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The Spiritual Optics of Narrative: John Wilkins's Popularization of Copernicanism

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> No places distance hindring their Commerce
> Who freely traffick through the Universe,
> And in a minute can a Voyage make,
> Over the Oceans universal Lake.
>
> (Sir Francis Kinaston, "To Mercury the Elder")

Blaise Pascal once admitted that man, although accessible to the language of reason, is much more susceptible to the language of seduction. On certain occasions, during times of confusion, the language of proof and the language of pleasure might even form a dubious balance in the mind, initiating "a combat of which the outcome is very uncertain" (qtd. in Man 4). Pascal suggested a way out of this basic controversy by deconstructing the strict opposition between proven reality and pleasant fiction, to bring out the active experience of the interplay between the two. Shortly before Pascal, John Wilkins (1614-1672), a British *virtuoso*, a founding member of the Royal Society of London, the inventor of an artificial language, and a prominent theologian who held more optimistic views on human nature, elaborated more pragmatically on the techniques of interplay between cognitive and performative language. Wilkins's early astronomical narrative interlinked the persuasive authority of ancient historical accounts and the data of the contemporary observations, to productively rework the opposition between the scholastic and the experimental paradigms of natural philosophy. *The Discovery of a World in the Moone* (1638) employed the performative properties of language to impart the experience of astronomical observations, which helped to visualize the phenomena and see them anew. Wilkins's *Discovery* has been analysed as criticism of rigorous Aristotelianism and a literal reading of Scripture endorsed, among others, by Alexander Ross, of which an account was given in Grant McColley's essay on the Ross-Wilkins controversy. This article will highlight those traits in Wilkins's first publication, which have once been termed "boy wonders" (Jardine 107) and allowed him to create a convincing projection from the past into scientific future. First reviewing the context, then the dialectical and rhetorical techniques in Wilkins's astronomical treatise, the article will finally outline the perspective of his subsequent legacy of methods for processing epistemic experience.

Wilkins's Astronomical Narrative in Context

Approximately what is now called scientific knowledge was referred to by seventeenth-century British intellectuals as "natural history," marking a similarity in the subject matters and the methods of study of both history and nature (Burke vi). Ancient sources had associated history with the realms of politics, uncertainty, and changeable experience. Studies of nature were linked to the more prestigious discipline of philosophy, which produced certain truth through the permanent conclusions of logic. History accounted for volatile, temporary occurrences, and received a lower standing, according to classical epistemic ranking. However, at the turn of the sixteenth to seventeenth centuries, the practices of learning within natural history benefited from combining the logical apprehension of phenomena and the vividness of experiential accounts. The overlap in epistemic values also created new socio-professional identities: the encounter with new natural realities occurred in experimenting at clubs and societies, which admitted a mixed audience of skilled amateurs and artisans, clerics, academics, and nobles.

This strategy for creating performative fora for communication between classical historical scholarship and "courtly" experimental learning proved to be a very successful one in Galileo's defence of Copernican cosmology (Biagioli 2). For instance, Galileo composed his *Dialogue on the Two Chief World Systems* (1632) as a series of carefully staged appearances, resembling the popular episodes of *Commedia dell' Arte.* Galileo's *Dialogue* also assumed a sympathetic and perceptive audience which was expected to appreciate the non-pedantic, complex and elaborate language of astronomical enquiry, which satisfied the Renaissance cultural appetite for the ingenuous, and endorsed the dignified state of intellectual freedom. Wilkins acknowledged Galileo's *Dialogue* as one of the sources of inspiration for his *Discovery*.

In spite of Bacon's warnings concerning the malice of the "Idols," mid-seventeenth-century England widely employed the rhetorical means of supporting scientific claims. Natural philosophers often defended their acquired insights with staggering rhetoric, even if equally fiercely repudiating rhetorical gestures on the part of their opponents. For instance, the controversy between John Wallis, a personal friend of Wilkins, and Thomas Hobbes, a rigid denouncer of rhetoric in natural studies, produced such titles as *Elenchus geometriae Hobbianae* (Wallis, 1655) and *Marks of the Absurd Geometry, Rural Language, Scottish Church Politics, and Barbarisms of John Wallis* (Hobbes, 1657). The emphasis that Hobbes and Wallis placed on the use of literary expressions in their argument on squaring the circle demonstrates that seventeenth-century mathematicians attributed a lot of significance to linguistic matters (Jesseph 331). Towards the mid-seventeenth century, the broadly construed field of natural history recombined in itself the elements of logic, dialectic, and rhetoric.

Employing humanist literary techniques, Wilkins composed the *Discovery* as a compendium of astronomical knowledge and its history. The fusing of history and natural philosophy allowed him to tackle some conceptual problems through historical appeals. Ancient historical accounts were used as auxiliary patches, which assisted in saving phenomena for the new cosmology. Even after Galileo managed to render the observational data that supported the Copernican hypothesis and made it more persuasive, some gaps in it remained visible, primarily due to the lack of a new physical and mathematical theory, which would only be attained towards the end of the seventeenth century. Therefore, Aristotelian physics and the ancient accounts of cosmological theories kept resurfacing in the criticism of the Ptolemaic system, if they happened to save appearances for Copernicanism. The same historical accounts often served to support both Copernican and Ptolemaic claims.

