

## NATURAL PHILOSOPHY IN *GULLIVER'S TRAVELS*: AN EPISTEMOLOGICAL CRITIQUE

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### ABSTRACT

In *Gulliver's Travels*, Swift challenges the epistemological authority of the experimental scientific models promoted by the Royal Society. Gulliver functions as an imaginative, literary embodiment of epistemological claims, a living thought experiment, that exposes the weaknesses of the Society's assumptions. Swift's satire thus offers a sceptical epistemological critique to some of the most important scientific claims of the eighteenth century. This paper argues that Swift challenges the Royal Society's methods of knowledge-making: first, Gulliver's troubled observations bely his representation as Boyle's ideal, modest observer; second, the Professor and his students in the Academy of Lagado undercut the social construction of facts and scientific knowledge as promoted by the Royal Society's public experiments and written reports. Swift's satire thus operates as a serious discursive move within the larger conversation about the truth claims of the new philosophy, and Swift situates himself not as an acolyte but as an intellectual partner in the dance between the story of science and satire.<sup>2</sup>

Keywords: Jonathan Swift; *Gulliver's Travels*; science; Royal Society; Charles Boyle; Isaac Newton.

While *Gulliver's Travels* is commonly labelled a novel, its literary identity has sometimes perplexed modern critics. By the 1720s, as Kathryn King (2001: 36–37) has noted, the novel had been established as a “distinct literary form” but it could encompass a “novella, short story, or even episode”. Prose fiction in the period was energetic, experimental, and versatile, and had not settled into the established forms found later in the century. Paula Backscheider (2013: 47) has argued that the broad range of styles and structures existed to do “different work”

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for the authors and readers. This paper argues that Swift's so-called but not-quite novel, in a highly experimental way, is also *doing work* for his readers, by accommodating a literary model to an epistemological critique of the new sciences and the claims made by their practitioners. *Gulliver's Travels* first appeared in print on 28 Oct 1726, only a few months after Isaac Newton told William Stukeley the story of how an apple falling in his garden in 1666 had prompted him to develop his law of universal gravitation. Gulliver's story and Newton's story are deeply entwined, for Swift's readers immediately recognized the voyages as responses to the new science and its practitioners, including Newton himself. This paper argues that Swift was deeply attentive to the epistemological claims of experimental philosophers, and rather than simply parodying the virtuosi of his period, employed satire as a literary illustration – a thought experiment embodied in Lemuel Gulliver and the characters he encountered – to clarify serious challenges to the epistemological claims made by the Royal Society.

The early modern period was marked by an absence of careful boundaries between discrete types of knowledge across multiple fields of inquiry, such as alchemy, chemistry, and medicine. The organisation of knowledge commonly conceived natural philosophy as encompassing the four inter-related disciplines of logic, ethics, physics, and metaphysics, with logic as the foundation upon which to begin one's study of the other three, and no epistemological distinction between them (Brockliss 2003: 45). Tita Chico (2018: 2) has argued that in the early eighteenth century even “literature and science were not settled as distinct epistemologies, but were understood as deeply, if sometimes awkwardly, implicated in one another”. She argues that literature in the period functioned as a “form of epistemology”, a way of developing knowledge that exceeds the possibilities of the laboratory or scientific paper. As she writes,

... early science finds its intellectual and conceptual footing in the metaphoric thinking available through literary knowledge and ... literary writers in turn wield natural philosophy as a figure for the importance and unique insights of literary knowledge.

(Chico 2018: 10)

It was not simply that early modern science “formulated itself through literary knowledge” – numerous writers in the early modern period “make the case for the epistemological superiority of literary knowledge” (Chico 2018: 1).<sup>3</sup>

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<sup>3</sup> During the nineteenth century, Swift's engagement with scientific principles was either not taken seriously or was dismissed as curmudgeonly Luddism. But in 1937 Marjorie Nicolson and Nora M. Mohler brought a new perspective, rediscovering Swift's detailed engagement with the intellectual developments of his day.

