when they come to model heav’n / And calculate the stars, how they will wield / The mighty frame, how build, unbuild, contrive / To save appearances, how gird the sphere / With centric and eccentric scribbled o’er, / Cycle and epicycle, orb in orb” (8.77-84). Secondly, in the body of his answer, Raphael asks Adam to consider his universe as geocentric, then heliocentric, and at last he asks him to imagine the existence of other inhabited worlds beyond his, with their own suns and orbiting satellites. But all are rendered strictly in hypotheticals, a number of “what ifs.” Such ambiguity leaves us

wondering what Milton's true conception of the universe is. Finally, the question seldom asked, and if asked, not satisfactorily answered, is simply: what is Raphael's point in giving such an elaborated astronomical talk to Adam? Let us not forget that he is sent by God on an urgent mission, to forewarn Adam of the potential threat to their paradisaical happiness, Satan. The doubtful answer is felt to have usurped the place of a practical warning Adam really needed. Or, does it contain some important lesson for Adam before the fall? If it does, what is it?

These are the issues and questions that shall occupy the first three chapters. In this chapter, I shall focus on Raphael's phrase "to save appearances" and his attitude towards astronomers and astronomy. Raphael's attitude, I shall show, is best understood when placed in the context of the early modern debates between sceptics and realists on the nature of "saving the appearances." I argue that Raphael's position is a sceptical one. The neat division of historical figures into sceptics and realists, it should be pointed out here, is reductive and ahistorical. As shall be seen below, both sides are composed of figures with varying views, degrees and kinds of scepticism or realism. The purpose of such a division is not to draw a rigid line through the two sides but to identify a thread of arguments and themes through which we may work our ways into the multifarious and complicated early modern intellectual network. A simple question may serve to test individual positions and roughly separate the sceptics from the realists, namely, can astronomers portray the true form of the whole universe? Those who answer "yes" can be put to the realists' group, and those who answer "no," the group of the sceptics. Milton's answer to the question, as shown in Raphael's attitude towards "saving the appearances," is "no." But it does not mean that Milton's sceptical position corresponds to any uniform

scepticism shared by all the sceptics. Such convenient uniformity, as that among the realists, does not exist in history. Indeed, the next step after the loose groups are formed, is to carefully differentiate various forms and motivations of the sceptics' positions and compare them to Milton's. I find that the closest sceptical position to Milton's is that of Montaigne. Both in turn, it seems to me, have been heavily influenced by Nicholas of Cusa. In the next chapter I shall endeavor to show that the Cusan doctrine of learned ignorance could be an important source of Milton's scepticism in astronomy and epistemological scepticism in general. But before I enter into those discussions, it is necessary to give a brief account of the more general critical background against which my discussion shall unfold.

Reconceiving *Paradise Lost* as a cosmic epic

Twentieth-century Milton criticism studied Raphael's talk mainly against the background of an astronomical revolution that took place in Europe in the sixteenth and seventeenth centuries. The core of the revolution is identified as the clash between the Aristotelian-Ptolemaic and the Copernican world systems, and by extension, between the old geocentric and the new heliocentric worldviews, between the medieval and the early modern, and between religion and science. Historical figures were divided accordingly into two camps, and Milton was aligned with one or the other. Support for such an approach emphasizing head to head, irresolvable conflicts is found not only in historiographies of science written in the twentieth century¹, one early example of such

¹ In addition to White's *History*, such historiographies include also, for example, Thomas Kuhn's *The Copernican Revolution*, and *The Structure of Scientific Revolutions*.

historiographies is Andrew Dickson White's *History of the Warfare of Science with Theology in Christendom* (1896, 1910), but also in Galileo, who first poses the cosmological opposition in his *Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican*, and in Francis Bacon, who advocates the modernist program of scientific progress and a shrewd differentiation between matters of faith and matters of science. Some critics perceive in Milton strong echoes of the spirit of the new science. They endeavor to prove that Milton's cosmology is Copernican, and his epistemology, Baconian.² While such effort certainly problematizes and helps to shake the long-standing misconception that Milton constructs his epic upon the orthodox Aristotelian-Ptolemaic system girded by solid spheres, its conclusions on the other hand are not wholly persuasive. Raphael's hypotheticals prove irreducible to either side of the oppositions, his derision of the astronomers and exhortation to Adam jar with the modernist enthusiasm for scientific progress. Nonetheless just as the sweeping conflict thesis continues to be endorsed in studies of the history of science, it exerts persistent influence on commentaries on Raphael's astronomical talk and Milton's universe in *Paradise Lost* in general. The result is often an oversimplified either / or. In Milton scholarship, most critics for a long time believed that they needed to choose either the Ptolemaic or the Copernican system for *Paradise Lost*.

It is worth pointing out that in recent reflections on the place of the Copernican theory in the scientific revolution in the Renaissance, historians of science started to

² Representative studies are Gilbert, "Milton and Galileo," and, Martin, "What if the Sun be Centre to the World: Milton's Epistemology, Cosmology, and Paradise of Fools Reconsidered."

criticize clear-cut divisions between the old and new, between superstition and science. Indeed the critique targets not only the twentieth-century construct of historical oppositions, but also reaches back to Galileo, who first presents the Ptolemaic and Copernican binary in his *Dialogue*.³ Similar critique of the false binaries finds expression within Milton scholarship in Dennis Danielson's *Paradise Lost and the Cosmological Revolution* (2014)⁴. Revisiting the affinities between Milton and Galileo, Danielson asks his readers to beware of "Galileo's influential binary of the 'two chief world systems, Ptolemaic and Copernican'," which is "anachronistic and tendentious" (x). Danielson also rejects generalizations and clichés promoted by the majority of "historians of science and popularizers," and their "uncritical Whiggish assumptions about struggles between the forward looking and the backward looking, between the scientific and the religious, between enlightened and obscurantist" (xiv). Against such a "monochrome backdrop," Milton is either "readily lumped together with traditional defenders of 'the discarded image'," or innovatively made "a hero of the rise of science" (Danielson xiv; xviii). Transcending the "persistent progressivist binary," Danielson's book tries to "situate Milton and *Paradise Lost* nonreductively in a wider culture of thought, replete with influences, that stretches backward and forward in time – indeed, to the present day – and to examine and illuminate his poem's rich engagement with astronomy and cosmology" (xxii). Danielson's much needed re-examination of the cosmological background of

³ See for example, Pietro Daniel Omodeo, *Copernicus in the Cultural Debates of the Renaissance: Reception, Legacy, Transformation* (2014). Patrick J. Boner. Ed. *Change and Continuity in Early modern Cosmology* (2011) also argues against any abrupt shift or diametric opposition of the old and new cosmological views in the early modern period.

⁴ Hereafter cited as *PL & CR*.

Milton's age helps to dispel the illusion of an abrupt shift of astronomy and cosmology from their medieval to early modern forms. Astronomers and cosmologists of Milton's age, he shows us, share the "most conspicuous" characteristic of many Renaissance thinkers, "the desire to conflate or at least harmonize ancient philosophies with each other and more recent development of thoughts" (27). They are tinkers, or as Danielson prefers to call them, "bricoleurs," who "build and rebuild a structure that is beautiful or useful" (66). Indeed Copernicus himself serves as a perfect example of such cosmological bricoleurs. Read in this widened context, "Milton's apparent tentativeness about Copernican cosmology [in book eight] is seen to be more deft and responsible than many have thought" (Danielson x).

My discussion of Raphael's talk shall likewise avoid the oversimplified Ptolemaic vs. Copernican binary, as well as the series of oppositions attached to it. In fact one of the points I shall make in this chapter is that Milton unmistakably echoes Andreas Osiander when stating his attitude towards astronomy through the mouth of Raphael. Osiander is author of the much berated preface to Copernicus's *De revolutionibus*,⁵ a conservative villain according to the progressivist binary. To forestall the impression that I am arguing for a "conservative" Milton who utilizes a geocentric cosmology for his poetic purposes, it is perhaps good to make it clear here that I take the view shared by John Leonard and Danielson that Milton's universe in *Paradise Lost* is definitely not Ptolemaic; that though it certainly accommodates Copernican heliocentrism, it goes

⁵ Full text of Osiander's preface is attached in Appendix.

beyond the universe of Copernicus and most firmly espouses the idea of the plurality of worlds.

In the last chapter of *Faithful Labourers*,⁶ Leonard effectively purges the non-existent crystalline sphere and *primum mobile*⁷ from *Paradise Lost*, and thereby frees Milton's universe from the models of Aristotle and Ptolemy. Alert to synonyms "universe" and "world" in *Paradise Lost*, he further rectifies persistent misunderstandings in past commentaries where these two words are concerned. And instead of concluding that Milton's universe is Copernican, he favors the view that Milton goes beyond Copernican heliocentrism. Danielson feels acutely with Leonard that the word universe is insufficient for the discussion of the cosmological scheme in *Paradise Lost*, given Milton's presentation of what lies beyond our universe. To solve this problem, Danielson brings, albeit anachronistically, the word Multiverse into his discourse, which, despite its historical pejorative meaning indicating lack of order, he uses "non-pejoratively to denote a maximal, comprehensive ensemble of potential cosmic components – some of which may be selected (or may have been selected) to make up the pieces of an actual universe or possibly more than one" (xvi). Applied to *Paradise Lost*, the word Multiverse therefore conveniently refers to the cosmic ensemble of Heaven, Hell, Chaos, the created universe inhabited by Adam and Eve, and possibly other created universes.

⁶ Hereafter cited as *FL*.

⁷ Not to be confused with Milton's outer shell, "the opacous globe," see, *FL*, p.742

For my purposes in this chapter, I would like to dwell a bit longer on Leonard's and Danielson's emphases on "the beyond" of the created universe in *Paradise Lost*, which most effectively restore the epic's true and awe-inspiring cosmic scale. The following scene from book two serves as an excellent example. When Satan manages to steer through Chaos, he first steadies himself in the air and from a distance beholds Heaven, which stretches so wide that he cannot tell whether it is square or round, then he catches sight of "this pendant world, in bigness as a star / Of smallest magnitude close by the moon" (2.1052-3). "This pendant world," Leonard reaffirms the insight of Zachary Pearce in 1733,⁸ does not refer to Earth but to our entire created universe. Its size, seen from Satan's position in space, is like that of a star, and not even a bright star – to illustrate the contrast between Heaven and our universe, Milton invites us to imagine what a star "Of smallest magnitude" would look like beside the Moon. As both Leonard and Danielson inform us, magnitude is a technical term for the measurement of the brightness of stars. Before the invention of telescope, "smallest magnitude" would be the sixth, i.e., the dimmest star visible to the naked eye. After the invention of telescope, lower magnitudes were added according to the stars' visibility to the assisted eye, that is to say, a star of the smallest magnitude would be virtually invisible to the naked eye.⁹ For centuries many critics have enormously shrunken Milton's relative scale between Heaven and "this pendant world" by reading the latter as Earth. But once we realize that, through Satan's spatial perspective beyond, Milton gives us a glimpse of our entire universe

⁸ See *FL*, p.725.

⁹ See *FL*, p.726; *PL & CR*, p.105.

hanging from the immense Heaven like a barely visible star to the angelic vision of Satan, which would be invisible to human sight, we begin to get the idea what incredible distance Satan has travelled through space thus far. Then indeed as readers of *Paradise Lost* “we are surprised not only by sin but also [. . .] by wonder” (Danielson xiv).

Wonder and fear are the two sentiments in our own age of space exploration. Many modern readers find a poignant early modern expression of fear in Pascal’s *Pensées*, where he registers terror at “*le silence éternel des ces espaces infinis* [the eternal silence of those infinite spaces].” Forty-five years have passed since the first moon landing, during which time advanced machines and telescopes have replaced human explorers, and indeed our exploration has extended further and further into the space, but till now no discovery of life beyond Earth has been announced. Pascal’s terror, in essence, a mixture of profound loneliness and fear of nothingness, is keenly felt by some of us today, similarly induced by an awareness of what vast space and time stretch increasingly beyond our existence on the tiny Earth. In Milton, however, as both Leonard and Danielson show in their readings, we find a much more positive response to the dawning awareness of the infinite space in the early modern period. Our entire universe looks indeed like a barely visible star from afar, but when Satan, in a different perspective, from the stairs to Heaven looks down “at the sudden view / Of all this world at once,” he is seized by wonder and then by envy, confronted by “the goodly prospect,” “though after Heaven seen” (3.542-3; 548; 552). Far from conveying a sense of loneliness and fear of nothingness, Milton suggests that the universe teems with life. Winding his way towards Earth through the interstellar space, Satan passes by “other worlds, [. . .], or happy isles, / Like those Hesperian gardens famed of old, / Fortunate fields, and groves

and flow'ry vales / Thrice happy isles, but who dwelt happy there / He stayed not to enquire" (3.567-71). Raphael stresses fruitfulness and vigor of the Earth which "though, in comparison of heav'n, so small, / Nor glistening, may of solid good contain / More plenty than the sun barren shines" (8.92-4). He hints at the existence of those other inhabited worlds Satan passed: "[. . .] The Maker's high magnificence, who built / So spacious, and his line stretched out so far; / That man may know he dwells not in his own; / An edifice too large for him to fill," and suggests to Adam that "other suns perhaps / With their attendant moons thou wilt descry / Communicating male and female light, / Which two great sexes animate the world, / Stored in each orb perhaps with some that live" (8.101-4; 8.148-52). Raphael's predictive suggestion of future discovery of extraterrestrial life in space finds strong echoes in our twenty-first century – our contemporary scientists are indeed optimistic that we are on the very brink of such discoveries. At this moment NASA's Curiosity rover is working diligently on Mars, looking for signs of life in ancient Mars. A recent story from *Scientific American* reports that "New results suggest evidence for extraterrestrial life could be near at hand."¹⁰ In *Faithful Labourers*, Leonard is thrilled that the ancient idea of the plurality of worlds is "poised to make a sage and serious comeback" with modern astronomy's discoveries of more and more exoplanets in habitable zone, and Milton's apparent enthusiasm towards the idea makes him "a true poet-prophet" (769; 725). As Danielson also shows in his new book, Milton's cosmic imagination stretches not only backward but also forward "indeed,

¹⁰ "NASA Rover Finds Mysterious Methane Emissions on Mars", *Scientific American*, <<http://www.scientificamerican.com/article/nasa-rover-finds-mysterious-methane-emissions-on-mars/>>; "NASA Rover Finds Active and Ancient Organic Chemistry on Mars", NASA, <<http://www.jpl.nasa.gov/news/news.php?feature=4413>>

to the present day” (xxii). And a proper appreciation of it as such helps us to see that far from being a tomb of dead ideas, *Paradise Lost* as a cosmic epic is particularly engaging and fascinating for our present space exploration era.

The crux: “to save appearances”

Our understanding of Milton’s cosmology in *Paradise Lost* thus rectified, we cannot but feel even more puzzled by Raphael’s derisive remark on future astronomers’ efforts “to save appearances.” In former criticism where the assumed cosmology of Milton’s epic was Ptolemaic, the remark had already provoked A. O. Lovejoy’s accusation of Milton’s anti-intellectualism and obscurantism. Milton’s God, Lovejoy fiercely reacts to Raphael’s reference, is “a humorous celestial sadist devising intellectual pitfalls for the human mind, to provide amusement for himself when some men fall into them” (“Milton’s Dialogue on Astronomy” 140). This is a charge that Miltonists have yet to answer squarely. Allen H. Gilbert, Kester Svendsen and C.S.Lewis choose to shift our attention from Raphael’s reference to God’s laughter to the difference between the early modern and modern meanings of the term “to save appearances.”¹¹ And it is in Owen Barfield’s passing remark on Milton’s use of the term we find the most explicit expression of their shared interpretation:

When we hear of ‘saving appearances’ to-day, we are apt to think of a society hostess at a dinner party where something has gone wrong in the kitchen. It was not so in the seventeenth century. Although he spoke of God’s laughter,

¹¹ See Gilbert, “Milton and Galileo”, p.171; Svendsen, *Milton and Science*, pp.78-9; Lewis, *The Discarded Image*, p.14.

Milton was not *himself* laughing at the astronomers when he wrote in the Eighth book of *Paradise Lost*:

*Or if they list to try
 Conjecture, he his fabric of the heavens
 Hath left to their disputes, perhaps to move
 His laughter at their quaint opinions wide
 Hereafter, when they come to model heaven,
 And calculate the stars; how they will wield
 The mighty frame; how build, unbuild, contrive,
 To save appearances; how gird the sphere
 With centric and eccentric scribbled o'er,
 Cycle and epicycle, orb in orb.*

Nor was he suggesting that desperate expedients were being resorted to, in order to ‘save’ (in the sense of rescuing) the Ptolemaic system – which, incidentally, he had made the framework of his own poem. He was introducing a learned cliché. (*Saving the Appearances* 48-9)

As “a learned cliché,” the term “to save appearances,” we are informed by Barfield, Gilbert and Lewis, is a translation of its Greek original *σώζειν τὰ φαινόμενα*, probably first used by Simplicius in his commentary on Aristotle’s *De caelo*. For Renaissance astronomers, it refers to “the construction of hypotheses to account for what they saw in the heavens,” and that is “the sober scientific meaning” intended by Milton when he puts it into Raphael’s mouth (Gilbert 171-2), although “most of us perhaps originally

misunderstood it” for its modern meaning (Lewis 14). But the modern meaning is perhaps not so far away from it. Indeed “the sober scientific” interpretation demands us to turn a deaf ear to God’s laughter at future astronomers’ “quaint opinions wide,” wide, that is, far from truth. The satirical tone was not missed by Milton’s seventeenth-century reader Patrick Hume, who was well aware of the Greek original of “saving the appearances” and its meaning in astronomy, nor by his eighteenth century readers the Johnathan Richardsons, father and son.¹² And as Leonard points out in his reading of Raphael’s lines quoted above by Barfield, Milton’s satire is conveyed not only through “quaint opinions wide” but also by the word “scribbled,” which clearly suggests a mocking tone in the description of astronomers’ effort “to save appearances, how gird the Sphere / With centric and eccentric scribbled o’er / Cycle and epicycle, orb in orb” (*FL* 757).

One of the few modern critics challenging the dominant view that Milton uses the Ptolemaic system as the framework of his epic, Catherine Gimelli Martin provides a much less evasive answer to the anti-intellectual charge provoked by Raphael’s attitude towards the astronomers. She makes no attempt to hide or deny that God laughs at the astronomers derisively, but that laughter, she argues, should be examined against Milton’s “fundamental heliocentrism” (“What if the Sun be Center” 253) in *Paradise Lost*. God’s laughter, Martin indicates, is directed solely at the Ptolemaists.

¹² See Leonard, *FL*, p.707; 710.

[. . .] Raphael, like Galileo, scornfully associates with the Ptolemists' 'devout' adherence to geocentrism. As a result of this idolatrous misdevotion, they earnestly 'contrive / To save appearances' by girding 'the Sphere / With Centric and Eccentric scribbl'd o'er, / Cycle and Epicycle, Orb in Orb' (8.81-84). Such contrivances promote a humanly commonsensical geocentrism only by defacing the vast frame of the cosmos with an ultimately uncommonsensical, ugly, and unwieldy system. ("What if the Sun be Center" 242)

Martin further reinforces her association of "saving the appearances" with Ptolemaists by connecting Milton to Francis Bacon:

[. . .] Milton, like Bacon, primarily associates elaborate techniques for 'saving the appearances' with the cumbersome, 'Papist,' and fundamentally superstitious *primum mobile* and mystically concentric crystalline spheres of the old astronomy, which in his epic cosmos have given way to scientific optical glasses. ("What if the Sun be Center" 242-3)

Martin thus ingeniously turns the presumed proof of Milton's anti-intellectualism into that of Milton's intellectualism. This seems to be a perfect defense of Milton against the charge raised by Lovejoy, but unfortunately, it is built upon a falsely shrunken scope of "saving the appearances." As shown in the first quotation above, Martin suggests that it is only the Ptolemaists who are employing the devices of centric and eccentric, cycle and epicycle in order to save appearances. But the fact is these devices are generally used by Renaissance astronomers to account for celestial motions. Tycho Brahe has the sun move like an epicycle to the Earth. Johannes Kepler certainly employs the eccentric in the form

of the elliptic. And Copernicus does not really get rid of epicycles; what he drops is the equant, a device Ptolemy introduces along with the epicycle and the eccentric, which Raphael does not mention.¹³ Sticking to the principle of uniform circular motion in the heavens, Copernicus still needs epicycles to explain the irregularity of planetary motions.¹⁴ That is to say, the practice of saving the appearances (or saving the phenomena) “is by no means tied to a geocentric system” (Danielson, *PL & CR* 11).

Martin persistently presents the Ptolemaic and Copernican world systems as sharply opposed to each other. As shown in the second quotation above, the cumbersome, Papist, superstitious, old astronomy of Ptolemy is pitted against the scientific, telescopically proven new astronomy of Copernicus. But these oppositions cannot stand once we recognize the tension within the so-called Aristotelian-Ptolemaic cosmology on

¹³ See Danielson’s discussion of how the devices are selected and used by renaissance astronomers in *PL & CR*, Chapter 1. The discarded image, esp. pp. 11-26.

¹⁴ The misconception that the Copernican system is free of the unwieldy epicycles is found in Milton’s contemporary poet, Henry More’s philosophical poem *Psychathanasia*. More suggests, mistakenly or with exaggeration, that once the earth is put on the ecliptic track of the sun, celestial motions are accounted for without epicycles: “All this disordered superfluity / Of Epicycles, or what else is show n / To salve the strange absurd enormity / Of Staggering motions in the azure skie; / Both Epicycles and those turns enorm / Would all prove nought, if you would but let flie / The earth in the Ecliptick line yborn” (Book III, Canto 3). In his article “A Forerunner of Milton,” Elbert N.S. Thompson argues that More anticipates Milton “in rejecting as unnecessary the whole complicated theory of cycle and epicycle, elaborated to explain the apparently irregular movements of the stars.” Like Martin, Thompson connects the use of cycle and epicycle with the Ptolemaists only and identifies Raphael’s comment on the effort of the astronomers as a parallel to More’s lines. Thompson wants to demonstrate that “Both More and Milton see that the Copernican theory has rendered all this complicated figuring needless” (481). But the difference between the lines of the two poets is alarming. More especially singles out the epicycles as his target, whereas Raphael comments more generally on astronomers’ effort to save appearances with all the devices available. Moreover, if we read the two poets’ lines in their contexts, we find that More leaves no doubt regarding his attitude towards the Ptolemaic and Copernican systems: he judges the latter to be “true,” and the former “untrue,” while Milton’s Raphael carefully avoids verifying the truth of any hypotheses of the universe he thrusts in front of Adam’s imagination.

the one hand and the partial conformity of the Copernican system to the principles Aristotle prescribed for astronomy on the other.

The joint adjective Aristotelian-Ptolemaic may easily mislead us into thinking that there is a complete agreement and harmony between the cosmological views of Ptolemy and Aristotle, but that is not the case. Aristotelian-Ptolemaic, as an adjective modifying cosmology, is most equivalent to the adjectives geocentric and geostatic. As Danielson summarizes conveniently for us, Aristotle lays down the theoretical demands for astronomers in five aspects: “(1) uniform (2) circular motion (3) upon crystalline spheres (4) turning about a universal center point, which, for reasons of heaviness, is occupied by (5) an immobile earth”(PL & CR 16). Ptolemy, making his effort to reconcile theoretical demands with the empirical data of astronomical phenomena available to him, uses the devices of the epicycle, the eccentric and the equant to account for irregularities observed, i.e., retrograde motion and variant speed of planets. The result of this negotiation, Danielson points out lucidly, is that only (2) and (5) of Aristotle’s demands are left intact. The other three demands, the demand for solid crystalline spheres among them, are either conceded or weakened (Danielson, PL & CR 16-21). In other words, Ptolemy’s astronomical model is not in full conformity to Aristotle’s mechanical construction of the heavens. Its devices of the epicycle, the eccentric and the equant not only violate the principle of concentric, uniform revolution of the stars, they also cause problems for maintaining the neat and contiguous crystalline spheres. These breaches of the teachings of Aristotle fueled the fifteenth-century dispute between Italian Averroists and Ptolemaists. The former, following the twelfth-century Iberian philosopher Ibn Rushd (Averroes), attacks the Ptolemaic astronomy for not strictly conforming to the

nature of things prescribed by Aristotle, whereas the latter insists on the truth of the Ptolemaic system in spite of its disregard for Aristotelian physics.

Although Martin does not mention Aristotle in the second passage quoted above, the tension within the Aristotelian-Ptolemaic cosmology matters when she suggests that “elaborate techniques,” i.e., the epicycle and the eccentric, are used by the Ptolemaic astronomers to save, in the sense of rescuing, the appearances of “the cumbersome, ‘Papist,’ and fundamentally superstitious *primum mobile* and mystically concentric crystalline spheres of the old astronomy.” As shown above, it is exactly Ptolemy’s elaborate techniques that do not corroborate but greatly weaken and even threaten to compromise the concentric crystalline spheres of Aristotle’s cosmos. On the other hand, the heliocentric system of Copernicus, which Martin represents as the new astronomy diametrically opposed to the old, is originally presented by Copernicus as an endeavor to save the celestial phenomena in better accordance to the ancient principle of uniform circular motion, which is forfeited in the Ptolemaic system. And not to deny its importance in changing the human understanding of the universe and the status of the Earth in it, Copernican astronomy does not break away abruptly from what Martin identifies to be the old astronomy. In the words of Danielson, “It requires no relinquishing of crystalline spheres and no abandonment of the perfect circularity of planetary motion. And it proposes no boundless domain of stars, even though this would later come to be associated with Copernicanism” (*PL & CR* 54).

The Aristotelian-Ptolemaic cosmology is indeed the target of Milton’s satire in his description of the paradise of fools in book three. The souls of Franciscan and Dominican friars are said to “pass the planets seven, and pass the fixed, / And that crystalline sphere

whose balance weighs, / The trepidation talked, and that first moved” (3.481-3). The three lines containing the only specific reference in *Paradise Lost* to the crystalline sphere and the *primum mobile*, “that first moved,” are identified by many critics as suggesting a Ptolemaic (or more precisely, Aristotelian) framework of Milton’s epic. Martin rightly refutes the critical credence of such evidence by putting the lines back to their context.¹⁵ Just when the friars think their ascension to heaven is about to happen, “A violent cross wind from either coast / Blows them transverse ten thousand leagues awry / Into the devious air” (3.487-89). “Milton’s relish for biting ecclesiastical satire is hardly less obvious here than his skill at cosmological spoof.” Martin points out persuasively, “Had he any more real credence in the Ptolemaic system [. . .], he would hardly have thus ‘exploded’ it along with all the hopes of this fool’s paradise, nor would he have placed the crystalline sphere in a scatological whirlwind flying off ‘the backside of the World’” (Martin, “What if the Sun be Center” 262).

It is tempting, as Martin does, to read Raphael’s mockery of the astronomers’ effort “to save appearances” in book eight in light of Milton’s satire against the Aristotelian-Ptolemaic cosmology in book three. The two episodes are undeniably connected for their astronomical and cosmological contents. But in addition to the tension within the Aristotelian-Ptolemaic cosmology discussed above, which problematizes Martin’s suggestion that the epicycle and the eccentric are used to save the concentric crystalline spheres, it is also important to recognize that astronomy and cosmology are dealt with at their different levels in each. The target of Milton’s satire in book three is precisely the

¹⁵ Validated by both Leonard and Danielson.

friars' vain, and indeed obsolete belief, given the evidence of the telescope, in the existence of crystalline spheres and the *primum mobile*, and how they have mapped the kingdom of the heavens accordingly in their afterlife fantasy. The friars' Christianized Aristotelian-Ptolemaic worldview belongs, so to speak, to the socio-cultural diffusion of astronomical and cosmological knowledge. The target of Raphael's satire in book eight is the astronomers' effort "to save appearances." The scope of the term covers, as shown above, not just Ptolemaic astronomers, but astronomers in general. The entire discussion of astronomy in book eight is dense with details beyond mere conventional knowledge or commonplaces. And Raphael's vocabulary right at the beginning of his reply to Adam suggests, I shall show in more detail below, that the discussion enters into the more specialized domain of mathematical astronomy.

Despite Martin's ingenuity, the question of God's laughter remains. Why does He laugh derisively at the astronomers' effort "to save appearances," at their experiment with "centric and eccentric," "cycle and epicycle"? Danielson shows that Ptolemy's epicycle and eccentric, and even the notorious equant are actually brilliant devices that "became, with some adjusting, components of the main cosmology that supplanted his" (*PL & CR* 24). Appreciating the work of Renaissance cosmologists as bricoleurs "who build and rebuild a structure that is beautiful or useful" (*PL & CR* 66), he does not hide his misgivings over the laughter of Milton's God:

With Milton's God, we may laugh at eccentrics and epicycles, but what Galileo actually saw in those cold nights of telescopic observation in the early months of 1610 were the Jovian moons in their *epicycles* about Jupiter – [. . .]. Moreover, with Kepler, all the orbits of the solar system came to be

seen as elliptical and therefore *eccentric*. The Sun is eccentric relative to Earth's orbit, as Earth is eccentric relative to the Moon's.

Finally, the notorious equant was also rediscovered by Kepler to stunning effect. [. . .] (*PL & CR* 24)

And what Galileo's observation demonstrates is "the existence of a true epicycle – one that was no mere 'device' contrived to save the appearances but rather itself an astronomical appearance – an orbit within an orbit" (Danielson, *PL & CR* 89).

Danielson's emphatic contrast between "the existence of a true epicycle" and the epicycle as "mere device" reflects one of the major issues in the debates upon the status of mathematical astronomy both before and after Copernicus, an issue very relevant to Raphael's comment on the work of the astronomers in book eight, namely, whether astronomical hypotheses, in this case, the epicycle and the eccentric, have substantial existence or they are mere geometrical devices used to save the appearances, and by extension, whether astronomical models represent the reality of the universe or are mere tenable or expedient constructs serve to save the appearances. These debates, instead of the clash between the geocentric and heliocentric cosmologies, form the background against which I shall examine Raphael's attitude towards astronomers.

In light of Pierre Duhem: realism vs. instrumentalism

Commentaries telling us that Milton uses the phrase "to save appearances" as "a learned cliché" and in its "sober scientific meaning" give us a false impression that the phrase is a commonplace with a stable and undisputed meaning in the Renaissance astronomical context. As quoted above, Gilbert simply explains that for Renaissance

astronomers it refers to “the construction of hypotheses to account for what they saw in the heavens.” But what Pierre Duhem shows us in his short but influential book *To Save the Phenomena: An Essay on the Idea of Physical Theory from Plato to Galileo* is that not only the meaning of “saving the phenomena / appearances” is debated and interpreted differently by Renaissance astronomers, but more importantly, a nuanced shift in the understanding of the nature of astronomical hypotheses in the sixteenth and seventeenth centuries marks a real intellectual turn from the medieval to the early modern.

The term “to save the appearances” for Duhem denotes a methodological position identifiable in ancient and medieval astronomers. Tracing its origin back to Plato and identifying Ptolemy and Proclus as its most important representatives in antiquity, and the Jewish philosopher Moses Maimonides its representative in the Medieval period, Duhem extracts two basic tenets of the position of saving the appearances: 1) the task of the astronomer is to construct geometric hypotheses to save, meaning, to account for or predict, the phenomena of planetary motions, and 2) since different hypotheses can save the same phenomenon (the famous example being that the motion of the sun can be accounted for by having it either moving eccentric to the world or by letting it be carried by an epicycle), the astronomer chooses the better hypotheses by the principle of simplicity. Such is what Duhem calls the method of the astronomer. It does not concern itself with offering the *true* hypothesis, because the astronomer is unable to choose the one that conforms to the nature of things from distinct hypotheses that save the phenomena equally well. Nor does it require that the astronomer’s geometric constructs meet the law of physics, the astronomer’s task is simply to make them account for or predict celestial phenomena. As such the method of the astronomer is distinguished from

what Duhem calls the method of the physicist advocated by Aristotle, who “wants to govern the choice of [astronomical] hypotheses by propositions that have justified certain speculation about the nature of heavenly bodies” (7).

