

Microrhetorica: Ethos and Empiricism in Robert Hooke's *Micrographia* (1665)

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Robert Hooke's *Micrographia* (1665) offered the world a first glimpse into the microworld of various natural and artificial objects, from lice and moss to cork and written ink. Ostensibly, *Micrographia* championed the empiricism of the New Philosophy of seventeenth-century Europe that would mature into modern, natural science. Yet, beneath its veneer of objective, empirical inquiry, *Micrographia* reveals both the deep-seated social and moral anxieties of Restoration England and the exigent problems of credibility and authority that lay, and might still lie, at the heart of empirical science. I argue that Hooke's project in *Micrographia* was fundamentally rhetorical; its success and its very epistemic legitimacy were contingent as much, if not chiefly, upon a multifaceted ethos that strove to resolve paradoxes of personal credibility and impersonal objectivity that shaped the emergence of seventeenth-century natural philosophy. By studying Hooke's complex verbal and visual rhetoric, one discovers the achievements and compromises that enabled the heroic empiricism of the so-called "Scientific Revolution" and that might continue to govern modern assumptions about the nature and aims of scientific inquiry.

Introduction

Robert Hooke's *Micrographia* (1665) introduced to seventeenth-century England a minute world curious and previously unseen, revealed to its author by the recently-invented microscope and conveyed to its readers by thirty-eight engravings and extensive commentary.[1] The accuracy and detail of *Micrographia*'s depictions of plants, insects, and other objects, both natural and artificial, endure as testimony to Hooke's keen eye and illustrative skill, his surpassing capacity as an observer. However, the conceit of *Micrographia* is not exclusively empirical, but also, if not primarily, rhetorical. In order to present his empirical knowledge of microscopic bodies persuasively, Hooke employed both verbal and visual language to establish a bipartite ethos that supported both the credibility and the objectivity of his observations and himself as an observer. The first component of Hooke's ethos, resting on an associative frame of reference that drew upon the social and political prestige of Hooke's colleagues and patrons as well as the moral consensus of natural theology, secured his status as a trustworthy author. The second component drew upon the mimetic qualities of Hooke's illustrations, which he called Schemes, to diminish his authority over *Micrographia*'s contents and, therefore, to efface the impression of human artifice imposed on a stable, natural world created by the providence of an omniscient deity. Together, these opposing functions of Hooke's ethos served to explain a hitherto invisible microworld as, at once, the province of sophisticated empirical science and the flawless, orderly creation of God.

Text and Content: Establishing Social Credibility

The text of *Micrographia* fulfilled the first of these ethical functions, legitimating Hooke's claims to empirical knowledge by establishing his moral and social credibility. *Micrographia*'s twin dedications, the first to King Charles II and the second to the Royal Society

of London, served as initial and prominent vehicles for this legitimation. Although conventional, Hooke's regal dedication nonetheless laid crucial foundations for his credibility on political ground only recently (if then only precariously) settled following the tumult of civil war and republican dictatorship. Hooke insisted that the prosperity of "Philosophy and Experimental Learning," of which *Micrographia* was one of several fruits, was chief "[a]midst the many felicities that have accompani'd your Majesties happy Restauration and Government," and that foremost among the treatise's purposes was "to offer some of the least of all visible things, to that Mighty King, that has establish't an Empire over the best of all Invisible things of this World, the Minds of Men." [2] By presenting his work as both the product of monarchy and the means of its reinforcement, Hooke ensured that his discoveries would not at all subvert, but instead support, the project of stabilizing a restored but still tenuous society and its government. Such would be the only intention of gentleman, whose credibility would, thus, be nigh unimpeachable. Unlike his contemporaries, such as the chemist Robert Boyle, Hooke wanted for such gentlemanly credentials, which his birth to an Anglican minister failed to furnish.[3] Indeed, endorsing monarchy served to align Hooke with a social and political elite that could be trusted to offer reliable accounts of natural reality—especially important to Hooke who proposed to account for the invisible.

Micrographia's second dedication to the Royal Society of London, founded by Charles II in 1660 (the year of his Restoration) carried out a related rhetorical role. In confirming himself as a member of the Society and his present project as obliged to "those many Engagements [the Society] ... laid upon [him]," [4] Hooke once more arrogated to himself external epistemic authority, namely that housed within the Royal Society and, more precisely, its first Fellows. Despite the relative immaturity of the Society, and its consequent lack of institutional legitimacy, its early membership was certainly a