Chico coins the term *experimental imagination*, which reveals “a doubled epistemological trajectory”. Experimentalists use “imaginative speculation”, and literary forms enable “new forms of understanding” (Chico 2018: 2). Science writing in the period was a literary trope that “understood the fictionality of objectivity and details, representing science as not only forged but also improved by the literary imagination”. Moreover, “as a specifically modern form, literary knowledge facilitates a redefinition of authority and evidence” (Chico 2018: 2). This developmental dependence upon each other – both scientific exploration and literary forms – means that early modern scientists “used the tools of literary representation to find and make truths about the world” (Chico 2018: 3). Chico challenges the traditional view that literary figures responded to science after the fact, with science as the primary source of truth against which writers positioned themselves. She proposes instead that “the imaginative qualities of literature” are a parallel, not subordinate mechanism, for discovering truth (Chico 2018: 11). If literariness makes science transparent and authoritative, literariness also functions within a larger discursive debate in which the claims of the scientific community can be modelled, critiqued, circulated, appraised, and corrected. Literature in this period partners with science in an intellectual dance of mutual exploration. It is within this discursive exchange that *Gulliver's Travels* exists, not responding to, but in conversation with scientific claims of his period. Chico (2018: 103) has argued persuasively that Swift anticipates the problematic role of science, as conceived by Bacon, “as of and for the state”. By contrast, I focus on the epistemological challenges Swift offers to the Royal Society's methods of knowledge-making, particularly (and for the purposes of this essay, only partially) in Lilliput and Laputa.

Formally established in 1660, the Royal Society invoked Sir Francis Bacon as its intellectual progenitor. In his *Novum Organum* of 1620 Bacon had argued for a new scientific method rooted in observation and induction. *Novum Organum* proposed a new method of reasoning from experiments, discarding traditional logic and scholasticism. As Dahlia Porter (2018: 5–6) notes, “inductive method became the hallmark of legitimate science well into the nineteenth century. She explains that “Bacon wanted to build a databank of observations and experiments that could be arranged, compared, distinguished, and ultimately composed into universal principles. ... for Bacon and those who took up his method in the seventeenth and eighteenth centuries, induction made experience *literate* — it was a technology for organizing information in writing, as text” (Porter 2018: 4). Bacon recognized the potential epistemological obstacles of his programme, which he termed *idols of the mind*. These included *idols of the tribe*, *den*, *market*, and *theatre*, with *idol* (*eidola*) meaning the transient (i.e. erroneous) images of things. While Bacon's influence on the Royal Society was profound, historians have recognized that the writings and methodologies of Sir Charles Boyle

established the most widely accepted experimental processes of the early modern sciences in Britain. Yet within the developing experimental sciences, there were significant variations in approaches, aims, and methods of validation. Boyle and the Royal Society created strict distinctions between natural philosophy and politics, for instance, but disagreements arose concerning the relationship between natural philosophy and theology. Members also disagreed concerning the degree to which natural philosophy should diverge from long-standing first principles. In her comparison between the Florentine Accademia del Cimento, the Royal Society of London, and (later) the Paris Académie des Sciences, Jutta Schickore (2017: 14–21) notes that “the Italian, French, and English investigators held varying views about what exactly the commitment to experimentalism involved” and “Royal Society members advocated experimentalism as the preferred alternative to reasoning from first principles”. Enthusiasm for the new methodology did not confer unanimity in its tenets, applications, or conclusions. But as a dominant figure, Sir Charles Boyle established several epistemological claims that we will see Swift subvert.

In their ground-breaking study of the Royal Society, Steven Shapin & Simon Schaffer have argued that Sir Charles Boyle, more than any other member, established specific criteria for establishing *matters of fact* as the foundation of proper scientific knowledge. It was not enough to simply perform experiments. The Royal Society wished to distance itself from traditional alchemical processes, which were often treated as proprietary secrets and conducted in private spaces. The Society’s experiments needed to be authoritative to gain credibility and be accepted by the larger community. Experimental activities required credible participants who could be trusted as reasonable and informed observers (i.e. educated gentlemen), a performance model Shapin & Schaffer called the *modest witness*. The collective commitment to witnessing included both a semi-public laboratory setting *and* the dispersal of knowledge to others not physically present so they could also “participate” through written accounts. Boyle insisted that “witnessing was to be a collective act” (Shapin & Schaffer 1985: 56). As they point out, Boyle’s publications worked to “exemplify a working philosophy of scientific knowledge ... largely through *ostension*: by showing others through his own example what it was like to work and talk as an experimental philosopher” (Shapin & Schaffer 1985: 49). Swift applies Boyle’s own methods to his experimental novel, performing Boyle’s epistemological claims through the literary model of Lemuel Gulliver. Through his imaginative experiment, and the body of Gulliver, Swift exposes epistemological reservations often glossed over in literature of the period.