Duhem praises the method of the astronomer / the mathematician as the better approach to astronomy than the method of the physicist. With the hindsight of a physicist in the twentieth century, he sees the former as more sensible and judicious in its understanding of the tentative scope and fictive nature of astronomical hypotheses than the latter’s realist approach. Indeed the modern terminology “instrumentalism,”¹⁶ as opposed to the physicist’s approach to astronomy advocating realism, is used by Duhem’s readers to highlight his interpretation of the methodological position of Greek astronomers, as they find that Duhem as philosopher of science is an instrumentalist himself. As historian of science, Duhem offers an alternative picture of the Renaissance astronomical and cosmological debates to that painted by his contemporary Andrew Dickson White. Applying the distinction of instrumentalist and realist approaches to his examination of the history of astronomy, Duhem sees the dispute between the fifteenth century Italian Averroists and Ptolemaic astronomers as essentially a debate between two misguided realisms:

If the Averroists were victims of the illusion that one can deduce an astronomical theory from a metaphysical doctrine [by the authority of Aristotle], the partisans of the Ptolemaic system sometimes let themselves be

¹⁶ Crowe also uses the word fictionalism, p. 69. Stanley L. Jaki in his introduction to Duhem refers to it as the positivist position, p. xxiii.

seduced by another illusion: They thought that the exact determination of appearances can bestow certainty on the assumptions that are designed to account for the observed facts. By opposite paths, Averroists and Ptolemaists both ended up in the same error: that of ascribing independent reality to the hypotheses upon which astronomical theory rests. (52)

This sets the tone for how Duhem will present the astronomical and cosmological debates gyrated around the Copernican theory. Duhem sees Copernicus as well as the famous Copernicans, Rheticus, Galileo and Kepler as in principle travelling down the road of the Ptolemaists by advocating their hypotheses as true. Thus different from White's historical picture of the irresolvable clash between the Ptolemaic and Copernican systems as religion versus science, the historical narrative of Duhem tells us that the differences between Ptolemaists and Copernicans are found in their specific hypotheses but not in their methodological principle. Both have diverted from the original understanding of the fictive nature of geometric hypotheses in astronomy, and seek to prove their hypotheses as true. This is a diversion Duhem deplors. Especially in the case of Galileo, it seems to him that the Copernican's stubborn realism unnecessarily provoked the Church's oppression of the Copernican theory, which till then had been spreading freely as a geometric alternative to the Ptolemaic theory. In the increasingly realistic atmosphere of Renaissance astronomy from the Averroists-Ptolemaists dispute to the Copernican debates, Duhem manages to identify a number of early modern figures who carry forward the ancient methodological position of saving the appearances. Among them, the arch villains in White's version of history, Andreas Osiander, who "wrote a grovelling preface" for Copernicus's *On the Revolutions of the Heavenly Bodies*, to the effect that

“the greatest and the most ennobling, perhaps, of scientific truth – a truth not less ennobling to religion than to science – [was] forced, in coming before the world, to sneak and crawl” (White 123), and Cardinal Bellarmine, “one of the greatest theologians the world has known” but “the most terrible champion” against another great upholder of the Copernican truth, the astronomer Galileo (White 134). White’s contempt and loathing for these two figures are widely shared in historiographies of science. Duhem, however, argues that Osiander and Bellarmine do not deserve such harsh judgment from the historians of science:

The physicists of our day, having gauged the worth of the hypotheses employed in astronomy and physics more minutely than did their predecessors, having seen so many illusions dissipated that previously passed for certainties, have been compelled to acknowledge and proclaim that logic sides with Osiander, Bellarmine, and Urban VIII, not with Kepler and Galileo – that the former had understood the exact scope of the experimental method and that, in this respect, Kepler and Galileo were mistaken. (113)

Duhem’s instrumentalist thesis is widely challenged by later historians of science, but his defense of Osiander’s preface to Copernicus’s masterpiece is generally accepted. After him, more historians of science can read Osiander’s preface as “essentially a reassertion of one traditional position regarding astronomical method” (Crowe 77), which “contains statements that seem quite innocent today, and which must have struck most sixteenth-century readers as eminently reasonable” (Gingerich 515). And many feel

necessary to correct the impression that Osiander intended his preface to discredit Copernicus's book.¹⁷

Despite its shortcomings, which shall be addressed below, Duhem's alternative picture of the Renaissance astronomical debates is very valuable to our reading of Raphael's discussion of astronomy in book eight. Chapters six and seven of Duhem's book, "From Osiander's Preface to the Gregorian Reform" and "From the Gregorian Reform to the Condemnation of Galileo" supply the relevant background against which we come to read properly how Raphael starts his reply to Adam's astronomical questions:

To ask or search I blame thee not, for heav'n
 Is as the Book of God before thee set,
 Wherein to read his wondrous works, and learn
 His seasons, hours, or days, or months, or years:
 This to attain, whether heav'n move or earth,
 Imports not, if thou reckon right; the rest
 From man or angel the great Architect
 Did wisely to conceal, and not divulge
 His secret to be scanned by them who ought
 Rather admire; (8.66-75)

Modern readers, taking the standard calendar used by the whole world for granted, may easily dismiss Raphael's reference to the use of astronomy to learn "seasons, hours, or

¹⁷ See Omodeo, p.86; Gingerich, p.515.

days, or months, or years” as a mere mundane matter. Indeed most Miltonists fail to pay attention to Raphael’s reference to the issue of the calendar, but all are struck by the lines after it: “whether heav’n move or earth, / Imports not [. . .].” Thus Lovejoy protests loudly: here “investigation into the truth of Copernican theory is equally discountenanced” – just another proof of Milton’s position as “pragmatic, in the most vulgar sense of that ambiguous term, the sense in which it designated an obscurantist utilitarianism hostile to all disinterested intellectual curiosity and to all inquiry into unsolved problems about the physical world” (“Dialogue on Astronomy” 139; 142). Lovejoy here misses the point entirely.

The matter of the calendar is not as vulgarly pragmatic as Lovejoy evidently thought.¹⁸ In the epistle of *On the Revolutions* addressed to Pope Paul III, Copernicus presents the value of his astronomical system to the ecclesiastical community by referring to the problem of the church calendar: “not long ago, under Leo X, the Lateran Council raised the issue of emending the church calendar. No decision was then arrived at merely because the Council concluded that the length of the year and the month and the motions of the sun and the moon were not yet measured accurately enough” (Danielson, *the Book of the Cosmos* 108). Astronomically, the Julian calendar in use then “was noticeably incompatible with solar events” (Cohen 5). From a religious point of view, the most serious problem caused by the inaccuracy of the old calendar is that the Church needed to fix the date of Easter. The Gregorian calendar based on the Prutenic Tables was introduced by Pope Gregorian XIII in 1582 and adopted in the same year by most

¹⁸ Cf. Danielson, *PL & CR*, p.2

Catholic countries in the continent, but England stuck to the Julian calendar, well after Milton's death, until 1752. The English people after the Gregorian reform soon began to use a double-calendar to cope with all sorts of inconveniences brought by the eleven days difference between the two calendars. For Milton, and his contemporary readers, the issue of the calendar was very much alive.

For the first man Adam, Raphael's addressee, to learn "seasons, hours, or days, or months, or years" of the world by observing the heavens would surely arouse in him great admiration of God's "wondrous works," a feeling seldom experienced by modern readers who, instead of observing the sky, rely on calendars and watches. Milton himself however expresses this admiration beautifully when he describes how, in relation to the Sun, the constellations "move / Their starry dance in numbers that compute / Days, months, and years, towards his all-cheering lamp / Turn swift their various motions, or are turned / By his magnetic beam" (3.579-83) – we shall come back to these lines in due course.

Read in light of Duhem's discussion in the last two chapters of his book, Raphael's position unmistakably echoes that of Osiander and a number of early modern figures in whom Duhem identifies a similar attitude towards astronomical hypotheses that reaches all the way back to Ptolemy and Proclus. In his famous preface, Osiander insists that Copernicus's hypotheses "need not be true nor even probable. On the contrary, if they provide a calculus consistent with the observation, that alone is enough" (xvi). Similarly, Gemma Frisius, the famous Dutch astronomer, writes about the Copernican hypotheses:

It hardly matters to me whether he [Copernicus] claims that the earth moves or declares it immobile, so long as we get an absolutely exact knowledge of the movement of the stars and of the periods of their movements and so long as both are reduced to altogether exact calculation. (qtd. in Duhem 69)

So Raphael tells Adam: “This to attain, whether heav’n move or earth, / Imports not, if thou reckon right.” “If thou reckon right” is a crucial hint here. Putting these words into Raphael’s mouth, Milton is not, pace Lovejoy, quashing “all disinterested intellectual curiosity.” He is stating an attitude towards astronomical hypotheses, to this point, similar to that of Osiander and Frisius as shown above: if the reckoning, or the computation, of the periods, measured by “seasons, hours, or days, or months, or years,” of the celestial phenomena is right, it does not matter whether the heaven moves or Earth. In other words, like Osiander and Gemma Frisius, Milton sees astronomical hypotheses as pure contrivances for the purpose of computation, and if they achieve this end, that alone is enough for astronomy. The virtue of understanding astronomical hypotheses “as pure contrivances [. . .] for reasoning and calculation” is that one can see the hypotheses as “essentially variable and perfectible” (Duhem 71). Such an attitude is not, it is reasonable to agree with Duhem, hostile to inquiry into unsolved problems, on the contrary, it tends to encourage and applaud the better solutions to the problems.

Indeed Duhem attributes the frictionless dissemination of the Copernican theory in the twenty to thirty years or so after the publication of *De revolutionibus* to the prevalence of the kind of attitude towards astronomical hypotheses adopted by Osiander, as well as by the mathematicians and astronomers in the German universities during the period. The latter epitomizes in the so-called Wittenberg Interpretation of the Copernican

theory under the influence of Erasmus Reinhold, the mathematician well-known for constructing the Prutenic Tables to facilitate computation based on the Copernican hypotheses, and the humanist and Lutheran theologian Philipp Melanchthon. Although Melanchthon rejects the truth of the Copernican hypotheses on the grounds of Aristotelian physics and theology, he at the same time, Duhem points out, accepts that they save the phenomena better than the Ptolemaic ones. Reinhold is a great admirer of the Copernican system but certainly not a Copernican like Galileo or Kepler. He does not promote the truth and reality of the motion of the Earth and fixity of the Sun, nor does he believe in the concrete existence of astronomical devices such as the epicycle and the eccentric. In *Narratio prima*, he hails Copernicus as the “new Ptolemy” (qtd. in Duhem 72), that is, a masterful geometer who offers a new system that is in better agreement with appearances. In *Prutenic Tables* he treats the Copernican hypotheses as geometric devices that need not to be true or probable, “similar in nature to the Ptolemaic ones” (Duhem 73). For Duhem, both Reinhold and Melanchthon’s attitudes towards the Copernican hypotheses therefore showcase the virtue of the traditional understanding of astronomical hypotheses as fictive, instrumental for computation, that is to say, such an understanding readily accepts any hypotheses that better save the phenomena.

The realist approach to astronomy, it is also reasonable to agree with Duhem, is heavily restrictive of the kind of theoretical freedom granted by the traditional method. Duhem detects changes of attitude towards astronomical hypotheses after the Gregorian reform of the calendar. In the works of Christopher Clavius, Tycho Brahe, and George

Horst,¹⁹ one reads the preference of the geocentric hypotheses over the heliocentric ones, and indeed the rejection of the latter on the grounds of peripatetic physics and the Scripture. Together they make the point that astronomical hypotheses should not only save the phenomena accurately and observe the principle of simplicity, they should also obey the rules of physics and not contradict the Scripture. And the two fundamental Copernican hypotheses, namely, the motion of the Earth and the fixity of the Sun should be rejected exactly because they conform neither to the nature of things nor to the authority of the Bible. Thus they declare themselves enemies of the Copernican system and discard the principles of Osiander. But it is the Copernicans who attack Osiander “with considerably more ardor than the Ptolemaists²⁰” (Duhem 99). They point out the contradiction between Osiander’s preface and Copernicus’s realist intentions. In Bruno’s words, Copernicus “took on the office, not only of the mathematician, who assumes the motion of the earth, but also that of the physicist, who demonstrates it” (qtd. in Duhem 100). Thus the Copernicans too argue that astronomical hypotheses should not be mere contrivances, but must be true, and they insist that only the Copernican hypotheses conform to reality. The great champions of the reality of the Copernican system are of course Kepler and Galileo. Both take important steps towards integrating mathematics and physics in astronomy, especially affirming the importance of the former to the latter.

¹⁹ Duhem, pp. 92-98.

²⁰ Context suggests that by Ptolemaists Duhem here refers to anyone insisting on Earth’s central place in the universe according to Aristotle’s physics, and Duhem includes Tycho Brahe in this category.

However to uphold the reality of the Copernican system in the late sixteenth and early seventeenth century not only means that the likes of Kepler and Galileo have to demonstrate that their hypotheses conform to the nature of things, meaning, to Aristotelian physics, it also means that they are obliged to reconcile them with the authority of the Bible. These are restrictions that Duhem believes the Copernicans could have avoided by subscribing to Osiander's principles, but what they did was exactly the opposite. From our vantage point in history, we now see that what the Copernicans needed then was a new physics to explain the motion of the Earth, which was not to be available till Newton posed his theory of gravity in the last quarter of the seventeenth century. Thus despite the empirical and mathematical support of the heliocentric system provided by Galileo's telescopic observations of the Jovian moons and the phases of Venus and by Kepler's laws, for Renaissance geocentrists like Clavius and Brahe, as well as the theologians, the reality of the Copernican hypotheses was rejected on the (then) strong grounds of physics and Scripture. Amidst the clash of the two realist positions, Duhem again favors a third position where he hears the traditional attitude towards astronomical hypotheses pronounced this time by Cardinal Robert Bellarmine and Pope Urban VIII.

Before we delve deeper into Duhem's discussion of Renaissance astronomical debates and address its shortcomings, first let us reap the benefits it has to offer to our understanding of Raphael's discussion of astronomy in book eight. Now we see that another way to read Raphael's discussion is not to consider whether the Earth or the Sun *is* at the center of the universe, or who gets the right system of the world, the Ptolemaists,

the Tychonians, or the Copernicans – rather we should pay more attention to Raphael’s ideas on the epistemological status of astronomy itself.

Duhem shows us that, in late sixteenth and early seventeenth century astronomy, locked in disputes are two realist positions. On the one side are the geocentrists and geoheliocentrists who insist that astronomical hypotheses should both save the appearances and conform to peripatetic philosophy, on the other side are the Copernicans who are convinced that exact determination of appearances through a combination of the mathematical and empirical methods can demonstrate their heliocentric hypotheses as true. And there is a third position reaffirming that astronomical hypotheses are simply devices for saving the phenomena, and they do not need be true or probable. The epistemological implications behind this position are that exact determination of appearances does not guarantee the truth of the hypotheses, because the same appearances can be saved by distinct hypotheses, and that the astronomer is ignorant of the real cause of the celestial phenomena, which is known only to God.

Thanks to Duhem’s explication and differentiation of the three positions, it becomes apparent to us that Raphael (and Milton behind him) not only states the third position clearly when he begins his reply with “This to attain, whether heav’n move or earth, / Imports not, if thou reckon right,” he also organizes his reply in consistent support of it by arguing against making realist claims in astronomy. Immediately he continues with the seemingly intriguing lines:

the rest,

From man or angel the great Architect

Did wisely to conceal, and not divulge
 His secret to be scanned by them who ought
 Rather admire; or if they list to try
 Conjecture, he his fabric of the heav'ns
 Hath left to their disputes, perhaps to move
 His laughter at their quaint opinions wide
 Hereafter, when they come to model heav'n
 And calculate the stars, how they will wield
 The might frame, how build, unbuild, contrive
 To save appearances, how gird the sphere
 With centric and eccentric scribbled o'er,
 Cycle and epicycle, orb in orb: (8.71-84)

Raphael's attitude in these lines is suggested in the tension he lays out between "This to attain" and "the rest." Having stated that it is enough for astronomy to accurately account for the celestial appearances, Raphael warns what would happen when astronomy wants to decide "the rest," meaning, the reality of the fabric of the heavens: astronomers cannot reach an agreement, and "their quaint opinions" are far from the truth. It is with their realist claims that the future astronomers' effort "to save appearances" acquires an ironic meaning. The geocentrists, Tychonians, and the Copernicans in Milton's age, experimenting the combination of "centric and eccentric," "cycle and epicycle," and building models to fit celestial appearances, take the resulting models for what things really are in the heavens. Such realist claims are laughable to the "the great Architect" who alone knows the true form of the universe. Theological issues aside, Milton, through

Raphael, endorses a methodological position considered by modern scientists to be more sensible and logical than the misguided realisms of his time. Because such a position allows the kind of theoretical freedom needed to improve the hypotheses, and tends to applaud the better hypotheses, so far the charge of Milton's anti-intellectualism cannot be supported.

Milton distinguished from Oslander, Bellarmine and the Wittenberg circle

Till now I have relied mainly on Duhem's valuable alternative picture of Renaissance astronomical debates to interpret Raphael's attitude toward the astronomers. Now it is time to address its shortcomings. A believing physicist and a proud French patriot, Duhem is often criticized for his "militant ecclesiastical Catholicism as well as a certain French chauvinism" (Omodeo 66). But Stanley L. Jaki in the introductory essay to his translation of Duhem's *To Save the Phenomena* judges that those aspects are present in Duhem's book "without, however, invalidating its main conclusions" (xx). The criticism against Duhem's instrumental thesis, on the other hand, is very relevant to our interpretation of Milton here. The main targets of this criticism are two: the accuracy of Duhem's historical picture itself, and his instrumentalist critique of scientific realism. Let us start with the first.

While not guilty of the oversimplified representation of the conflict between the Ptolemaic and Copernican cosmologies as religion versus science, Duhem's picture of instrumentalists versus realists in Renaissance astronomy is not without its own exaggerations. N. Jardine finds fault especially with his "tidy partition" of the former camp which "involves [. . .] both an underestimation of the diversity of positions adopted

and a failure to appreciate the extent to which they represent responses to specific problems in the astronomy of the [Renaissance] period rather than the promotion of general metaphysical or epistemological theses” (225). And Jardine is not alone in faulting Duhem’s exploitation of the fuzzy consensus to an instrumentalist or fictionalist position he finds in a medley of figures including the theologians (Osiander, Bellarmine, Urban VIII), the humanist and theologian like Philipp Melanchthon, and the Wittenberg astronomers (Reinhold, Caspar Peucer, etc.). Michael J. Crowe in his *Theories of the World from Antiquity to the Copernican Revolution* questions almost all those figures’ commitment to the instrumentalist position.

Although our concern is mainly Renaissance astronomy, it is worthwhile to take a look at Crowe’s re-evaluation of the save the phenomena position in late antiquity and the medieval period. Duhem emphasizes that the logical reason behind the basic principles of the position is the problem of equivalent hypotheses recognized by all the astronomers before the Renaissance, i.e., the same phenomena can be saved by distinct hypotheses. Crowe agrees that the problem is the obvious reason, but he points out that there are other reasons too. Proclus and Maimonides both warn against astronomers’ making realist claims not only because they identify the problem of equivalent hypotheses as a great source of uncertainty in astronomy, but also because they consider astronomy / mathematics depending on the inductive method to be inferior to physics / philosophy, which works by deduction. This latter reason is clearly based on Aristotelian epistemology, according to which scientific knowledge *par excellence* is deducing the particular from the general, and one has knowledge of something only when he knows the cause on which the facts depend. Astronomers can explain the observed celestial

phenomena through geometric devices, but they don't know the real cause of these celestial motions, that is to say, their knowledge is at best contingent. Thus Proclus writes against the reality of astronomical hypotheses in *Hypotyposis*:

[. . .] the astronomers exhibit a very casual attitude in their exposition of these hypothetical devices. Why is it that, on any given hypothesis, the eccentric or, for that matter, the epicycle moves (or is stationary) in such and such a way while the star moves either in direct or retrograde motion? And what are the explanations (I mean the real explanations) of those planes and their separations? This they never explain in a way that would satisfy our yearning for complete understanding. They really go backwards: they do not derive their conclusions deductively from their hypotheses, as one does in the other sciences; instead, they attempt to formulate the hypotheses starting from the conclusions, which they ought to derive from the hypotheses. It is clear that they do not even solve such problems as could well be solved. (Danielson, *the Book of the Cosmos* 77)

The implicit realist criteria originated from Aristotle are also detectable in the following passage where Maimonides suggests that the save the phenomena position is most congruent with religion. In between the lines one perceives a presumed structure of Aristotle's cosmos:

[. . .] regarding all that is in the heavens, man grasps nothing but a small measure of what is mathematical; and you know what is in it. I shall accordingly say in the manner of poetical preciousness: *The heavens are the*

heavens of the Lord, but the earth hath He given to the sons of man. [Psalm 114:6] I mean thereby that the deity alone fully knows the true reality, the nature, the substance, the form, the motions, and the causes of the heavens. But he has enabled man to have knowledge of what is beneath the heavens, for that is his world and his dwelling-place in which he has been placed and of which he himself is part. This is the truth. For it is impossible for us to accede to the points starting from which conclusions may be drawn about the heavens; for the latter are too far away from us and too high in place and rank. . . . And to fatigue the minds with notions that cannot be grasped by them and for the grasp of which they have no instrument, is a defect in one's inborn disposition or some sort of temptation. (qtd. in Crowe 75; in Duhem 35)

Aristotle's cosmos is a two-storey structure²¹ distinguishing the ever changing, imperfect sublunary world of man from the unchanging, perfect superlunary spheres of eternal beings. And this distinction of the places is combined with a distinction of physics, science of the lower domain, and metaphysics, science of the superlunary spheres. Maimonides in the passage above clearly accepts both the distinctions of places and of the different sciences corresponded to them. Now the problem for the natural philosophers in late antiquity and the medieval period is that astronomy, studying the same domain as metaphysics, tends to contradict the first principles laid down by the latter when it sets out to account for the celestial phenomena, as shown by the tension

²¹ See Danielson, *PL & CR*, pp.6-9.

between the world systems of Ptolemy and Aristotle. And it is very unlikely that in favor of the reality of astronomical hypotheses, the truth of Aristotelian cosmos is given up. Under these conditions, Crowe argues that “the medieval interpretation of mathematical hypotheses as mere devices was at best instrumental as a strategy or response to the demanding standards of a realist epistemology bound to acceptance of the Aristotelian cosmos” (77).

From there, Crowe proceeds to show that the carefully guarded Aristotelian criteria continue to hold their places in the save the phenomena position in the Renaissance. It is true, he writes, that

[. . .] the Melanchthon circle [the Wittenberg interpretation] rejected the literal heliocentrism of the Copernican system. Its members saw the advantages of the system for purposes of calculation and because it eliminated the equant. So far this sounds instrumentalist. But what has been overlooked here are the reasons for the rejection of heliocentrism – the fact that it contradicts Scripture and that there was no empirical evidence that supported the theory. In short, one of the standards whereby Copernicanism was rejected as literally true was a clearly realist criterion, namely, the presence or absence of empirical verification. Without such absolutely certain empirical verification, it was extremely unlikely that anyone would lightly accept the consequence that Scripture would have to be reinterpreted. (Crowe 81-2)

Nor can one call Cardinal Bellarmine an instrumentalist, who demanded from the Copernicans a true demonstration of the motion of the Earth, and by true demonstration he meant “Aristotelian demonstration, and every such demonstration requires a premise that is an absolutely certain principle derived from empirical evidence or that is self-evident” (Crowe 84). Crowe thus concludes his examination of the save the phenomena position in the Renaissance: “It seems that the instrumentalism of Melanchthon, Osiander, and Cardinal Bellarmine was a response conditioned by indubitable and clearly realist conclusions derived from Aristotle and Scripture” (84).

Before Crowe, in his article “From Copernicus to Kepler: Heliocentrism as Model and as Reality,” Owen Gingerich has already provided interesting details in the Wittenberg interpretation of the Copernican theory which may undermine its place in Duhem’s instrumentalists group. Apparently in both his *Prutenic Tables* and personal copy of *De revolutionibus*, Reinhold, the great influence on the Wittenberg interpretation, tries his best to isolate the heliocentric idea and the mobility of Earth from “the small details – minor hypotheses that were not part of the major cosmological revolution” (515). And it is these minor hypotheses that interest him. Reinhold’s tacit rejection of the central hypotheses of the Copernican system is mirrored in the teaching of astronomy at the University of Wittenberg in the late 1560’s. Gingerich’s examination of teaching notes and textbooks used there indicates that the reason for this rejection must be Aristotelian realism. In those notes and textbooks, citations of Copernicus are almost all technical. Whenever the possible mobility of the Earth is discussed, Copernicus’s name is carefully avoided, and the possibility is invariably rebutted as absurd (Gingerich 516-7). Caspar Peucer, pupil of Reinhold, complains explicitly in his *Hypotyposes astronomicae*

of the “offensive absurdity so alien to the truth, of the Copernican theories” (qtd. in Gingerich 517). And he suggests that “the proper solution [. . .] is the Ptolemaic model made consistent with recent observations” (Gingerich 517).

Just so Pietro Danial Omodeo argues that the Wittenberg interpretation of the Copernican theory is the German astronomers’ effort to find “a geocentric translation” (120) of Copernicus’s geometric devices, and that effort culminates in Tycho Brahe’s geo-heliocentric system, a model “originated from a long debate about how to accept geometrical innovations from *De revolutionibus* without renouncing the centrality and immobility of the Earth” (116).

Now let us come back to Milton. I have shown, with the help of Duhem’s study, that Raphael’s attitude towards astronomy bears unmistakable resemblance to that of a number of early modern figures including Osiander, Bellarmine, Melanchthon and Reinhold from the Wittenberg circle. According to Duhem, they endorse a most sensible and logical position towards astronomy and keep their distance from the narrow realist positions in the Renaissance. But what Crowe, Gingerich, and Omodeo argue above is that despite their vocal advocacy of theoretical freedom, almost all of them hold realist criteria rooted in Aristotelian physics and cosmology, which in turn belies their support of the axiom that astronomical hypotheses are mere geometric devices constructed to account for or predict the celestial motions, if they serve this purpose well, they do not need be true or probable. To be fair to Duhem, he is not hiding the fact that in the camp of Osiander, figures in the Wittenberg school like Melanchthon and Caspar Peucer tend to testify hypotheses by realist criteria based on Aristotelian physics, and therefore contradict the statements of Osiander. Duhem simply considers these deep-rooted

Aristotelian criteria to be part of the reality that are “given out as *true*” (77). But let us not dwell on this. For the reading of Milton, the studies of Crowe, Gingerich and Omodeo naturally lead to the question: is it also the case with Milton? Or more specifically, does Milton, while advocating “whether heav’n move or earth, / Imports not, if thou reckon right,” at the same time hold to the truth of the principles rooted in Aristotelian physics and cosmology?

Thanks to the studies of Leonard and Danielson, we can now answer without hesitation that Milton’s cosmology in *Paradise Lost* is definitely neither Aristotelian nor Ptolemaic, which at the same time means that Milton cannot be committing himself to Aristotelian physics and metaphysics. Crowe, Gingerich and Omodeo’s critiques of Duhem’s thesis, meanwhile, help us realize that, though Raphael’s attitude to astronomy in book eight easily reminds us of the attitudes of Osiander, Bellarmine and the Wittenberg astronomers, it is not supported by reasons that may eventually lead to some carefully guarded Aristotelian realism. This I shall show through a brief contrastive reading below.

Gingerich tells us above that teaching of astronomy at the University of Wittenberg, under the influence of Reinhold, develops a special strategy to incorporate Copernicus’s technical devices without exposing students to the “absurd” ideas of the mobility of Earth and the Sun at the center of the world. Such a strategy would have the hearty approval of Melancthon, another mentor of the Wittenberg circle, who thinks that the new astronomy should be “kept to scholarly discussion and should not be presented to the youth” (Omodeo 88):

Although subtle practitioners [*artifices*] take into consideration many [different theories] in order to exercise their intellects, nonetheless the youth should know that they [the practitioners] do not dare to affirm such theories. In their first education, [students] shall appreciate theories [*sententias*] transmitted with the shared consensus of the practitioners, which are minimally absurd. If [students] grasp that truth is manifested by God, they will embrace this [truth] with reverence and be satisfied by it. (qtd. in Omodeo 89, all the brackets are Omodeo's)

Melanchthon's teaching strategy appears to have been widely adopted in European universities in the Renaissance.

Raphael's astronomical talk in book eight is often seen as part of his educational program for Adam. Yet the angel's teaching method forms a striking contrast to the Wittenberg pedagogy. In his first astronomical education, Adam is not only exposed to the "absurd" ideas of the Sun being the center to the world, of the mobility of the Earth, but also to the best reasons conjectured in support of these "absurdities." Consider, so he says to Adam: What if the Sun is the center to the world, and the Earth actually a planet in the sky? The former could have the planets moving around it by its "attractive virtue" (8. 124), and while you cannot feel the motion of the Earth around the Sun, it is perhaps because the Earth, "from West her silent course advance, / With inoffensive pace that spinning sleeps / On her soft axle, while she paces ev'n, / And bears thee soft with the smooth air along" (8.163-66). And Raphael does not stop with the heliocentric hypothesis. He continues to exert Adam's imagination with speculations on the inhabitants on the Moon, and then on other inhabited worlds where "other suns perhaps /

With their attendant moons [. . .] / Stored in each orb perhaps with some that live”
(8.148-52).

Apparently such audacity in teaching would not have won the approval of Melanchthon. But even more strikingly different from the traditional save the phenomena position is that Milton’s Raphael confounds the disciplinary boundary between astronomy and physics. To help Adam imagine heliocentrism, Raphael supplies him with a physical cause of the planetary motions around the Sun, namely, the Sun’s “attractive virtue,” or, the “magnetic beam” (3.583), whereas Osiander emphasizes in his preface that astronomers are free to introduce any hypotheses as long as “they are not put forward to convince anyone that they are true, but merely to provide a reliable basis for computation,” that is to say, they should be kept within the discipline of astronomy. Raphael’s practice here certainly echoes Kepler, who believes that astronomical calculations should be “founded upon the motions’ physical causes themselves” (Donahue 5).

As quoted above, Raphael’s suggestion of the Sun’s “attractive virtue” is accompanied by an explanation of daily rotation of the Earth based upon the principle of the relativity of appearances. The similar explanation can be traced all the way back to the time of Ptolemy. One also reads it in the works of Nicolas Oresme (fourteenth century French bishop and scholar), Nicholas of Cusa, and Copernicus himself. All three use the

analogy of the experience of a man on board a ship.²² In *De revolutionibus*, Copernicus embellishes his analogy with a line from Virgil:

As regards the daily rotation, why not grant that in the heavens is the appearance but in the earth is the reality? It is like the case spoken by Virgil's Aeneas: "We sail forth from the harbor, and lands and cities draw backwards" [*Aeneid*, III.72]. For when a ship glides along smoothly, its passengers see its motion reflected by everything outside of the ship and, by contrast, suppose themselves and everything else on board to be motionless. No wonder, then, that the movement of the earth makes us think the whole universe is turning round. (Danielson, *the Book of the Cosmos* 115)

Adam of course does not have the experience of boarding a smoothly gliding ship. Raphael therefore simply asks him to imagine the Earth carrying him and everything else including the air with it, and moving with such even and "inoffensive pace" that he cannot feel any motion.

It is in giving this explanation, even if hypothetically, that Milton's Raphael parts company with Bellarmine, Osiander and the Wittenberg astronomers. In a letter to Paolo Antonio Foscarini, Bellarmine decisively rejects the argument based on relativity of appearances:

²² See Danielson, *the Book of the Cosmos*, chapters 11,16,17,18.

Anyone who departs from the beach, though to him it appears that the beach moves away, yet knows that this is an error and corrects it, seeing clearly that the ship moves and not the beach; but as to the sun and earth, no sage has needed to correct the error, since he clearly experiences that the earth stands still and that his eye is not deceived when it judges the sun to move, just as he is likewise not deceived when it judges that the moon and the stars move. And that is enough for the present. (qtd. in Crowe 83)²³

The immobility of Earth is not negotiable for Bellarmine. It is self-evident to his experience. According to Aristotelian epistemology, this is enough to justify it as an absolute certainty. Raphael's hypothetical appeal to the principle of the relativity of appearances would also have been rejected by Osiander, who in his preface clearly upholds the authority of empirical evidence, denying the probability of the epicycle of Venus because it is "refuted by the experience of every age."

Osiander and Bellarmine are adamant that the empirical principle cannot be contradicted. Milton's Raphael, however, in support of his statement that "whether heav'n move or earth, / Imports not, if thou reckon right," appeals consistently to the unreliability of the empirical principle, and to the relativity of appearances. Thus when we look again at the three groups of hypotheticals corresponding respectively to three views of the world, i.e., the geocentric, the heliocentric, and a plurality of worlds, we realize that Raphael is not absolutely neutral to each. The geocentric hypothesis is

²³ Crowe's source is Stillman Drake, *Discoveries and Opinions of Galileo* (New York, 1957), p.164.

represented in a most unfavorable light. While apparently affirming the possibility of Earth “standing still” (8.89), Raphael however undermines Adam’s reasoning based on common sense, the kind of reasoning that will be used unquestionably by his offspring: “Already by thy reasoning this I guess, / Who art to lead thy offspring, and supposes / That bodies bright and greater should not serve / The less not bright” (8.85-88). The problem is, Raphael states unequivocally, “great / Or bright infers not excellence,” nor does “small / Nor glistening” necessarily suggest the inferior state of the Earth (8.90-4). But the Earth is considered to be the least noble in the geocentric cosmology partly because of its attributes, small and opaque, which in turn indicates great or bright does infer excellence. Thus while supposedly affirming the possibility of the geocentric worldview, Raphael explicitly rejects the supportive principle of reasoning behind it. Raphael’s discussion of the motion of the heavens is also in stark contrast to Bellarmine’s words above. Where Bellarmine says one “clearly experiences the earth stands still and that his eye is not deceived when it judges the sun to move, just as he is likewise not deceived when it judges that the moon and the stars move,” Raphael urges Adam to admit “motion in the heav’ns, to show / Invalid that which thee to doubt it moved,” but not because he asserts it to be the reality, but because “so it seem / To thee who hast thy dwelling here on earth” (8.115-8). And the typical admonition against any breaches of the geocentric worldview follows immediately, if we read carefully, as a caution against Adam’s taking the relative appearance of the motion of the heavens based on his observation from the Earth for the reality: “God to remove his ways from human sense, / Placed heav’n from earth so far, that earthly sight, / If it presume, might err in things too high, / And no advantage gain” (8.119-22).

Emphasizing relativity of appearances and unreliability of sensual experience, as well as freely traversing the disciplinary boundary between astronomy and physics, Raphael approaches astronomy in a remarkably Copernican way. The heliocentric worldview is presented undeniably in a much more favorable light than the geocentric one in his hypothetical talk. But it is important for us to bear in mind that the Copernicans appeal to relativity of appearances only to undermine the absolute certainty of geocentrism, and they certainly do not stick to it. The argument itself is a double-edged sword – it cannot prove the truth of heliocentrism. What it does is relativize the realities of both geocentrism and heliocentrism. What the Copernicans really want to prove is that their system portrays the true form of the universe. To achieve this purpose, they advocate a realism based, predominantly, not upon common sense, but upon mathematics, especially geometry.

Raphael sticks to the principle of relativity of appearances and goes beyond the Copernicans in not dwelling on the truth of heliocentrism. The hypotheticals of heliocentrism give way to the most favored of the three possible worldviews, the plurality of worlds. Indeed the hint that there are other worlds beyond Adam's perception is first given when discussing the geocentric worldview. Asserting that a fruitful Earth though "so small / Nor glistering, may of solid good contain / More plenty than the sun that barren shines," Raphael purposefully braces Adam for the first hint of other inhabited worlds: "for the heavn's wide circuit, let it speak / The Maker's high magnificence, who built / So spacious, and his line stretched out so far; / That man may know he dwells not in his own; / An edifice too large for him to fill, / Lodged in a small partition, and the rest / Ordained for uses to his Lord best known" (8.100-6). Then we just have to wait for

Raphael's hypotheticals of heliocentrism to flow almost involuntarily and rapidly towards speculations on inhabitants on the Moon and other inhabited worlds:

[. . .], if land be there,
 Fields and inhabitants: her spots thou seest
 As clouds, and clouds may rain, and rain produce
 Fruits in her soft soil, for some to eat
 Allotted there; and other suns perhaps
 With their attendant moons thou wilt descry
 Communicating male and female light,
 Which two great sexes animate the world,
 Stored in each orb perhaps with some that live. (8.144-52)

A multiplicity of inhabited worlds, Raphael suggests, must be the most logical conception of God's creation, and the opposite is apparently unreasonable, or "obvious to dispute"²⁴:

For such vast room in Nature unpossessed
 By living soul, desert and desolate,
 Only to shine, yet scarce to contribute
 Each orb a glimpse of light, conveyed so far
 Down to this inhabitable, which returns
 Light back to them, is obvious to dispute. (8.153-8)

²⁴ See Leonard's discussion of the phrase in *FL*, pp.776-7.