Although the *Discovery* represented a bold venture, Wilkins was not the first English scientific writer to refer to Copernicanism. John Russell in "The Copernican System in Great Britain," a concise account of the arrival of Copernicanism in England, testifies that Robert Recorde's *The Castle of Knowledge* (1556) holds priority for a cautious mention of Copernican supposition in the context of an introduction to "the necessary partes of the Sphere" (Recorde 1), as by that time Johannes de Sacrobosco's *The Sphere* (c. 1230) became a part of scholastic curricula. Recorde comments on the rhetoric of the debate: Ptolemaic cosmology is "so firmelye fixed in moste menne headdes, that they accept it mere madness to bring the question in doubt" (165). On the other hand, it would be equally "muche follye" to attempt to disprove Copernicanism, since "no manne praiseth" it in the first place. However, Copernicanism soon became appraised in England in the writings of John Dee and Thomas Digges, the latter apparently making the first explicit Copernican statement in England. In 1576, Digges reprinted an almanac entitled *A Prognostication Everlasting*, to which he added an appendix containing a summary translation of Copernicus's *De revolutionibus orbium coelestium*. Ironically, Copernicanism debuted in England under the cover of *Prognostication Everlasting*, and since its new mathematics did not correlate with the astrological advice, Digges had to reinforce the persuasive power of geometry with an elaborate diagram of the heliocentric model (Digges 43).

In 1600, William Gilbert's *De Magnete* defended Copernicanism by employing a teleological providential argument which remained popular even well into the eighteenth century. Book VI, Chapter VIII of *De Magnete* convinces the reader:

> And surely it must seem more probable that the appearances of the heavens should be produced by a deflection and inclination of the small body, the earth, than by a whirling of the whole system of the universe – especially as this movement is ordered for the good of the earth alone, and is of no benefit at all to the fixed stars of the planets. (349)

Wilkins's *Discovery of a World in the Moone* (1638) reproduces a similar allusion to providence, alongside other popular argumentative patterns. Certain public mistrust of Copernicanism, as well as the great difficulty of its pertaining computations, were hampering its successful integration into a common worldview even a hundred years later. Both these circumstances prompted Wilkins to address the problem primarily with the expert methods of imparting new knowledge through experience and various ways of creating belief, which at the time were conventionally available within the framework of dialectical rhetoric.

Owing to its dual function of bringing the geometrical theory of Copernicanism into the space of mixed but refined cultural discourse, Wilkins's narrative in the *Discovery of a World in the Moone* derives not only from astronomical hypotheses but also from the imaginary projections of this other world. In the seventeenth century, as now, such a dialogical exchange between science and fiction was by no means an exception; for instance, Gilbert's *De Magnete* exercised immediate influence on Francis Godwin's *The Man in the Moone* which was published posthumously in 1638 but composed in the 1620s or even earlier. Godwin's character follows a flock of domestic geese in a towed chariot, and Wilkins's 1640 edition of the *Discovery* stated that his fascination with flying to the moon was mainly due to "a late fancy to this purpose under the feigned name of Domingo Gonsales" (Wilkins, *A Discourse Concerning a New World* 240). Godwin's narrative also inspired Wilkins to extend his argument and assert that not only the occasional travel to the moon should be possible, but also regular

commerce and habitation (242).

Travel to the moon as a literary endeavour received a fresh stimulus in England in 1603, with the translation of Plutarch's *Moralia*. Wilkins extensively quotes its part "Concerning the Face which appears in the Orbs of the Moon" which summarized Greco-Roman speculations about whether the moon represented a great fire or a solid body. In 1620, Ben Jonson's masque *News from the New World Discovered in the Moon* was performed twice before King James I. This satirical, but educational, play mentions the wings on which a poet can be "mounted to the moon" (Jonson 44), and features Galileo's analogy between the moon and the earth, which also provided the main framework for Wilkins's argument. Allusions to popular literature vividly depicting the materiality of the moon helped Wilkins impart the experient knowledge of this phenomenon and imprint his Copernican statement on the public mind.

Apart from the tradition of literary representations of the moon, Wilkins's narrative was also part of an advancement in astronomical visualizations through drawings and maps. The masterful exaggerated sketches made by Galileo were meant to raise the credibility of his verbal argument about the moon's uneven surface. In 1647, Johannes Hevelius, an amateur astronomer from Danzig, published his *Selenographia*, the earliest atlas of the moon. Hevelius described the work of translating the imagery from lens to paper as a specific experience involving many hours of imagining and "exploring" the moon through sketches and notes (Müller 356). He was searching for a new visual language of astronomy and a technique of delineation that would create a convincing style and a seamless environment of "virtual witnessing" (Winkler and Van Helden 99, 109-11). John Wilkins, who was composing his *Discovery* over ten years before this naturalistic representation became a standard in observational literature, attempted to achieve the same experiential and performative effect of virtual witnessing through the techniques of dialectical rhetoric.