Lemuel Gulliver, the narrator of his tale, appears as a recognizable and conventional figure of the time, the physician or surgeon who would prefer to spend his days investigating the natural world but must find a profession to

support himself and his family.<sup>4</sup> He is educated at Cambridge (as a gentleman) and can move easily between the various social classes he encounters, whether an Emperor's court or a farmer's kitchen. In this he confirms Steven Shapin's argument that the "credibility and presumed reliability of gentlemen's utterances could survive without the chivalric ritual forms of oath and promise" which made such figures indispensable in the transmission of factual scientific accounts (Shapin 1994: 69). Gulliver's accounts of experiences and people around the world are not the simple travel narratives of an English sailor. He takes seriously the Royal Society's instructions to travellers, published in *The Philosophical Transactions*, which attempted to standardise reports of foreign lands, discoveries, and information that could prove useful to natural knowledge, navigation, manufacturing, or trade. The Royal Society emphasized reports of reliable witnesses as an ideal, though reports by individuals whose data could not be verified were necessarily included in the accumulation of scientific information. As Chico (2018: 37) confirms, "[f]rom its earliest days, a major preoccupation of the Royal Society was training that observer". The initial recommendations to authors were to limit reports to simple descriptive accounts, a self-conscious attempt to "inoculate experimental discoveries from the charge of incredulity" (Chico 2018: 26). She writes, the "'knowing Naturalist,' the modest witness is a masculine figure of authority, gentility, and privilege, admired for his morality and knowledgeability and, just as notable, distinguished from women and laboring men" (Chico 2018: 37). So, whether lost, shipwrecked, or abandoned, Gulliver conducts himself like a natural philosopher conscious of serious readers back home. Yet the *incredulity* of his accounts is not just the point of his satire, but an epistemological critique of the process of knowledge-making.

Engaged as he was – through friendships, intellectual exchanges, readings of the *Philosophical Transactions*, and self-study in mathematics – Swift recognized that the experimental method adopted by the Royal Society rested heavily upon the power and authority of observation.<sup>5</sup> Accurate and useful observations required precision instruments: well-crafted telescopes, microscopes, sextants, watches, etc. In the late seventeenth and early eighteenth century, the role of natural philosopher was not easily distinguished from the role of instrument maker. For decades, many

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<sup>4</sup> As Steven Shapin (2003: 160) has pointed out, "At neither end of the eighteenth century did the role of the 'man of science' exist as a coherent and distinctive social kind". We find instead a number of professions in which men with an interest in natural philosophy could pursue those interests as part of their normal duties. Nor would we necessarily expect natural philosophy to distract them from such duties; their contemporaries would expect their interests in natural philosophy to function as a legitimate element of their work, whether that work was medicine, civil service, or the Church.

<sup>5</sup> See Sir Walter Scott, Irvin Ehrenpreis, and Walter Keithley for critical discussions of Swift's connections with the natural philosophers and the Dublin Philosophical Society.

leading members of the new science were also precision instrument makers, and the craftsmen who provided these instruments were included in rosters of natural philosophers.<sup>6</sup> When Lemuel Gulliver travels to Lilliput and Brobdingnag, where the people are either much smaller or larger than himself, eighteenth-century readers recognized the invitation to think about microscopes and telescopes, devices designed specifically to alter perspective between observers and the observed, or subject and object. However, by drawing our attention to the objects under observation, Swift simultaneously suggests important flaws in the instrument through which we are observing them: Lemuel Gulliver.