Just as the suggestion of the relativity of appearances undermines the authority of the empirical principle, the likely existence of multiple worlds, namely other suns with their attendant planets, makes both the competing geocentric and heliocentric models²⁵ devised by future astronomers claiming to have portrayed the true form of the universe “quaint opinions wide” and laughable illusions. The true form of the entire universe, an edifice of truly unimaginable immensity, in which Adam’s world, the form of which future Ptolemaists, Tychonians and Copernicans are trying to decide, occupies merely “a small partition,” is known only to the great Architect, God himself.

Milton distinguished from two groups of sceptics and compared to Kepler

Correcting Duhem, N. Jardine argues that the debates on “save the phenomena” are better understood as part of the conflict between realism and scepticism in astronomy than as the anachronistic and misleading realism versus instrumentalism. The issue at stake is whether astronomers can portray the true form of the universe. Denying that possibility, Milton’s position echoes that of the sceptics. But his sceptical position should be further distinguished from the two kinds of sceptics identified by Jardine while reconstructing the context of Kepler’s *Defence of Tycho against Ursus* (*Apologia pro Tychone contra Ursum*). According to him, the figures we have encountered above, Osiander, Bellarmine, the Wittenberg astronomers, together with Ursus, hold but a very limited version of scepticism, or “a sceptical, but not radically sceptical, realism” (240). Like Crowe, Jardine recognizes that their scepticism applies only to “postulation of

²⁵ Tycho Brahe’s geo-heliocentric model can be seen as a revised geocentric model.

epicycles and eccentrics, not to such basic cosmological issues as the immobility of the earth or the existence and ordering of the planetary spheres” (239). This group emphasizes the disciplinary boundary and hierarchy according to the Aristotelian scheme of knowledge. The duty of the astronomer is merely to provide a calculus consistent with observations. The cause of celestial motions and the true form of the universe are the concerns of the natural philosopher. Their shared aim is to “evade the potential conflict” between the two disciplines. Much like Crowe, Jardine argues that, instead of endorsing a general sceptical epistemology, this group essentially advocates a “pragmatic compromise” between mathematical astronomy and Aristotelian physics and cosmology (243). Jardine thinks Kepler rightly refers to the position of this group as those “who confine their thinking within the bounds of astronomy and geometry” (qtd. in Jardine 243).

The other group of sceptics, a minority, indeed promotes a general epistemological position that is “at least partially inspired by Plato and Proclus” (Jardine 236). This group includes, according to Jardine, Giovanni Gioviano Pontano (1426-1503), Christian Wursteisen (1544-88), Nicodemus Frischlin (1547-90), Pierre de la Ramée (1515-72) and Francesco Patrizi (1529-97). Their shared tenets are 1) planetary models are fabrications merely for the purpose of saving the phenomena; 2) to discover the simple and regular celestial motions that underlie the phenomena is utterly beyond the capacity of human intellect and senses. Pontano and Ramus are the most radical of the group who even doubt “the intelligibility about claims about real celestial motions” and indeed come close to the modern “fictionalist” or “instrumentalist” position. Pontano in addition rejects the notion that planets are moved by the Sun’s rays or its magnetism, instead he believes that

planets retrograde because they move by their own volition like animals, a belief partially shared by Patrizi. According to Jardine, Kepler in his *Apologia* chastises holders of these views as “deluded seekers after abstract forms who despise matter (the one and only thing after God)” (Jardine 156; 236).

I have shown earlier that Milton’s position is strikingly different from the first group (Osiander, Bellarmine, the Wittenberg astronomers). Raphael does not support his attitude to astronomy (“whether heav’n move or earth, / Imports not, if thou reckon right”) with reasons that may eventually lead to some carefully guarded Aristotelian realism. Read against Jardine’s analysis, it is also safe to say that Raphael certainly does not promote a pragmatic compromise between astronomy and philosophy. He shows no attempt to keep mathematical astronomy and physics within their respective disciplinary boundaries, which Osiander considered absolutely necessary lest the novelties of the new astronomy were “to throw the liberal arts into confusion.” On the contrary, as shown in my reading of the astronomical talk in book eight above, the angel freely traverses the territories of the two disciplines in his discussion of astronomy. Nor does he avoid the inhibitive topic of the mobility of Earth; it enters his astronomical discussion in such a way that many tend to hear him as a Copernican.

Like the figures in the minority group of sceptics identified by Jardine, Raphael (or Milton behind him) *is* promoting a general epistemological position in book eight. His discussion of astronomy ends with a general moral and epistemological note – “be lowly wise.” But compared to this small group of sceptics Milton’s position is again built upon different grounds. The scepticism of Pontano and Ramus is anchored in platonic dualism which sees the abstract, nonmaterial forms as the reality and despises matter. Milton

however like Kepler recognizes the dignity of matter as “the one and only thing after God.” In *Christian Doctrine* Milton argues that God does not create the universe out of nothing, but out of the primal matter that is good and originated from God.²⁶ In book five of *Paradise Lost*, Raphael teaches “one first matter all”:

O Adam, one Almighty is, from whom
 All things proceed, and up to him return,
 If not depraved from good, created all
 Such to perfection, one first matter all,
 Endued with various forms, various degrees,
 Of substance, and in that live, of life;
 But more refined, more spirituous, and pure,
 As nearer to him placed or nearer tending
 Each in their several active spheres assigned,
 Till body up to spirit work, in bounds
 Proportioned to each kind. (5.467-79)²⁷

I shall return to these lines in a moment. For now, it is enough to point out that, in contrast to the dualism of Pontano, Ramus and others who see matter and spirit as distinct entities and deny that we can apprehend the spiritual reality of celestial motions through study of physical phenomena, Milton’s monism certainly accommodates that possibility.

²⁶ *YP* 6.308.

²⁷ See Fallon, *Milton among the Philosophers*, pp. 102-5.

Because matter and spirit are not separate entities, and all things are formed from “one first matter” which in turn originates from God, knowledge of the phenomena should reveal something of the reality.

Before examining their different epistemological positions in astronomy, we need to first register Milton’s affinity to Kepler. Milton and Kepler share two important and connected understandings: metaphysical monism and the conflation of mathematics and physics in astronomy. The belief in monism leads to the belief that studying the celestial phenomena can bring us knowledge of the reality. Kepler says that the universe is the “very Book of Nature, in which God the Creator manifested and represented in part and by a kind of writing without words his essence and his will towards mankind” (qtd. in Jardine 250). Similarly, Raphael tells Adam that “heav’n / Is as the Book of God before thee set, / Wherein to read his wondrous works [. . .]” (*PL* 8.66-7). Kepler advocates in both *Epitome astronomiae Copernicanae* and *Apologia* that astronomers should not limit their work within the mathematical arts, but should seek to postulate acceptable or adequate physical causes of the astronomical hypotheses. A well-known example, already referred to above, is of course his postulation of the Sun’s magnetic power as the cause of planetary motions. So Raphael postulates to Adam: “What if the sun be centre to the world, and other stars / *By his attractive virtue* and their own / Incited, dance about him various rounds?” (8.122-5; my emphasis). Earlier in book three, we have heard the narrator: “they [the stars] as they move / Their starry dance in numbers that compute / Days, months, and years, towards his all-cheering lamp / Turn swift their various motions, or are turned / *By his magnetic beam*” (3.579-83; my emphasis).

In modern astronomy the conflation of mathematics and physics has long become a standard approach. To fully appreciate the significance of Milton's affinity to Kepler in this regard we have to remind ourselves of the radical nature of Kepler's explicit demand for such a conflation. What is radical is not, merely, his bridging the gulf – to use Jardine's word – between mathematical astronomy and natural philosophy still very much visible for most of the sixteenth century, but his understanding of the nature of physical knowledge itself. Aristotle's natural philosophy is characterized by qualitative distinctions. Kepler's natural philosophy shows a distinctly quantitative feature. Jardine produces evidence from an early work of Kepler, *De fundamentis astrologiae certioribus* (1601), where Kepler explicitly contrasts the quantitative / geometrical character of his physics and metaphysics and the qualitative character of these of Aristotle:

Aristotle, wishing to philosophise at a higher level than geometry and more generally, admits as the first contrariety in metaphysics that which is between sameness and difference. It seems to me that diversity in created things arises only from matter or by reason of matter. But where matter is, there is geometry. So that which Aristotle declares to be the primary contrariety, namely between sameness and difference without a mean, I find likewise in the realm of geometry, considered philosophically, to be the primary contrariety, but with a mean, more and less. So since geometry represented the exemplar for the creation of the whole world, this geometrical contrariety accords not improperly with the furnishing of the world which consists of the diverse powers of the planets. (qtd. in Jardine 253)

The defining sentences in this passage – “It seems to me that diversity in created things arises only from matter or by reason of matter. But where matter is, there is geometry.” – point to a latent connection between Kepler’s monistic understanding of the universe and his conflation of mathematics and geometry and physics in astronomy. As we all know, the combining form “geo-” means “related to earth.” Geometry, etymologically, means measurement of the Earth. Within the Aristotelian scheme of knowledge, Geometry is supposedly an earthly science, but it is also employed as a necessary instrument in mathematical astronomy, which provides quantitative information of the heavens but not their intrinsic qualities or causes of their motions. Kepler, rather like his slightly elder contemporary Galileo, discards Aristotle’s problematic disciplinary distinctions based on place and subject matter. Geometry is conceived as the “exemplar for the creation of the whole world,” or, the very alphabet with which God writes the book of nature. Man, making intellectual effort to reduce phenomena to ratios, proportions, and patterns, can reveal the underlying harmonious order of the cosmos.

Invoking John Selden in *Areopagitica*, Milton understands that “what is truest” is “mathematically” demonstrable:

Mr. Selden, whose volume of naturall & national laws proves, not only by great authorities brought together, but by exquisite reasons and theorems almost mathematically demonstrative, that all opinions, yea errors, known, read, and collated, are of main service & assistance toward the speedy attainment of what is truest. (*YP* 2. 513)

In *Paradise Lost*, three memorable mathematical images serve to illustrate the quantitative character of Milton's natural philosophy. The Son is the divine geometer who creates our universe by applying God's "golden compasses" to Chaos:

He took the golden compasses prepared
 In God's eternal store, to circumscribe
 This universe, and all created things,
 One foot he centred, and the other turned
 Round through the vast profundity obscure,
 And said, Thus far extend, thus far thy bounds,
 This be thy just circumference, O world.
 Thus God the heav'n created, thus the earth,
 Matter unformed and void: [. . .] (7.225-33)

A mathematical order of the universe is indicated in the cosmic "starry dance in numbers that compute / Days, months, and years" (3.580-1). Even the impending battle between Satan and the angels led by Gabriel in Eden is weighed by God's "golden scales":

Th' Eternal to prevent such horrid fray
 Hung forth in heav'n his golden Scales,
 [. . .]
 Wherein all things created first he weighed,
 [. . .] in these he put two weights
 The sequel each of parting and of fight;
 The latter quick up flew, and kicked the beam. (4.996-1004)

Satan is weighed and shown “his mounted scale aloft.” Gabriel spells out the message: “how light, how weak, / If thou resist.” As a result Satan “fled murmuring” (4.1012-5). Milton asks us to imagine God’s golden scales as a cosmic weighing device that can reduce apparent physical phenomena to quantitative data. It weighs the consequence “each of parting and of fight” and the latter is found wanting²⁸. Such weighing suggests a mathematical order underlying the events. Indeed all together the images of the cosmic compasses, numbers and scales remind us of Wisdom 11:20: “thou [God] hast ordered all things in measure, and number, and weight.”

In the lines where Milton’s monism is most clearly expressed by Raphael, the quantitative character of Milton’s natural philosophy again stands out. There we learn that all things in the universe, human and angelic beings included, come from the one primal matter, and differ from each other not qualitatively but quantitatively, “Endued with various forms, various degrees / of substance, and in things that live, of life” (5.473-4). The disposition of things is proportional and dynamic rather than fixed and stable. Things and beings are “more refined, more spirituous, and pure,” not just because they are “nearer to him [God] placed,” but more importantly because they are “nearer tending.” As Stephen Fallon points out, the “metabolic” dynamism in Milton’s universe is such that “direction is more important than position” (103). Created things or beings are assigned to “spheres” and “bounds / proportioned to each kind” (5.477-9), but such spheres are at the same time “active,” and the word “bounds,” Leonard reminds us, puns

²⁸ As Leonard points out in his note to Milton’s lines of the golden scales (*John Milton: The Complete Poems* 774), also evoked there is Daniel 5:27: “TEKEL; Thou art weighed in the balances, and found wanting”.

on both “limits” and “leaps” (*John Milton: The Complete Poems* 781). Even the difference between human and angelic reason is “but in degree, of kind the same” (4.490).

Let us bear in mind this distinct quantitative character of Milton’s natural philosophy and return to the discussion of astronomy. Like Kepler, Milton apparently does not consider the Sun’s central place as a mere geometrical dot. In book eight Raphael especially acknowledges the crucial physical role the Sun plays in the solar system, namely, keeping the planets in regular motion. There the advantages of the heliocentric system over the geocentric one are considered not in terms of mere diagrammatic simplicity, but in very specific physical terms. The planetary motion in the former is simple, regular and harmonious. All the planets are incited by the Sun’s “attractive virtue” and “dance about him various rounds,” though, from Earth’s perspective, “Their wand’ring course now high, now low, then hid, / Progressive, retrograde, or standing still” (8.126-7). The heliocentric system saves not only “the sun his labour” but also “that swift / Nocturnal and diurnal rhomb supposed, / Invisible else above all stars, the wheel / Of day and night” (8.133-4). Both are awkward physical inconveniencies required for keeping an immobile Earth in the center. And they are not all. A geocentric universe also necessitates more spheres “Moved contrary with thwart obliquities” (8.131-2). Indeed despite his noncommittal, Raphael’s comparison of the two systems in physical terms makes the probability of a geocentric universe “obvious to dispute.”

Based upon the comparison of Milton and Kepler above, we can say that for Milton, as for Kepler, reckoning, or, computation of celestial motions, certainly takes into

consideration the physical causes of the motions. But this methodological agreement, as well as their consensus on the metaphysics behind it, at the same time, makes the difference between the two even more striking. For Kepler, astronomers' causal considerations give astronomy a status as "part of physics," that is to say, astronomy gets the license of inquiring into the nature of things. He insists in the *Apologia* that astronomy can "establish things in the realm of physical knowledge" (Jardine 147; 249). These claims or indications form the basis of Kepler's realist plan for an advancement of learning in astronomy. So he writes in *Epitome astronomiae Copernicanae*:

[. . .] the astronomer [. . .] now draws together in a single form those things which he had previously determined one at a time. And having set aside what was, up till then, his intended purpose (which was the demonstration of the phenomena, and the things useful for everyday life which flow from this), himself aspires, with the greatest joy in philosophising, to a higher end. To this end he directs all his opinions, both by geometrical and by physical arguments, so that truly he places before the eyes an authentic form and disposition or furnishing of the whole universe. Truly this is the very Book of Nature, in which God the Creator manifested and represented in part and by a kind of writing without words his essence and his will towards mankind. (qtd. in Jardine 250)

This passage forms a notable contrast to Raphael's advice to Adam's astronomical inquiry in book eight. Milton agrees that the universe is "the book of God" wherein Adam can read "his wondrous works." He also agrees, as shown by the discussions above, with Kepler that the book is written in a mathematical language. However in

contrast to Kepler's enthusiastic call for the astronomer to aspire "to a higher end" with "the greatest joy in philosophising," that is, to decide the reality of the fabric of the heavens, Raphael says to an aspiring astronomer of Adam that "whether heav'n move or earth, / Imports not, if thou reckon right." Where Kepler is confident that astronomers, combining geometrical and physical arguments to account for the appearances, can depict "the authentic form and disposition or furnishing of the whole universe"; Raphael mocks astronomers' efforts "to save appearances": "if they list to try / Conjecture, he [God] his fabric of the heav'ns / Hath left to their disputes, perhaps to move / His laughter at their quaint opinions wide"; and his final note: "heav'n is for thee too high / To know what passes there; be lowly wise."

The difference between Milton and Kepler boils down to their understandings of the epistemological status of astronomy. Kepler denounces scepticism because for him a geometrically constructible universe and a causal / physical approach to astronomy provide sure grounds and means for realism. With him, "saving the appearances" can and should aim at establishing the one-to-one correspondence with the ultimate reality of the universe. Different from the sceptics Kepler attacks in his *Apologia*, Milton does not hold a dualistic view of appearance and reality, and is highly receptive to Kepler's new astronomy based on physical considerations.²⁹ Nevertheless he still denies that astronomers can portray the true form of the universe, and advocates computational

²⁹ The definition is Kepler's own, as stated by his book titled *Astronomia Nova, Aitologetos, seu physica coelestis, tradita commentariis de motibus stellae Martis. Ex observationibus G.V. Tychonis Brahe: New Astronomy Based upon Causes or Celestial Physics Treated by Means of Commentaries on the Motions of the Star Mars from the observations of Tycho Brahe* (trans. Donahue).

sufficiency, with, let us bear in mind, one subtle but important revision of the traditional position which originally tends to limit astronomy within the discipline of mathematics and geometry – for Milton, as for Kepler, computation, or reckoning, combines both geometrical and physical considerations.

Chapter 2 Nicholas of Cusa as Guide to Milton

1

Curious and unexpected perhaps, Milton's distinct sceptical position is not irreconcilable with his positive reception of the new astronomy. I argue in this chapter that Nicholas of Cusa serves as our best guide in understanding Milton's evaluation of the epistemological status of astronomy. Or, Milton is the true heir to Cusanus, inheriting the latter's delicately balanced scepticism which encourages progress in human inquiry for truth while recognizing the nature of human knowledge as necessarily partial and relative.

First let us return to Kepler's proposition for a new astronomy based upon physical considerations. In it, Jardine perceives an original contribution to astronomical and scientific inquiries in general comparable to that made by Francis Bacon and René Descartes, especially, in terms of Kepler's providing "a rational methodology for the resolution of theoretical conflict [specifically in astronomy, the problem of equivalent hypotheses]" and "the concept of scientific progress mediated by a rational method and evincing ever more accurate portrayal of the world" (5; 289). We have had a glimpse of Kepler's methodology in our last quotation from his *Epitome astronomiae Copernicanae*, where he supports his realist agenda with an experimental and inductive process that indeed reminds us of that promoted by Bacon. First the astronomer determines "one [celestial motion or phenomenon] at a time," then he draws these local certainties together "in a single form." Demonstrable by both geometrical and physical arguments,

the final product shall be “the authentic form and disposition or furnishing of the whole universe.”

Physical / causal considerations play an important role in Kepler’s realism. Understanding the whole universe as homogeneous and geometrically constructible, Kepler accordingly erases Aristotle’s distinction of metaphysics and physics based on distinction of superlunary and sublunary spheres. However he retains the Aristotelian conception of physics in general as a causal science providing certain knowledge of nature. Despite his criticism of Aristotle, his “physicalization of astronomical theories” can be regarded as “the realization in the field of astronomy of the old Aristotelian ideal of knowledge: ‘knowledge’ means to grasp the causes of the phenomena” (Di Liscia). It is in this sense, saving the appearances / phenomena in astronomy for Kepler now means grasping the causes of celestial motions and portraying the true form of the universe.

A century before Kepler, Nicholas of Cusa had already been seeing the universe as homogeneous. Accordingly he too rejected the Aristotelian distinction of metaphysics and physics based upon the qualitative distinction of places. But unlike Kepler, who unites two physics into one and believes that it *can* grasp the causes of things and give an accurate portrayal of the whole universe, Cusanus says that “the precise truth is inapprehensible” to human inquiry in every dimension.

Cusanus’s scepticism is not based upon a dualistic distinction of appearance and reality but upon a metaphysical monism not unlike that held by Milton. God is the “Absolute Maximum” or “Absolute Oneness” or “Absolute Being,” absolute in the sense of being “free from all relation and contraction [i.e., restriction or limitation]” (*On*

*Learned Ignorance*³⁰ 1.2). Cusanus teaches that the universe exists as “a universal oneness of being” or “a maximum deriving from the Absolute [Maximum]” – the lower cases differentiate the same terms, namely “oneness,” “being,” and “maximum,” from those applied to God, in that the universe exists only *from* God, therefore is not absolute but “contracted in plurality,” and “cannot exist without plurality” (*DI* 1.2). We perceive the same understanding of God and his relationship to the world in *Paradise Lost*. God tells Adam of Himself: “who am alone / From all eternity, for none I know / Second to me or like, equal much less” (8.405-7). Bargaining with God for a companion, Adam says that God does not need one because He is already “perfect” and “infinite,” who is “through all number *absolute*, though One” (8.415; 420-1, my emphasis).

Human inquiry Cusanus understands to be essentially measuring, which proceeds necessarily by means of comparison and depends on numbers. His is a distinctly quantitative natural philosophy like Kepler’s and Milton’s: “number, which is a necessary condition of a comparative relation, is present not only in quantity but also in all things which in any manner whatsoever can agree or differ either substantially or accidentally” (*DI* 1.1). All things comprehended in the universal oneness thus relate to each other proportionally, and “all those who make an investigation judge the uncertain proportionally, by means of a comparison with what is taken to be certain” (*DI* 1.1). Given the conditions and means of human inquiry, Cusanus declares that we have precise knowledge neither of God nor of things, or phenomena in nature:

³⁰ Hereafter cited as *DI*.

It is self-evident that there is no comparative relation of the infinite to the finite. Therefore, it is most clear that where we find comparative degrees of greatness, we do not arrive at the unqualifiedly Maximum; for things which are comparatively greater and lesser are finite; but necessarily, such a Maximum is infinite. Therefore, if anything is posited which is not the unqualifiedly Maximum, it is evident that something greater can be posited. And since we find degrees of equality (so that one thing is more equal to a second thing than to a third, in accordance with generic, specific, spatial, causal, and temporal agreement and difference among similar things), obviously we cannot find two or more things which are so similar and equal that they could not be progressively more similar *ad infinitum*. Hence, the measure and the measured – however equal they are – will always remain different.

Therefore, it is not the case that by means of likeness a finite intellect can precisely attain the truth about things. For truth is not something more or something less but is something indivisible. Whatever is not truth cannot measure truth precisely. (By comparison, a noncircle [cannot measure] a circle, whose being is something indivisible.) Hence, the intellect, which is not truth, never comprehends truth so precisely that truth cannot be comprehended infinitely more precisely. For the intellect is to truth as [an inscribed] polygon is to [the inscribing] circle. The more angles the inscribed polygon has the more similar it is to the circle. However, even if the number of its angles is increased *ad infinitum*, the

polygon never becomes equal [to the circle] unless it is resolved into an identity with the circle. Hence, regarding truth, it is evident that we do not know anything other than the following: viz., that we know truth not to be precisely comprehensible as it is. For truth may be likened unto the most absolute necessity (which cannot be either something more or something less than it is), and our intellect may be likened unto possibility. Therefore, the quiddity of things, which is the truth of beings, is unattainable in its purity; though it is sought by all philosophers, it is found by no one as it is. And the more deeply we are instructed in this ignorance, the closer we approach to truth. (*DI* 1.3; brackets originally added in translation)

Cusanus's recognition of the incommensurability between the finite and the infinite is thus grounds both for a sceptical epistemology and infinite progress in human learning. He denies that precise truth is apprehensible to human inquiry because of this incommensurability. But at the same time, he does not suggest that human beings should simply renounce their quest for truth. Quite the contrary, oriented towards the infinite, the human intellect is now likewise bounded by no definite limit. It gains infinite room for progress. And real progress is attained, Cusanus argues, only through recognizing the limit of the human intellect, namely, what it does not know. What he calls "learned ignorance" is the means for progress in human learning both collectively and individually:

[. . .] since the desire [to know] in us is not in vain, assuredly we desire to know that we do not know. If we can fully attain unto this [knowledge of

ignorance], we will attain unto learned ignorance. For a man – even one very well versed in learning – will attain unto nothing more perfect than to be found to be most learned in the ignorance which is distinctively his.

The more he knows he is unknowing, the more learned he will be. (*DI* 1.1)

Different from Kepler's, Cusanus's conception of physics, namely, natural sciences in general or human inquiry into the natural phenomena, is not Aristotelian. For Cusanus, physics cannot grasp the causes of things and thereby provide certain knowledge of nature. Instead it is forever in the process of progressively getting closer to truth. As Duhem puts it, Cusanus replaces Aristotle's distinction of metaphysics and physics based upon qualitative distinction of places in the cosmos with a new distinction of the physics of God and the physics of man:

One physics is the knowledge of essences and causes. It meets the requirements of the definition that scholastic philosophy had imposed on all knowing: *scire per causas*. Necessarily perfect and immutable, it is not accessible to man but is God's science.

The other physics is of a radically different sort: they are as heterogonous as polygon and circle. It does not know genuine causes and essences. If it uses these words, it can apply them only to hypothetical causes and fictive essences, which are creatures of reason, not realities. The physics so constituted is ever on the way of self-perfection. The physics of essences and causes functions as its limit, giving direction to its development. Yet it is forever barred from reaching its limit. The physics

of fictions and abstractions is the only physics accessible to man. (Duhem 58)³¹

In relation to our discussion of “saving the appearances / phenomena,” we see that Cusanus’s understanding of the nature of human inquiry shakes the grounds of Kepler’s realist claims for a new astronomy based upon physical considerations. In essence Cusanus advocates “an important modification and extension of the ‘save the phenomena’ position” to include physics (Crowe 76). He agrees with Kepler that the same physics / laws apply to both the superlunary and sublunary regions, but for him, physical considerations, just like geometrical ones, cannot procure the one-to-one correspondence between appearances and reality: “the measure and the measured – however equal they are – will always remain different.” Rather what physics aims to grasp – to borrow Milton’s words in *Areopagitica* – is “what is truest.” If Kepler advocates that man can attain *to* truth, Cusanus believes that man can only attain *towards* truth.

Like Cusanus, Milton’s Raphael advocates a modified save the phenomena position that is extended to include physics. He approaches astronomy with the Keplerian reckoning, namely computation based upon both geometrical and physical considerations, but without regarding the latter as grounds for realism in astronomy. His position remains “whether heav’n move or earth, / Imports not, if thou reckon right.” Also like Cusanus, Raphael rejects realism on the grounds of the incommensurability

³¹ Duhem here interprets *DI* 1.1,3.

between the finite and the infinite, that is, between man and the whole universe, and between man's and God's knowledge. Adam is "lodged in a small partition" of "An edifice too large for him to fill." There is an insurmountable gap between his finite knowledge of the universe and "the rest / Ordained for uses to his Lord best known." At the same time, in Raphael's astronomical talk in book eight we trace no suggestion of any definite limit for Adam's desire to know. The emphasis is rather repeatedly upon the infinite disproportion between man and the universe, and man and God, ontologically and epistemologically. The same disproportion, as that in Cusanus, provides grounds both for scepticism and infinite room for progress. Thus the angel unequivocally encourages Adam to study the universe as "the book of God," and predicts that in the future man's knowledge of it will extend far beyond Adam's familiar Sun, Moon, and Earth: "other suns perhaps / With their attendant moons thou wilt descry [. . .]."

We see that this balanced sceptical position is consistently asserted in *Paradise Lost*. Satan, disguised as "a stripling Cherub" (3.636), asks Uriel to point out to him the direction to Earth, and justifies his wandering with his "unspeakable desire to see, and know / All these his [God's] wondrous works, but chiefly man" (3.662-3). In reply, Uriel, like Raphael to Adam, praises the disguised Cherub's desire to know, and more explicitly than Raphael, makes it clear that there is "no excess / That reaches blame" of such desire to know the works of God:

Fair angel, thy desire which tends to know,
 The works of God, thereby to glorify
 The great Work-Master, leads to no excess
 That reaches blame, but rather merits praise

The more it seems excess, that led thee hither
 From thy empyreal mansion thus alone,
 To witness with thine eyes what some perhaps
 Contented with report hear only in Heav'n: (3.694-701)

Beside Uriel's emphasis that there is no limit to God's creatures' inquiry into His works, and rather the eagerness to go to excess in such inquiry "merits praise," it is also interesting to note that he affirms the disguised Cherub's empirical approach to knowledge. Uriel lauds the "young angel" for making effort to "witness with [his] eyes what some perhaps / Contented with report hear only in Heav'n" – suggestion once again of Milton's favorable reception of the rational and empirical methodology of the new science. But immediately, Uriel strikes balance between the creatures' unlimited desire to know and knowledge of the causes of things denied to them:

For wonderful indeed are all his works,
 Pleasant to know, and worthiest to be all
 Had in remembrance always with delight;
 But what created mind can comprehend
 Their number, or the wisdom infinite
 That brought them forth, but hid their causes deep. (3.702-7)

The aspiration of God's creatures is indeed to know *all* His works. But what the created mind can comprehend is necessarily numbered, that is, finite. At the same time, just as one can always continue to count with numbers, the mind can always continue to comprehend – like Cusanus says – *ad infinitum*. Again, Uriel's reference to "what created

mind can comprehend” imposes no definite limit to the created mind other than “the wisdom infinite / That brought them [the works] forth, but hid their causes deep.” The causes are hidden not because of any intended obscurantism by God, but because they are “deep” and dwell with the infinite, which by definition, will be forever out of reach. Again like Cusanus Milton emphasizes the incommensurability between the creatures’ and God’s knowledge of His works in mathematical terms – it is between “number” and “wisdom infinite.” The latter is the forever regressing limit to the former. The desire to know “all his works” functions as the impetus of the creatures’ “nearer tending,” and praiseworthy is the creatures’ matching the desire to know with the best possible way to know. So Uriel praises the Cherub’s empirical approach to knowledge as better than gaining information by hearsay. Raphael, as we have seen above, approaches astronomy by reckoning in the Keplerian way. But unlike Milton’s contemporary seventeenth-century scientists, especially the Copernicans like Galileo and Kepler, who are increasingly confident that the new methodology, with the help of mathematics, geometry, and the new instruments will help man reveal the ultimate secrets of nature, Milton carefully guards the delicate balance, rooted in the contemplation of the infinite, between a sceptical epistemology and the possibility of progress in human as well as angelic inquiries into nature.

2

In the discussion above I have endeavored to show that in both Cusanus and Milton there is a connection between their “contemplation of the infinite” and “sceptical epistemology.” It is necessary to further clarify this connection, especially given the concern of this chapter, with regards to the two thinkers’ respective conceptions of the

whole universe. What should be noted first is the obvious difference between the two. Both believe in a plurality of worlds. But, whereas Cusanus imagines one infinite³² or boundless universe, Milton clearly suggests in *Paradise Lost* that our universe is bounded by a solid shell,³³ and therefore finite. This may raise an objection to our foregoing discussion – if Milton is certain that our universe is finite, how can we say that he advocates scepticism in astronomy because of his contemplation of the infinite?

To answer, we have to remind ourselves that Milton does not conceive our universe to be the *whole* universe in *Paradise Lost*. A dynamic, boundless Chaos continues to exist after the creation of our universe and functions as the stage of much of Satan's activity in the epic. As a whole our universe is a speck bounded from Chaos. But this speck, though finite, is immensely large in comparison to Adam's familiar world, which as Raphael carefully indicates, is most likely a solar system with the Sun at its center. Within our universe, as Satan's journey to the Earth seems to corroborate Raphael's hint to Adam, there are other such systems – "other suns perhaps / With their attendant moons" – utterly beyond Adam's naked eye observation, and indeed, well beyond the power of the telescopes for more than two and half centuries after Milton's time.³⁴ Outside our universe, there are other universes, probably likewise bounded and finite as ours, though their sizes may vary. Heaven and Hell are two of them, which we have also seen through

³² As shall be seen in the following pages, the infinity of the universe as God's entire creation and the infinity of God are carefully distinguished in Cusanus.

³³ As indicated in Satan's landing on the shell in *PL* 3.74-5, and Uriel's account of the creation of our universe, in *PL* 3.714-21. See Leonard's discussion of the shell of our universe in *FL*, p.718.

³⁴ See Leonard, *FL*, pp.724-5.

Satan's eyes in the poem. And Milton beckons the speculation that there could be an infinite or at least indefinite number of bounded universes interspersing the boundless Chaos. Just as Raphael suggests that this inhabited world cannot be the only one in this universe (*PL* 8.153-8),³⁵ so we may well infer that this universe cannot be the only one created by God, because God, by nature creative, is free to create "more worlds" (*PL* 2.916) as he chooses to.

Is the whole universe in *Paradise Lost* finite or infinite? Danielson helps us greatly with his interpretation of Milton's conception of the entire universe as the Multiverse "coextensive" with a boundless Chaos (*PL & CR* 49). The Multiverse is "everything that exists beyond God himself" and thus includes Chaos (*PL & CR* 50). If Chaos, as the "ocean of potentiality" (*PL & CR* 44) for the creation of new universes, is "illimitable" and "without bound" (*PL* 2.892), it is only reasonable to say that the Multiverse is likewise so. That is to say, the Multiverse, or, the whole universe portrayed in *Paradise Lost*, is not bounded or limited by an outside shell.

Indeed if we put aside for a while how Milton fleshes out the idea of a plurality of worlds in his conception of the Multiverse, we see that he posits the entire universe to be infinite. Viewed against this recognition, Raphael's renunciation of the idea of a unique and universal center, i.e., "whether heav'n move or earth / Imports not," should be read as a logical corollary of the infinity of the whole universe. Grant McColley's "The

³⁵ See Leonard, *FL*, pp.767-9.