From *Inventio* to Invention in the Discovery of the Moon

The full title of Wilkins's discourse states his projected goals: *The Discovery of a World in the Moone or a Discourse tending to prove that 'tis probable there may be another habitable world in that Planet*. Wilkins published the volume as a 24-year old graduate of Magdalen Hall (later Hertford College), Oxford. Magdalen Hall was a Puritan stronghold, but Wilkins also studied mathematics and astronomy with John Bainbridge, the first Savilian Professor of Astronomy. While working on the *Discovery*, Wilkins became a nominal vicar of the hamlet parish of Fawsley in Northamptonshire, where his Puritan grandfather John Dod was performing the actual duties. By 1638, Wilkins's imaginative vision apparently escaped Puritan orthodoxy and reached out all the way to the moon as the fabulous and ultimate travelling destination of his time.

Wilkins is said to have acted as a popularizer of scientific novelties throughout his career. Barbara Shapiro, a celebrated authority on Wilkins studies, consistently maintains this interpretation: "All of Wilkins's scientific works are informed by a desire to spread scientific information to those who would not ordinarily come upon it or who were themselves incapable of dealing directly with scientific discourse due to a lack of education" (30). While the argument in Wilkins's *Mathematicall Magick* (1648), written ten years later, is definitely structured through repeated appeals to intelligent artisans, laymen, and the interested gentry to support the invention of mechanical wonders, the argument in the *Discovery* may have a less straightforward motivation. Wilkins never made any secret of his communicative intentions. For instance, in *Mathematicall Magick* he directly outlines his target audience of gentlemen and "common artificers" who may be in various ways advantaged by studying mechanical

tools (Wilkins, *Mathematical Magick* A4^{v}). But his ultimate purpose for the *Discovery*, as stated in the preface, consisted in proving the probability that there indeed is "another habitable world" on the moon. In the England of 1638, Wilkins's publication could barely enter state-of-the-art astronomical debates on probability of the Copernican hypothesis. Although in 1612, in *Descriptio globi intellectualis* (1653), Bacon enumerated "many and great inconveniences" to be found in the system of Copernicus (qtd. in Russell 215), in *De augmentis scientiarum* (1623) he, among others, already admitted that the acceptance of Copernicanism was spreading (Finocchiaro 142). However, references to the immovable Earth were still prevailing in literary culture. Besides, in 1630, the Copernican debates reignited after the publication of Philipp van Lansbergen's *Commentationes in motum terrae diurnum & annuum*, to whom Alexander Ross answered with his *Commentum de terrae motu circulari* (1634), which prompted Wilkins to compose his own, fine and persuasive, treatise defending Copernicanism.

The *Discovery* sought to overcome certain common prejudices, but Wilkins was primarily addressing the educated part of his readership:

> Since it must needs be a great impediment unto the growth of sciences, for men still so to plod on upon beaten principles, as to be afraid of entertaining anything that may seem to contradict them. An unwillingnesse to take such things into examination, is one of those errours of learning in these times observed by the judicious Verulam. Questionless there are many secret truths, which the ancients have passed over, that are yet to make some of our age famous for their discovery. If by this occasion I may provoke any reader to an attempt of this nature, I shall then thinke my selfe happy, and this worke successefull. (Wilkins, *The Discovery of a World in the Moone* A3)

Apparently, in the *Discovery* Wilkins, a recent Oxford graduate, keeps an approachable but essentially academic profile. He aims not to popularize the established facts in a simple form but to help overcome the "unwillingnesse to take such things into examination" and the fear of contradicting the "beaten principles." Wilkins's statement sounds sincere and authentic, and although he obviously aims to communicate new knowledge, he does not seem to view his task in terms of filling gaps in education. Wilkins assumes that his readership is versed in the "principles" of Ptolemaic cosmology, as well as that they are familiar with the new "things" articulated according to the Copernican hypothesis (A3). However, he sees the problem being that these contexts cannot be juxtaposed in a legitimate discussion. Furthermore, in the main reason he indicates for that, he also does not stress insufficiency in scholarship as such, but highlights the realm of epistemic experience and emotions. At some points he even expresses emotions in his *apologia pro Galileo*: "how horrid so ever this may seeme at the first, yet is it likely enough to be true" (*Discovery* 93). Wilkins commits himself to addressing the fear and "unwillingnesse," as well as inducing the desire for learning and knowing (A3), which in themselves represent not the phenomena of knowledge but those of cognitive experience.