Lorraine Daston & Peter Galison have argued for sharp distinctions between the observations central to empirical methods, and the desire for absolute “objectivity” desired by nineteenth- and twentieth-century scientists. What other historians have assumed was objectivity, Daston & Galison have defined as “truth-to-nature”, a devotion to the practice of enlightened observation, which presumes not simply reportage but the ability to sift through idiosyncrasies and particulars to represent natural phenomena in a universal and “typical” form. The “concrete practices of abstract reasoning as understood by Enlightenment naturalists” included “selecting, comparing, judging, generalizing”. In short, “Allegiance to truth-to-nature required that the naturalist be steeped in but not enslaved to nature as it appeared” (Daston & Galison 2007: 59). The meaning of objectivity in the *sciences*, they argue, did not solidify until the nineteenth century, and common usage in early modern scientific writings conflated elements of objectivity, such as “emotional detachment”, “automatic procedures for registering data”, “recourse to quantification”, or a “belief in a bedrock reality independent of human observers” (Daston & Galison 2007: 29). The earliest use of the term in the fourteenth century was linked to subjectivity, with objectivity in philosophy referring to one’s *concept* of a thing, and subjectivity referring to the independent *existence* of a thing. As they note, eighteenth century dictionaries could maintain these earlier meanings (Daston & Galison 2007: 29).

It is worth noting that the concepts of object and subject, or objectivity and subjectivity, vary during the period, as objectivity and subjectivity existed as concepts outside of the scientific community. Daston & Galison (2007: 31–32) point out that these words formed part of the scholastic metaphysical programme of study. In philosophy, the search for a less ideologically driven method of inquiry could also employ these terms. Stephen Gaukroger (2012: 59) has noted that philosophers were seeking a method “that guides arguments by making sure they proceed in the right way, as opposed to finishing in the right way”. Likewise, Guy Axtell (2016: 23) has argued that “the epistemological turn in

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<sup>6</sup> Robert Hooke and Frederick William Herschel are only two of the most famous. London was, in fact, the world’s leader in precision instruments.

philosophy, in parallel with early modern scientific developments, initiated a shift away from concern with questions of theology and metaphysics, emphasizing instead the need to study our own sensible and mental faculties and to recognize on this basis the limits of what we can justifiably claim to know", a concern voiced by Sir Francis Bacon in his discussion of the four *idols*. Axtell (2016: 23) argues that "[c]ognitive objectivity concerns the means by which we come to know something; it concerns our epistemic praxis – our norm-governing practices of evaluation and guidance-giving". In addition to this philosophical concern, and of particular interest to Swift, *object* and *subject* had grammatical meanings, as the *subject* of a sentence is the agent or actor and the *object* is acted upon by the agent. Indeed, Swift's great talent as a satirist is his ability to conflate meanings and implications into absurdities that transcend the mundane realities of life.

Significantly, the truth-to-nature impulse of the new philosophy was paralleled in literature by the rise of literary Realism, which the novel appeared custom-made to develop. Psychological Realism had erupted on the early modern stage, particularly with Shakespeare, was taken up by Milton in *Paradise Lost*, but found its literary home in the prose novel. Likewise, the role of insightful observation played a crucial role in developing the techniques of Realism – not simply the internal psychological motives and responses of characters, but also the myriad of mundane details about everyday life that made the novel seem to represent the 'real' world. Satire, of course, is not wedded to the 'real' in the same sense, as it often relies upon distortions and exaggerations. *Gulliver's Travels* confuses readers because it is a satire written in the *style* of a realistic novel, where monstrosities and fantasies are presented as everyday objects of study. In this sense, novels and other forms of literary realism sometimes exceed the truth-to-nature aims of naturalists, as truth-to-nature aspires to a level of generality – the plant archetypes of Linnaeus, the Laws of science, the characteristic responses of materials in a laboratory. Generality in literary realism is less desirable in many cases than the specific, such as the individual character who differs from his or her family members, peers, or social group. Standardisation, in other words, while important in the emerging sciences, was not always overtly desirable in literary realism.<sup>7</sup>

Swift was certainly aware of the storytelling element central to the new philosophy and the Royal Society. The story of science, as related by Boyle and Thomas Sprat in their publications, required literary elements such as metaphor, imagery, linear plots, and deliberate rhetorical structures. Chico (2018: 21) has argued that, far from avoiding imaginative literature, the Royal Society and its spokespersons eventually adopted the methods of literature to create the shared experience that established and sustained corporate knowledge. "Observation",