Seventeenth-Century Doctrine of a Plurality of Worlds” furnishes us with a quotation from Plutarch to this point:

For the universe is infinite; now that which is infinite hath neither beginning nor limit, so that it does not belong to it to possess a *middle*: for infinity is the deprivation of limits. He who makes out Earth to be the middle not of the universe, but of the *world*, is ridiculous for his simplicity if he does not reflect that the *world* itself is liable to the very same objection: for the universe hath not left a middle place for it also, but it is borne along without house or home in the boundless vacuum, towards nothing cognate to itself. (qtd. in McColley 388-9)

As McColley informs us, “to a majority of the Greeks, whether advocates or opponents, a plurality or an infinity of worlds [. . .] meant a plurality or an infinity of relatively small bounded universes, each equipped with an earth, sun, moon, planets and fixed stars” (385-6), we may understand Plutarch’s “world” as equivalent to Milton’s bounded universe, though their conceptions of things within may differ. What is noteworthy is that the statement quoted above pinpoints an unsettling implication to any effort made to identify a fixed cosmic center – strictly speaking, in an infinite universe of a plurality or an infinite number of worlds (be they smaller bounded universes or not), the idea of a unique or universal center cannot hold. If we are unable to decide the center of the universe, there is little sense to talk about its circumference, let alone discussions of the real form of the universe.

Imagining a plurality of unbounded worlds in one infinite universe, Cusanus too rejects the idea of a fixed cosmic center. And he does so through his reflection on the relativity of motion and rest, which is also a reflection on the relativity of appearances.³⁶ Stating that “we apprehend motion only through a certain comparison with something fixed,” Cusanus illustrates the difficulty to recognize the motion of Earth with the analogy of a person’s perception of motion while on a ship in the middle of the water where the shore is out of sight. Just as this person cannot perceive that the ship is being moved, so people on the Earth cannot perceive that the Earth is being moved. As we have seen in former discussions, Copernicus employs a similar analogy only to show that daily rotation of the Earth is plausible, but he does not discard the idea of an absolute cosmic center. Cusanus pushes the analogy further and undermines the idea completely. So he continues:

And because of the fact that it would always seem to each person (whether he were on the earth, the sun, or another star) that he was at the “immovable” center, so to speak, and that all other things were moved: assuredly, it would always be the case that if he were on the sun, he would fix a set of poles in relation to himself; if on the earth, another set; on the moon, another; on Mars, another; and so on. (*DI* 2.12)

Thus Cusanus invites his readers to reflect not just on the relativity of motion and rest, but more importantly on the relativity of our own perception of the appearances or the

³⁶ The following discussion of Cusanus’s insights into the phenomenon of perspective is indebted to the view of Harries, *Infinity and Perspective*, pp. 30-36.

phenomena itself – our identification of the fixed center of the universe will always depend on and be limited by our points of view. We shall return to the significance of this argument in due course.

Plutarch and Cusanus understand that if we talk about a center to our world-universe, such a center cannot be understood as the center to the whole universe, of which our world-universe is only a tiny portion. They make the case that because the entire universe is infinite and illimitable, its physical form and center are ultimately indeterminable. That is to say, beliefs in the infinity of the universe and the plurality of worlds undercut the truth claims not only of the geocentric and the geo-heliocentric systems (since the latter is designed to keep the Earth as the fixed center to a single, unique universe) but also of the heliocentric system that replaces it, and render all three provisional models.

Placing our bounded universe in a boundless, infinite Multiverse that is co-extensive with Chaos, Milton is therefore being perfectly logical to have Raphael point out that “Whether heav’n move or earth / Imports not, if thou reckon right.” That is to say, against the infinitist cosmology of *Paradise Lost*, it is logical that Raphael rejects not only the geocentric system but also the heliocentric system as depicting the true form of the entire universe.

3

It is therefore ironic that McColley gives us the Plutarch remark against the idea of a cosmic center and yet is blind to the acentric implications of the conception of an infinite universe. He instead unjustly subjects Milton’s dialogue on astronomy in book

eight to the scrutiny of his one-sided assumption that acceptance of an infinite universe implies and requires acceptance of the Copernican hypothesis. Since he does not find the required (or simplistic) acceptance of the Copernican hypothesis in Raphael's talk, he ends up portraying – in the words of Leonard – “a cranky, arch-conservative Milton who spurns all astronomical enquiry as impertinent intrusion upon God's mysteries” (*FL* 761). But it is McColley's reductive science versus religion dichotomy³⁷ that leaves no room for Milton's well-deliberated middle path intended to harmonize rather than endorse the split between science and religion. Before we return to Cusanus and Milton and delve deeper into the problem of the center in an infinite universe, a brief discussion of McColley's misjudgement of Milton's attitude toward astronomy seems proper here – it shall help us see, in the following chapter, why a Kuhnian approach to Milton is likewise problematic.

McColley is troubled by the fact that Milton's “imports not” implies a rejection *even* of the Copernican hypothesis, which he identifies to be not just a trigger but the exact origin of the post-Copernican ideas of the infinity of the universe and of the possible existence of a plurality or infinite number of worlds or solar systems.³⁸ He is certainly right to say that Copernicus's heliocentric system “provided a new basis for the conceptions of other ‘worlds’” by replacing “the enclosed universe of the Greeks and the Medievalists” (“The Seventeenth-Century Doctrine of a Plurality of Worlds” 406). But he

³⁷ Most clearly expressed in his articles “Milton's dialogue on Astronomy: the Principle Immediate Source” and “the Ross-Wilkins Controversy.”

³⁸ The argument of McColley's two articles: “Nicholas Copernicus and an Infinite Universe,” and “The Universe of *De Revolutionibus*.”

is wrong to say that acceptance of an infinite universe implies or even requires acceptance of the heliocentric system. McColley bases his assertion on the examples of Bruno and Thomas Digges³⁹ who went from accepting Copernicus's heliocentric system to accepting an infinite universe on the one hand, and on the other hand, on the more scientific reasons that by the Copernican system the distance from Earth to the fixed stars is greatly increased, that the diameters of the fixed stars must be so large that they cannot be located on the surface of the eighth sphere, and that the eighth sphere, which is also the universe itself, must be infinite.⁴⁰

But what we hear above is only half the story told of the relationship between the Copernican hypothesis and the idea of an infinite universe. McColley wants the modern conception of an infinite universe to begin exactly with the Copernican hypothesis, and gives minimum consideration to the influence of the condemnation of 1277 and theology on the conceptions of an infinite universe and a plurality of worlds – which, if given due consideration, one should say that the modern worldview is post-Christian⁴¹ as well as post-Copernican. We shall return to this topic in the following chapter. Right now, it is enough to point out that the acentric implication of an infinite universe, utterly ignored by McColley, is much more radical and revolutionary than a shift from the geocentric to the heliocentric worldview. Thus in contrast to McColley's neglect of the problem of the center in an infinite universe, Lovejoy judges its potential importance for human

³⁹ “The Theory of a Plurality of Worlds as a Factor in Milton's Attitude towards the Copernican Hypothesis.” *Modern Language Notes* 47.5 (May 1932):319-25.

⁴⁰ “The Seventeenth-Century Doctrine of a Plurality of Worlds,” p.407.

⁴¹ The argument of Harries. See *Infinity and Perspective*, p.128.

imagination and reason “difficult to overestimate” – by the theses of an infinite universe and the existence of multiple or infinite suns surrounded by their own satellites,

the physical universe ceased to have *any* center; it was broken up into (at the least) a vast multiplicity of isolated systems distributed upon no recognizably rational plan; it ceased to be a shape and became a formless aggregate of worlds scattered irregularly through unimaginable reaches of space. (*The Great Chain of Being* 109)

It is true that with Bruno and Digges, the problem of the center is somewhat shadowed by their enthusiasm toward the Copernican hypothesis. Not so with Kepler:

This very cogitation [that the universe is infinite] carries with it I don't know what secret, hidden horror; indeed one finds oneself wandering in this immensity, to which are denied limits and center and therefore also all determinate places. (qtd. in Koyré 61) ⁴²

If Bruno advocates infinity of the universe because of the infinity of God, Kepler rejects it too on theological grounds – a heliocentric universe provides a perfect symbolism of Trinity⁴³ that is nowhere to trace in an infinite, formless universe. What interests us more, however, is Kepler's rejection of the infinity of the universe on scientific grounds.

⁴² Originally from Kepler's *De stella nova in pede Serpentarii*, p.687 (*Opera Omnia*, ed. Frisch, vol.II, Frankofurti et Erlangae, 1859).

⁴³ Kepler sees the universe as “the corporeal image of God,” “a symbolic copy of the Holy Trinity.” The form of the universe is a sphere, “its center point denotes God the Father, the surface God the Son, the space between, the Holy Ghost” (Caspar 378).

Alexandre Koyré's representation of the case⁴⁴ is most relevant to our purposes. I summarize below.

The arguments of Kepler cover two aspects, his rejection of the infinity of the universe, and his defense of the central place occupied by our solar system. With regard to the first aspect, Kepler argues that infinitists like Bruno and William Gilbert simply form the idea in their minds with no astronomical proof whatsoever. Astronomy is a science that saves appearances, that is to say, it deals with observable celestial phenomena and constructs hypotheses to account for these phenomena. That the universe is infinite has no empirical proof and is certainly not a hypothesis constructed in an astronomical sense but with one's eyes closed. With regard to the second aspect, Kepler is well aware that the authority of Copernicus is used to support the speculation that the universe could be infinite, but he thinks this is a misuse of Copernicus's theory. He takes to task the hypothesis of the infinitists that in an infinite universe the distribution of the fixed stars must be uniform, that is to say, there should be equidistance between the fixed stars (at least those of the same magnitude).⁴⁵ The distance between the Sun and the fixed stars must be the same as the distance between the fixed stars. Using the astronomical data available to him, Kepler proves that the distance between the fixed stars are not equal, some stars are closer to each other, others are much further apart; but their distance

⁴⁴ See *From the Closed World to Infinite Universe*, Chapter III, "The New Astronomy Against the New Metaphysics: Johannes Kepler's Rejection of Infinity," pp. 58-87. Cf. Miguel A. Granada's article, "Kepler and Bruno on the Infinity of the Universe and of the Solar Systems," and, Hilary Gatti, *Giordano Bruno and Renaissance Science*, pp. 123-125.

⁴⁵ Koyré follows Kepler and believes that this is a premise shared by Bruno himself. Gatti argues that Bruno does not hold the premise, rather Kepler confuses Bruno's idea of uniformity with the "neo-Platonic, geometrical uniformity" (125).

to us is indeed equal. That is to say, the “real” distribution of the fixed stars is not uniform, but we occupy a unique central place in the universe. Naturally, in his refutation of the infinitists before the invention of the telescope, Kepler relies on data obtained by what the naked eye can actually see. He assumes, with his contemporary astronomers, that the fixed stars of the same magnitude must be at an approximately equal distance from us, and that their visible diameters correspond to their real ones. After the invention of the telescope, astronomers come to know that the brightness and visible diameters of the fixed stars seen by the naked eye are optical illusions that have nothing to do with their real sizes and distance to us. Kepler is obliged to modify some of his arguments in face of the evidence provided by the telescope. But he does not submit to the infinitist cosmology. Indeed the telescope does not change the situation for him. Galileo discovers four moons of Jupiter, not four planets of a star. In the latter case Kepler would be obliged to agree with Bruno that stars are suns and our Sun is not unique but one of the many. But since they are only moons of Jupiter just like the Moon of the Earth, their discovery is not a threat to Kepler’s anti-infinitist argument. And although the new instrument enables astronomers to see much clearer and farther than ever before, it does not prove the infinity of the universe – if simply because what can be seen cannot be at an infinite distance from us. Thus for Kepler the new observational data obtained by the telescope does not invalidate his argument that the infinitists’ hypothesis, i.e., a uniform distribution of the fixed stars, fails to save the appearances. Rather the appearances observed by the assisted eye further testify that our Sun occupies a unique central place in the universe.

Of course we know Kepler is wrong, in terms of the unicity of our solar system. Whether he is wrong to reject the infinity of the universe, modern astronomy does not have an answer. As pointed out by Koyré, Kepler's rejection is "by no means negligible, and modern science seems rather to have discarded than to have solved the problem" (86). For Koyré, what makes Kepler's rejection of infinity so interesting is that the early modern astronomer anticipates "some present-day epistemologies" in declaring the idea of an infinite universe "scientifically meaningless" (58). Indeed in his refutation of the infinitists, Kepler consistently emphasizes that astronomy is an empirical science that deals with *observable* appearances or phenomena, and that any hypothesis not based upon measurable and verifiable empirical data does not concern astronomy – a view we may still hear from our contemporary scientists.

For our discussion of Milton, what interests us in the first place is that Kepler really shows us how astronomy is closely related to and limited by the sense of sight. The invention of the telescope assists and extends the power of our vision, but does not eliminate its limitation. To say that our astronomical knowledge depends ultimately on what we *can* see is not an exaggeration. But what we can see is subject not only to our point of view but also, as shown clearly in the case of Kepler, to distance. That is to say, the observable phenomena, the raw data astronomy relies on, may not reflect how things really are. This is especially so with the appearances of the fixed stars.

Pushing for his realist epistemology, Kepler does not raise doubts about the reliability of his astronomical data. But we should praise Milton's Raphael for pointing out exactly to Adam that appearances may be illusory due to his point of view and distance. Thus, as already cited before, Adam believes the Earth is at rest and the

immense heaven moves around it; Raphael does not deny what Adam sees, but carefully points out that “so it seem / To thee who hast thou dwelling here on earth.” What has not been cited in former discussions is Raphael’s emphasis on distance: to arrive in Eden, the angel says he travels “distance inexpressible / By numbers that have name” (8.113-4). And he rightly cautions Adam that “earthly sight, / If it presume, might err in things too high, / And no advantage gain” (8.120-2). While critics tend to read too much into Raphael’s critique of the presumption of “earthly” sight, they ignore the literal meaning of Raphael’s caution – “earthly” designates the Adam’s point of view, “too high,” literally too far away. As shown in the case of Kepler, astronomers are mistaken about the appearances of the fixed stars exactly because they are too far away us. Astronomers who claim to be able to portray the true form of the universe by “saving appearances” need to be reminded that astronomical appearances, though not cut off from reality, can be sheer illusions due to point of view and distance; they need to be reminded that what they save are, strictly speaking, “appearances.”

Needless to say that Kepler’s rejection of infinity shows us that the Copernican hypothesis does not lead necessarily to the infinitist cosmology. But more importantly he helps us see how much more radical it is to adopt an acentric, infinitist worldview than to shift from a geocentric to a heliocentric cosmology. The stock argument for the revolutionary nature of the latter shift is that with the Copernican cosmology man and the Earth were removed from the privileged center, hence the conservative reactions against

the new astronomy. But despite its almost undying popularity, the argument is false.⁴⁶

The center is not a privileged but the lowest place in the medieval cosmos. The status of man and the Earth was promoted rather than demoted in a heliocentric universe. In fact Kepler's defense of the unicity and centrality of our solar system is deeply motivated by his Copernican anthropocentrism. Man is located in the privileged central place of the universe so that he alone is given a unique view of it. Kepler's geometrical God, though Himself infinite, creates a finite and orderly universe especially for man, so that the human mind partakes the divine mind through studying its perfect harmony and order. The idea of an infinite universe with an infinite number of worlds, though conforming to the infinity of God, causes a dilemma on the other front of Christian theology: if God created other inhabited worlds, is the sequence of the fall and redemption universally repeated in other worlds? If so, what about the unique relationship between man and God and the uniqueness of incarnation as revealed in the Bible? How would man understand his status in the universe and his relationship to God?⁴⁷

The question of the fall and incarnation however does not seem to bother Kepler. Rather his greatest fear is that an infinite universe dampens the astronomer's newly awakened confidence in his ability to grasp reality as it is. Indeed this confidence is rooted in his belief that the universe has an intelligible form and order, which is to say, it must be finite. If the universe is infinite, it has no determinate shape or form. To the

⁴⁶ See Danielson's article "The Great Copernican Cliché," and *PL & CR*, Ch. 7 "Planet Earth." See also, Lovejoy, *Great Chain of Being*, pp. 101-8.

⁴⁷ See Leonard, *FL*, pp.760-4.

human mind trying to comprehend it, the universe becomes a labyrinth. As quoted above, Kepler is abhorred by the thought of man “wandering in this immensity, to which are denied limits and center and therefore also all determinate places.” After Galileo’s telescope reveals that the Moon looks very much like the Earth, Kepler cannot help speculating on the dwellers on the Moon. But he never drops his resistance to Bruno’s belief in infinite worlds.

Dedicated to a great renewal and advancement of human learning, Francis Bacon too believes that the universe must have a regulated form and be intelligible to human reason. He is well aware that an infinite universe, acentric and formless, poses a threat to his project. Thus in “A Description of the Intellectual Globe,” he writes that concerning the celestial bodies,

The first question [. . .] is, *whether there be a system?* that is, whether the world or universe compose altogether one globe, with a centre; or whether the particular globes of earth and stars be scattered dispersedly, each on its own roots, without any system or common centre. (*Philosophical Works* 683)

No doubt the belief in an infinite universe “destroyed and confounded systems” (*Philosophical Works* 683). An anti-Copernican, Bacon judges that though Copernicus portrays the universe as an ordered system, in this system “are found many and great inconveniences.” One of such inconveniences is the “loading of the earth with a triple motion.” Bacon is ready to accept Earth’s diurnal rotation, but considers the other two “superstitious.” Moreover, he thinks that if Earth is a planet, “it would seem more natural to suppose that there is no system at all, but scattered globes” (*Philosophical Works* 685).

Instead of indulging himself in speculations on an infinite universe, Bacon's primary concern is to put astronomy on the right track so that it discovers the *true* system of the universe. He is satisfied with neither Ptolemy nor Copernicus, because they "embrac[e] only the phenomena themselves" and aim at "merely calculations or predictions" (*Philosophical Works* 681). The astronomy he has in mind should do more and aim at philosophy, that is,

Such a philosophy [. . .] as may inform the human understanding, not only of the motion of the heavenly bodies and the period of that motion, but likewise of their substance, various qualities, powers, and influences, according to natural and certain reasons, free from the superstition and frivolity of traditions; and again such as may discover and explain in the motion itself, not what is accordant with the phenomena, but what is found in nature herself, and is actually and really true. (*Philosophical Works* 681)

Thus despite being an anti-Copernican, Bacon shares the essential ideas of Kepler's conception of a new astronomy, and believes that the astronomer should not only account for and predict the celestial motions, but also grasp the reality of the universe. As pointed out by Jardine before, Kepler and Bacon even share a methodological affinity. Both lay emphasis on establishing progressive stages of certainty in their scientific enquiries into the book of nature. The Copernican and the anti-Copernican are joined together by their scientific realism. As it is necessarily demanded by their realist epistemology, they presuppose a finite universe where there must be a system with a determinate center, although their specific conceptions of such a system and center differ. At a deeper level,

their rejections of an infinite universe are similarly motivated by their soaring confidence in the human reason to grasp reality as it is.

Thus the idea of an infinite universe causes a crisis to the realism of Bacon and Kepler that presupposes a finite universe. Both respond to it by reinforcing their realist epistemology and rejecting the infinity of the universe. But the underlying assertion of their scientific realism, namely, disciplined and assisted by scientific methodologies and instruments, human reason can grasp reality as it is, establishes human reason as an (if not *the*) authority of truth. This very assertion, despite the often heard early modern claim that the new science shall be the handmaid of faith, makes the clash between truth claims respectively of reason and faith unavoidable. We shall examine this in the following chapter. Right now, let us return to Milton and Cusanus.

4

If Bacon and Kepler show us that there is a connection between their realism and their rejection of an infinite universe, in Milton and Cusanus we find a connection between a sceptical epistemology and contemplation of the infinite. Contemplation of the infinity of the universe leads to the renunciation of the idea of the center. It also leads to the recognition that it is impossible for finite human reason to comprehend an infinite universe. The sceptical epistemology belongs entirely to man. Truth, or a full understanding of reality as it is, is reserved for God alone. Thus, the core value of Christianity, the humility of man, is reasserted against an infinitist cosmology. The potential conflict between reason and faith is theoretically dissolved.

However, as already mentioned in the section before, an infinitist cosmology causes its own peculiar problems for Christian theology and challenges the traditional understanding of the relationship of man, the universe, and God. Indeed, rewriting the fall against an infinitist cosmology, Milton imposes upon himself multiple dilemmas that could have been best avoided in a Ptolemaic universe. But our poet has an “unusual conception of the truth poetry requires” and is dissatisfied with merely producing a “poetic lie” in his great epic (Fallon 160). Just as he chooses to describe material angels in accordance with his belief in the goodness of matter, so he chooses to represent the most important event in the history of man against what he judges to be the truest cosmology, rather than against an outdated and obviously crumbling one.

It is important for us to recognize that Milton is not only concerned with poetics. By making the cosmological choice he knowingly takes upon himself the task of reconciling the increasing gap between the teachings of reason (authority asserted by the new science) and of faith. He is well aware that his poetic endeavor amounts to no less than a much needed justification of “the ways of God to men.” I shall reserve substantial discussions of reason and faith for the next chapter. In the final section of this chapter, I shall restrict myself to showing that sufficient details of *Paradise Lost* suggest that Milton consciously answers the dilemmas man faces when placed in an infinite universe in which he “dwells not in his own”; that in providing these answers, Milton carefully avoids the pitfall of another infinitist, Bruno; and that he takes a step back and finds important help from Cusanus in his search for a balanced middle path.

First of all, as pointed out by Leonard, though Milton does not pursue the theological dilemma of the fall and incarnation *per se*, he does provide a solution to it.

The lines to look at in *Paradise Lost* are 3.567-71 and 4.250: in the former we see Satan passes by “other worlds,” or “happy isles / Like those Hesperian gardens famed of old, / [. . .] / but who dwelt happy there, / He stayed not to inquire.” That is to say, other worlds may have their own gardens, but Milton does not speculate who the dwellers are or what happens to them. Line 4.250 describes the fruit of the earthly Paradise as “Hesperian fables true” and “If true, here only,” suggesting that “Extraterrestrials need not be punished for Adam’s sin and Christ need not die on other worlds to redeem a Fall that did not occur there” (*FL* 764).

The reader is thus assured by the narrator that the fall is a unique event in our world. Raphael is to carry out a much more difficult task. He is to break the news to Adam that his senses may be deceptive and the Earth could be moving; that the Sun could be the center to this world, but this world he sees is only a small partition of God’s entire creation; and that beyond this world, there could be other worlds with their own suns, satellites and habitants. Adam cannot be burdened by the theological dilemma of the fall and incarnation. But he is bound to be affected by the similar psychological disruptions experienced by early modern people collectively after Copernicus: from absorbing the incredible news that the Earth can be a planet, to countenancing an unimaginably large, boundless universe, and finally to pondering the dislocating yet curiously attractive possibility that there are other inhabited worlds in the universe. Indeed the important developments of the sixteenth- and seventeenth-century astronomy and cosmology are to be condensed and delivered to Adam all in one breath.

But why bombard Adam with this heavy load of information? Or, as we have asked in the beginning of this chapter, what is Raphael’s point in giving Adam such a talk at the

crucial juncture before the fall? The point, it seems to me, is to help Adam properly understand the status of man in the universe and his relationship to God. And this is by no means trivial.

The relationship between man and God is the most important relationship in Christianity. A cosmology that serves as the framework for conceiving the relationship is no less important. A good example is Dante's *Divine Comedy*. The pilgrim's transcendental journey to God is actuated in the perfectly hierarchical structure of a Christianised Aristotelian-Ptolemaic cosmos. He passes the concentric spheres of the planets, then of the fixed stars, and then of the *primum mobile*, each sphere becoming more perfect as he moves closer to God's Empyrean heaven. Looking back from his transcendental perspective, the pilgrim is able to contemplate the Earth's lowly status in the cosmos and understands that a wise man should not fix his eyes on the transient earthly things but raise his gaze upward toward the heavens. The pilgrim's journey ends in a gratifying recognition of the universal union of man and God.⁴⁸ Despite the lowly status of man and Earth in it, Dante's perfectly ordered, hierarchical cosmos helps man experience the certainty and comfort of providence. Man is not privileged in the medieval cosmos, but he does feel at home in it.

But belief in such a cosmos became more difficult after the invention of the telescope. In *Paradise Lost*, it exists only in the foolish afterlife fantasy of the dying friars, who dream an ascension similar to the one taken by Dante the pilgrim: "they pass

⁴⁸ See, "Paradise," cantos 22 and 27.

the planets seven, and pass the fixed, / And that crystalline sphere whose balance weighs,
/ The trepidation talked, and that first moved” (3.481-3); instead of entering the ethereal Paradise, they end up in a Paradise of fools.

Raphael is to “advise [Adam] of his happy estate” (5.234), not in a geocentric cosmos geared up to a transcendental ascension to God, nor in a heliocentric cosmos understood to be created solely for man, but in an acentric, boundless universe which man shares with other habitants of other worlds. He is to lead Adam to go beyond not only his commonsensical geocentrism but also his Copernican doubt, and give him a new worldview as a framework of thinking about himself and his relationship to God.

Koyré has famously pointed out that a fundamental change of the “very framework and patterns” of the European minds in the sixteenth and seventeenth centuries is brought forth by two connected actions: “the destruction of the cosmos and the geometrization of space,” that is,

the substitution for the conception of the world as a finite and well-ordered whole, in which the spatial structure embodied a hierarchy of perfection and value, [by] that of an indefinite or even infinite universe no longer united by natural subordination, but unified only by the identity of its ultimate and basic components and laws; and the replacement of the Aristotelian conception of space – a differentiated set of innerworldly places – by that of Euclidean geometry – an essentially infinite and homogenous extension. (vii-viii)

We may say that the overall effect of Raphael’s hypothetical talk in book eight amounts to a destruction of the cosmos. A geometrization of space is also readily

perceptible in Raphael's description of the largeness of the entire universe. In book seven Raphael has already presented the idea of Christ as a divine geometer in circumscribing this universe from Chaos. Here in book eight the angel says that "The Maker's high magnificence" is manifest in "his line stretched out so far" (8.101-2) – Adam is led to imagine a homogenous extension of space as the extension of lines, and expected to understand that in such an extension of space his world does not occupy a determinate place but an indeterminate "partition" (8.105).

Koyré's study of the fundamental shift in European cosmology from the closed world to the infinite universe tells us that the understanding of the universe as indefinite or infinite in form and "united only by the identity of its ultimate and basic components and laws" eventually renders God and his creation unnecessary and leaves man drifting aimlessly in the infinite space:

The infinite Universe of the New Cosmology, infinite in Duration as well as in Extension, in which eternal matter in accordance with eternal and necessary laws moves endlessly and aimlessly in eternal space, inherited all the ontological attributes of Divinity. Yet only those – all the others the departed God took away with Him. (276)

This is indeed the direction to which Bruno's infinitist as well as atomistic worldview will lead. But Milton, though he too was an infinitist, follows Cusanus rather than Bruno in keeping the crucial ontological distinction between the infinity of the universe and the infinity of God. As we shall see in more details below, he voices this important

distinction mainly through Raphael's account of the creation in book seven. But first let us finish our discussion of Raphael's talk of astronomy and cosmology in book eight.

Milton understands well that it is not a heliocentric but a boundless, acentric or multi-centered (because of the existence of other worlds) universe that really makes man feel at loss, displaced, and deprived of his uniqueness. Raphael's task is not simply to destroy Adam's conception of the universe as ordered and definable according to the limited perception and reason of man, it is also to repair the ruins caused by the destruction. If we read carefully, it becomes clear to us that what Raphael wants to instill in Adam is a balanced understanding of the status of man and the Earth and a restoration of the purpose of his world against the new cosmology. Thus immediately after having undermined Adam's definitive and hierarchical value system in accordance with his geocentric worldview, i.e., "great / Or bright infers not excellence," and before giving Adam the first hints that the universe stretches far beyond the highest heaven he can see and that he "dwells not in his own" but "Lodged in a small partition," Raphael carefully points out to Adam that the Earth contains "solid good" (8.102-5; 8.93), and that his world is teleological: the sunbeams do not work on the Sun itself, but "in the fruitful earth"; more specifically, they serve "thee earth's habitant" (8.95-9). But such assertions are not that of the Copernican anthropocentrism, which recognizes the universe as created solely for man and completely comprehensible to man. As later on Raphael's "what ifs" will not rest on the heliocentric hypothesis but on the idea of a plurality of worlds, so in his preamble (8.85-122) Raphael has already been emphasizing that there is more beyond

the observable cosmos, there is “the rest / Ordained for uses to his Lord best known” (8.105-6). As Danielson puts it:⁴⁹

What emerges from Raphael’s lesson is therefore a doctrine of what we might call *multicentrism* or *a manifold teleology*. Yes, the heavenly bodies do shine *propter nos* – but not “merely.” There is always a larger *propter Deum*, as there may also be a *propter alios*. More is going on in God’s creation than only what concerns us. (*PL & CR* 175).

Consistent, as we shall see, with his earlier creation story, Raphael also reasserts the absolute ontological status of God as “the great Architect” and “The Maker” (8.72; 8.101) of the boundless universe. With this note, let us turn our mind to a comparison of the conceptions of the relationship between the infinite universe and God in Bruno, Milton, and Cusanus.

Though Bruno is often credited as the first and the principal representative of the new infinitist cosmology, it is also often pointed out that, beside Copernicus and Lucretius, Cusanus is another source of inspiration for his conception of the infinite universe. Most notably, following Cusanus, Bruno transfers the metaphor of the infinite sphere from God to the universe, so that the universe is likewise conceived as an infinite

⁴⁹ Leonard expresses the similar idea: “[Raphael] explicitly rejects the idea that other worlds exist ‘Onely to shine’ (VIII. 155), and so opens Adam’s eyes to a universe where nature’s ‘vast room’ (VIII. 153) contains many worlds, all sharing ‘reciprocal’ (VIII.144) benefits, yet each with its own reason for existing” (*FL* 800).

sphere whose center is everywhere and circumference nowhere.⁵⁰ But whereas Cusanus carefully distinguishes God from the universe, Bruno obliterates such a distinction.

Before we go into details, it should be noted that in former discussions the words “infinite” and “infinity” are applied somewhat indiscriminately to both Cusanus’s universe and Milton’s Multiverse. There these two words served the purpose of distinguishing the boundless universe and Multiverse respectively of Cusanus and Milton from the bounded universe of either the geocentrists or the heliocentrists. Now we have reached a point where a discrimination of the infinity of the universe and the infinity of God is necessary.

In *On Learned Ignorance*, as already mentioned in the first part of this section, Cusanus describes God as the Absolute infinite. That is to say, only He is free from all limitation and contraction; everything else that exists, that is, the universe, is contracted. But if the universe is contracted, how can it be infinite? Indeed, here we encounter one of the many paradoxical teachings of Cusanus, who in fact says that the universe is “neither finite nor infinite,” or, that it is “privatively infinite” (*DI* 2.1). On the one hand, Cusanus denies that the physical universe is finite, because it is unbounded, not only in the sense that it is not bounded by an outward shell or the heavenly spheres, but also in the sense that it encompasses everything that exists; that is to say, except God, anything that exists outside or beyond it is inconceivable. Or, more precisely, the universe cannot be finite because we cannot find a way to conceive of it as finite. This recognition leads to

⁵⁰ See Harries, “The Infinite Sphere: Comments on the History of a Metaphor.”

Cusanus's paralleling God and the universe and constitutes a basis of the doctrine of the learned ignorance: "since it is not possible for the world to be enclosed between a physical center and circumference, the world – of which God is the center and the circumference – is not understood" (*DI* 2.11). On the other hand, Cusanus denies that the universe is infinite as God is infinite: because the universe is not God, but is derived from God. Nor can he agree that the universe is eternal as God is eternal. The universe is eternal in the sense that time only begins with its creation, that it "always existed" because there is "no *before*" (*DI* 2.2.91). But God is eternal in the sense that He is beyond time. "Thus, God is prior to the world in the order of dependency: without God the world would be nothing (i.e., there would be no world); but without the world God would remain the eternal and immutable God" (Hopkins 19).

Cusanus's consistent emphasis on the ontological distinction between God and the universe forestalls a pantheistic interpretation of the universe, because according to this distinction, God is, paradoxically, both immanent in the universe and transcendent to the universe. It thus keeps the medieval theological distinction between the creator and creation intact against his no longer medieval, infinitist cosmology. In his conception of an infinite universe with infinite worlds, Bruno compromises exactly this ontological distinction of Cusanus. The infinity of the universe becomes indistinguishable from the infinity of God. The implications of Bruno's compromise are laid forth by Karsten Harries in his *Infinity and Perspective* with great clarity:

[According to Bruno] creation is the full manifestation of the infinite divine essence. In keeping with that infinity, creation had to be itself infinite. A voluntarist conception of an all-powerful deity is here rejected. Rejected, too,

is the idea of the contingency of the world: creation could not have been other than it is. The universe comes to be understood as the fully adequate self-reproduction of God. Creation is thus the necessary unfolding of the infinite divine essence. There is no place in this vision for a personal creator. Nor is there a need or even a place for the Incarnation, as Bruno was ready to tell the inquisitors. (261)

Bruno thus not only portrays a pagan and pantheistic universe, he also sketches the outline of the automatic and Godless universe of the modern age that is to come. Such a universe is what Koyré's study *From the Closed World to the Infinite Universe* finally reveals, fulfilling his argument that modern science and philosophy are "at the same time, the root and the fruit" (vii) of the revolution of the sixteenth and seventeenth centuries that is reducible to the two connected actions, the destruction of the cosmos and the geometrization of space. We shall need to revisit Koyré's argument in a moment. Right now let us see how Milton follows Cusanus rather than Bruno in carefully distinguishing the infinity of God from the infinity of the universe.

First it should be pointed out that Milton, like Bruno, is influenced by Lucretius. Leonard has traced for us the textual parallels between *De Rerum Natura* and *Paradise Lost*.⁵¹ Most significantly, Milton is perhaps inspired by Lucretius to imagine that our universe is enclosed by an outward shell, "the firm opacous globe / Of this round world" (3.418-9), from the "ever-threat'ning storms / Of Chaos blust'ring round" (3.425-6). Not

⁵¹ See *FL*, pp.717-8; 720-1.

only does “the firm opacous globe” distinctively echo Lucretius’s dividing walls of the world (“*moenia mundi*”), but Milton’s general picture of Chaos also closely resembles Lucretius’s “warring atoms” – the parallel is especially strong in their descriptions of the formation of heavenly bodies and the walls of the world in “a never-ending binding and unbinding” (*FL* 717-8).