Like Hobbes's *Leviathan*, Wilkins's *Discovery* can be named an exercise in *ars rhetorica*, but to estimate the pragmatics behind this exercise necessitates taking note of the polemical circumstances, his tone and epistemic manner (Skinner 14). Wilkins's discourse aimed to provide an arena for dialogical communication between the old principles and the new things, to ensure the required "commensurability, comparability, and communicability" (Kuhn 669), that is, a certain homology and coherence of the

narrative grids of rival theories. The reputation of Wilkins as a popularizer of the Copernican hypothesis is chiefly based on two factors: that he employed non-mathematical arguments in support of a fundamental mathematical statement, and the fact that his approach was indeed popular. Wilkins's argumentative style has often been regarded as an eclectic transitional mixture of old and new methods (see: Shapiro 59). However, the epistemic views of seventeenth-century British *virtuosi* were far from post-Newtonian interpretation of celestial mechanics, to the extent that mathematical certainty was rated lower than moral certainty based upon the assent of a large segment of the community composed of professionals and amateurs. Furthermore, within the experimental paradigm of natural history, mathematical proofs would be deemed unacceptable precisely because in mathematics "one may be sure of the truth of the conclusion without consulting experience" (Boyle 182).

Additionally, taking into account the specific mathematical training that Wilkins's readers might receive as part of scholastic university curricula, it could be a questionable strategy for him to use mathematical demonstrations for proving that the moon is a solid body. In scholastic terms, the materiality of objects was demonstrated through their weight, in the words of Aristotle, "every sensible body has either weight or lightness, and if a body has a natural locomotion towards the centre if it is heavy, and upwards if it is light" (Aristotle, 205^{b}: 25). Therefore, to demonstrate in scholastic terms that the object was "sensible," one needed to establish its "locomotion towards the centre," which at that point posed problems in the case of the moon. Besides, Aristotle considered the quality of weight on a par with the quality of lightness, for instance, fire did not have any weight but had lightness, since it tended upward (Barnes 142). Both weight and lightness were regarded as qualities, that is, inherent features that made objects "tend" in a particular direction, and qualities were overall deemed incalculable. Later, in *Mathematical Magick*, Wilkins would try to legitimize the procedure of calculating weight by reminding the reader that Aristotle himself considered it within the category of discrete quantities (Wilkins, *Mathematical Magick* 12). Therefore, it would be hard for Wilkins to claim the materiality of the moon through mathematical means, since in that case he would have to refer to its weight which could not be demonstrated via calculations.

Instead of weight, Wilkins's description of the moon's materiality relied heavily on the assumption of its analogous similarity to the earth, which had to be argued through what can be named the perlocutionary strategies of achieving assent (Shapiro 32-34). Indeed, Wilkins's *Discovery* was meant to be popular, but principally in a technical epistemic sense. Wilkins's argumentation needed to gain the obligatory amount of moral assent, as required by the paradigm of early modern probabilistic science. Wilkins famously appreciated the role of observational perception and mathematical demonstrations in astronomy, but even in his mature writings he himself kept rating "moral certainty" as the highest epistemic value and level of reliability in natural history (Wilkins, *The Principles and Duties of Natural Religion* 3-5).

The early modern tradition of astronomical accounts suggested treating the ancient opinions on questions about the moon as testimonies, and the term was not cleared from rhetorical connotations.[1] Wilkins's lecturer in astronomy at Oxford, John Bainbridge, employed a very similar method in his *An Astronomical Description of the Late Comet* (1619). In December 1618, Bainbridge became one of the first astronomers to conduct detailed observations of a comet through the telescope. Although placed at the forefront of contemporary astronomical practices, Bainbridge employed very mixed descriptive strategies. Deploring the prognostications of "vulgar Astrologie," (Bainbridge 32) he used the pictorial layout of the constellations of the Zodiac to

determine and explain the position of his observed comet against the stars and planets. Similarly, clearly stating his loyalty to Copernican views, and providing a conspicuous up-to-date depiction of the solar system, he did not forget to enumerate any remotely supportive quotations from Plato, Seneca, Gerolamo Cardano and "our Fathers" (13). Wilkins was familiar with the descriptive methods of Bainbridge's astronomical treatise, and he reproduced them in his own discourse, by similarly supporting his geometrical statements with historical accounts derived from ancient texts. While these historical inclusions might be considered narrative additions in contemporary analysis, in the mid-seventeenth century they were not perceived as entertaining inclusions but as professional testimonies that ensured the popularity or, strictly speaking, the moral certainty of conclusions: the highest possible level of persuasiveness for any argument in natural history, including astronomy.

Wilkins's astronomical argument employed hypothetical modelling and geometrical thought experiments as a means of gaining access to phenomena that were otherwise barely accessible in experience. The Copernican hypothesis worked for him as "spiritual optics," a phrase used by an early modern theologian Nathaniel Culverwell, and also by the Victorian essayist Thomas Carlyle, who spoke of a Galilean movement of "collecting the experience" necessary for correcting outdated insights (qtd. in Vijn 126). Wilkins's moon narrative operated as a semi-fictional lens, collecting the experience which would allow him to lay out the primary structure of a new astronomical description. Copernicanism served as a pattern for argumentative *inventio*, and helped him "discover" or construct the moon as a material and scientific object.