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<sup>7</sup> The tension between literary realism and experimental science becomes clear when Daston & Galison discuss the truth-to-nature model of the emerging sciences in the eighteenth century.

she writes, “is at once a figure and a scientific technology, and it can be so only through its reliance on imaginative work” and “the two dominant technologies of the experimental imagination are the observed particular and the modest witness”. In fact, “[a]t their core, scientific subjects, both the object of study and the individual who studies, require literariness to exist. ... [L]iterariness makes possible the conceptualization of scientific findings and the individual who produces them” (Chico 2018: 21).

Gulliver conducts himself as a model of Boyle’s *modest witness*. “A man whose narratives could be credited as mirrors of reality was a *modest man*”, Shapin & Schaffer (1985: 65) write, and “his reports ought to make that modesty visible”. They locate the source of modesty in Boyle’s construction of the experimental essay. “The essay, that is, the piecemeal reporting of experimental trials, was explicitly contrasted to the natural philosophical *system*” (Shapin & Schaffer 1985: 65). In a parody of such essay collections, conflated with the picaresque technique common to travel literature, Gulliver supplies four reports of his voyages, accreting rather than systematising the experiences he has gathered in each.<sup>8</sup> Moreover, Gulliver’s narrative style mimics Boyle’s desire to write in a “plain, ascetic, unadorned” even “functional” style (Shapin & Schaffer 1985: 65). By the 1720s, this plain style had shifted from philosophical and experimental discourse to the broader narrative style of periodical essays and fiction in general, as the values of early modern science and its attempt to capture the mirror (or truth) of nature echoed the development of the novel and its parallel interest in sharply observed realism.

Yet, if “the cultivation of attentiveness preoccupied naturalists throughout the seventeenth and eighteenth centuries”, as Chico (2018: 2) argues, Gulliver functions as a literary model that embodies the flaws in these assumptions. The apparent trustworthiness of Gulliver as an astute observer becomes suspect early in his first journey to Lilliput as he is both nearsighted and a giant. Though the Lilliputians are smaller than Gulliver and therefore difficult to see, Gulliver evades his near-sightedness and wears glasses only as protection from arrows. He nevertheless convinces himself that he is observing everything at the appropriate level of detail, violating the principles of the *modest witness*. Many experimentalists recognized the limitations of sensory inputs, particularly given advancements in microscopy and the telescopes used in advanced astronomy. In his *Micrographia*, for instance, Robert Hooke (1665) argued that such instruments could enlarge the senses. Gulliver possesses the tools required to enlarge his senses but refuses to use them, as he fears revealing them to the

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<sup>8</sup> By supplying these four voyages without a reasoned explanation of how such widely different creatures can all exist simultaneously, Swift anticipates some elements of later “objectivity”, as described by Daston & Galison.

Lilliputians and perhaps losing control over them. Gulliver's physical blindness embodies Bacon's *idols of the tribe*, relying on sense perception that he should know, as a reasonable person, is inadequate to the task at hand. His epistemological claims are thus implausible, even "incredible", as he does not know what he cannot see. His near-sightedness casts all his observations, no matter how seemingly thorough, into doubt.

The ridiculousness of Gulliver's observations relies upon all of these meanings, for his observations are always spoiled by the fact that he is a giant. There is nothing 'modest' about his body or experience. Wherever he goes, he becomes the object of interest, while the objects he is observing transform into subjects responding to the giant in their midst. He can simply never be a neutral observer. Shapin & Schaffer (1985: 23) have argued that, in the experimental norms established by Boyle, "the solidity and permanence of matters of fact reside in the absence of human agency in their coming to be. ... Matters of fact are regarded as the very 'mirror of nature'". Yet Swift warns us that even the well-meaning and informed observer can determine or alter what he is observing simply by his presence, as walking through a stream determines the sediment that appears. Gulliver's name reminds us that he is gullible, and that his scientific observations are affected by his physical and material presence. His body distorts all that he sees, whether through near-sightedness or immense size, so his observations necessarily lead to flawed conclusions. Sir Francis Bacon had raised similar concerns about distrust of the physical senses. But Gulliver's unreliability as a *tool* of observation, within the context of the books most likely to suggest a microscope or telescope, raises epistemological questions about the claims made by practitioners of the new science.