It should not surprise us that Milton, as an infinitist, is attracted to Lucretius’s atoms. The revival of ancient atomism in the Renaissance, prompted by the rediscovery of Diogenes Laertius’s *Lives of Eminent Philosophers* and especially Lucretius’s *De Rerum Natura*, has been identified by historians of science like Koyré and Thomas Kuhn as crucial for the infinitization of the universe. Replacing the Aristotelian division of the constantly changing elementary matter of the sublunary sphere from the stable quintessence of the heavens, atomism provides a theory of matter corresponding to the new cosmology that sees the universe as homogeneous, and according to some, infinite.

Thus Milton’s compatriot Walter Charleton, though objecting to the atomist worldview that understands the chaotic, spontaneous collisions of atoms instead of God as responsible for the generation of the universe, finds it difficult to reject the atoms as “the Material Principle of the Universe” – indeed Charleton believes that it is perhaps possible to build upon it a theory of everything compatible with Christian theology, a theory that may “salve all the Phaenomena’s with less apostasie from first Principles proposed, then by any other hypothesis yet excogitated” (qtd. in *PL & CR*, Danielson 32).

In his *Giordano Bruno and Renaissance Science*, Hilary Gatti points out that Bruno is “the first post-Copernican philosopher to have understood that the full implications of

the new astronomy required a parallel revolution in the field of matter theory” (128). And it only seems natural that he turns to Epicurus and Lucretius for help. But his atomism, as Gatti informs us, is considerably different from the atomism of the two ancient philosophers. Having in mind that the universe is the full expression of the divine principle and cause, Bruno is not satisfied with ancient atomism which understands the forces responsible for the agglomeration of the atoms in space to be completely random and casual. To reconceive the guiding principle of the motion of the atoms, he borrows, on the one hand, from Pythagoras the idea of the soul, understood as a power or energy that vivifies and agglomerates the atoms temporarily before their dissolution; and he combines this vitalistic principle, on the other hand, with the Cusan idea of the universe as an infinite sphere whose center is everywhere and circumference nowhere. As a result, each atom is considered to be the center of the infinite sphere; each atom, indivisible and therefore the monad of things, also contains within it the full power of the infinite cause. Apparently, Bruno’s new atomism is not intended to reconcile the pagan theory with the Christian account of creation. It is rather to serve as a metaphysical basis for his peculiar infinitist cosmology. And despite the many internal contradictions of his atomistic theory, we may agree with Gatti that “it is ultimately in the atom that Bruno founds his idea of an intelligent universe governed by intelligible laws” (134).⁵²

Milton too wants to utilize the atom as the material basis for his infinitist cosmology. But unlike Bruno, he is only willing to do so if it is reconciled with his

⁵² For a more detailed discussion of Bruno’s new atomism, see Gatti, *Giordano Bruno and Renaissance Science*, ch.8, “The Minimum Is the Substance of All Things,” pp.128-142.

Christian cosmogony. In this regard, Bruno offers no useful help. In *Paradise Lost*, the influence of Bruno's new atomism is hardly traceable. As pointed out by Danielson, Milton's own adaptation of ancient atomism is quite original – it has a “literary and theological boldness” that sets him apart from “even his contemporaries' critical efforts at saving appearances of creation and Chaos” (*PL & CR* 33).

Without diminishing Milton's originality, it seems reasonable to me to conjecture that Cusanus, though not dealing with atomism, could help Milton not only with his paradoxical distinction of the infinity of God and the infinity of the universe, but also with his doctrine of learned ignorance, which, as Harries understands it rightly, relies on the principle of perspective. To obtain learned ignorance is essentially to be aware of perspective, that is, “to be aware not only of what is seen, but also of the way our particular point of view lets the seen appear as it does”; or, in other words, it is to recognize that “Everything that presents itself in that space is relative to that subject, is the subjective appearance of some object. Whatever thus presents itself in this space is no more than the appearance of a reality” (Harries, *Infinity and Perspective* 42).

That Milton consciously uses perspectival representations for his poetic purposes will be illustrated by more examples in the following two chapters. Right now, let us see how he uses perspectival representations of Chaos to assimilate ancient atomism into his infinitist cosmology. Unlike Bruno who conceives intelligible laws for the motion of the atoms, Milton gives us depictions of Chaos characterized exactly by the eternal warring atoms of Epicurus or Lucretius. We first find Chaos, “the hoary deep, a dark / Illimitable Ocean without bound,” standing in “Eternal anarchy” amidst the “fierce strive” of the four elements' battling atoms. True to its name, Chaos is ruled by Chaos, and next to

Chaos, “Chance governs all” (2.891-910). But, this description is not to be understood as a representation of the reality, rather it is a perspectival representation of what Satan, together with Sin and Death, sees when peeping out from the gate of Hell. Milton carefully brackets the description so that it begins with “Before their eyes in sudden view appear / [. . .]” and ends with “Into this wild abyss the wary Field / Stood on the brink of Hell and looked a while, / Pondering his voyage” (8.890; 917-9).

Ever conscious of the point of view with which we are given this first description of Chaos, Danielson shows in his analysis of it that such a picture “of which any atheist Epicurean might approve” is “in keeping with Satan’s own godless worldview” (46). Moreover, he points out that within it, Milton trumps the pagan world picture by the words “unless” and “ordain”: the atoms “thus must ever fight, / Unless th’ Almighty Maker them ordain / his dark materials to create more worlds” (2.914-16; qtd. in Danielson, *PL & CR* 48).

Often it is with these carefully planted stumbling blocks and hints of a point of view that Milton’s perspectival representation reminds us that its content is perspectival appearances. As such one perspectival representation can be either complemented or contradicted, invalidated or relativized by another. Thus Satan’s vision of Chaos ruled by chance, as pointed out by Danielson, is contradicted by Raphael’s account of creation, according to which “Chaos and Chance emphatically do not form the government” and become obedient to the Word performing the act of creation: “ ‘Silence, ye troubled waves, and thou deep, peace,’ / Said then the omnific Word, ‘your discord end’” (7.216-17).

Finally, Satan's vision of Chaos becomes an ignorant grasp of the appearances against God's own account of the ultimate origin of the prime matter:

Boundless the deep, because I am who fill
 Infinitude, nor vacuous the space.
 Though I uncircumscribed myself retire,
 And put not forth my goodness, which is free
 To act or not, necessity and chance
 Approach not me, and what I will I fate. (7.163-73)

Discernible in these lines is a crucial first step of what Danielson calls the three-fold creation conceived by Milton in *Paradise Lost*, "in which the prime matter is in some way 'alienated' from God – rendered external to him" (*PL & CR* 41). Chaos as Satan perceives it seems to exist eternally, but it gains existence only when it is alienated from God; the warring atoms seem to be governed by chance, but it is only because God retires from this prime matter that comes from him, and is "free / To act or not." God's account of creation asserts most unequivocally the difference between the Creator and his creation. Only the Creator dwells in "infinitude" and is "uncircumscribed," the deep or in effect the raw material of the multiverse is "boundless" – it is in God's own account of the crucial first step of creation *ex deo* that we discern most clearly the paradoxical Cusan understanding of God alone as properly infinite, and the universe as "privatively infinite" or "boundless."

5

For Koyré, as for many other historians of science, the revolution is initiated by the Copernican hypothesis. The root of modern science can be traced no further back than Copernicus. And it is the post-Copernican Bruno who took the decisive step towards a conception of the modern infinite universe. Although he grants that in some of its assertions, Cusanus's conception of the universe "goes far beyond anything Copernicus ever dared to think of," it is "not based upon a criticism of contemporary astronomical or cosmological theories, and does not lead, at least in his own thinking, to a revolution in science," that is to say, Cusanus is "not a forerunner of Copernicus" (8).

Harries, however, objects to Koyré's thesis that modern science and philosophy are born with the Copernican hypothesis; he believes their root goes much further back than the sixteenth century. Nor can he agree with Koyré's thesis that modern science is *the* fruit of the cosmological revolution; rather it is "only one fruit" (*Infinity and Perspective* 14).

What makes Harries's objections relevant to our discussion here is that they are mainly raised against Koyré's study of Cusanus. Indeed Koyré's view that Cusanus is not a forerunner of Copernicus and therefore does not anticipate the birth of modern science is rather curious. In fact he admits that the opposite is asserted by the "illustrious admirers of Cusanus," namely, Bruno, Kepler, and Descartes, who "read into him all kinds of anticipations of later discoveries, such, for instance, as the flattened form of the earth, the elliptic trajectories of the planets, the absolute relativity of space, the rotation of

the heavenly bodies upon their axes.” Yet he insists that “we must resist this temptation” of understanding Cusanus as such, because, he believes, Cusanus asserted none of these.

Moreover, in deep opposition to the fundamental inspiration of the founders of modern science and of the modern worldview, who rightly or wrongly, tried to assert the panarchy of mathematics, he [Cusanus] denies the very possibility of the mathematical treatment of nature. (Koyré 19)

This is indeed a very curious statement at first sight. As shown in the first part of this section, Cusanus does not deny but rather advocate the very possibility of the mathematical treatment of nature. Such advocacy is obvious and explicit in *On Learned Ignorance* as well as in several other works. To make Koyré’s statement above even more curious is the fact that Bruno, whom he considers to be one of the founders of the modern worldview, is suspicious of the very possibility of the mathematical treatment of nature – as Koyré says himself of him – “he is a very poor scientist, he does not understand mathematics” (54). Nonetheless, Koyré thinks Bruno’s conception of the universe is “so powerful and so prophetic” and “in its formal features [. . .] so deeply influenced modern science and modern philosophy, that we cannot but assign to Bruno a very important place in the history of the human mind” (54).

What do we make of Koyré’s glaring self-contradiction here? Is it out of his whimsical personal preference of Bruno over Cusanus? By no means. Koyré’s seeming self-contradiction is no contradiction if we recognize that his historiography is informed by his ideology of scientific realism – perhaps most clearly indicated in his statement above: “the fundamental inspiration of the founders of modern science and of the modern

worldview” with its assertion of “the panarchy of mathematics.” The fundamental inspiration of modern science, nurtured by “the mathematization of nature and its concomitant and convergent emphasis upon experiment and theory” (Koyré 3), is the belief that human reason can grasp reality as it is. As Harries points out, this belief “is presupposed by the outrage with which Giordano Bruno and Kepler were filled with when they read the preface to *De Revolutionibus* – which claimed that Copernicus was trying to provide not a true picture of the cosmos, but only a device that would allow us to calculate more easily the observed motion of the sun and the planets” (*Infinity and Perspective* 119). “What separates Cusanus from the new science is thus not, as Koyré claims, that he denies the possibility of the mathematical treatment of nature; rather, he lacks the faith or confidence that human reason, thus reply on mathematics, is able to penetrate the secrets of nature” (Harries, *Infinity and Perspective* 197).

If we recognize the ideology of scientific realism adopted almost unquestionably in most historiography of science, we will recognize that the popular dichotomy of medieval and modern worldviews is false because of this ideological bias. Such a dichotomy, for example, emphatically does not work when applied to thinkers like Cusanus, Milton, and we shall see, Montaigne, who question the belief that human reason can grasp reality as it is and that the new science gives us – in Harries’s words – the Ariadne’s thread that leads out of the labyrinth of an acentric, infinite world.

Chapter 3 “Be lowly wise”

First man and first philosopher

Let us take, as our points of departure, a fable of an astronomer from Aesop, and Plato’s retelling of it:

An astronomer was in the habit of going out regularly in the evening to observe the stars. Once as he was strolling through the outskirts of the town with his attention completely fixed on the heavens, he fell into a well before he knew what was happening to him. While he was howling and shouting, a passer-by who heard his pitiful tones came up and, as soon as he found out what had happened, remarked, “My good fellow, while you’re trying to watching things in the heavens, you don’t even see things on the earth.”

(Aesop, *Aesop without Morals* 110)

[T]hey say Thales was studying the stars, Theodorus, and gazing aloft, when he fell into a well; and a witty and amusing Thracian servant-girl made fun of him because, she said, he was wild to know about what was up in the sky but failed to see what was in front of him and under his feet. The same joke applies to all who spend their lives in philosophy. It really is true that the philosopher fails to see his next-door neighbor; he not only doesn’t notice

what he is doing; he scarcely knows whether he is a man or some other kind of creature. (Plato, *Theaetetus* 174a)⁵³

Identifying the anonymous astronomer as Thales, and replacing a random passerby with a jeering Thracian maid, Plato turns Aesop's fable into an anecdote of the first philosopher in western history. The moral of the Aesopic fable is directed to "men who, while they make a great show of wisdom about matters of opinion, can't even deal with matters of common experience" (Aesop, *Aesop without Morals* 271). Plato's anecdote addresses a more specific group – "all who spend their lives in philosophy." The passerby in the fable does not witness the inadvertent fall of the astronomer; the derisive servant girl does, and thus brings liveliness to the anecdotal scene: "a witty and amusing" character, she follows the whole incident with her own eyes and bursts out laughing.

For Hans Blumenberg, Plato's story of the confrontation between the absentminded Milesian philosopher and the ever attentive Thracian maid gives background to the figures in the fable; it also, perhaps more importantly, captures in it a clash of worlds, or, a clash between concepts of reality. The first philosopher immersed in his observation of the sky is blind to what lies ahead of him and under his feet, who as a result, falls into a well. His exotic behavior and its consequence (well-deserved in the eyes of the maid) are laughed at by the domestic servant girl. Despite the fact that he is the native Milesian and she a foreigner, Thales the philosopher, captivated by the world of the stars so far above him, seems a foreigner to the world under his feet. A prototypical confrontation between

⁵³ Translated by M. J. Levett, revised by Myles Burnyeat.

theory and the lifeworld, conveyed through the images of the theorizing philosopher and the *Schadenfreude* of the maid, is what Blumenberg perceives in Plato's designed departure from the Aesopic fable. In over two and half millennia, the anecdote was refashioned and endowed with new meanings in different historical contexts. It is a story that has "an obstinacy against fading" and "stood the test of history" (Blumenberg, *Laughter of the Thracian Woman* vii). Despite variations, the identified kernel of the anecdote, the conflict between theory and the lifeworld, whether interpreted as one between knowledge of things far away from us and of things near to us, or as one between knowing nature and knowing oneself, always manages to emerge. The reception history of this enduring anecdote is the subject of Blumenberg's *The Laughter of the Thracian Woman: A Protohistory of Theory*.⁵⁴

A distinctive variant of the anecdote is provided by Montaigne in his "Apology for Raymond Sebond":

I feel grateful to the Milesian wench who, seeing the philosopher Thales continually spending his time in contemplation of the heavenly vault and always keeping his eyes raised upward, put something in his way to make him stumble, to warn him that it would be time to amuse his thoughts with things in the clouds when he had seen to those at his feet. Indeed she gave him good counsel, to look rather to himself rather than to the sky. For as Democritus says by the mouth of Cicero,

⁵⁴ Hereafter cited as *Laughter*.

No one looks underfoot, but at the stars.

But our condition makes the knowledge of what we have in our hands as remote from us and as far above the clouds as that of the stars. As Socrates says in Plato, whoever meddles with philosophy may have the same reproach made to him as that woman makes to Thales, that he sees nothing of what is in front of him. For every philosopher is ignorant of what his neighbour is doing, yes, and of what he himself is doing, and does not know what they both are, whether beasts or men. (*Complete Works* 402)⁵⁵

Notable changes are made to the maid. The details, “Thracian,” “servant,” “witty and amusing,” which would be of significance to Plato’s contemporary audience, are dropped in Montaigne’s retelling. Now she is simply a Milesian as the philosopher himself. More importantly, she is no longer a *Schadenfreude* figure. Instead of watching the philosopher fall, then laughing derisively at him, the Milesian girl in Montaigne’s anecdote becomes the one responsible for the absentminded philosopher’s little accident. Rather out of good intentions, she trips him over, only to make him stumble, and to remind him that “it

⁵⁵ Je sçay bon gré à la garse Milesienne qui, voyant le philosophe Thales s’amuser continuellement à la contemplation de la voute celeste et tenir tousjours les yeux eslevez contremont, luy mit en son passage quelque chose à le faire broncher, pour l’avertir qu’il seroit temps d’amuser son pensement aux choses qui estoient dans les nues, quand il auroit proueu à celles qui estoient à ses pieds. Elle lui conseilloit certes bien de regarder plustost à soy qu’au ciel. Car, comme dict Democritus par la bouche de Cicero,

Quod est ante pedes, nemo spectat; coeli scrutantur plagas.

Mais nostre condition porte que la cognoissance de ce que nous avons entre mains, est aussi esloignée de nous, et aussi bien au dessus des nues, que celle des astres. Comme dict Socrates en Platon, qu’à quiconque se mesle de la philosophie, on peut faire le reproche que fait cete femme à Thales, qu’il ne void rien de ce qui est devant luy. Car tout philosophe ignore ce que fait son voisin, ouy et ce qu’il fait luy-mesme, et ignore ce qu’ils sont tous deux, ou bestes ou hommes. (*Les Essais* 2.12.538)

would be time to amuse his thoughts with things in the clouds when he had seen to those at his feet.” She does not ask the philosopher to abandon his study of the stars for the study of the familiar world on the ground that the latter promises sure success. Thus she poses no irresolvable conflict between studies of two realms. Rather the teaching is that the philosopher should *first* “look to himself rather than to the sky.”

Montaigne believes the human condition is such that man can grasp the essence of things neither far above us nor immediately close to us, “our condition makes the knowledge of what we have in our hands as remote from us and as far above the clouds as that of the stars.” The Milesian woman’s reproach is applicable to people who will devote their lives to philosophizing – regardless of what the subject is, it is better that they understand something of themselves first. Supposedly, if they understand the human condition as such that no absolute certainty is clenched by human knowledge, they shall not fall into the illusion that philosophy is able to grasp the essence of things. “Timeliness of intervention” is “the most important virtue” (Blumenberg, *Laughter* 55) of Montaigne’s moralist in the shape of the Milesian wench. Right when the first philosopher Thales begins to lose himself theorizing the heavens, “continually spending his time in contemplation of the heavenly vault and always keeping his eyes raised upward,” the Milesian girl makes him stumble and rebukes him, to prevent him from falling into the real danger – metaphorically – the false belief that he can or shall grasp the essence of things.

Montaigne and Milton, two idiosyncratic thinkers dwelling far apart in the mind of their readers, come instantly close to each other in their kindred refashioning of the Thales anecdote. Milton makes no appearance in Blumenberg’s reception history. The

name Thales never appears in *Paradise Lost*. But the characters and structure of the anecdote are readily perceptible in the interaction between Adam and Raphael in book eight. Apparently already making a habit of raising his head to “behold this goodly frame, this world / Of heav’n and earth consisting, and compute / Their magnitudes” (8.15-7) before the angel’s visit of Eden, Adam calls forth the anecdotal first philosopher Thales, who is further recognizable in the image of the former fully occupied with his contemplation of the universe and “by his count’nance seemed / Ent’ring on studious thoughts abstruse” (8.39-40).

Adam’s interlocutor and observer, Raphael fulfills the role of the attentive maid. Indeed he rather closely resembles his counterpart in Montaigne. (The difference between the backgrounds of an angel and a wench can be easily bridged – after all in ancient Greece, it is possible that the rather unusual wench Thales encountered that night was some good-willed deity in disguise.) “Benevolent and facile” (8.65), Raphael also intends to forewarn and admonish rather than to jeer. Like the Milesian wench, he does not say that Adam should not study the heavens – “To ask or search I blame thee not” (8.66) – rather the admonishment is *first* “Think only what concerns thee and thy being” (8.174), and rest “Contented that *thus far* hath been revealed / Not of earth only but of highest Heav’n” (8.177-8; my emphasis).

The instruction “Think only what concerns thee and thy being” not only echoes Montaigne’s “look rather to himself rather than to the sky,” it also faithfully conveys to Adam the danger pointed out by God, who has told Raphael before the latter’s visit of Eden that for man the imminent danger lies within rather than without: “his will though free, / Yet mutable; whence warn him to beware / He swerve not too secure” (5.236-8).

That Adam should be “Contented that thus far hath been revealed / Not of earth only but of highest Heav’n” is also akin to Montaigne’s scepticism, for the teaching indicates that man⁵⁶ on his own has sure knowledge neither of highest Heav’n nor of earth, unless God shows him it. As the drama of the fall unfolds, the danger turns out to be none other than the twofold illusion, generating false security, that man can obtain knowledge of the universe and that he has sure knowledge of things close to him, including his own being.

It is not overstretching to say that Raphael, perceiving Adam the proto-philosopher engrossed in thoughts abstruse, causes him to stumble. Adam has subjected “this world of heav’n and earth consisting” to his survey and reasoning, trying to absolve what he perceives to be unreasonable according to his computation and value system, namely, the “disproportion” committed by “Nature wise and frugal” by having the greater and nobler heavenly bodies in incredible speed daily circling the Earth, which is “sedentary” and a “punctual spot” in comparison to the firmament (8.30; 23). Would it not be much more reasonable, Adam proposes, that the Earth “with far less compass move” (8.33)? The question “whether heav’n move or earth” is no doubt posed by Adam in all seriousness. Raphael tells him it “imports not, if thou reckon right.” Trying to account for the observed disproportion of the world, Adam has already initiated the very practice future astronomers and philosophers would call “saving the appearances.” Raphael sees exactly that, and tells him that God would perhaps be moved to laughter at the future astronomers who “contrive / To save appearances.”

⁵⁶ Both Adam and Eve.

The element of laughter further evokes the well-known anecdote fashioned by Plato, except in Milton we hear it, not from the maid's counterpart Raphael, but from God. Indeed it suits Milton's purpose well that God, not Raphael, fellow creature of Adam, laughs at the astronomy of Adam's descendants. After all, human and angelic reason differ "but in degree, of kind the same" (4.490). God alone has knowledge of the hidden cause of things, thus he is fully entitled to laugh at the astronomers' "quint opinions wide" (8.78). The case Milton makes is not that Adam's astronomical inquiry is forbidden by God, but that, subjugating the universe under the scan⁵⁷ of human reason and fully occupied with its perceived "disproportion" in accordance with the latter, Adam forgets the real disproportions both between him and the universe, and, between human and divine reason. Thus being blind to the latter disproportions, Adam is in danger of a pitfall. As shown in the previous chapter, what Raphael tries to show is that there is much more *beyond* what Adam can perceive and think of in the entire creation of God.

The laughter of God is not *Schadenfreude* towards Adam. Milton's God is not – as Lovejoy calls Him – "a humorous celestial sadist devising intellectual pitfalls for the human mind, to provide amusement for himself when some men fall into them" ("Milton's Dialogue on Astronomy" 140). Adam is in danger of falling, but not yet fallen. In fact Raphael's timely presence in Eden is commanded by God, out of pity, to

⁵⁷ Raphael says that God does "not divulge / His secrets to be scanned by them who ought / Rather admire" (8.73-4). The Johnathan Richardsons noted that the word scan comes "From *Scandere* to Climb up to. to be Examin'd, Criticis'd" (356). Danielson also points out, "'scanned' carries a strong sense, contrary to the piety one ought to exercise in beholding the heavens, of standing in criticism or judgement of a particular work of art (OED, 2.a. &b.)" (*PL & CR* 3).

forewarn Adam of his danger.⁵⁸ Saying that God perhaps laughs derisively at future astronomers who contrive to save appearances, Raphael lays a stumbling block to Adam who is about to do so, minding him where the pitfall lies. Like the Milesian wench in Montaigne, Raphael offers timely intervention.

Nor does the laughter disappear from Montaigne's text. As in Milton, the Milesian wench as Thales the philosopher's fellow creature does not laugh at him, but, perceiving his danger, improvises her timely, good-willed intervention. It is only from the point of view of God, the Creator of all things, that man's philosophy becomes laughable, or, "*ridicule*" (ridiculous). Indeed the dominant motif of Montaigne's "Apology" can be identified as a persistent and thoroughgoing distinction between the ontological and epistemological status of Him, the Creator, and us, the creature. Hence the rhetorical question: "Is it possible to imagine anything so *ridiculous* as that this miserable and puny creature, who is not even master of himself, exposed to the attack of all things, should call himself master and emperor of the universe, the least part of which it is not in his power to know, much less to command?" ("Apology," *Complete Works* 329; my emphasis).⁵⁹ Leading up to the Thales anecdote, Montaigne reminds his reader again of the laughable ("ridiculous") enterprise of astronomy:

⁵⁸ *PL* 5.220-45.

⁵⁹ Est-il possible de rien imaginer si ridicule que cette miserable et chetive creature, qui n'est pas seulement maistresse de soy, exposée aux offences de toutes choses, se die maistresse et emperiere de l'univers, duquel il n'est pas en sa puissance de cognoistre la moindre partie, tant s'en faut de la commander? (*Les Essais* 2.12.450)

Is it not a ridiculous undertaking, in those things which by our own confession our knowledge cannot reach, to go and forge another body for them and lend them a false shape of our invention; as is seen in the movement of the planets, wherein, since our mind cannot reach it nor imagine its natural course, we lend them, on our own part, material, gross, physical springs: [. . .]

You would think we had had coach makers, carpenters, and painters that went up there and set up machines with various movements, and arranged the wheelwork and interlacings of the heavenly bodies, in motley colors, around the spindle of necessity, according to Plato: [. . .]. These are all dreams and fanatical follies. (“Apology,” *Complete Works* 400)⁶⁰

These are indeed fanatical follies and dreams that Milton also mocks with a Paradise of fools. It is more than a happy coincidence that, like Milton, Montaigne on the one hand ridicules the concrete spheres of medieval astronomy, as shown above; on the other hand, as shown in the passage below, readily acknowledging the merit of Copernican astronomy, he thinks it would be wiser to not believe it is the last word said about the universe:

⁶⁰ N’est ce pas une ridicule entreprise, à celles ausquelles, par nostre confession, nostre science ne peut atteindre, leur aller forgeant un autre corps, et prestant une forme fauce, de nostre invention: comme il se void au mouvement des planettes, auquel d’autant que nostre esprit ne peut arriver, ny imaginer sa naturelle conduite, nous leur prestons, du nostre, des ressorts materiels, lourds et corporels [. . .].

Vour diriez que nous avons eu des cochers, des charpentiers et des peintres, qui sont allez dresser là haut des engins à divers mouvemens, et ranger les rouages et entrelassemens des corps celestes bigarrez en couleur autour du fuseau de la necessité, selon Platon: [. . .]. Ce sont tous songes et fanatiques folies. (*Les Essais* 2.12.536)

The sky and the stars have been moving for three thousand years; everybody had so believed, until it occurred to Cleanthes of Samos, or (according to Theophrastus) to Nicetas of Syracuse, to maintain that it was the earth that moved, through the oblique circle of the Zodiac, turning about its axis; and in our day Copernicus has grounded this doctrine so well that he uses it very systematically for all astronomical deductions. What are we to get out of that, unless that we should not bother which of the two is so? And who knows whether a third opinion, a thousand years from now, will not overthrow the preceding two? (“Apology,” *Complete Works* 429) ⁶¹

When we compare Montaigne’s remark on geo- and heliocentrism here to Raphael’s “whether heav’n move or earth, / Imports not, if thou reckon right,” a similar attitude towards astronomical inquiries to that of Milton emerges.

⁶¹ Le ciel et les estoilles ont branlé trois mille ans; tout le monde l’avoit ainsi creu, jusques à ce que Cleanthes le Samien ou, selon Theophraste, Nicetas Siracusien s’avisa de maintenir que c’estoit la terre qui se mouvoit par le cercle oblique du Zodiaque tournant à l’entour de son aixieu; et, de nostre temps, Copernicus a si bien fondé cette doctrine qu’il s’en sert tres-regléement à toutes les consequences Astronomiques. Que prendrons nous de là, sinon qu’il ne nous doit chaloir le quel ce soit des deux? Et qui sçait qu’une tierce opinion, d’icy à mille ans, ne renverse les deux precedents? (*Les Essais* 2.12.570).

Early in the “Apology” Montaigne gives the impression that he endorses the geocentric distinction of the sublunary and superlunary realms, when he says that “[man] feels and sees himself lodged here, amid the mire and dung of the world, nailed and riveted to the worst, the deadest, and the most stagnant part of the universe, on the lowest story of the house and the farthest from the vault of heaven” (*Complete Works* 330). “[l’homme] se sent et se void logée icy, parmy la bourle et le fient du monde, attachée et clouée à la pire, plus morte et croupie partie de l’univers, au dernier estage du logis et le plus esloigné de la voute celeste” (*Les Essais* 2.12.452). Such is indeed the impression of Lovejoy, who believes that Montaigne, “still adhering to the older astronomy,” exemplifies the medieval understanding of the universe as a two-storey structure, and that this understanding forms the foundation of the essayist’s critique of the pride of man (*Great Chain of Being* 102). But there Montaigne seems only to be rehearsing an argument in favor of his case without committing to the cosmology behind it. As shown in his comment on the geocentric and heliocentric conceptions of the universe here, Montaigne is committed to the truth of neither. As shall be shown below, Montaigne is an infinitist and clearly states his favor of the idea of the plurality of worlds. Montaigne’s epistemological scepticism is better understood against his infinitist cosmology.

In chapter two we have seen that Raphael's statement is neither a covert defence of geocentrism, nor a blunt rejection of astronomical inquiries in general. Rather the angel suggests that astronomical theories be properly understood as conjectures rather than true descriptions of the universe. Astronomers will not incur God's derision if they do not install their astronomical models as the reality of the universe. Likewise on the geocentric and heliocentric conceptions of the universe, Montaigne believes that we should not bother which of the two is in fact true, because they would probably be overthrown by a truer third opinion in the future. "[F]or those epicycles, eccentrics, concentrics, which astrology calls to its aid to conduct the movement of its stars, it gives us as the best it has succeeded in inventing on that subject" ("Apology," *Complete Works* 401).⁶² And Nature is best seen as "a veiled and shadowy picture, shining through here and there with an infinite variety of false lights to exercise our conjectures" ("Apology," *Complete Works* 400-1).⁶³

The affinity in attitude between the epic poet and the essayist towards astronomical and human inquiry in general goes deeper than mere verbal echoes. Most importantly, Montaigne is an infinitist like Milton. Not only does he refer to the celestial vault as "that infinite sea (*cette mer infinie*)," he also clearly states his belief in the plurality of worlds: "Your reason is never more plausible and on more solid ground than when it convinces

⁶² "car ces epicycles, excentriques, concentriques, dequoy l'Astrologie s'aide à conduire le bransle de ses estoilles, elle nous les donne pour le mieux qu'elle ait sçeu inventer en ce sujet" (*Les Essais* 2.12.537).

⁶³ "une peinture voilée et tenebreuse, entreluisant d'une infinite varieté de faux jours à exercer nos conjectures" (*Les Essais* 2.12.536).

you of the plurality of worlds”⁶⁴ (“Apology,” *Complete Works* 328; 390). Milton’s depiction of our entire universe as a barely visible star in the boundless Multiverse created by God would not surprise Montaigne. Just as Raphael reminds Adam that man is “Lodged in a small partition” of “An edifice too large for him to fill,” so Montaigne reminds his reader of the utter incommensurability between the whole universe and his allotted part:

Put the case, O man, that you have been able to observe here some traces of his deeds; do you think that he has used all his power and put all his forms and all his ideas into this work? You see only the order and government of this little cave you dwell in, at least if you do see it. His divinity has infinite jurisdiction beyond; this part is nothing in comparison with the whole.

(“Apology,” *Complete Works* 389)⁶⁵

That God is infinite is a common theme in Christianity. That the universe is infinite⁶⁶ and contains in it an infinite number of worlds is not. What distinguishes Montaigne and Milton from Christian thinkers who believe in the infinite God but reject the infinite Multiverse is their cosmology. It in turn aligns them with Cusanus, who, according to Harries, first transferred the metaphor of the infinite sphere from God to the universe. What further betrays the intellectual kinship of the trio is that their infinitist

⁶⁴ “Ta raison n'a en aucune autre chose plus de verisimilitude et de fondement qu'en ce qu'elle te persuade la pluralité des mondes” (*Les Essais* 2.12.524).

⁶⁵ Mets le cas, ô homme, que tu ayes peu remarquer icy quelques traces de ses effets: penses-tu qu'il y ait employé tout ce qu'il a peu et qu'il ait mis toutes ses formes et toutes ses idées en cet ouvrage? Tu ne vois que l'ordre et la police de ce petit caveau où tu es logé, au moins si tu la vois. (*Les Essais* 2.12.523)

⁶⁶ As discussed in Chapter 2, Cusanus distinguishes the infinity of the universe from the infinity of God.

cosmology forms the proper basis of their epistemological scepticism that is applied exclusively to man (and other creatures including angels in Milton). This I shall elaborate in more detail in the next section.

As we have started this section with an anecdote, let us as well end with one that is very much relevant to Milton. In his “Being, Spirit, God,” Hans-Georg Gadamer reports that when Martin Heidegger formulated the expression for the word “*Dasein* [*Da-sein*, *Da*, there, *sein*, Being]”: the world was there “when the first man raised his head,” they “disputed for weeks whether Heidegger had meant Adam or Thales by this first man” (65). Gadamer tells the anecdote only to dismiss the dispute: “you can see that we were at that time still not very advanced in our understanding” (65). Blumenberg, commenting on the anecdote, thinks that “on the contrary, [. . .] few questions so astute would ever be posed to Heidegger in all of the years that followed” (*Laughter* 118). We do not want to go deep into Heidegger’s philosophy here. But Blumenberg’s further remark is of interest: “As watchers of the sky, Adam and Thales must have been very dissimilar; but they were at least metaphorically comparable through the immediate consequence of their self-elevation: their fall” (*Laughter* 119). The remark testifies the extreme unconventionality of Milton’s Adam even from a perspective of the twentieth century – in *Paradise Lost*, Adam is at least as good as, if not better than, Thales as a sky-watcher. As Blumenberg remarks, the fall links Adam and Thales the protagonist of the anecdote together. But Milton overwrites the anecdote both by installing Adam the first man as the first philosopher, and by putting the desire to know at centre stage. Now it is Thales who is foreshadowed by Adam. And Milton corrects the message of the Thales anecdote popularized in history: what is culpable is not the desire to know – Adam, yet faultless,

has it in him by nature; nor the specific subject of that desire, astronomy. In Milton, as in Montaigne's retelling of the anecdote, "astronomy is no longer the epitome of overshooting curiosity" (Blumenberg, *Laughter* 54). Why, then, is the fruit of the tree of knowledge forbidden to Adam and Eve? What does "be lowly wise" mean? I hope the foregoing discussion of this section has shown that the affinity between Montaigne and Milton is promising for a rethinking of these perennial questions through further mutual illuminations of the two thinkers.