Rhetoric and Experience in the Discovery of the Moon

Wilkins's argument in the *Discovery* (1638) contains thirteen chapters or propositions, and starts with a severe critique of common sense: "The First Proposition: That the strangeness of this opinion is no sufficient reason why it should be rejected, because other certaine truths have been formerly esteemed ridiculous, and great absurdities entertained by common sense" (Wilkins, *The Discovery of a World in the Moone* 1). After casting doubt on the certainty of common knowledge, Wilkins attempts to counterbalance it with its opposite, a hypothetical construct in the imagination, and he presents this as a potentially more reliable foundation for cosmological argumentation. Wilkins employs the figure of antithesis, which often worked as a dialectical tool for inventing an argument. Antithesis stimulates the discovery of specific material by delivering a contrast, which helps formulate premises built on opposed concepts. The Oxford graduate demonstrates cutting-edge skills in orchestrating a dialectical performance: he builds up several pairs of opposites, such as common sense/imagination, qualified/unqualified common sense, and true/false imagination, and sets them against each other in complex combinations. He compares the circumstances of his own attempt to "discover" a world on the moon with the suspicious attitude surrounding the early travels of Columbus, indicating that even the minds best qualified for reasoning about things may lack the capacity to imagine "an incredible thing" (19). Wilkins notices that human perception of scientific probability is experiential and context-dependent, and therefore "things are very hardly received which are altogether strange to our thoughts and our senses," and the understanding of a new truth begins with being "formerly acquainted with some colours and probabilities for it" (21). Pointing out the vulnerability of a new truth, he insists that he personally is grounding his conclusions on the insights obtained from a hypothesis that is well-qualified and trustworthy.

Wilkins's other dialectical trick consists in drawing attention to the gaps in

common astronomical knowledge. He construes these gaps as breaks in the coherent texture of cosmological description and employs the figure of antithesis to analyse and mediate the contradictory premises. The lack of observational experience among his readers makes it unavoidable to employ the techniques of creating belief, as "things that are not manifested to the senses, are not assented unto without some labour of mind" (21). These techniques are intended for presenting the new probabilities "as certain and plaine, as sense or demonstration can make it" (12). Ultimately, Wilkins strives to build a "positive argument" bringing together the statements by Plutarch, Galileo, and Kepler into a coherent description "confirmed by such strong authority" (22).

The required authority could also be gained through writing style, and Wilkins's narrative depictions in the *Discovery* sometimes show structural traces of a Puritan sermon. But he maintains the attitude of cautious criticism towards the contents of doctrinal views on nature, sometimes mockingly suggesting political reasons for their domination. For instance, he facetiously supposes that Aristotle could have subscribed to the idea of the plurality of worlds but was obliged to reconsider his position on civil grounds, "because he feared to displease his scholler Alexander, of whom 'tis related that he wept to heare a disputation of another world, since he had not then attained the Monarchy of this" (29). Wilkins even permits himself some stinging irony towards the generally worshipped philosopher himself, supposing that Aristotle might be "as loth to hold the possibility of a world which he could not discover" (29).

The Galilean analogy between the earth and the moon helps visualize Wilkins's probabilistic narrative.[2] Combining geometrical and teleological suppositions, Wilkins stresses the role of providence in creating similar planets:

> a compendium of providence, that could make the same body a world, and a Moon; and world for habitation, and Moone for the use of others, and the ornament of the whole frame of Nature … as the members of the body serve not only for the preservation and convenience of themselves, but for the use and conveniency of the whole. (43)

However, apart from the similarities between two providently created worlds, one would expect certain differences to be revealed between them as celestial bodies. Since Wilkins's argument mainly underlines the analogy, the differences are bound to break openings in his argument, but even that he manages to put to good use. Since within probabilistic reasoning the arguments are not essentially estimated as right/wrong but probable/improbable or convincing/unconvincing, it brings forward the quality of argumentative performance, making it into one of the criteria for winning the case. Therefore, when a rival theory contradicts Wilkins's proposition, he estimates the quality of the attacked argumentation and sometimes acknowledges that this particular statement may be weak or outdated. Then, since the victory of the rival theory was sustained over a weak author or supposition, Wilkins declares that the skills employed for disproving it must have also been rather crude. This implies an insufficient mastery of methods on the part of his opponent and possibly entails a deficiency in moral certainty, which eventually undermines the prestige of the rival narrative.