Like Gulliver, the Royal Society valued and laid claim to scientific accuracy but struggled to demonstrate it consistently, even in laboratory conditions. For instance, Robert Boyle was unable to conduct reliable demonstrations of his air pump without the skilled assistance of Robert Hooke to operate the machinery. Nor was it clear whether Christiaan Huygens's later air pump could be proven a superior device since neither Huygens's nor Boyle's equipment operated consistently from one demonstration to the next. If Gulliver's flawed vision and corresponding observations are concerning, Book III challenges not simply whether instruments are serving useful purposes, but whether the written accounts of experimental discoveries can be trusted, regardless of their "authoritative" sources.

Swift's earliest readers recognized Book III as the most obvious parody of the Royal Society and Sir Isaac Newton.<sup>9</sup> As Gregory Lynall (2005: 19) has pointed out, "It is generally accepted that the attack on mathematicians in the 'Voyage to Laputa'

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<sup>9</sup> Sir Walter Scott concurred and consolidated these early responses to Swift in his *Life of Swift*.

is to some degree a form of revenge against Isaac Newton for his involvement in the assay of William Wood's Irish halfpence". Gregory Lynall has also argued that the "Taylor's error" does not refer to "the printer's error in Newton's calculation of the distance between the Earth and the Sun", as has been generally accepted since Sir Walter Scott. Instead, "the most significant error in the first edition of the *Principia* concerns resisted motion". Lynall (2005: 22) contends "Newton discovered that the mistake was due to a more fundamental flaw in his reasoning, and would involve extensive work, especially because the proof of the new result would need to exactly fit the space allotted in the second edition of the *Principia* which was already printed". As a result, the "Taylor's error" passage may "partly refer to Newton's attempt to 'tailor' his proof to fit the space available" on the reissued page. Moreover, "Gulliver's remark that he 'observed such Accidents very frequent, and little regarded' suggests that perhaps Newton's scientific errors as a whole are ridiculed in the 'Taylor' passage" (Lynall 2005: 23). Swift's attack on Newton, therefore, is rooted in scepticism of his actual mathematical abilities. Swift lampoons the Laputans' calculations but goes further in attacking fundamental assumptions about the authority of natural philosophy itself. As Peter Hanns Reill (2003: 27) has pointed out, "Mathematics became the privileged language of natural philosophy; more than that, it was assumed to be its ideal form of exposition". Although Newton critiqued what he called hypothetical reasoning, that is, the development of an over-arching system, his own mathematical method depended on mathematics, an organising, logical system. To attack the system is to attack the premises underlying Newton's entire enterprise. While the Newtonian Laputans create a ridiculous spectacle, there are real consequences to their failings as civic leaders and competent virtuosi. Gulliver notes that the houses on Laputa are dilapidated, crooked, and uneven, complaining that while they are good at calculations, Laputans are clumsy, awkward and unhandy with anything beyond mathematics or music.<sup>10</sup> When Gulliver encounters difficulties in having a simple suit of clothes made, Swift not only parodies Newton, but attacks his reputation as a mathematician, imputing to him a startling degree of incompetence.

Book III likewise continues Swift's epistemological critique of scientific tools and their reliability. In the *Astronomers Cave*, a hundred yards beneath the surface, we find a "great Variety of Sextants, Quadrants, Telescopes, Astrolabes,

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<sup>10</sup> The rebuilding of London after the Great Fire into the elegant, well-planned city Swift personally knew had occurred under the supervision of Sir Christopher Wren and Robert Hooke, founding members of the Royal Society, suggesting that we should read this portion of the book as an indictment of Isaac Newton specifically. Sir Christopher Wren worked under the auspices of King Charles II as the royal surveyor, and Robert Hooke worked under the auspices of the Corporation as the City of London's official surveyor. In fact, they both worked together from the same architectural office for many years, and were widely respected for the sensible and well-managed professionalism of the enterprise.

and other Astronomical Instruments" (Swift 2012: 241). These instruments require celestial observations to function properly, yet the only reflection available is from the twenty lamps that light the cave. We are reminded of Bacon's *idol of the den* which refers to Plato's "Myth of the Cave". The Laputans' limited perspectives create distortions of the truth, which in turn prevents them from imagining different models of thought. If the misused tools of observation are the source of epistemological concerns, we find yet another "system" under attack when we discover the island is controlled through a complex mechanical device centred on a loadstone (Philosopher's Stone). Once again attacking Newton, Swift explains in obtuse mathematical language the exact gravitational effects required for the island to be steered in any direction.