Reason and faith

Montaigne's only reference to Copernicus in the *Essays* has caught the attention of a good number of critics. Interestingly but not surprisingly, his noncommittal to the Copernican model of the universe incurred similarly divided responses as Milton's. Given the significance of Copernicus in the history of science, critical responses to Montaigne's reception of Copernicus can tell us a lot about how his scepticism has been interpreted in relation to his attitude towards scientific and human inquiries in general. In what follows let us first take a look at some of those responses, which shall offer us a glimpse of the same problem in Montaigne scholarship as in Milton criticism: the lack of a proper way to understand the emphasis on *both* reason and faith in the two authors.

As shown in the previous section, Montaigne takes notice that in his own time Copernicus uses the ancient heliocentric hypothesis so well as to account "very systematically for all astronomical deductions" and responding to it he writes: "what are we to get out of that, unless that we should not bother which of the two is so? And who knows whether a third opinion, a thousand years from now, will not overthrow the preceding two?"

M. A. Screech believes this comment from Montaigne only shows the scope of his “Catholic scepticism”: “Montaigne emphasized his mistrust of all human reason when working by itself, without the guidance of divine grace. Even Copernicus’s theory did not impress him over much” (*Montaigne and Melancholy* 4). Ann Hartle thinks Montaigne’s comment on Copernicus illustrates his “healthy commonsense skepticism,” by which she probably means that Montaigne recommends “moderation based on past experience of one’s mistaken beliefs” (14). Jean Starobinski reads it as “just one more argument to dissuade us from clinging to any ‘opinion’ whatever,” and “there is not the slightest hint of any notion of scientific progress” (286). Robert S. Westman sees in Montaigne’s “glancing reference to Copernicus” the expression of “an emergent fallibilist temper” typical of the 1570s (258). Thus all the critics cited above understand Montaigne’s attitude towards Copernicus as one either of distrust or indifference. They may have been influenced by Richard Popkin, who in his 1969 article “The sceptical Origins of the Modern Problem of Knowledge” remarks:

Montaigne and Charron and their followers regarded the developing scientific enterprises in astronomy, medicine, chemistry, physics, etc, as just one more dogmatic effort to accomplish the impossible, to know the nature of reality. They were not impressed by the scientific revolution going on around them, seeing it as just the replacement of one set of dubious opinions by another such set. They recommended abandoning scientific research along with other misguided efforts to find out what is really going on. (14)

Popkin understands Montaigne’s scepticism as the epitome of what he calls “Christian scepticism” or “fideism” that flourished in the late sixteenth century and the first half of

seventeenth century, which in the same article he describes as “anti-intellectual, destructive” (15). Thereby a strong opposition between reason and faith is established: “the more one probed and laid bare what was involved in the attempt to know anything, the more dubious the whole cognitive enterprise became”; “Faith and revelation alone could provide any genuine assurance and any basis for understanding the world” (14).

In contrast to Popkin and the critics cited above, R. A. Sayce explores a different line of thinking about Montaigne’s relation to scientific inquiries. In general he agrees with Jules Michelet who summed up the relation with the comment “*son doute n’est que le doute provisoire qui rendra la science possible* [his doubt is only the provisional doubt that renders science possible]” (qtd. in Sayce 185). Likewise Sayce sees in Montaigne an unmistakable inclination towards empiricism, one of the hallmarks of the new science that is to come. Montaigne is “distrustful of words which correspond to no observable fact” and demonstrates “a true if elementary manifestation of the experimental spirit” which is to be further developed by Bacon, Descartes, and Pascal, though with the essayist, “scepticism perhaps has the last word” (186-7). But if Montaigne’s scepticism is at odds with the great confidence in science demonstrated by Bacon & co, it is “clearly more in tune with the doubts of recent science” – Sayce finds that Montaigne’s attitude towards astronomy comes “very close to the recent concept of models in science, [namely, astronomy gives] not an exact picture of reality but an approximate representation of how it might be thought to work” (187-8). Such an understanding reminds us of Duhem, who sees Osiander’s attitude towards astronomical hypothesis to be very similar to the modern instrumentalist position.

David Lewis Schaefer picks up Sayce's argument and pushes it to the extreme. The affinity between Montaigne's attitude and the modern position towards scientific theories is strengthened through a careful rereading of the essayist's response to Copernicus. *Pace* Popkin, Montaigne is not unimpressed by or indifferent to Copernicus. The essayist acknowledges the astronomer's success in using the ancient hypothesis "very systematically for all astronomical deductions" – the language here is "highly favorable" (Schaefer 124). Montaigne's remark that "we should not bother which of the two is so" because "a third opinion [. . .] will overthrow the preceding two" should be understood as a suggestion that "the ground of the choice we make among views of nature be shifted from 'truth' to utility: that is, the extent to which a particular view can facilitate our prediction, and even our manipulation, of nature's behavior, with a view to satisfy our physical needs" (Schaefer 124).

Sayce has considered that Montaigne's scepticism anticipated and perhaps even directly influenced the empiricism of Bacon, Descartes, and Pascal, but Montaigne ultimately differed from the latter three in that he remained a sceptic. Schaefer overturns this last difference and argues that Montaigne is only a "putative" sceptic, who consciously intends his scepticism to be constructive to scientific progress. More specifically: shifting the aim of natural science from truth to utility, Montaigne suggests "a transformation of our bearing or attitude toward nature," namely, we should "take the place of God in another sense, by achieving the *creative* power that the Bible attributed to the Deity." A figure like Montaigne "will force nature to serve our needs" (Schaefer 126). Montaigne's new attitude toward nature also indicates that there is no limit for "our desire for earthly comforts." Such an attitude requests "the redirection of human concern

from transcendent things to earthly ones,” which redirection is recognized to be “the precondition of a science that – unlike previous philosophy – will be inherently, not accidentally, progressive” (Schaefer 127). Montaigne does promote the pursuit of knowledge, albeit a different kind of knowledge, which concerns itself not with the final cause, but only with the “efficient causes” that produce the observable phenomena; in this “empirical, practical” knowledge, “progress can be made, since the findings of a series of properly conducted experiments can be refuted only by new findings that in turn broaden our knowledge and our capacity to predict nature’s behavior.” Montaigne has also indicated that the pursuit of knowledge be divided by subjects, which are further subdivided into “a variety of specialized fields.” This in turn can be understood that he conceives the pursuit of knowledge to be “essentially a collective endeavor”: “The divisibility of this knowledge eliminates the need for each inquirer to reproduce previous investigations; instead, the inquirer builds on prior researchers’ findings, following the rules of method to advance to further discoveries” (Schaefer 128). In the end, what Montaigne accomplishes amounts to “the severance of science from metaphysics – as well as its consequent divorce from theology” (Schaefer 129). The effect of his teaching “will be to stimulate our appetite for the practical fruits of the new science.” To sum up, Schaefer’s Montaigne is one who conceives himself “in the scientific realm, [. . .], as a kind of master architect, outlining and advocating a project that would be executed by others” (133).⁶⁷

⁶⁷ Schaefer reads the Baconian project into Montaigne. But how his language, while describing it, evokes the fallen angels’ attitude towards nature in Milton’s epic!

Substantiating his case with quotations not only from the “Apology” but also from all three books of Montaigne’s essays, Schaefer is obliged to answer one objection: what about the essayist’s relentless attack on human reason and presumption, which, especially in the “Apology,” often accompanies his discussion of human inquiries? Schaefer’s reply would sound familiar to Miltonists: it is true that Montaigne has a “peculiarly backhanded way of expressing his thoughts on science,” and the reason for this is that he writes for two kinds of audiences, the few “men of understanding,” who would read the *Essays* carefully and “discern the author’s true purpose”; and the many who would read it cursorily and recognize “only the more obvious, surface meaning” (132). But the *true* Montaigne, according to Schaefer, while attacking human assumption, only gives “lip service” to the “older, teleological view” of the world setting limits to human inquiry, which he “ultimately rejects” (127). In other words, Schaefer believes Montaigne is a covert atheist who consciously uses his scepticism as a rhetorical tool to hide his real intentions, while in fact promoting pursuit of knowledge and scientific progress.

Schaefer’s understanding of Montaigne’s scepticism in relation to his attitude towards scientific inquiry is thus diametrically opposed to that of Popkin. Popkin considers Montaigne’s scepticism as essentially “a Christian scepticism, a fideism,” which is “anti-intellectual, destructive”; Schaefer argues that Montaigne’s scepticism is both a mask for his atheism and an intellectual tool for his pursuit of knowledge. Despite their difference, both Popkin and Schaefer in their own ways deepen the opposition between reason and faith. Montaigne’s scepticism is aligned with either one or the other: it is either intellectual and atheistic, or anti-intellectual and Christian. But the fact that

both find enough proof in Montaigne's use of scepticism to support their opposite cases argues only the partiality of their respective interpretations.

In the "Apology," where Montaigne's scepticism is most clearly expressed, reason is joined rather than opposed to faith. This Montaigne makes clear in his answer to the first objection to Sebond's natural theology. The objection is made on behalf of fideism: "Christians do themselves harm in trying to support their belief by human reasons, since it is conceived only by faith and by a particular inspiration of divine grace."⁶⁸ To answer, Montaigne first expresses his respect for this position – he agrees that purely human means alone are not capable of arriving at the Christian belief; for if they are, the wise people in antiquity would not have failed to do so. The Christian belief comes to man only with the help of God, and "It is faith alone that embraces vividly and surely the high mysteries of our religion" (*Complete Works* 321).⁶⁹ Montaigne then continues:

But this is not to say that it is not a very fine and very laudable enterprise to accommodate also to the service of our faith the natural and human tools that God has given to us. There can be no doubt that this is the most honorable use that we could put them to, and that there is no occupation or design more worthy of a Christian man than to aim, by all his studies and his thoughts, to embellish, extend, and amplify the truth of his belief. We do not content ourselves with serving God with mind and soul, we also owe and

⁶⁸ "les Chretiens se font tort de vouloir appuyer leur creance par des raisons humaines, qui ne se conçoit que par foy et par une inspiration particuliere de la grace divine" (*Les Essais* 2.12.440).

⁶⁹ "C'est la foy seule qui embrasse vivement et certainement les hauts mysteres de nostre Religion" (*Les Essais* 2.12.441).

render him a bodily reverence; we apply even our limbs and movements and external things to honor him. We must do the same here, and accompany our faith with all the reason that is in us, but always with this reservation, not to think that it is on us that faith depends, or that our efforts and arguments can attain a knowledge so supernatural and divine. (*Complete Works* 321)⁷⁰

The last sentence sums up Montaigne's conception of the relationship between reason and faith: we should "accompany our faith with all the reason that is in us," but always bear in mind that we do not therefore think faith depends on us or is attainable through our reason alone. A balance between reason and faith is indicated there: the two are compatible, not mutually exclusive. But critics are at a loss as to what Montaigne means by such a balance, or how it is possible to maintain it. The difficulties they confront are mainly: 1) in the relentless attack on human reason and presumption that is to follow in the rest of the "Apology," Montaigne's suggestion of the compatibility and balance of reason and faith seems to have disappeared from view; 2) if they look for support for such compatibility and balance in the historical context they find rather the opposite: in early modern Europe, both religious discords and the rise of the new science were further alienating reason and faith from each other. Montaigne's readers in general have either

⁷⁰ Mais ce n'est pas à dire que ce ne soit une tres-belle et tres-louable entreprinse d'accommoder encore au service de nostre foy les utils naturels et humains que Dieu nous a donnez. Il ne faut pas douter que ce ne soit l'usage le plus honorable que nous leur scaurions donner, et qu'il n'est occupation ny dessein plus digne d'un homme Chrestien que de viser par tous ses estudes et pensemens à embellir, estandre et amplifier la verité de sa creance. Nous ne nous contentons point de servir Dieu d'esprit et d'ame; nous luy devons encore et rendons une reverence corporelle; nous appliquons nos membres mesmes et nos mouvements et les choses externes à l'honorer. Il en faut faire de mesme, et accompagner nostre foy de toute la raison qui est en nous, mais tousjours avec cette reservation de n'estimer pas que ce soit de nous qu'elle dépende, ny que nos efforts et argumens puissent atteindre à une si supernaturelle et divine science. (*Les Essais* 2.12.441)

espoused Popkin's fideistic, anti-intellectual interpretation, dismissing the essayist's emphasis on reason, or followed Schaefer's atheistic intellectualism, taking Montaigne's tribute to faith as a "lip service."

We cannot but notice that Milton's readers have been facing more or less the same difficulties.⁷¹ Like Montaigne in his "Apology," Milton in *Paradise Lost* insists that reason and faith are compatible. As already quoted above, Montaigne considers reason to be one of the "natural and human tools that God has given to us"; and we should use it *to its full capacity* to serve God, that is, "to accompany our faith with *all* the reason that is in us." Raphael tells Adam that God makes man to be a creature "endued / with sanctity of reason," by which he is to "Govern the rest, self-knowing, and from thence / *Magnanimous* to correspond with Heav'n" (7.507-8; 509-10, my emphasis). Montaigne's only reservation is "not to think that it is on us that faith depends, or that our efforts and arguments can attain a knowledge so supernatural and divine." Milton's Raphael harps the same cord: "But grateful to acknowledge whence his good / Descends, thither with heart and voice and eyes, / Directed in devotion, to adore / And worship God supreme" (7.512-5). One may question whether the views of Montaigne and Milton are comparable, because Raphael is talking about the condition of man before the fall. But Milton's attitude is essentially the same when he discusses the relationship between reason (learning) and faith after the fall. Hence the well-known words from *Of Education*:

⁷¹ See Leonard's discussion of the critical reception of Milton's attitude towards astronomy under the heading "Anti-intellectual Milton," *FL*, pp. 774-86.

The end then of learning is to repair the ruins of our first parents by regaining to know God aright, and out of that knowledge to love him, to imitate him, to be like him, as we may nearest by possessing our souls of true vertue, which being united to the heavenly grace of faith makes up the highest perfection. (*YP* 2.366-7)

But like Montaigne, Milton disrupts his readers' understanding of his assertion of the compatibility of reason and faith as a matter of course. If we think it is only natural that such an assertion comes from someone like Milton, who lived in a time when confidence in reason was surging with the rise of the new science, who also was known for his personal love of learning, both new and old, then we are surprised by Raphael's exhortation that Adam leave his astronomical inquiries aside and "be lowly wise," and we are puzzled to hear Jesus slight all classical learning as "false, or little else but dreams, / Conjectures, fancies, built on nothing firm" (*PR* 4.291-2). Like readers of Montaigne, Milton's readers find themselves at a loss to reconcile this perceived contradiction in Milton's attitude towards reason and faith. The precise difficulty, Raphael's "be lowly wise," has forced McColley to choose between a scientific and an anti-intellectual Milton. He started with the former, but ended with the latter. It is worth pointing out again that McColley's struggle is intimately related to his unquestioned assumption of the irreconcilability between reason and faith, or between science and religion. As I have already shown in chapter two, McColley identifies Copernican astronomy as the starting point of the new science, and reads Milton's noncommittal to it as a flat rejection of all astronomical inquiries on behalf of religion.

McColley's science versus religion dichotomy agrees with the views of Thomas Kuhn. In his *Copernican Revolution*, Kuhn emphasizes the incompatibility of science and religion by sketching a picture of the Copernican controversy as a deep conflict between the new astronomy and the fundamental values held by Christianity. He points out that "Copernicanism required a transformation in man's view of his relation to God and of the bases of his morality." And "Until that transformation was achieved, sensitive observers might well find traditional values incompatible with the new cosmology" (193). To illustrate the impact of this incompatibility on "sensitive observers," Kuhn cites John Donne's uneasy reception of Copernicanism in his *Anatomy of the World*, the anti-Copernicanism of both the Protestant and Catholic leaders, and Milton's choice of cosmology in *Paradise Lost*. Unlike McColley, Kuhn does not read Milton as an anti-intellectual. Rather like Allan H. Gilbert, he distinguishes Milton's private and official attitudes toward the Copernican model: "Milton thought that Copernicus' innovation might very well be true. [. . .] But in his epic, whose project was 'to justify the ways of God to man [*sic*],' he was compelled to use a traditional cosmological frame," because "the Christian drama and the morality that had been made dependent upon it could not be adapted to a universe in which the earth was a planet and in which new worlds could continually be discovered 'in the Planets and the Firmament'" (194-5).

After our discussion of Milton's astronomy and cosmology in chapter two, we are confident that Kuhn was wrong to say that Milton uses "a traditional cosmological frame," namely the Ptolemaic system, in *Paradise Lost* because it conforms to orthodox Christianity. But that is not our point here. Now let us focus on Kuhn's distinction between Milton's private and official opinions of Copernican astronomy based upon his

thesis of the incompatibility of the new science and the Christian religion. Kuhn believes it is almost impossible to adapt the “traditional fabric of Christian thought,” in which “Cosmology, morality, and theology have long been interwoven,” to the new cosmology (*Copernican Revolution* 192). Therefore Milton, who probably thought the Copernican system of the world true, had to choose the untrue Ptolemaic system for his religious epic. Such a reading contains an implicit compliment of Milton’s intellectual ability, but virtually undermines Milton’s epic by turning his ambitious poetic project to “assert eternal providence, / And justify the ways of God to men” into an artificial project of pretense.

We see that as long as the hypothesis of the incompatibility of science and religion (in its core, the incompatibility of reason and faith) remains untouched, we will always be obliged to choose either an intellectual, atheistic Milton, or an anti-intellectual, Christian Milton, or a double-dealing Milton, which ultimately means an intellectual, atheistic Milton. Under the presumed incompatibility, a double-dealing Milton provides a *via media* that best saves the appearances of the poem. It allows Kuhn to account for Milton’s obviously above commonplace knowledge of the new astronomy in his “lengthy description of the two opposing systems of the world” in *Paradise Lost* (194). It is also sufficiently flexible to adapt to the argument on the other side. Arguing for an intellectual Milton who actually rejects the old astronomy and embraces the new in *Paradise Lost*, Martin reads Raphael’s “be lowly wise” as only being “superficially [. . .] closer to [an] ironic denial of our capacity to ultimate truth than to the new astronomers’ revolutionary attempts to penetrate the heavens”; and as an expression of “the kind of conventional piety expected of any contemporary scientist, from Bacon himself to the Christian

virtuosi of the Royal Society.” It is one of those “requisite disclaimers about the folly of seeking superhuman knowledge and the proper assurances of humility before heights of Divine Wisdom” often found in the epigraphs of early modern scientific works (“What if the Sun Be Center” 238; 232). In other words, Raphael’s “be lowly wise” is like an indulgence paid so that Adam freely probes and explores without sin. Thus Martin’s intellectual Milton also is a double-dealing Milton like Kuhn’s (or like Schaefer’s Montaigne, who gives “lip service” to faith). If we take the purpose of Milton’s epic seriously, then we have to admit that Martin’s reading of Raphael’s “be lowly wise,” like Kuhn’s account of Milton’s choice of cosmology, virtually forfeits the moral of the poem.

Let us come back to Kuhn’s observation for a moment: “Copernicanism required a transformation in man’s view of his relation to God and of the bases of his morality. Such a transformation [. . .] was scarcely even begun” (*Copernican Revolution* 193), Kuhn suggests, in the seventeenth century – he uses Milton to illustrate his point, whom he considers unprepared for the “destructive” implications of the Copernican astronomy to an entire fabric of Christian thought. Kuhn’s assumptions behind this observation are that the Copernican revolution effected a radical break between reason and faith, but people of the time were necessarily slow to respond because evidence testifying the truth of the Copernican astronomy was only slowly emerging; and, living in a time when the break between reason and faith became obvious, Milton utterly lacked means in bridging the two. The incompatible thesis of the relationship between reason and faith, we may say, is also well detectable in critical understandings of Montaigne as either an anti-intellectual fideist or a covert atheist as presented above. But as we shall see below, Kuhn’s

assumptions are probably invalid. And as we have done in previous chapters, once again we may rely on the more sensible historical thesis advocating that a seemingly abrupt Copernican revolution did not come out of the blue, but was actually made possible by a long series of transformations in previous centuries.

In what follows, I shall present several arguments of this historical thesis that are especially helpful for our understanding of Milton's and Montaigne's insistence on the compatibility of reason and faith. Reading the texts of the two authors in light of those arguments, I shall show that neither of them reacts passively to the challenges posed by the new science to the Christian faith with anti-intellectual fideism, nor do they simply take the side of reason and pay lip service to faith; rather both find a compatible model for reason and faith in the Cusan project of learned ignorance, which they consider to be a better alternative for human inquiry than a project of the advancement of learning promoted by the pillars of the new science. My argument is that both Montaigne and Milton critique the latter project, and their respective critique shall be the focus of our textual analysis.

Pushing the history of modern science much further back than the Copernican astronomy, Duhem proclaims the condemnation of 1277 as the "birth certificate of modern physics" (*Medieval Cosmology* 4): to defend the dogma of the creative omnipotence of God, the Church rejected the idea of the creation as necessarily an Aristotelian cosmos; and medieval scholars were prompted to challenge, speculate on possible revisions of, the fundamental ideas in Aristotelian physics and laws, which the Church had considered to be extremely restrictive of God's power and in direct conflict with Christian faith. Duhem believes that especially fruitful in leading the medieval

scholars beyond the confines of Aristotelian philosophy are their discussions in relation to two condemned errors, namely, that God could not make several worlds, and that He could not move the world with rectilinear motion because it would cause a vacuum. The condemnation of the former leads to free speculations on the possibility of a plurality of worlds. The condemnation of the latter leads to discussions of the possibility of void and movement in the void. Thus Duhem makes the paradoxical case that an apparently conservative reaction of the Church to Aristotelian philosophy – the new science of the thirteenth century – stands at the head of a long series of transformations leading to the new science almost three centuries later.⁷²

Though Edward Grant⁷³ believes that Duhem exaggerates when he says that the condemnation of 1277 gave birth to modern science, he readily agrees with him that it had a significant impact on the medieval conceptions of the actual operation and construction of the physical world. Further supplementing Duhem's extensive documentation and analysis of medieval cosmological discussions before and after the condemnation, Grant shows how the speculative efforts of a group of medieval

⁷² Duhem's emphasis on the importance of the condemnation of 1277 to the new science of the seventeenth century was challenged by Koyré, his younger contemporary, "then the leading historian of science and leader of the opposition to Duhem's historical views" (Ariew xix). Koyré argues that the discussions prompted by the condemnation could pose no real challenge to Aristotelian philosophy. Since such discussions are based on the important distinction between the potential and actual creation of God, medieval Christian philosophers would no doubt have chosen to study the world as what they believe it actually is (that is, according to Aristotle, who provides the only physics available then) than "to study the conditions of possibility of the universes which God could have created had he wished to do so, but which he did not create because he did not wish to do so" (qtd. in Grant 216). Koyré's challenge is pertinent. But it does not mean that Duhem's emphasis is therefore negligible. Edward Grant's arguments presented immediately after Duhem's are actually intended to counter Koyré's rebuttal of Duhem.

⁷³ See Grant, "The Condemnation of 1277, God's Absolute Power and Physical Thought of Late Middle Ages."

scholastics,⁷⁴ endeavoring to make the possible existence of other worlds and the rectilinear motion of the world intelligible, produced a rich set of arguments and questions that challenged fundamental Aristotelian principles in terms of space, motion, and vacuum. And “some of the problems and solutions which had emerged as a direct consequence of [the condemnation] continued to exercise influence in the late sixteenth and seventeenth centuries” (Grant 242).

But most valuable for us is Grant’s insight that the condemnation of 1277 effectively turns the doctrine of God’s absolute power into “a powerful analytical tool in natural philosophy” (217). Though the doctrine was formulated before the condemnation and therefore not novel, it was only after the condemnation that it became “a convenient vehicle for the introduction of subtle and imaginative questions, which generated novel replies.” The general effect of the doctrine of God’s absolute power is it “made many aware that things might be quite otherwise than were dreamt of in Aristotelian philosophy” (Grant 241). More specifically, we may say that invocations of the doctrine produce those “if” and “what if” moments – as they are often formulated with them: for example, “what if God had created a completely homogeneous universe?” or, “if God moved the world, a vacuum would remain” (Grant 228; 231) – that lead discussants beyond the dogmas of Aristotle, or indeed any dogma considered to be restrictive of God’s absolute power.

⁷⁴ Grant lists Godfrey of Fontaines, Richard of Middleton, Ramon Lull, Johannes Bassolis, William of Ockham, Walter Burley, Robert Holkot, William of Ware, Gaietanus de Thienis, Nicole Oresme, Thomas of Strasbourg, as well as John Buridan and Albert of Saxony, who probably opposed the condemnation of 1277, but nonetheless provided speculations that could be used to attack Aristotelian physics and cosmology. See Grant, p.220, n30.

Both Montaigne and Milton carry this tradition forward in their masterful uses of the doctrine of God's absolute power as a liberating analytical tool, which counters not only the dogmas of the old philosophy, but also those generated by the new. Raphael's "what ifs" and "ifs" are promptly introduced after an invocation of "The Maker's high magnificence" and "his Omnipotence" (8.101; 108). Step by step, the angel first leads Adam beyond his geocentric conception of the universe to the hypotheses of a heliocentric cosmos and a planetary Earth, then he leads him beyond the idea of a unique, bounded cosmos with a definite centre to the idea of a boundless Multiverse, in which any claim of a definite centre becomes meaningless. The same type of reasoning guided by the doctrine of God's absolute power also leads Montaigne well beyond the Ptolemaic-Copernican dispute of his time, and to proclaim the idea of the plurality of worlds as the most plausible and solid conjecture of human reason about God's creation.

Thus presenting the condemnation of 1277 as an incident by which the Christian faith paradoxically facilitated the progress of science, however, we cannot deny that, in its essence, the condemnation was the first serious confrontation between science and religion. As Grant points out, some contemporary philosophers certainly saw it as "a dangerous restriction to philosophical and theological inquiry" (213). Therefore, although it is true that the thirteenth-century event established a productively anti-dogmatic tradition under the doctrine of God's absolute power, we have to bear in mind that another tradition, which many understand to be anti-intellectual, takes its root in the most important story for man in the Christian faith – the fall. The teaching of this tradition is *Scientia inflat*, knowledge makes man swell. Indeed the serpent takes advantage of man's aspiration for knowledge in its temptation of man. In the scripture, it is a motif

propounded repeatedly by St. Paul in his first letter to the Corinthians: “For it is written, I will destroy the wisdom of the wise, and will bring to nothing the understanding of the prudent. Where is the wise? Where is the scribe? Where is the disputer of this world? hath not God made foolish the wisdom of this world?” (Corinthians 1.19-20). “Let no man deceive himself. If any man among you seemeth to be wise in this world, let him become a fool, that he may be wise. For the wisdom of this world is foolishness with God. For it is written, He taketh the wise in their own craftiness” (Corinthians 3.18-19). “And if any man think that he knoweth any thing, he knoweth nothing yet as he ought to know” (Corinthians 8.2).

We can see that this latter tradition is in direct conflict with the defining claims of the new science of the sixteenth and seventeenth centuries, namely knowledge is good, and human reason can grasp the reality and have true knowledge of the world. Because those were the centuries when practitioners and promoters of the new science were still Christians, efforts were often made to reconcile the two. It suits well our discussion of Montaigne and Milton that we take a look at such efforts made by Bacon, since both authors have been read as Baconians in terms of their attitudes toward learning.

“To clear the way” for his great project of the advancement of learning, Bacon sets himself the task of delivering the dignity of learning from “the discredits and disgraces it hath received, all from ignorance.” Such ignorance, Bacon believes, is “severally disguised” in “the zeal and jealousy of the divines,” “the severity and arrogancy of politiques,” and “the errors and imperfections of learned men themselves” (*Advancement*

of Learning⁷⁵ 5). We shall focus on Bacon's discussion of the first type of "ignorance."

Bacon presents the usual objections:

I hear the former sort say, that knowledge is of those things which are to be accepted of with great limitation and caution: that the aspiring to overmuch knowledge was the original temptation and sin whereupon ensued the fall of man: that knowledge hath in it somewhat of the serpent, and therefore where it entereth into a man it makes him swell; *Scientia inflat*: that Salomon gives a censure, *That there is no end of making books, and that much reading is weariness of the flesh*; and again in another place, *That in spacious knowledge there is much contristation, and that he that increaseth knowledge increaseth anxiety*: that Saint Paul gives a caveat, *That we be not spoiled through vain philosophy*: that experience demonstrates how learned men have been arch-heretics, how learned times have been inclined to atheism, and how the contemplation of second causes doth derogate from our dependence upon God, who is the first cause. (AL 5)

Bacon counters the objections one by one with scriptural support or citations. To answer the objection that pursuit of knowledge led to the fall, he distinguishes "the pure knowledge of nature and universality" by which Adam "did give names unto other creatures in Paradise" from "the proud knowledge of good and evil, with an intent in man to give law unto himself, and to depend no more upon God's commandments."

⁷⁵ Hereafter cited as *AL*.

Apparently the scripture has no objection against pursuit of the first kind of knowledge, it is only the second kind of knowledge that “gave the occasion to the fall” and was “the form of the temptation” (*AL* 5-6).

To refute the belief that knowledge makes man swell with intellectual pride, Bacon argues that it is not “any quantity of knowledge, how great soever, that can make the mind of man to swell; for nothing can fill, much less extend the soul of man, but God and the contemplation of God.” Bacon uses Solomon to counter Solomon’s own objection to knowledge and learning: “speaking of the two principal senses of inquisition, the eye and the ear, [Solomon] affirmeth that *the eye is never satisfied with seeing, nor the ear with hearing*; and if there be no fulness, then is the continent greater than the content.” In addition, the following saying from Solomon is also pro-learning: “*God thus made all things beautiful, or decent, in the true return of their seasons: Also he hath placed the world in man’s heart, yet cannot man find out the work which God worketh from the beginning to the end.*” Bacon understands this passage as a clear statement that “God hath framed the mind of man as a mirror or glass, capable of the image of the universal world, and joyful to receive the impression thereof, as the eye joyeth to receive light”; and God makes the mind of man thus so that his eye is “not only delighted in beholding the variety of things and vicissitude of times, but raised also to find out and discern the ordinances and decrees, which throughout all those changes are infallibly observed” (*AL* 6).

But does not Solomon state clearly that “*yet cannot man find out the work which God worketh from the beginning to the end*”? Yes, Bacon admits that in this sentence Solomon “doth insinuate that the supreme or summary law of nature [. . .] is not possible to be found out by man.” But he thinks it “doth not derogate from the capacity of the

mind, but may be referred to the impediments, as of shortness of life, ill conjunction of labours, ill tradition of knowledge over from hand to hand, and many other inconveniences, whereunto the condition of man is subject” (*AL 6-7*). In other words, Bacon believes that the human mind *is* capable of discovering the “supreme or summary law of nature”; though the task would obviously be impossible for one man or one generation of man to accomplish, by accumulative generations and generations of efforts of man it shall be accomplished. For in another place of the scripture, the same Solomon “doth rule over, when he saith, *The spirit of man is as the lamp of God, wherewith he searcheth the inwardness of all secrets*” – that is to say, “nothing parcel of the world is denied to man’s inquiry and invention” (*AL 7*).

Thus Bacon shows his reader that the scripture itself affirms that the human mind is capable of comprehending *all secrets* of the world. He reiterates: “it is manifest that there is no danger at all in the proportion or quantity of knowledge, how large soever, lest it should make it swell or out-compass itself” (*AL 7*). The danger lies “merely in the quality of knowledge” which “hath in it some nature of venom or malignity, and some effects of that venom, which is ventosity or swelling.” Like a good physician who makes his diagnosis then provides the cure, Bacon proffers “the corrective spice” for the symptoms of ventosity or swelling caused by the inquisition of knowledge, namely, “charity.” The prescription is taken directly from St. Paul, who says: “*Knowledge bloweth up, but charity buildeth up*” (*AL 7*).

We shall come back to Bacon’s corrective spice in due course. Now, our question is: are Montaigne and Milton both Baconians in terms of their attitude towards learning and knowledge? The following comparison rather reveals them to be anti-Baconians.

Montaigne and Milton the anti-Baconians

A first point in dispute between the two authors and Bacon is the question of bounds. Bacon has most eagerly asserted that there is no danger at all that the mind shall out-compass itself no matter how large the quantity of knowledge it takes. Milton's Raphael thinks the opposite. The angel will only answer Adam's "desire / Of knowledge, within bounds" (7.119-20). He points out unequivocally that there *is* danger for the mind to out-compass itself: "knowledge is as food, and needs no less / Her temperance over appetite, to know / In measure what the mind may well contain, / Oppresses else with surfeit, and soon turns / Wisdom to folly, as nourishment to wind" (7.126-30). Montaigne provides a perfect illustration of Raphael's point: his own testimony of the case of Torquato Tasso, the Italian poet who had been in the grip of madness for many years, and thus one of the "Countless minds [. . .] ruined by their very power and suppleness" [*Infinis esprits ... ruinez par leur propre force et souplesse*]:

What a leap has just been taken, because of the very restlessness and liveliness of his mind, by one of the most judicious and ingenious of men, a man more closely molded by the pure poetry of antiquity than any other Italian poet has been for a long time! Does he not have reason to be grateful to that murderous vivacity of his mind? To that brilliance that blinded him? To that exact and intent apprehension of his reason, which has deprived him of reason? To the careful and laborious pursuit of the sciences, which has led him to stupidity? To that rare aptitude for the exercises of the mind, which has left him without exercise and without mind? I felt even more vexation than compassion to see him in Ferrara in so piteous a state, surviving himself,

not recognizing himself or his works, which, without his knowledge and yet before his eyes, have been brought out uncorrected and shapeless.

(“Apology,” *Complete Works* 363)⁷⁶

What Bacon argues against, Montaigne and Milton reinforce.