As an example, enumerating ancient opinions prohibiting the existence of multiple worlds, Wilkins comments on a discussion by Aquinas, who stated that this idea contradicted the principle of divine perfection. Wilkins mainly quotes Aquinas because his scholastic position "is so much stood upon by Julius Caesar la Galla" (34). Lagalla published a response to Galileo's *Starry Messenger*, doubting that telescopic observations could provide enough ground for conclusions on the three-dimensional

materiality of the moon. Elizabeth Spiller argues that, unlike Galileo, Lagalla was prone to use the optical instrument not as a tool for observing three-dimensional objects but as a reading device for discerning two-dimensional images (Spiller 101-02). The difference of opinion between Lagalla and Galileo was because Lagalla's perception was trained within the culture of reading and commenting on printed texts, whereas Galileo represented a new generation of experimentalists who needed to develop a perception of the space-continuum, which gave room for the live observation of scientific events. In the *Discovery*, Wilkins treats Lagalla's argument as such a triviality that it deserves very few comments. Wilkins mentions that, apart from trying to prove the necessity of one world, Lagalla endeavoured to "take much needlesse pains to dispute against Democritus, who thought that the world was made by the casuall concourse of atoms in a great vacuum" (35). Although modern cosmologists and particle physicists at CERN might appreciate Democritus's insight as surprisingly accurate, this is where Wilkins declares that Democritus's claim was weak, and therefore Lagalla's argumentative skills might also be not particularly prominent, "or else he would have ventured upon a stronger adversary," which Lagalla in fact accomplished in his anti-Galilean pamphlet *De phaenomenis in orbe lunae novi telescopii usu nunc iterum suscitatis* (1612).

When citing historical testimonies on astronomy, Wilkins is not selective in picking only the sources that sustainably defended Copernicanism. He uses any source supporting his propositions, even if in another case that same historical authority proved spectacularly wrong. At some point, he mentions that there is "no mathematician such a foole as to thinke it [Ptolemaic cosmology] true" (*Discovery* 87). Yet, at another point he claims that "learned Egyptian (and Ptolome) seemed to agree that the body of the moon is moister, and cooler than any of the other Planets" (Wilkins, *A Discourse Concerning a New World* 49). Considering the Ptolemaic system as controversial, Wilkins nevertheless respects it as an authoritative adversary and strives to at least win its partial assent about his own claims.

Starting from the third proposition, which is devoted to the hypothetical materiality of the moon, Wilkins maintains the same measure between persuasion and demonstration as was also characteristic of his approach to Scripture. As long as the verbatim reading of a statement is supportive of the argued thesis, all historical and scriptural accounts related to astronomy remain a literal authority. But as soon as any such account contradicts observational data or astronomical common sense, it is treated as a metaphorical interpretation for the sake of saving appearances. When some traditional opinions, being part of the core views of Wilkins's readership, simultaneously intervene with the very fundamentals of Copernicanism, Wilkins sometimes leaves the contradiction unresolved on the level of moral certainty, providing a non-conclusive double interpretation: "some there are who interpret all these relations to bee hyperbolicall expressions, and the noble Tycho thinkes it totally impossible" (Wilkins, *Discovery* 62). In this way, Wilkins moves freely not only between literal and metaphorical interpretations but also between levels of certainty.

Quoting the views of adversaries of Copernicanism, Wilkins sets up a stage for imaginary debates. By allowing Copernican proponents and opponents to contest each other on the printed pages of his *Discovery*, he follows a standard recommendation that dialectical rhetoricians received on the use of the procedure of *stasis* as a tool for connecting a new fact or an argument to the scope of accepted understanding. Stasis essentially meant asking questions and establishing if a particular statement may comply with a certain adopted narrative. Since in different contexts the statements appear differently to different people, and thus display their various sides, the

rhetorician was supposed to consider them against the background of several narrative perspectives to detect the emerging clashes and congruities. Wilkins considers how the proposition about the materiality of the moon may interact with a variety of different theological and philosophical contexts, and finds that his hypothesis is at least partly compatible with most of them, which he views as a positive support for his argument.

Another common rhetorical advice that Wilkins always employs consists of implementing the principles of *enargeia*, the technique of translating living experience into written or spoken discourse. Wilkins's choice of classical authorities often depends on the vividness of their accounts. In some cases, the requirements of verbal *enargeia* demanded the use of extremely picturesque forms of ordinary language. In one of Wilkins's rare episodes of falling back upon the Renaissance's animated view of nature, he quotes from Kepler on how "Venus … lies downe in the Perige or lower part of her supposed epicycle" (Wilkins, *Discovery* 160). As a virtuous *matrona* she is then "in conjunction with her husband the Sunne, from whom after she hath departed for the space of ten moneths, she gets plenum uterum, and is in the full" (160). This performative description means to invoke the gender-oriented experience of human relationships, which compensated for the lack of understanding of Kepler's laws of motion among the readership.

At another point, Wilkins is obliged to use a similar descriptive strategy, when proving one of his most complex propositions concerning the moon's reflected light. He describes the reflection of light in the performative language of *magia naturalis*, again comparing it with a sort of personal relationship: when the moon cannot receive the light from the sun, "the gratefull Earth returnes to her a great, nay greater light when shee most wants it" (154), and "as loving friends equally participate in the same joy and grief, so doe these mutually partake of the same light from the Sun" (153). Wilkins also complements his efforts on narrative enargeia concerning light reflection with a graphic illustration portraying the sun (with a gendered face) together with his "family members," the moon and the earth, the light streaming and reflecting from one to another.