The stone offers a nod to the new science and its technological marvels, including scientific interest in magnetism. But the Philosopher's Stone was also an essential aspiration of alchemy and here we find a sophisticated caricature of Newton's tension with his continental contemporaries. Newton's concept of gravity was not universally accepted, for it seemed to imply that matter had occult qualities, eliminating distinctions between alchemy's "action at a distance" and the new sciences. The definition of matter was the central issue that engaged natural philosophers throughout the eighteenth century. Through Newton's theories, it became simplified into two basic principles of extension and motion. As Reill (2003: 26) notes, "the idea of inertia became one of the pillars supporting the mechanical philosophy of nature". But even Newton could not satisfactorily explain the cause of gravity. In the second edition of the *Principia* he argued that such an explanation would lead him into the forbidden territory of a hypothesis: "to us it is enough that gravity does really exist, and act according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies" (Newton English Translation 1728: 547; Iliffe "Sciences and Voyages of Discovery" 2003: 273). Leibniz, in particular, raised serious concerns about this "explanation", for if at the creation God implanted a force of attraction in all the bodies in the universe, it amounted in effect to a "continual miracle" (Iliffe 2003: 273). In effect, Leibniz and others accused Newton of applying an occult quality to matter, contrary to the concepts of a mechanical universe full of inert, or passive, matter. The Astronomer's Cave imaginatively reinforces their critiques, for the explanations of the loadstone confuse more than they illuminate. According to Gulliver, the island cannot move beyond the boundaries of its own dominions; gravity and the magnetic attractions that keep the island floating exist only within the realm of the Laputan king. The Astronomer's Cave thus reveals a deep scepticism about Newton's mathematical reasoning and scientific claims to knowledge.

In perhaps the most effective critique of Boyle's claims to *matters of fact* and their construction, Gulliver is taken to the Academy of Lagado, where we find the famous language machine. Here he encounters a Professor "employed in a

Project for improving speculative Knowledge by practical and mechanical Operations" (Swift 2012: 266). The books being "written" by the Academy are the result of random spins of blocks, carefully transcribed by the Professor's assistants (Swift 2012: 268).<sup>11</sup> As Daston & Galison have pointed out, the truth-to-nature model of scientific observation required expertise as the naturalist would translate the particular elements of what was observed into a "reasoned image". Raw data alone was insufficient. Experience and expertise could identify the universal or types within the larger discipline, making comprehensive connections between the varieties of observations (Daston & Galison 2007: 74). Boyle had tried to establish *matters of fact* as the foundation of proper scientific knowledge, relying upon the "modest witnesses" of the scientific community. The status of the witnesses, and the multitude of them, conferred scientific authority upon the experiments reported. But Swift's language machine exposes the epistemological weakness of this model, as the witnesses at the Academy produce nothing more than random gibberish and the Professor offers no intellectual intervention into the process. Once again, the weaknesses of the epistemological claim rests with the inherent foolishness of the people behind them, specifically their inability to distinguish between truth and nonsense.

In *Gulliver's Travels* Swift imagines and demonstrates his own epistemological critique of the Royal Society's experimental methods, not as a simple parody of established norms, but as a serious discursive move within a larger conversation about the truth claims of the new philosophy. Through imaginative fiction, Swift inserts himself into some of the most problematic scientific issues of the 1720s, not as an acolyte but as an intellectual partner in the dance between the story of science and satire.

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<sup>11</sup> I have argued elsewhere that Swift also uses the Language Machine to challenge epistemological claims relating to war games and civic leadership. See Davis Perry (2019).

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