A second point in dispute between Bacon and the two authors is whether the human mind can attain to the universal knowledge of the world. Bacon has argued for the affirmative. He believes the true limitations for man to achieve this goal are only the shortness of man’s lifespan, and other disadvantages and inconveniencies pertaining to the human condition, which however can be remedied by patient, long-term, and accumulative efforts of the human race. Here is what Montaigne has to say on this subject. He readily agrees that

[. . .] it is not easy to set limits to our mind: it is curious and insatiable, and has no occasion to stop at a thousand paces any more than fifty. Having found by experience that where one man had failed, another has succeeded, and that what was unknown to one century the following century has made clear, and that the sciences and arts are not cast in a mold, but are formed and shaped little by little, by repeated handling and polishing, as the bears lick their cubs

⁷⁶ Quel saut vient de prendre, de sa propre agitation et allegresse, l'un des plus judicieux, ingenieux et plus formés à l'air de cette antique et pure poisie, qu'autre poete Italien aye de long temps esté? N'a il pas dequoy sçavoir gré à cette sienne vivacité meurtrière? à cette clarté qui l'a aveuglé? à cette exacte et tendue apprehension de la raison qui l'a mis sans raison? à la curieuse et laborieuse queste des sciences qui l'a conduit à la bestise? à cette rare aptitude aux exercices de l'ame, qui l'a rendu sans exercice et sans ame? J'eus plus de despit encore que de compassion, de le voir à Ferrare en si piteux estat, survivant à soy-mesmes, mesconnoissant et soy et ses ouvrages, lesquels, sans son sçeu, et toutesfois à sa veue, on a mis en lumiere incorrigez et informes. (*Les Essais* 2.12.492)

into shape at leisure, I do not leave off sounding and testing what my powers cannot discover; and by handling again and kneading this new material, stirring it and heating it, I open up to whoever follows me some facility to enjoy it more at his ease, and make it more supple and manageable for him, [. . .]. The second will do as much for the third; which is the reason why difficulty should not make me despair, nor my impotence either, for it is only my own. (“Apology,” *Complete Works* 420-1)⁷⁷

This is precisely the Baconian plan, laid out here decades before Bacon’s *Advancement of Learning*, but it is not all Montaigne has to say. He continues:

Man is capable of all things as he is of any. And if he confesses as Theophrastus says, ignorance of first causes and principles, let him boldly give up all the rest of his knowledge. If his foundation is lacking, his argument is flat on the ground. Discussion and inquiry have no other aim and limit but principles; if this terminus does not stop their course, they fling themselves into infinite irresolution. (“Apology,” *Complete Works* 421)⁷⁸

⁷⁷ il est malaisé de donner bornes à nostre esprit: il est curieux et avide, et n'a point occasion de s'arrester plus tost à mille pas qu'à cinquante. Ayant essayé par experience que ce à quoy l'un s'estoit failly, l'autre y est arrivé, et que ce qui estoit incogneu à un siecle, le siecle suyvant l'a esclaircy, et que les sciences et les arts ne se jettent pas en moule, ains se forment et figurent peu à peu en les maniant et pollissant à plusieurs fois, comme les ours façonnent leurs petits en les lechant à loisir: ce que ma force ne peut descouvrir, je ne laisse pas de le sonder et essayer; et, en retastant et pétrissant cette nouvelle matiere, la remuant et l'eschaufant, j'ouvre à celuy qui me suit quelque facilité pour en jouir plus à son ayse, et la luy rends plus souple et plus maniable, [. . .]. Autant en fera le second au tiers: qui est cause que la difficulté ne me doit pas desesperer, ny aussi peu mon impuissance, car ce n'est que la mienne. (*Les Essais* 2.12.560-1).

⁷⁸ L'homme est capable de toutes choses, comme d'aucunes; et s'il advoue, comme dit Theophrastus, l'ignorance des causes premieres et des principes, qu'il me quitte hardiment tout le reste de sa science: si le fondement luy faut, son discours est par terre; le disputer et l'enquerir n'a autre but et arrest que les principes; si cette fin n'arreste son cours, il se jette à une irresolution infinie. (*Les Essais* 2.12.561)

Again, Montaigne's argumentation serves his belief that human reason, without outside help, i.e., divine revelation, cannot attain to truth, or what Bacon calls "the supreme law of nature." Milton shares Montaigne's belief. Uriel indicates that the causes of things are hidden beyond the capacity of the mind of both angel and man. Raphael asks Adam to be contented with what God has revealed thus far. The same point is most clearly illustrated in *Areopagitica* with the Osiris-Isis myth:

Truth indeed came once into the world with her divine Master, and was a perfect shape most glorious to look on: but when he ascended, and his Apostles after him were laid asleep, then strait arose a wicked race of deceivers, who as that story goes of the *AEgyptian Typhon* with his conspirators, how they dealt with the good *Osiris*, took the virgin Truth, hewed her lovely form into a thousand peeces, and scatter'd them to the four winds. From that time ever since, the sad friends of Truth, such as durst appear, imitating the careful search that *Isis* made for the mangl'd body of *Osiris*, went up and down gathering up limb by limb still as they could find them. We have not yet found them all, [. . .], never shall doe, till her Masters second comming (*YP* 2.549)

This recalls Montaigne's understanding of nature as "a veiled and shadowy picture, shining through here and there with an infinite variety of false lights to exercise our conjectures," and human reason by itself can never grasp nature as it is.

But does not Bacon also distinguish the first and second causes? Does he not say that he only proposes to study the second causes of God's creatures and works, and aims not to attain to the mysteries of God the first cause? On the other side, how do we square

Montaigne's and Milton's insistence on the limit and bound of the human mind and its incapacity to obtain true knowledge without divine revelation, with their shared recognition that man is created by God with a natural desire to know that knows no limit and bound?

Let us take those questions in order. Bacon's distinction and claim are crucial indeed. They were intended as, and seem to be, important justifications for his project against the accusation that learning inclines man to atheism. But in actuality, they were radical steps towards the separation of reason and faith, science and religion. Bacon readily agrees that the first cause, which is "the nature or will of God" or God himself (*AL* 8-9), is necessarily enrappt in mysteries and unattainable for the human mind. But, in the Baconian context, this is not a statement of epistemological scepticism. Bacon rather uses it to divert the human inquiry from the first cause, and to direct it only to the second causes. Shifting the focus of human inquiry from the first cause to the second causes does not mean a renunciation of the human claim to truth. On the contrary, Bacon clearly believes that a sure grasp of the second causes of things will lead man to discovering "the supreme or summary law of nature": "For certain it is that God worketh nothing in nature but by second causes"; "for the contemplation of God's creatures and works produceth (having regard to the works and creatures themselves) knowledge, but having regard to God, no perfect knowledge, but wonder, which is broken knowledge" (*AL* 9). In these statements, and in their underlying assumption, we recognize the mind of Bacon as congenial to the spirit of the new science in spite of his anti-Copernicanism. Bacon's understanding of nature as only determined by second causes had already been pointing towards a mechanistic worldview – saying that "God worketh nothing in nature but by

second causes” is also saying that even God has to follow the rules and laws (that is, identified by man) by which the world operates, although, Bacon still acknowledges, He is the ultimate cause of things.

Bacon’s distinction of the first and second causes also fundamentally informs his distinction of the studies of the two books. The study of the book of God’s word should now be restricted to the domain of theology, whereas study of the book of God’s works is the proper field of philosophy. And men who study the two books should not “unwisely mingle or confound these learning together” (*AL* 10). In other words, to know God and to know nature are two different projects. Bacon readily renounces the claim to true knowledge in the former project, but he unequivocally asserts it in the latter. To show how man can attain to the true knowledge of the natural world is what Bacon’s project is about. Bacon recognizes that “the fabric of the universe, its structure, to the mind observing it, is like a labyrinth, where on all sides the path is so often uncertain, the resemblance of a thing or a sign is deceptive, and the twists and turns of natures are so oblique and intricate.” But that does not mean the human mind cannot understand the fabric of the universe and the nature of things. Certainly “one cannot count on the unaided power of men’s judgement; one cannot count on succeeding by chance.” To succeed, we need “a thread to guide our steps; and the whole road, right from the first perceptions of sense, has to be made with a sure method” (Bacon, *New Organon* 10). Such a method and such a thread, which promise “human progress and empowerment” (*New Organon* 13), and will eventually lead us out of the labyrinth, are what Bacon claims to offer.

Thus it is only right that we identify Bacon as a pillar of the new science in his confidence in the power of the human mind to grasp reality as it is and in his emphasis on the scientific method. If we follow Koyré and agree with him that the new science leads to an understanding of the world as eternal, mechanical, and “unified only by the identity of its ultimate and basic components and laws” which in turn will render God and his creation unnecessary, then Bacon has taken a crucial stride towards that direction. If we recall Kuhn’s historical thesis that the new science demands a break between reason and faith, then Bacon, advocating a rigorous demarcation of the studies of the book of nature and the book of God’s word, seems to testify the validity of this thesis. Moreover, if Kuhn is right that reason and faith are irreconcilable, then Bacon seems to provide the best solution possible to let the two go about their respective businesses peacefully, that is, by not entering into each other’s domains.

If we try to fit Montaigne and Milton into the historical framework of Koyré and Kuhn, we will find them hopelessly stuck in contradictions. How could they maintain that reason and faith are compatible when the two were, it seems, increasingly irreconcilable? However, as we have stated briefly in the end of chapter two, and also above in this chapter, we have to remind ourselves that there was another tradition to which both authors could resort when they formulated their compatible model. As mentioned above, the condemnation of 1277 was the first serious conflict between science and religion. The event was a valuable preparation for Christian thinkers to respond to the challenges posed by the new science almost three centuries later. The issues at stake in the two conflicts between science and religion are similar and boil down to the question: how we are to understand the relationship between God and the physical world? In the thirteenth

century, the specific question was: should we interpret the physical world in strict conformity with the laws and principles of Aristotle even though such interpretations conflicted with the Christian view?⁷⁹ The question in the sixteenth and seventeenth centuries was: should we believe that the world is necessarily in the form and shape depicted by the new astronomy, and governed by those rules and laws construed by the new philosophy, and that God has to work by these rules and laws? The new science denounces Ptolemy and Aristotle only to replace their laws and rules with its newly formulated ones. But it lays its claim to truth much more unequivocally and powerfully, aided by empirical evidence, new instruments and new methods. The conflict between the new science and religion becomes an ever more heightened one between the truth claims made respectively by man and by God.

There were those who, trying to defend the Christian faith against the assault of the new science, resorted to a type of fideism, which is – in Popkin’s words – “anti-intellectual,” “destructive.” Bacon offered a non-interference solution, which, while severing the study of nature from the study of God, also confines the latter within bounds. But Cusanus, who came to the idea of an infinite, homogeneous universe whose center is everywhere and circumference nowhere through his contemplation of God, gave Montaigne and Milton a model of human inquiry in which reason and faith are compatible.

⁷⁹ See Grant, p.212.

A brief comparison of the Baconian and Cusan projects will help us see more clearly why Montaigne and Milton choose the latter and critique the former. Bacon imagines human inquiry, properly regulated by his new method, as an accumulative growth of knowledge that will eventually culminate in the discovery of truth or what he calls the supreme law of nature. He sees learning and absolute freedom of inquiry as good and definitely opposed to ignorance and any limitation or bounds. He also believes that man's capacity to know must be greater than his desire to know – as quoted above, for Bacon, Solomon's saying that "*the eye is never satisfied with seeing, nor the ear with hearing*" means that "if there be no fulness, then is the continent greater than the content." Cusanus's understanding of human inquiry is Socratic, paradoxical. The end of human inquiry is not truth but learned ignorance, that is, to fully attain to the knowledge of our ignorance. Knowing is paradoxically not knowing: "The more [one] knows he is unknowing, the more learned he will be" (*DI* 1.1.4). This paradoxical mode of reasoning is based upon assumptions almost diametrically opposed to those of Bacon. Cusanus believes human knowing can never grasp truth as it is, it can only be striving forever towards it. Accordingly, he recognizes that man's capacity to know is never adequate to his desire to know. The desire to know is indeed a gift from God. It drives and propends us to know what we do not know, even though we can have true knowledge neither of created things, nor of God. To be learned in ignorance is also to recognize the bounds of human reason and mind. But when we recognize it, we are already beyond it. Thus bounds are also leaps.

Bacon separates the study of nature from the study of God, and distinguishes our being from our knowing – our being is necessarily finite, mortal, imperfect, but our

knowing, he claims, can be infinite, immortal and perfect. We may rightly say that the Baconian project of the advancement of learning is indeed a self-elevation of man, through which man, despite his existential conditions, aims to take the place of God in the physical world. And the physical world Bacon understands to be a finite, ordered structure, completely knowable to the human mind. He compares the human inquiry into the world to a game of hide and seek: “the divine nature delighted in the innocent and amusing children’s game in which they hide themselves purposely in order to be found” (*New Organon* 12). Cusanus’s project of learned ignorance, as Clyde Lee Miller points out, is nothing less than a project of “thinking God”; and for Cusanus, “thinking God was a heartfelt religious desire as well as an ambitious intellectual project” (1). Cusanus understands God as the Absolute Maximum or the Absolute One “in which is all things,” and “all things are in the Maximum.” Human inquiry into things is therefore also an effort to “investigate incomprehensibly above human reason this Maximum” (*DI* 1.2.5). Thus with Cusanus, knowing nature and knowing God are one project, which is at the same time religious and intellectual; our knowing is not and cannot be distinguished from our being, they are both necessarily finite and imperfect.

Both Montaigne and Milton approve the Cusan project of learned ignorance and reject a Baconian advancement of learning which aims to elevate man above his being and beyond his capacity. Montaigne’s denunciation of Copernicanism at some point of his “Apology” should be understood as a rebuke of the new science’s elevation of man rather than a defense of geocentrism: “in his imagination he goes planting himself above the circle of the moon, and bringing the sky down beneath his feet. It is by the vanity of this same imagination that he equals himself to God, attributes to himself divine

characteristics” (*Complete works* 330).⁸⁰ To counter this mode of human inquiry aiming at self-elevation, Montaigne invokes the Socratic-Cusan project of learned ignorance:

The wisest man that ever was, when they asked him what he knew, answered that he knew this much, that he knew nothing. He was verifying what they say, that the greatest part of what we know is the least of those parts that we do not know; that is to say the very thing we think we know is a part, and a very small part, of our ignorance. (“Apology,” *Complete Works* 370)⁸¹

Montaigne’s approval of the Cusan mode of human inquiry shines only more brightly when placed side by side with his disapproval of the human claim to truth, of bounding God to the compass of man: “[What is] more vain than to try divine God by our analogies and conjectures, to regulated him and the world by our capacity and our laws, and to use at the expense of the Deity this little shred of ability that he was pleased to allot to our natural condition?” (“Apology,” *Complete Works* 380).⁸² But it is a different matter when human inquiry is understood as knowing God. In Montaigne as in Cusanus, knowing God is both a religious and an intellectual project:

⁸⁰ “se va plantant par imagination au dessus du cercle de la Lune et ramenant le ciel sous ses pieds. C’est par la vanité de cette mesme imagination qu’il s’egale à Dieu, qu’il s’attribue les conditions divines” (*Les Essais* 2.12.452).

⁸¹ Le plus sage homme qui fut onques, quand on luy demanda ce qu’il sçavoit, respondit qu’il sçavoit cela, qu’il ne sçavoit rien. Il verifioit ce qu’on dit, que la plus grande part de ce que nous sçavons, est la moindre de celles que nous ignorons; c’est à dire que ce mesme que nous pensons sçavoir, c’est une piece, et bien petite, de nostre ignorance. (*Les Essais* 2.12.501)

⁸² qu’est-il plus vain que de vouloir deviner Dieu par nos analogies et conjectures, le regler et le monde à nostre capacité et à nos loix, et nous servir aux despens de la divinité de ce petit eschantillon de suffisance qu’il luy a pleu despartir à nostre naturelle condition? (*Les Essais* 2.12.512-3)

Pythagoras adumbrated truth more closely in judging that the knowledge of this first cause, and being of beings, must be undefined, unprescribed, undeclared; that it was nothing else but the utmost effort of our imagination toward perfection, each man amplifying the idea of it according to his capacity. (“Apology,” *Complete Works* 381)⁸³

It is based upon this understanding that Montaigne appreciates Epicurus’s Atoms, Plato’s Ideas and Pythagoras’s Numbers not as true, but as “some semblance of light, such as it was” “into the obscurity and ignorance of this world.” [*une telle quelle image de lumiere*] “*en cette obscurité et ignorance du monde*”]. Their theories save the appearances as the best they can but cannot claim to be absolutely true: “they exercised their minds on such conceptions as had at least a pleasant and subtle appearance, provided that, false though they might be, they could hold their own against opposing ideas” (“Apology,” *Complete Works* 379).⁸⁴ With the same understanding Montaigne applauds Copernicus for having “grounded [the heliocentric hypothesis] so well that he uses it very systematically for all astronomical deduction,” but does not bother whether it is true, because another opinion will probably overthrow it in the future.

In chapter two we have shown that Milton’s attitude towards astronomical inquiry and the Copernican hypothesis agrees with the Cusan attitude towards human inquiry in

⁸³ Pythagoras adombra la verité de plus pres, jugeant que la connoissance de cette cause premiere et estre des estres devoit estre indefinie, sans prescription, sans declaration; que ce n'estoit autre chose que l'extreme effort de nostre imagination vers la perfection, chacun en amplifiant l'idée selon sa capacité. (*Les Essais* 2.12.513)

⁸⁴ “[ils] ont promené leur ame à des inventions qui eussent au moins une plaisante et subtile apparence: pourveu que, toute fausse, elle se peust maintenir contre les oppositions contraires” (*Les Essais* 2.12.511).

general. To briefly summarize, in Milton as in Cusanus and Montaigne: to know the created things and to know God are of the same inquiry; we strive to know God through the created things, but we have true knowledge neither of the created things nor of God; our desire to know is insatiable, but our capacity to know is necessarily limited – the former gives momentum to our “near tending,” enables us to reaching bounds and taking leaps at the same time; whereas the latter is traced back ultimately to the incommensurability between the Creator and the creatures, both in terms of being and knowing.

Unlike St. Thomas Aquinas who gives omniscience to angels, in *Paradise Lost* Milton, in accordance with the Cusan hierarchy of the Absolute One and the many “Endued with various forms, various degrees / Of substance, and in that live, of life” (*PL* 5.471-2), portrays angelic knowing as conditioned, contextualized, and proportional to their being. The angels, just as man, are always in the midst of knowing and unknowing, judging and choosing. Thus when Satan first finds Uriel on the Sun, he finds him “fixed in cogitation deep” (*PL* 3.629). Milton emphasizes the imperfect knowing of the angels by telling us that “the false dissembler” is “unperceived” by Uriel, who is “regent of the sun, and held / The sharpest sighted Spirit of all in Heav’n” (*PL* 3.681; 690-1). The same imperfection of knowing also belongs to Satan, whose perception in his space travel is necessarily conditioned by his changing perspectives: from a distance, the outside of our universe “seemed / Firm land imbosomed without firmament, / Uncertain which, in ocean or air” (*PL* 3.74-6); when he finally alights it, he notices the change of his perception: “a globe far off / It seemed, now seems a boundless continent / Dark, waste and wild, under the frown of Night / Starless exposed” (*PL* 3.422-4). Thus in these places and others

Milton makes the point that angelic and human knowing are indeed “differing but in degree, of kind the same” (*PL* 5.490). Both are necessarily conditioned and conjectural. Angelic reasoning is more powerful, but not infallible.

Viewed in light of the Cusan project of learned ignorance, God’s command that the fruit of the tree of knowledge is forbidden is not a divine caveat of the freedom of human inquiry, but a true statement of our natural condition. Knowledge here of course means Truth, the precise understanding of reality as it is, which will be forever out of reach for both man and angel. Is then our condition wretched and hopeless, because we are given an insatiable desire to know but will never attain to true knowledge? W. Gardner Campbell in his article “Paradisal Appetite and Cusan Food in *Paradise Lost*” shows us that Cusanus rather understands it to be joyous and blessed, who describes the situation as

[. . .] someone hungry were seated at the table of a great king, where he was supplied with the food he desired, so that he did not seek any other food. The nature of this food would be [such] that in filling him up it would also whet his appetite. If this food were never depleted, it is obvious that the perpetual consumer would always be filled, would always desire this same food, and would always willingly be brought to the food. And so, he would always be able to eat; and after having eaten, he would still be able to be led to the food with whetted appetite. (qtd. in Campbell 242-3)

In light of this description of the Cusan food, Campbell gives us wonderful insights into Milton’s paradoxical conception of bounds and freedom, temperance and immoderation, which makes life in Paradise truly joyful and blessed. On the same question whether we

are wretched and hopeless because we will never attain to what we desire, or we are better off if we can attain to knowledge, Montaigne helps our contemplation with an anecdote of Democritus:

Democritus, having eaten at his table some figs that tasted of honey, immediately began to seek out in his mind whence came this unaccustomed sweetness; and to clear up the matter, he was about to get up from the table to see the situation of the place where these figs had been gathered. His maidservant, having heard the cause of this stir, laughed and told him not to trouble himself about it, for the reason was that she had put them in a vessel where there had been some honey. He was vexed that she had deprived him of this occasion for research and robbed him of matter for curiosity: “Go along,” he said to her, “you have made me angry; I will not for all that give up seeking the cause as if it was a natural one.” And he willfully sought and found some “true” reason for a false and supposed effect. (“Apology,” *Complete Works* 378)⁸⁵

What would happen if we are given what we desire? Would we then prefer to be left in our former Tantalus- or Sisyphus-like condition? And given this scenario, do we still feel

⁸⁵ Democritus, ayant mangé à sa table des figues qui sentoient le miel, commença soudain à chercher en son esprit d'où leur venoit cette douceur inusitée, et, pour s'en esclaircir, s'aloit lever de table pour voir l'assiete du lieu où ces figues avoyent esté cueillies; sa chambriere, ayant entendu la cause de ce remuement, luy dit en riant qu'il ne se penast plus pour cela, car c'estoit qu'elle les avoit mises en un vaisseau où il y avoit eu du miel. Il se despita dequoy elle luy avoit osté l'occasion de cette recherche et desrobé matiere à sa curiosité: Va, luy dit-il, tu m'as fait desplaisir: je ne lairray pourtant d'en chercher la cause comme si elle estoit naturelle. Et ne faillit de trouver quelque raison vraye d'un effect faux et supposé. (*Les Essais* 2.12.510-1)

that Satan is justified to query, as if on behalf of us: “knowledge forbidden? / Suspicious, reasonless. Why should their Lord / Envy them that? Can it be sin to know, / Can it be death? And do they only stand / By ignorance, is that their happy state, / The proof of their obedience and their faith?” (*PL* 4.515-20).

Many readers of Milton have felt that Satan’s questions are just. But we should point out the problematic Baconian assumptions behind these questions: knowledge is an absolute good; knowledge is definitely opposed to ignorance; if faith demands ignorance, then it is reasonless, suspicious. Satan can be said to be a Baconian rationalist, who sees himself an equal to God in reason, inferior only in force. As we hear him immediately after his fall from heaven: “farthest from him is best / Whom reason hath equalled, force hath made supreme / Above his equals” (*PL* 1.247-8). There is more to explore between Milton’s depiction of Satan and the Baconian attitude towards faith. We have mentioned that Bacon prescribes a “corrective spice” for the symptoms of ventosity or swelling caused by the aspiration to knowledge, namely “charity.” But how do we apply it? Bacon shows us in his Preface to the *New Organon*. After a general explanation of his ambitious project, Bacon applies the corrective spice first in a prayer:

We [. . .] humbly pray that the human may not overshadow the divine, and that from the revelation of the ways of sense and the brighter burning of the natural light, the darkness of unbelief in the face of the mysteries of God may not arise in our hearts. Rather we pray that from a clear understanding, purged of fantasy and vanity, yet subject still to the oracles of God and wholly committed to them, we may give to faith all that belongs to faith. And finally we pray that when we have extracted from knowledge the poison

infused by the serpent which swells and inflates the human mind, we may not be wise with too high or too great a wisdom, but may cultivate the truth in all charity. (12)

Prayer done, then “some salutary advice” to men:

First we advise (as we have prayed) that men may restrain their sense within their duty, so far as the things of God are concerned. [. . .]. And then we warn men not to err in the opposite direction as they avoid this evil; which will certainly happen if they believe that any part of the inquiry into nature is forbidden by an interdict. [. . .]. For the angels fell because of an appetite for power; and men fell because of an appetite for knowledge; but charity knows no bounds; and has never brought angel or man into danger. (*New Organon* 12-3)

Despite the announced intentions of these passages, we can hardly miss the throbbing tension between reason and faith in Bacon’s expressions: “*subject still* to the oracle of God and wholly committed to them”; “give to faith all that belongs to faith”; and “*restrain* their sense within their duty, so far as the things of God are concerned” (my emphases). Separating the study of nature and study of God, and claiming to aspire to knowledge only in the former, now man only needs to pay his service due to faith and to remind himself to seek knowledge with charity. Is that not an easy task? Milton shows us that an easy service becomes unbearable for an ambitious mind. Satan recalls his fall: “lifted up so high / I ‘sdained subjection, and thought one step higher / Would set me highest, and in a moment quit / The debt immense of endless gratitude, / So burdensome, still paying, still to owe” (*PL* 4.49-53). Indeed he sees that “a grateful mind / By owing

owes not, but still pays, at once / Indebted and discharge; what burden then?" (PL 4.55-7). But his dilemma is that he cannot adore God anymore once he believes that he is equal to God in reason, inferior only in force: faith becomes an onerous duty, subjection, limitation, unbearable servitude; but faithless and fallen he is in an even more miserable condition and finds only "infinite wrath, and infinite despair," "And in the lowest deep a lower deep / Still threat'ning to devouring [him] open wide" (PL 4.74; 76-7).

Milton artistically translates the consequence of the Baconian solution to the problem of reason and faith into Satan's dilemma, which is also the dilemma of modernity. As Harries rightly points out in his *Infinity and Perspective*, at the bottom of the dilemma of modernity is the problem of freedom.⁸⁶ In Satan's soliloquy on Mount Niphates we find him to be truly unable to persuade himself that he could not have fallen, because he cannot reconcile his ambition with submission; nor could he believe that he can be redeemed, because he cannot repent – one can repent only by submission, "and that word, / Disdain forbids me" (PL 4.81-2). Satan revolted to be free from those "feigned submission swore" (PL 4.96) in heaven, but cast out of heaven and then breaking loose from Hell he cannot find freedom: "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 place" (PL 4.20-4).

It is significant that Milton lets us know that an important claim Satan makes to justify his self-assertion is that he is equal to God in reason. If we examine Satan's

⁸⁶ See Harries, *Infinity and Perspective*. Chapter 1 "Introduction: the Problem of the Modern," pp.2-20.

assertion against the historical background of *Paradise Lost*, we cannot but connect it to the same assertion of the authority of human reason made by the new science, which is typically represented by the Baconian project. As stated in this chapter, reason and faith would be incompatible if we believe that man can attain to truth and take the place of God. But with their shared understanding of the infinity of the universe (or the multiverse) and the infinity of God, Milton, together with Cusanus and Montaigne, shows us that the human (and angelic) inquiry is a Sisyphus / Tantalus project. Our capacity to know is disproportionate to our desire to know. And we can never attain to truth, but are always in the midst of striving towards it. If we recognize our condition as such, then we can “be lowly wise.”

Chapter 4 The Miltonic Simile

. . . all those who make an investigation judge the uncertain proportionally, by means of a comparison with what is taken to be certain.

– Cusanus, *On Learned Ignorance*

In his article “Milton and Ramist Similitude,” Christopher Grose draws our attention to what he believes to be “Milton’s most important original departure from his Ramist sources” in the *Art of Logic*. The relevant passage, part of “Milton’s only formal theory of similitude,” goes as follows:

*Similitude is called proportion, in Greek usually analogy, and similars are called proportionals, or, in Greek, analogues. But proportion is nothing other than similitude of two processes of reasoning. But a process of reasoning is the comparison of two terms or things among themselves. **

Warning, however, should be given that likes whether of short or full form are not to be urged beyond that quality which the man making the comparison intended to show as the same in both. Thus a magistrate is likened to a dog, yet merely in the fidelity of his guardianship, whence came the sayings of the

schools: “Nothing similar is identical; likeness does not run on four feet; every likeness hobbles.” (*The Works of John Milton*⁸⁷ 11.193-5)

After three sentences recognizably Ramist, an asterisk ushers in a caveat. Grose points out that Milton’s emphasis on “the man making the comparison” is nowhere to trace in Ramus’s *Dialectica* and writings of other Ramists:

He [Milton] puts the burden of emphasis on “the man making the comparison” (*assimilanti*) – on the poet’s “intention,” one might say, as declared in the specific terms for the comparison. By introducing the logical inventor (or poet?), Milton shifts somewhat abruptly from the intrinsic rationality assumed to inhere in all Ramist arguments. Moreover, in citing the school formula *omne simile claudicat* – “every likeness hobbles” – Milton diverts the general thrust of Ramist theory, which in this context begins with the proposition that “proportion not merely mathematical but also logical is common to all things” and moves (inevitably enough, perhaps, given the premise) toward the critical practice of inverting and alternating terms and elements. Significantly, Milton’s caveat, apparently so skeptical on an important Ramist assumption, replaces extensive passages in the sources [. . .]

(109)

This sceptical departure from Ramist sources is not the only one Grose finds in Milton’s *Art of Logic*. Another one stands at the first sentence of chapter one, “What is Logic?”

⁸⁷ Columbia edition. Hereafter cited as *Works*.

Milton gives the definition as “Logic is the art of reasoning well.” Immediately drawing his reader’s attention to the word “well” missing in Ramus, Milton explains that “In order to distinguish the perfection of the art from the imperfection of the natural faculty, the word *well* [*bene*], that is rightly, skillfully, promptly, is added to the definition” (*Works* 11.19). Grose reads this addendum as a reminder of “human knowledge in all its frailty” (110). This leads him to yet another sceptical departure, one with the broadest sweep. There Milton discusses the difficulty of knowing “form” at all. Again he starts with traditional definitions. Form is “*the cause through which a thing is what it is*”; it is “*produced in the thing simultaneously with the thing itself*”; and cause or form is “the fount of all knowledge” (*Works* 11.59; 61). Then, as in the similitude passage quoted above, Milton uses the word “but” [*sed*] to bring in his caveats:

But to know the internal form of anything, because it is usually very remote from the senses, is especially difficult. In artificial things, however, the form, as being external and exposed to the senses, is more easily observed [. . .]

But there is no true distribution of form. For the distribution of internal or external which some hold will not apply to all things but merely to the corporeal; and the external is not less essential to each artificial thing than the internal to each natural thing. (*Works* 11.63)

Here Grose sees Milton defining “the difficulty basic to any knowing as being precisely the confusion between internal form and sensuous experience” and further remarks that “It would be difficult to surpass this emphasis on the problems faced in acquiring true knowledge” (111; 112). He cannot but notice that “substantially the same attitude pervades Milton’s discussion of the relation between ‘definition’ and ‘description’”

(112). Milton distinguishes a “*perfect*” definition from an “*imperfect*” one. A perfect definition is “*that which depends only on the causes constituting the essence of the thing defined*”; an imperfect definition is called a “*description*” (*Works* 11.263). Again, after the differentiation, a caveat awaits:

Because of the obscurity of causes and especially of forms, perfect definitions are difficult to come upon. *Description* has been devised to supply their scarcity. *Description* is an imperfect *definition, defining a thing through other arguments*, that is, explaining the thing in some way from whatever is available.

So where form cannot be had (for the genera are commonly better known) a property must be accepted in place of form or distinguishing difference, as when it is said *An angel is an incorporeal substance; or A horse is an animal that whinnies*, etc. (*Works* 11.267)

After some general remarks on the purpose of the *Art of Logic*, Grose presents us with one last sceptical departure from Ramus he identifies in Milton’s book, this time on the more general difficulty with language. Discussing the subject “notation” or etymology, Milton first makes it clear that he agrees that “*Names are truly the signs of things, and a reason for any name whether derived or composite, if the name was bestowed with true notation, can be given from some primitive argument*” (*Works* 11.219). Then as expected:

But languages, both that first one which Adam spoke in Eden, and those varied ones also possibly derived from the first, which the builders of the

tower of Babel suddenly received, are without doubt divinely given; hence it is not strange if the reason of primitive words is unknown. (*Works* 11.221)

Grose reads this caveat as “simply a manifestation of the general linguistic predicament [of the entire human race]”; and making it, “Milton enters serious reservations about the human capacity to know truly and about the possibility of recovering in language the ‘symbol of some primitive argument,’ even though languages ‘are without doubt divinely given’” (113).

Above I have presented Grose’s findings from Milton’s *Art of Logic* with complete quotations, partly for the purposes of following discussions in this chapter, partly because they were largely ignored in past studies of Milton’s epic similes. Critics have formulated various theories of the Miltonic simile without referencing “Milton’s only formal theory of similitude.”⁸⁸ But if they seldom paid attention to it even after Grose’s article, it seems that Grose himself was somewhat responsible for that. Sharp-sighted in spotting the “underlying epistemological skepticism, the doubt of the power of men’s minds” (111) implicit in Milton’s discussion of similitude, logic and language in general, he however does not quite know what to make of it in relation to Milton’s epic similes. Indeed his article is torn by contradictory impulses to the point that he explicitly discourages his reader from utilizing his findings in reading Milton’s poetry.

It is clear to him that Milton’s discussion of similitude in the *Art of Logic* shows “significant independence from Ramist methods and even assumptions” and “a total

⁸⁸ As far as I know, Herman is the only other critic beside Grose who refers to Milton’s warning in the first quoted passage. His response to it shall be presented below.

theory of knowledge and language is involved” (104). The traditional Ramist attitude does not distinguish the logical and mathematical proportion inherent in things from man’s subjective perception of it, in other words, the proportion is simply assumed to be “common to all things.” Functioning as a principle of similes, the Ramist assumption would be “indicated, perhaps, in neat, detailed correspondences between formal image and immediate context” (Grose 114). Grose believes that most of Milton’s own epic similes exemplify such neat, detailed correspondences desired by the Ramist principle. Indeed it is what “James Whaler’s discussion of Miltonic ‘homologation’ amply demonstrates” (Grose 114).

At the same time, Grose is aware, “As many readers have noticed,” that “the occasion of likeness in the similes of *Paradise Lost* accounts for only part of their total effects”; the problem is that “Milton is not very helpful to readers of his own similes in putting the burden of the reader’s attention on the intention of the poet or arguer” (114). Soon “not very helpful” becomes “perplexing”: “invoking what the ‘assimilating’ poet or arguer proposes to show, [Milton] has implicitly refused to encourage examination of the argumentative poem itself, apart from that perplexing cause of its being, the ‘person’ of its poet” (114).