In the *Discovery*, Wilkins's astronomical message comes delivered in the same metaphorical language as that in thirty years' time would be repudiated under his close supervision by the Royal Society of London, as representing but vulgar "fancies" and "fables" (Sprat 62). However, in 1638, Wilkins needed to employ such fancies and fables not only because of their wide circulation and accessibility but sometimes also due to the complete absence of more rigorous terms. For instance, explaining the phenomenon of gravity, Wilkins does not compare it to, but actually names it, "a respective mutual desire of union," which was well-compliant with the animated depiction of "condensed [celestial] Bodies, when they come within the Sphere of their own Vigour, do naturally apply themselves one to another by attraction or coition" (Wilkins, *Discourse* 211-12). Wilkins displays awareness of inaccuracy of the animistic model and attempts to compare this "attraction or coition" to the "affection which causes the union betwixt the Iron and Loadstone" (212). But in the end he is forced to admit that it "is some kind of nearenesse and similitude in their natures, for which Philosophie as yet has not found a particular name" (213). On several occasions he quotes William Gilbert's *De Magnete* (1600) but cannot accept its interpretation of gravity as magnetism and instead chooses rather hermetic Rosicrucian terms reminiscent of Robert Fludd's *Philosophia Moysaica* (1638), with its notions of cosmic magnetism and early explications of natural theology, speaking of "love and unity" created through magnetic forces. Interestingly, Wilkins always strives for accuracy in lexis, but in the absence of a satisfying formal term, employs a neo-Platonic poetic

expression instead of more technical and conventional but slightly misleading terminology.

Enumerating the difficulties that he encountered due to a lack of observational data, Wilkins notes that "'tis very imperfect and difficult, by reason of the vast distance of those bodies from us, we could not by our senses see such alterations [in heavenly bodies], yet our reason might perhaps sufficiently convince us of them" (Wilkins, *Discovery* 50). Due to the rarity of direct observational experience, Wilkins's *Discovery* could not assume that all his readers had had a chance to use Galileo's "famous perspective," which would allow them to observe the moon closer and approach it visually. But Wilkins likens the effectiveness of Galileo's "perspective" as an instrument of scientific vision to his own narrative presentation of the moon. Noting this similarity, he distinguishes the recently acquired experiential vision of the moon from that of the ancients, who "were said by their magical charms to represent the Moones approach," whereas "we cannot onely bring her lower with a greater innocence, but may also with a more familiar view behold her condition" (89).[3] He emphasizes the similarity of targets pursued by his probabilistic *inventio* and Galileo's experimental discovery, in that they both strive for such a mode of vision that "those things that could scarse at all bee discerned by the eye, … might plainely and distinctly bee perceived, … and that as they were really in themselves, without any transposition or falsifying at all" (91). In this way, Wilkins legitimizes the spiritual optics of dialectical constructs alongside optical experiments and observations.

The Perspective of Wilkins's Discoveries

Even if performed with literary techniques, Wilkins's probabilistic narrative aims at the knowledge of things themselves, as opposed to verbal demonstrations. In the late 1660s he would inspire the members of the Royal Society to accept it as one of their primary goals. In 1638, the first discourse ever composed by this ambitious Oxford graduate already projects into the future his versatile occupations. While weighing the possibility, of whether the Galilean "famous perspective" could be used as an ultimate device for reading the book of nature irrespective of the distance, the narrative in *Discovery* was intended to bring the moon "lower with a greater innocence" (89). Wilkins's next publication, *Mercury, or the Secret and Swift Messenger* (1641) would review the means of secret and long-distance communication, and elaborate on possibilities of viewing scientific language as a "tool for linguistic therapy" (Formigari 78). Later, Wilkins's *An Essay towards a Real Character and a Philosophical Language* (1668) would attempt to work out a procedure for deepening the understanding of nature through language as an artificial instrument of spiritual optics, augmenting the natural capacity of the mind for the apprehension of phenomena, and processing and making sense of scientific experience.

Another of Wilkins's future writings, *A Discourse Concerning the Beauty of Providence* (1649), advances some of the theological notions that he first expressed in the *Discovery*. In the edition of 1638, on establishing that in all probability the moon is another world, the argument of propositions VII to XIII explores the concrete features of this world, largely deriving them from the providential analogy between the earth and the moon, since "if our earth were one of the Planets … then why may not another of the Planets be an earth?" (Wilkins, *Discovery* 94). The probabilistic *inventio* in this argument generates new conjectures about the physical properties of phenomenon in question, including the presence of water and air and consequently the possibility of habitation (138). Wherever his observational argument seems to fail, Wilkins tends to fall back on the coherence of providential narrative, arguing that the similarity between

the moon and the earth can be morally certain. The notion of divine providence serves him as a solid framework for interpreting the sometimes inexplicable data obtained through observations. In spite of the fact that the earth and the moon may possess different material features, nevertheless they are both to be found within the uniform domain of nature governed by providence (103). Providence furnished the moon with a set of conveniences, similar to that it supplied to the earth, which testifies to the intention of establishing the same natural order on both the earth and the moon, "since providence hath some speciall end in all its works, certainly then these mountaines were not produced in vaine, and what probable meaning can we conceive there should be, than to make that place convenient for habitation" (138).