Thus identifying “the man making the comparison” or the *assimilanti* with the poet, Grose sees that the question to what degree Milton is a Ramist becomes important. If earlier in his article he has emphasized Milton’s originality in his skeptical departures from his sources, towards the end of his article he wishes to play it down. Milton is not that original after all. Except for the emphasis on the *assimilanti*, or on “the man making the comparison,” degrees of scepticism can be detected in writings of other Ramists. And,

Even if the evidence for Milton's departure from Ramism bulked much more largely than it does in the *Art of Logic*, it would be difficult to assess fairly the question or degree of Milton's Ramism. I wish to imply no such innovation. [. . .]. We still need to know how scrupulous Milton's Ramism was. [. . .] (114)

Likewise when using Milton's *Art of Logic* as "one guidepost" of his poetry, "we must pick our way carefully," and limit discussion to general terms, because "it is dangerous, if tempting, to speak of the relation between Milton's handbook and the poems in terms more specific than these [the aspects Grose prescribed]" (Grose 114).

Apparently and understandably, Grose is anxious about the connection between Milton and scepticism – the two do not usually go together in the mind of most Miltonists. But let us put Grose's article aside for a while, and come to James Whaler's well-known discussion of the Miltonic simile. As already mentioned by Grose, the thrust of Whaler's argument is homologation, which is in turn based upon his belief that Milton's similes are "reducible to logical patterns" (1034). Whaler groups Milton's similes by patterns. Introducing a whole set of symbols, he reduces each pattern to a formula. Indeed, he successfully fits a good number of Milton's similes into the group headed by "*Complex Pattern with Perfect Homology*," which success is intended to demonstrate his case.

Yet one cannot but notice that Whaler's success is somewhat threatened by his discussion of a number of similes in the group under the heading "*Complex Pattern with Logical Digression*." In it, we find a number of question marks, indicating missing correspondences or homologations. Supposedly because such missing terms both violate

the rule of homologation and is comparatively rare in Milton, Whaler calls them digressions.

One type of those digressions Whaler identifies in his article interests us especially. He draws our attention to the poet's curious practice of "adding human beings to [the simile]," namely, "Though the central image in [the simile] be complete without human beings, Milton may add them" (1057). The "belated peasant" in the simile of 1.781-88, and "the ploughman" in the simile of 4.980-85 are two of such added human beings. Because the practice is termed "logical digression," Whaler feels obliged to provide for it a rubric of some sort: "In each case Milton persuades us to take the point of view of the human figure introduced. And in each case that point of view is the life of the application of image to fable"; thus the Ploughman simile engages the reader in the following way:

Looking at *S* [the simile] not through our own eyes, but through those of a worried plowman's we feel something of the consternation that Satan must have felt watching that angelic squadron turn "fiery red" in "mooned horns." It is true that the object of the plowman's solicitude, i.e.,

Lest on the threshing-floor his hopeful sheaves
Prove chaff

does not correspond with the object of Satan's; but rhetorically, artistically the digression is valuable. (1057)

Same with the simile to which the belated peasant is added. Whaler sees that Milton wants to stir up feelings accompanying a certain experience: "we are persuaded to look at faery elves just as that belated peasant looks at them" and "we are experiencing the poet's

mingled awe and delight as he looks upon the diminished demons he has created underneath the cressets of Pandemonium” (Whaler 1058). In addition to these “two most signal instances” of the type of digression, Whaler thinks the simile in 1.287-91 is also notable. There Satan’s shield is compared to the moon viewed through a telescope. The added human being is the “Tuscan artist,” who is none other than Galileo. Milton provides a load of precise details to aid the reader’s imagination: “Look at the moon [. . .] with an artist’s eye, with the daring imagination and furtively proud mind of a scientist in the days of the Inquisition – and you are then prepared to imagine the brightness of that shield of Satan’s” (Whaler 1058). “And so what logically we have called a digression is seen to be an illuminant and guide, an unobtrusive means of emotionalizing this image” (Whaler 1058).

Whaler tries to show that even Milton’s digressions are somewhat functional to the poem and reducible to more or less neat logical patterns. He reminds us “how small is the number” of the complex similes with digressions “in proportion to” those with perfect homology in *Paradise Lost* – that is to say, proportionally, the predominant feature of the Miltonic simile should be exact homologation. However, though smaller in number, Milton’s “digressive” similes prove much more powerful in catching his readers’ attention than his homologated ones. Among these, the ploughman simile takes the crown.

Contrary to Whaler’s view that the ploughman simile belongs to one type of Milton’s digressive similes in which the added human beings function as “an unobtrusive means of emotionalizing [his] image,” the eccentric eighteenth-century critic Richard Bentley finds the added ploughman to be not only intrusive but also offensive to the

image of the simile. Milton compares the movement of the angels' phalanx "with ported spears" to "a field / Of Ceres ripe for harvest waving bends / Her bearded grove of ears, which way the wind / Sways them" (4.980-3). In between this windy cornfield image for the angels' army and the other describing Satan – "On the other side Satan alarmed / Collecting all his might dilated stood, / Like Teneriffe or Atlas, unremoved" (4.985-7) – Milton inserts the ploughman: "the careful ploughman doubting stands / Lest on the threshing floor his hopeful sheaves / Prove chaff" (4.980-5). For Bentley, what is wrong here is exactly the emotions of the ploughman, namely, doubt and fear, which change "a salutary Gale of Wind" to "a Tempest." He bursts out with questions: "What an Injury is this to the prior Comparison? What are Sheaves bound up in a Barn to the Phalanx, that hem'd *Satan*? Where's the least Similitude?" What is more, the ploughman inflicts further damage on the simile's immediate context: "Besides, to suppose a *Storm* in the Field of Corn, implies that the Angels were in a ruffle and hurry about *Satan*, not in regular and military Order." All these downsides "clearly betray whose Manufacture they are" – not from Milton but "The Editor" – Bentley suggests the detrimental lines of the ploughman be deleted from the poem (143).

Spelling out the implication of the ploughman's doubt and fear on the angels' army, Bentley inadvertently provides William Empson with a piece of evidence against Milton's God: the cornfield image for the angels' army "certainly makes the angels look weak," which only betrays Milton's unperceived liaison with the devil's party. Empson puts the identity of the ploughman under the spotlight. Though the poem provides no counterpart for the ploughman, Empson toys with speculations that he may correspond to either God or Satan. If the former, the indication is that God is "not omnipotent"; if the

latter, Satan is “only anxious for a moment” and comes out the “stronger” (172). Empson thus provocatively reads the ploughman simile as not digressive but thematically embedded – it signals Milton’s secret hostility against God despite the announced aim of the poem.

Empson’s exploitation of Bentley has prompted various critical efforts to rescue the ploughman simile from its unwanted implication against God. But, as Leonard shows us, whereas such efforts do open new possibilities for interpretation, they have yet to answer Bentley and Empson.⁸⁹ Epic precedents only confirm their impression that the image of a wind-tossed cornfield makes the angels look weak. Critics like John Broadbent and Alastair Fowler have excavated anti-Satan allusions both in the simile and from the lines surrounding it, but the crux remains to be resolved, namely, why is the good angels’ army compared to a cornfield threatened by a storm, and the ploughman fears that “on his threshing floor the hopeful sheaves / Prove chaff.” The interpretational difficulty has compelled Christopher Ricks, who generally sees Milton’s similes as relevant to their contexts, to admit with Zachary Pearce and Whaler before him that the ploughman simile is one of those similes in *Paradise Lost* that is “beautiful but digressive” (130). To the contrary, in their introduction to *The New Milton Criticism*, Peter Herman and Elizabeth Sauer have followed Empson and insisted that the simile is thematically significant. They believe that the interpretational difficulty surrounding the ploughman simile is only caused by the critical “impetus to make *Paradise Lost* conform to preconceived notions

⁸⁹ Leonard provides the most complete discussion of the reception of the ploughman simile in the history of Milton criticism before 1970. See *FL*, pp. 355-6; 358-60; 364; 373-5; 383; 385-6.

of religious orthodoxy” (5). They call for critics to discard this impetus and recognize that the ploughman simile, like the pilot simile in book one (1.200-9), showcases what they call Milton’s “open-ended poetics”: both similes contain unexpected suspensions – we are not told the fate of the pilot who fixed his anchor on the whale compared to Satan, and we do not know what becomes of the ploughman who “doubting stands” awaiting the outcome of his cornfield threatened by a storm, which outcome is supposedly compared to the result of the pending battle between the good angels and Satan. Herman and Sauer believe that Milton uses these suspensions to defy the reader’s anticipation that the pilot will be plummeted by the whale and the ploughman’s doubt will be resolved; and thus the reader is prompted to re-assess such orthodox anticipations, and awaken to the incertitude and ambivalence of the professed moral of Milton’s poem (*New Milton Criticism 2*).

It is worth pointing out that, in *Destabilizing Milton*, Herman has cited Milton’s warning from the *Art of Logic* that “likes whether of short or full form are not to be urged beyond that quality which the man making the comparison intended to show as the same in both.” But there Herman, like Grose, brought it up only to reject it as a useful guide to understand the similes in *Paradise Lost*. Herman believes that in the *Art of Logic* Milton demonstrates his familiarity with the “Classical and Renaissance rhetorical theory proposed that metaphors should be proportional to their subject”; and he understands Milton’s warning to be a significant caution “against interpreting metaphor too liberally.” But the problem is “the quality that ‘the comparison intended to show’” is seldom “self-evident and unambiguous” in Milton’s metaphors. Moreover, “in *Paradise Lost*, Milton embraces the very capacity to generate multiple and contradictory meanings that he

warns against in the *Art of Logic*” (Herman, *Destabilizing Milton* 26). Thus Herman dismisses Milton’s discussion of similitude as an unsuitable guide to his own epic similes and instead finds in Jacques Derrida’s exploration of the word “*pharmakon*” in his comments on Plato’s *Phaedrus* a better help “to a fuller understanding of Milton’s metaphors and their subsequent critical fate” (*Destabilizing Milton* 27).⁹⁰ Herman’s general argument is that, with their irresolvable complexities, the epic similes in *Paradise Lost* “encrypt Milton’s incertitude about the Republic, kingship, Cromwell, the tenability of rebellion, in short, about all the political values explored in Milton’s earlier political tracts” (*Destabilizing Milton* 26). As shown above, reading the pilot and the ploughman similes, Herman and Sauer will extend this argument to Milton’s religious values in their co-authored introduction to the *New Milton Criticism*.

I agree with Herman and Sauer that the pilot and the ploughman similes are of the same type in terms of their suspended structure, and the latter as the former is thematically significant.⁹¹ I also agree with them that critics should not flatten out unsettling contradictions in Milton’s epic similes, nor should they resort to

⁹⁰ *Pharmakon* can mean both poison and cure. Derrida points out that the French translators of Plato have chosen the most assuring meanings of the word, namely, “cure,” “remedy,” or “recipe” while translating the text of *Phaedrus*. By doing so, the translators “resolve multivalence into univalence by privileging one set of meanings” (Herman, *Destabilizing Milton* 27). Herman sees parallels both between the contradictory and self-canceling meanings of the word *pharmakon* and Milton’s epic similes offering “a multiplicity of contrary meanings,” and between the practice of the French translators of Plato and Milton’s critics – both “generally privilege only *one* aspect – the most ‘reassuring aspect’” (Herman, *Destabilizing Milton* 27).

⁹¹ Whaler distinguishes the two in his “Miltonic Simile.” The pilot simile is cited as a perfect example of prolepsis, under the heading “*Complex Pattern with Perfect Homology*,” whereas the ploughman simile is categorized under “*Complex Pattern with Logical Digression*” (1050; 1054; 1057). What makes Whaler put the ploughman simile in the latter group is apparently its interpretational difficulties. Both similes contain added human beings that do not correspond to any tenor in the text. Whaler supplies the tenor for the deceived pilot – “Deceived fellow fiends,” but uses a question mark for the “Plowman standing in fear” (1050; 1054).

“aestheticizing the similes and evacuating them of all meaning” (Herman and Sauer 8). But I do not share their arguments and interpretations. They explore the two similes as vehicles of Milton’s religious doubt. I shall argue that the pilot and the ploughman similes belong to a group of epic similes which function as important devices of Milton’s epistemological scepticism; with his highly artistic design in this group of similes, Milton directs us to the recognition that our perception (which is also cognition) is always the contextualized, conditioned, and perspectival understanding of the appearances, and never an absolute grasp of the cause or the reality underlying the appearances. I shall establish this interpretation upon a rereading of Milton’s emphasis on the *assimilanti* in the *Art of Logic*.

First of all, what group of epic similes am I referring to? What brings them together? I believe they are brought together by their shared structural features – they all contain what Whaler describes as extra “added human beings”; all these added human beings are in the middle of a perceptive, or, cognitive, experience. This group therefore includes similes with: the pilot (1.204), the Tuscan artist (1.288), the perplexed Monarchs (1.599), the belated peasant (1.783), and most famous of them all, the careful ploughman (4.983). They are also brought together by a thematic connection. All of them are introduced in relation to descriptions of Satan.

Milton’s emphasis on the *assimilanti*, or “the man making the comparison,” is crucial in directing us to understand these difficult similes as instruments of his epistemological scepticism. Both Grose and Herman have identified “the man” with Milton himself, and understood his emphasis as an authorial warning against liberal interpretations of his comparisons. But it is more likely that what Milton really means is

the very opposite of demanding any standard, authorial interpretation of the comparison of things. When he warns that “likes whether of short or full form are not to be urged beyond that quality which the man making the comparison intended to show as the same in both,” the emphasis is rather on the subjectivity of the comparison made. The similarity in two different things in a comparison depends on “the man making the comparison”; “intended to show as the same in both” designates a particular understanding of the two terms, that is, from a specific point of view. In fact Grose has rightly sensed that “Milton ultimately pulls back from linking ‘similars’ with the proportions inherent in nature, only to direct the reader’s attention to the maker of ‘formal simile’” (104). He has also rightly pointed out that a whole theory of knowledge is involved in Milton’s understanding of similitude as shown in the *Art of Logic*. We need only recognize that, rather than stating any authorial interpretation of the meaning of the comparisons, Milton’s warning shows that he is highly conscious of the perspectival nature of our perception, which he distinguishes from the perceived reality as it is. That is why, as quoted in the beginning of this chapter, he illustrates his warning with the saying: “Nothing similar is identical; likeness does not run on four feet; every likeness hobbles.”

We may say that Milton deviates from Ramus only to come closer to Cusanus. If both Cusanus and Ramus understand that a comparison between things is possible because there are proportions inherent in things, Cusanus alone distinguishes proportions inherent in things from man’s subjective perception of them. Just as Milton does in the *Art of Logic*, Cusanus has his caveat imbedded in his statement (serving as epigraph of this chapter) that “all those who make an investigation judge the uncertain proportionally, by means of a comparison with what is taken to be certain” – “what is taken to be

certain,” instead of “what is certain,” implies that the ground of human knowledge is only man’s surest assumptions or conjectures of things, that is to say, such a ground is shifty and slippery rather than stable and certain. As Cusanus clearly states elsewhere in *On Learned Ignorance*: “For whatever things are apprehended by the senses, by reason, or by intellect differ both within themselves and in relation to one another – [differ] in such way that there is no precise equality among them” (*DI* 1.4). This is also Milton’s understanding as shown in Grose’s findings from the *Art of Logic*. Cusanus’s “what is taken to be certain” is readily comparable to Milton’s caveat “that quality which the man making the comparison intended to show as the same in both.”

Milton draws our attention to the difference between our perception and the reality by persistently adding the perceiving human beings into the similes. We have pointed out that the shared features of the group of similes with added human beings are that all the human beings are suspended in the middle of a perceptive, or cognitive experience, and all are added to similes related to Satan. We should further point out that in each case Milton not only carefully defines the perceivers, the conditions and contexts of their perceptions, but more significantly, he confronts them with confusingly similar appearances, all are comparatively related to Satan’s appearances in various occasions, that may point to different underlying entities. The former practice emphasizes perceptions as contextualized and conditioned, the latter almost forces us to the recognition that “to know the internal form of anything, because it is usually very remote from the senses, is especially difficult” (*Works* 11.63). These effects I shall endeavor to show in the following interpretations of the similes as a group.

The pilot simile is the elaboration of one of the comparisons describing the monstrous size of Satan in the lake of Hell: “With head uplift above the wave, and eyes / That sparkling blazed; his other parts / Prone on the flood, extended long and large / Laying many a rood” (1.193-6). Satan’s huge bulk in the lake, we are told, may be compared to the size of the “Earth-Born” Titans, “Briareos or Typhon,”

[. . .] or that sea-beast

Leviathan, which God of all his works

Created hugest that swim th’ Ocean stream:

Him haply slumb’ring on the Norway foam

The pilot of some small night-foundered skiff,

Deeming some island, oft, as seamen tell,

With fixed anchor in his scaly rind

Moors by his side under the lee, while night

Invests the sea, and wished morn delays:

So stretched out huge in length the Arch-Field lay (1.200-209)

The tenor and the starting point of the simile is the appearance of the size of Satan in the lake of Hell, Milton’s comparisons take our imagination to the land on earth, by comparing his size to the Titans, then to the Norway Sea, by linking him with the sea-beast Leviathan. The perspective of a Norwegian pilot then takes over, who, sailing “some small night-foundered skiff” and looking for shelter from the cold night at sea, gladly took the monstrous-sized sea-beast for “some island,” moored by his side, and “wished morn delays.” The introduction of the perspective of the pilot at the very end of Satan-Titans-Leviathan comparisons literally conveys the remoteness between the form

or essence of things and man's sensual perceptions. Following the poet's comparisons from Hell to the land of earth then to the sea, we know the distant albeit indeterminate (for Satan is also compared to the Titans) resemblance of the sea-beast to Satan. For the pilot, who approaches reality from the other end of the appearances, even the remote significance of Satan attached to the size of the sea-beast dims. The pilot can hardly communicate with the reality underlying the appearances. Moreover, his particular state then – "night-foundered" – skewered his perception and inclined him to see only what he wanted to see, a monstrous sea-beast became "some island."

The pilot fixing his anchor on the false island thus not only anticipates the theme of deception, it is also a highly symbolic act of human perception and cognition. Our knowledge starts with our perception, and has to rely on our sensuous experience, which offers no stable ground. As shown by the pilot, we fix our anchors on what is taken to be certain rather than what is certain. The pilot's encounter with the sea-beast is also potentially compared to a blind encounter with Satan. When we examine the similes with added human beings as a group that are all related to Satan (in the case of the belated peasant, the devils), we find Satan's shifting, indeterminable appearances come to signify the complexity of the phenomenal world itself. The tenors of those similes are not even the identity or essence of Satan, defined as the "Evil One" (9.463), but only the appearances of Satan, and the added human beings are persistently introduced at the very end of the images of one or multiple comparisons (except the ploughman), confined to the vehicles and only given access to images describing the appearances of Satan. Thus like the pilot, they are literally separated from the essence of thing by layers of appearances.

The distance between the essence of things and our sensuous experience is visualized when the circumference of Satan's "ponderous shield / Ethereal temper, massy, large and round" is compared to the moon. In the vehicle, we find Galileo, or the Tuscan artist examining the orb of the moon through his "optic glass," "At evening from the top of Fesole, / Or in Valdarno, to descry new lands, / Rivers or mountains in her spotty globe" (1.289-91). The time and the location are well-chosen. As Whaler points out, "At evening from the top of Fesole / Or in Valdarno," that is, "under ideal atmospheric conditions, under the clear dry sky of Italy." Imagining an observation of the moon "under such conditions, and with an artist's eye, with the daring imagination and furtive proud mind of a scientist," Whaler believes, the reader is "then prepared to imagine the brightness of that shield of Satan's" (1058). Whaler's interpretation here contains an implicit compliment to the new astronomy's claim to know reality as it is – the Tuscan artist's observation of the moon helps us imagine exactly what Satan's shield looks like. But if Galileo's empirical observation of the moon is potentially compared to our observation of Satan (for naturally we are not interested in Satan's shield *per se* but in Satan), then we find the symbolic image of the new science – Galileo pointing the telescope to the moon – is rather ironically presented in the simile. The comparison helps us see the shape and brightness of the shield, but it gives us no insight other than the visual resemblance. Indeed Galileo's moon hanging in the sky above him, just like the shield hung on Satan's shoulder, remains a distant and mysterious object. The moon is not readily observable all the time. A good observation of the moon depends on ideal atmospheric conditions and positions on earth. And the power of the optic glass may have been exaggerated in Whaler's reading. Furthermore, granted that the comparison to

Galileo's observation of the moon helps us imagine the shield clearly, it only makes the shape of Satan behind it even more elusive and unobservable. The cognitive experience of Galileo, though much more rationally regulated compared to that of the pilot at sea, does not differ from it essentially. He too has to rely on what he takes to be certain to judge proportionally the unknown features of the moon: to spot "Rivers or mountains in her spotty globe," he necessarily relies on what he knows to be the visual appearances of rivers or mountains on earth. In this, he is vulnerable to the same mistake made by the pilot, some shapes may look like rivers or mountains but are in fact not what they look like.

Milton's practice of confronting the human perspective with similar appearances of different realities is obvious in the simile describing Satan's dimming glory:

[...] as when sun new ris'n
 Looks through the horizontal misty air
 Shorn of his beams, or from behind the moon
 In dim eclipse disastrous twilight sheds
 On half the nations, and with fear of change
 Perplexes monarchs (1.594-599)

Satan's slowly changing complexion after the fall is compared indeterminately to a misty sun rising or an eclipsed sun setting. The monarchs are perplexed by the confusing appearances, the reality of which by experience they know may be either. The simile is of course open to political and thematic explorations. But for us, what is significant is that here again, we find human beings suspended in the middle of a cognitive experience, and

the phenomenal world is felt like a labyrinth. Such a labyrinthine feeling is heightened in the simile containing the belated peasant, who is confronted by suffused sensory (or dream-like) data of both the eye and ear:

Behold a wonder! They but now who seemed
 In bigness to surpass Earth's giant sons
 Now less than smallest dwarfs, in narrow room
 Throng numberless, like that Pygmean race
 Beyond the Indian mount, or faery elves,
 Whose midnight revels, by a forest side
 Or fountain some belated peasant sees,
 Or dreams he sees, while overhead the moon
 Sits arbitress, and nearer to the earth
 Wheels her pale course, they on their mirth and dance
 Intent, with jocund music charm his ear;
 At once with joy and fear his heart rebounds. (1.777-88)

The details of the simile have been well explored by critics, but why Milton gives such elaborate, rich details to describe the experience of the belated peasant is not satisfactorily explained. I believe Milton's interest and emphasis here are the same as in the similes with added human beings discussed above, namely, the complexities of the phenomenal world itself and the difficulty for human perception to penetrate the appearances and grasp the reality as it is.

The problem of perception is dramatically staged in the careful ploughman simile:

[. . .] the angelic squadron bright
 Turned fiery red, sharp'ning in mooned horns
 Their phalanx, and began to hem him round
 With ported spears, as thick as when a field
 Of Ceres ripe for harvest waving bends
 Her bearded grove of ears, which way the wind
 Sways them; the careful ploughman doubting stands
 Lest on the threshing floor his hopeful sheaves
 Prove chaff. On the other side Satan alarm'd
 Collecting all his might dilated stood,
 Like Teneriffe or Atlas unremoved:
 His stature reached the sky, and on his crest
 Sat horror plumed. (4.977-89)

Bentley's reading almost three hundred years old is still the most valuable reading we have of this simile. He is right that it is the ploughman's anxiety, doubt, and fear that change "a salutary Gale of Wind" to "a Tempest," causing the impression that "the Angels were in a ruffle and hurry about Satan, not in regular military order." Is it not just the point Milton is making with his dramatization of the perspective of the ploughman? The ploughman's perception of the windy cornfield compared to the angels' army *makes* the angels look weak, and Satan strong. But in reality the angelic phalanx hemming around and pointing their spears at Satan is active and in militant order. The strength of Satan is only his appearance, who was in fact "alarm'd" and "dilated" his shape to look "Like Teneriffe or Atlas unremoved." But like the pilot, the Tuscan artist, the monarchs,

and the belated peasant, the careful ploughman, being literally confined to the vehicle and behind layers of appearances, has no direct access to this reality, and can only approach it from the appearances with their sensual perceptions. Like them, the ploughman is permanently suspended in the middle of his perceiving and doubting.

When we examine these similes with extra added human beings as a group, we find that Milton's persistent practices of confining these human beings to the vehicle of the simile and making them non-correspondent to the tenor come to signify the distance between our perception of things and the essence of things. The recurrent image of human beings timelessly suspended in the middle of cognitive experiences in those similes directs us back to the understanding of human inquiry as a Tantalus or Sisyphus project, and to the recognition that knowledge is denied to us. Milton's group of similes also collectively points to a complex, labyrinthine phenomenal world: the false and treacherous islands at the Norway sea, the mysterious, spotty globe of the moon, the confusing appearances of a misty sun rising and a shadowy sun setting, the indescribably attractive flickers and sounds in the midnight forest, and the unpredictable changes of the wind. Our condition in such a world as indicated in Milton's group of similes is effectively described in the words of Bacon:

One must travel always through the forests of experience and particular things, in the uncertain light of the senses, which is sometimes shining and sometimes hidden. Moreover those who offer to guide one on the way are also lost in the labyrinth and simply add to the number who had gone astray.
(New Organon 10)

But Bacon, we know, does not accept that this is our permanent human condition, and believes he has the thread that will lead us out of the labyrinth. Milton answers Bacon in the simile of the night-wanderer describing Eve following the serpent to the fatal tree:

Lead then, said Eve. He leading swiftly rolled
In tangles, and made intricate seem straight,
To mischief swift. Hope elevates, and joy
Brightens his crest, as when a wand'ring fire,
Compact of unctuous vapor, which the night
Condenses, and the cold environs round,
Kindled through agitation to a flame,
Which oft, they say, some evil Spirit attends
Hovering and blazing with delusive light,
Misleads th' amazed night-wanderer from his way,
To bogs and mires, and oft through pond or pool,
There swallowed up and lost, from succor far,
So glistered the dire snake, and into fraud
Led Eve our credulous mother, to the tree
Of prohibition, root of all our woe. (9.631-645)

Epilogue

Recently the question in the air in Milton criticism seems to be: should we *still* take the announced moral of *Paradise Lost* seriously? The question was perhaps first raised by William Empson's book *Milton's God* published in 1961, in which he states that "Milton's poem is good not in spite of but especially because of its moral confusions" (13) – the suggestion is that *Paradise Lost* is good because it is fundamentally divided against itself despite its announced purpose ("to assert eternal providence / And justify the ways of God to men"). In the last decade Peter C. Herman has taken the cue from Empson and called for a new Milton criticism that seeks to emphasize ambivalence, discontinuity and open-endedness as the main features of Milton's work.⁹² Those emphases spring from his assumption of mature Milton as "a poet of deep incertitude" politically disillusioned in "the aftermath of the Revolution," who therefore in his later works engages himself in "a wholesale questioning of just about everything he had argued for in his earlier prose works, and *he does not come to a conclusion*" (*Destabilizing Milton* 21). Herman believes that not only should the Christian moral of *Paradise Lost* not occupy the central stage anymore, but Miltonists were fundamentally wrong trying to make the poem cohere in relation to it. Herman's new Milton criticism advocates that *Paradise Lost*, as well as *Paradise Regained* and *Samson Agonistes*, be explored as texts asking the "irresolvable questions – religious, philosophical, and literary critical" (*New Milton Criticism* back cover).

⁹² See Herman and Sauer, *The New Milton Criticism*, back cover.

In terms of its tendency to see Milton as either a covert or involuntary atheist, Herman's "New Milton Criticism" is nothing new but – as William Poole puts it in his review – "Empsonian Milton Again" (190). In terms of its general critical assumptions and approach, however, there is something new. Herman's call for a paradigm shift in Milton studies, that is to say, a new Milton criticism that recognizes Milton's project to be hopeless and will instead focus on Milton's struggle with his project is irreconcilable to and should replace the current, established Milton criticism that is always trying to justify Milton's project, comes from his reading of Kuhn's *Structure of Scientific Revolutions*.⁹³ We may say that what is new in Herman's new Milton criticism is that it proposes a Kuhnian approach to Milton. There its problem lies.

In *Structure*, Kuhn argues that science does not develop by accretion, but through revolutions or the so-called "paradigm shifts"⁹⁴: the practitioners of normal science will always try to commit to their paradigms and suppress or explain away anomalies. But when the accumulation of anomalies reaches a point that fundamental commitment to the existing paradigms is undermined, a shift of commitment occurs. The practitioners begin investigating the anomalies, which will lead to formulation of and commitment to new paradigms. Thus Kuhn emphasizes that discontinuity and incompatibility between the old and the new, instead of linear continuity and accretion from the old to the new, are the general features of scientific development. The new science has to break away from the old to find solutions to new problems. Fundamental innovations, because of their

⁹³ See Herman, *Destabilizing Milton*, "introduction," esp. pp. 5-6, 11, 19, 20.

⁹⁴ Kuhn uses the word paradigm in *Structure*, but he did not coin the phrase "paradigm shifts."

subversive nature, are necessarily incompatible with the established paradigms. In Kuhn's words, innovations are "tradition-shattering," whereas the activity of normal science is always "tradition-bound" (6). Kuhn's idea of scientific communities binding themselves together through commitment to shared paradigms and necessarily suppressive of fundamental innovations has sociological implications. His claim that scientific revolutions result in changes of worldviews also makes the ambiance of his argument extend well beyond his field, namely the history of science.

Herman catches the sociological and general historical implications of Kuhn's argument and applies them to both Milton criticism and Milton's text. We may put aside his claim that there is a normal science in Milton research perpetuating various Miltonic paradigms of certainty. Rather let us focus on his application of the general historical implications of Kuhn's thesis of scientific revolutions to Milton's text, because it is from his assumptions regarding Milton's text that he issues his call for a paradigm shift in Milton criticism.

As cited above, Herman emphasizes "discontinuity" as one of the main features of Milton's work. The word echoes Kuhn's view on how science proceeds in history: not by linear accretion, but by discontinuities between the old and the new sciences. Herman understands the historical context of Milton's work in similar terms. Milton's contemporary culture can no longer confirm that "the principles guiding the past remain valid." And Milton shares his culture's "deepest anxieties" over the undermined old principles and "Consequently [. . .] structures *Paradise Lost* according to [. . .] a poetics of incertitude [. . .] out of the turmoil of not knowing what to affirm in the wake of the Revolution's failure" (*Destabilizing Milton* 21). The suggestion is that Milton together

with his culture was caught in the middle of a paradigm shift, when the old paradigms were undermined, and the new ones were yet to come into being. This is precisely Kuhn's understanding of Milton's choice of cosmology in *Paradise Lost*. The "many gigantic problems" Copernican astronomy caused for a believing Christian "have answers. But the answers were not easily achieved [. . .]. Until that [. . .] was achieved, sensitive observers might well find traditional values incompatible with the new cosmology" – Milton is cited as one of such "sensitive observers" caught in an intermediate state between the old and the new, who was compelled to choose the outdated Ptolemaic cosmology for his religious epic.

We see that Kuhn's earlier study of the Copernican Revolution actually paves the way for his later, more general argument about scientific revolutions; the core concepts, discontinuity and incompatibility between the old and new sciences and their corresponding worldviews, have already been present in his case study of the Copernican revolution. But whatever general success Kuhn's argument of the scientific revolutions may have had, it failed when applied to Milton. Herman is interested in neither Milton's cosmology nor his relation to intellectual or scientific history. He mentions in passing the "contemporary example of Donne's complaint that the new philosophy has put all in doubt" (21), and vaguely refers to the no longer confirmable "principles guiding the past." But he finally identifies the cause of the incertitude and doubt in Milton's text to be Milton's political disillusion in the failure of the English Revolution. Thus unknowingly Herman anchors his new Milton criticism in the Kuhnian terms of the incompatibility and discontinuity between the old and new in scientific history, the very terms that failed to accommodate the case of Milton.

Appendix

Osiander's Preface to Copernicus's *De revolutionibus*

There have already been widespread reports about the novel hypotheses of this work, which declares that the earth moves whereas the sun is at rest in the center of the universe. Hence certain scholars, I have no doubt, are deeply offended and believe that the liberal arts, which were established long ago on a sound basis, should not be thrown into confusion. But if these men are willing to examine the matter closely, they will find that the author of this work has done nothing blameworthy. For it is the duty of the astronomer to compose the history of the celestial motions or hypotheses about them. Since he cannot in any way attain to the true causes, he will adopt whatever suppositions enable the motions to be computed correctly from the principles of geometry for the future as well as we past. The present author has performed both these duties excellently. For these hypotheses need not be true nor even probably. On the contrary, if they provide a calculus consistent with the observation, that alone is enough. Perhaps there is someone who is so ignorant of geometry and optics that he regards the epicycle of Venus as probable, or thinks that it is the reason why Venus sometimes precedes and sometimes follows the sun by forty degrees and even more. Is there anyone who is not aware that from this assumption it necessarily follows that the diameter of the planet at perigee should appear more than four times, and the body of the planet more than sixteen times, as great as at apogee? Yet this variation is refuted by the experience of every age. In this science there are some other no less important absurdities, which need not be set forth at the moment. For this art, it is quite clear, is completely and absolutely ignorant of the causes of the apparent nonuniform motions. And if any causes are devised by the imagination, as indeed very many are, they are not put forward to convince anyone that they are true, but merely to provide a reliable basis for computations. However, since different hypotheses are sometimes offered for one and same motion (for example, eccentricity and an epicycle for the sun's motion), the astronomer will take as his first choice that hypothesis which is the easiest to grasp. The philosopher will perhaps rather seek the semblance of the truth. But neither of them will understand anything certain, unless it has been divinely revealed to him.

Therefore alongside the ancient hypotheses, which are no more probably, let us permit these new hypotheses also to become known, especially since they are admirable as well as simple and bring with them a huge treasure of very skillful observations. So far as hypotheses are concerned, let no one expect anything certain from astronomy, which cannot furnish it, lest he accept as the truth ideas conceived for another purpose, and depart from this study a greater fool than when he entered it. Farewell.

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