This appeal to the teleology of providence solidifies Wilkins's position in theological terms and also serves as a criterion for evaluating the probability of specific properties of rival cosmologies. The notion of providence was employed by him not only as a moral hinge, but also as a warrant for the coherence and probability of his conjectures about the laws of nature. But in the third edition of the *Discovery*, published in 1640, Wilkins describes a new inspiration which came to him after reading Francis Godwin's *The Man in the Moone*. Godwin's copious enumeration of the technical details of a flying chariot as a means of travel made Wilkins muse about the pleasures and benefits of regular commerce with the moon. Wilkins's *inventio* becomes focused on exploring the ways for "bringing the moon closer," not through the spiritual optics of narrative but by human travelling through space, thus suggesting a methodological shift in astronomy from contemplation to action. This prompts him to ruminate about various opportunities for, and obstacles to, such activity: the nature of gravity, the ways for overcoming the heaviness of the human body, and the coldness and thinness of the moon's air.

Interestingly, at this point, Wilkins's conjectures begin to entertain certain doubts in the teleological perfection of providence. In the edition of 1640, he professes a slight vexation towards divine nature that did not apparently mean a human body to fly on its own (Wilkins, *A Discourse Concerning a New World* 208). Wilkins starts approaching the issue of space travel from the prospective of an engineer, where the coherence of conjectures is ensured not through the vividness of verbal teleology but through the rigour of mathematical calculations. Wilkins switches to the pragmatic tone of an artisan: "I doe seriously, and upon good grounds, affirme it possible to make a flying Chariot.… This engine may be contrived from the same principles by which Archytas made a wooden dove, and Regiomontanus a wooden eagle" (Wilkins, *Discourse* 238-39). Wilkins's engineering thought stops relying on the teleology of providence, which consequently makes him abandon the probabilistic universe and enter the realm of mathematical certainty.

Wilkins's *Discovery* comes a long way from confirming the status of the moon as a material object to designing the means of actual space travel through a quarter of a million miles. Summarizing the essential features of Wilkins's early argumentative style, his probabilistic narrative displays a flexible configuration of dialectical and rhetorical devices. The breaks in coherence, occurring due to a lack of experient knowing of the moon, are filled by various performative strategies of persuasion. The content of the narrative does not achieve validation via truth-claims, since Wilkins mainly claims the probability-value of his propositions, but he achieves assent through evaluation of argumentative practices, involving the criteria of moral certainty and the mastership of dialectical methods.

Even though many of Wilkins's astronomical conjectures were premature, current investigations of the moon still follow the same trajectory of questions that were

proposed four centuries ago, such as the presence of water on the moon and the possibilities of regular travel and colonization. The discursive methods of early modern cosmology are of primary interest to historiography, but may also be relevant to a consideration of the modern pragmatics of scientific rationality. Even now, the probability of knowledge in science is viewed in connection with the aesthetic qualities of scientific language. The principles of epistemic justification are embedded into the value-laden interactions within scientific practices. The experiential character of investigation is undeniable even in the case of modern mathematics, whose methods are suspected of being not purely logical but containing a contingent, persuasive context-dependent function. Early modern dialectical and rhetorical techniques may attract interest not only as patterns of persuasion, but also in their heuristic capacity to introduce novelties and facilitate making sense of scientific experience.

Notes

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1. Testimony remained one of the *loci communes* of argumentative invention. Like in judicial rhetoric, in scientific rhetoric, testimonies served as a means of imparting credit to the argument. The proof that they provided was regarded as "artless," i.e. not contaminated with "the paint of art" or rhetorical effects. For a study on testimony as a rhetorical tool, see: Richard Serjeantson. "Testimony: the Artless Proof." *Renaissance Figures of Speech*. Ed. Sylvia Adamson, et al. Cambridge: Cambridge UP, 2007. 181-94.

2. Wilkins's analogous narrative effectively elaborates on the Galilean technique of "lunar movie." See: Mario Biagioli. *Galileo's Instruments of Credit: Telescopes, Images, Secrecy*. Chicago: Chicago UP, 2007. 106-11.

3. Wilkins mentions that he refers here to the experience of Johannes Fabricius who in March 1611 employed a *camera obscura* to conduct the observations of spots on the sun and then published a brief tract interpreting these observations, entitled "De Maculis" in *Sole Observatis et Apparente earum cum Sole Conversione Narratio* (Wittenberg, 1611). For an account of Fabricius' experiments, see: Albert Van Helden and Eileen Reeves. *On Sunspots. Galileo Galilei and Christopher Schneider*. Chicago: Chicago UP, 2010. 30-36.

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