lack of institutional legitimacy, its early membership was certainly a “most illustrious assembly.”[5] For instance, not in the second dedication, but rather at the end of the subsequent preface, Hooke praised another of the Society’s founders, John Wilkins, as “a man born for the good of mankind, and for the honour of his Country... [whose] Zeal has been so constant and effectual in advancing all good and profitable Arts...” and who has, therefore, allowed “the chief Seat of generous Knowledge and true Philosophy” to reside in England.[6] He also acknowledged another colleague, the anatomist, astronomer, and architect Christopher Wren, as “so eminent a Person... who was the first that attempted any thing of this nature [i.e., to illustrate and annotate microscopical observations].”[7] And Hooke’s references to other members of the Royal Society spared neither in quantity nor extravagance beyond even the preface. In fact, *Micrographia* was peppered with praise for Sir John Cutler’s “munificence...in endowing a Lecture for the promotion of Mechanick Arts;”[8] for “the eminently Ingenious and Learned Physician, Doctor [George] Ent;”[9] for “the most Illustrious Mr. [Robert] Boyle...the Patron of Philosophy it self;”[10] and for the numerous other members of the Royal Society. Thus, the credibility and authority of the Royal Society, or at least of its esteemed Fellows, was endowed to Hooke by repeated affiliation. By their plentitude and their recursion, Hooke’s effusions serve not to align him and his work with a single gentleman philosopher, but with a cadre of learned squirearchs whose corporate methodology and association vis-à-vis the institution of the Royal Society constituted a veritable fountain of credibility from which Hooke was eager to drink. Hooke’s personal ethos in *Micrographia* was, thereby, thoroughly nourished, but so too was the collective ethos of the fledgling Royal Society. By portraying the moral unity of the Society’s membership, Hooke awarded to the body as a whole a persona of shared virtue that could authenticate the claims of each of its members, himself, of course, first among them. The basis for Hooke’s literary ethos as a trustworthy, gentlemanly observer, then, was associational. By associating his work and himself with credible authorities, he appropriated their integrity to himself. However, Hooke expanded his associative frame to encompass not only social and institutional sources of moral and epistemic authority, but also the religious and philosophical habits of mind that could afford him a similar legitimacy.

Natural Philosophy and Natural Theology

The detailed commentary on *Micrographia*’s illustrations was not disinterested, nor was it prosaic or purely descriptive; rather, it was moralizing and explicitly invested in the confirmation of a natural theology that explained a mechanical universe subject to a rational order imposed upon it by its Creator. Indeed, Hooke maintained that “so infinitely wise and provident do we find all the Dispensations in Nature...that [they] wil...appear the products of the highest Wisdom and Providence.”[11] The increasingly mechanistic natural philosophy of the seventeenth century was ever the close ally of natural theology, which promised a singular, functional order despite the restive tendencies of government, society, and organized religion.[12] In claiming that he, through *Micrographia*,

gave “infinitely cause further to admire the wisdom and providence of the Creator;”[13] Hooke cemented this alliance and extracted from it the moral authority necessary to validate his empirical observations. What is more, Hooke asserted that his microscopy prosecuted a particularly vital and virtuous task, revealing that “the Wisdom and Providence of the All-wise Creator, is not less shewn in these small despicable creatures, Flies and Moths...then in those greater and more remarkable animate bodies, Birds.” [14] Or that moss, which “the wisest of Kings thought...unworthy” is, in fact, “a most perfect Vegetable, wanting nothing of the perfections of the most conspicuous and vastest Vegetables of the world.”[15] The ethical value of Hooke’s theological and moral associations, as much as that of his social and political affiliations, is clear. They established Hooke’s credibility as a trustworthy, erudite gentleman whose *Micrographia* could legitimately claim knowledge about the minute bodies its author observed.

Crucially, by establishing a personal ethos, Hooke not only admitted, but also emphasized his role as *Micrographia*’s author. It was Robert Hooke who was credible, for his deference to monarchy; for his membership in the Royal Society; for his theological commitments; and for his moral rectitude. The authority

of the observations contained within *Micrographia* could not, therefore, be divorced from Hooke’s authorship. His proximity, as an abstract, impersonal observer, to experimental phenomena was insufficient to impart legitimacy to purported empirical knowledge, for the recognition of that knowledge was also contingent on the “moral texture of social relations.”[16] Thus, Hooke exerted a magisterial, authorial presence through the text of *Micrographia*, offering incessant moral and religious commentary and frequent references to the achievements of his venerable colleagues in the Royal

Society. Such a presence reveals Hooke’s, and, indeed, Restoration England’s, anxieties about moral and social credibility. But it also effectively resolves those anxieties with an associative rhetoric that substantiates Hooke’s authorial ethos to legitimate his figure as a reliable empiricist.

Visual Rhetoric and the Limits of Authority

But an authorial ethos alone was not adequate to the lofty epistemological status Hooke sought for *Micrographia*. Contingent as it was on the social and moral credibility Hooke endured himself, such an ethos threatened to conflate Hooke’s authorship of and authority over *Micrographia*, which he must have, with authorship of and authority over the microworld he had observed, which only God might have. What use was the frequent invocation of the “All-wise Creator” if control over creation was seized, rather, by Hooke? In order to maintain the integrity not of his persona but of Nature, Hooke established a second component of his ethos by which he became no author at all, but a personless observer. Already the text of *Micrographia* was dominated by Hooke’s authorial presence, necessary to validate his visual and verbal testimony. Thus, it is through *Micrographia*’s illustrations that Hooke worked to extract himself (or, his rhetorical self) from his own work.

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the text; nor did Hooke draw rhetorical or conceptual boundaries between them. They are obviously complementary, not least for the indices Hooke used to label and organize the illustrations. Indeed, it was through his textual references to the illustrations themselves that Hooke accomplished part of his self-extractive task. For Hooke did not name *Micrographia's* graphics as illustrations, nor drawings, nor sketches, nor pictures, and certainly not as images, which would be, at best, faithful representations or, at worst, misleading illusions. He insisted, instead, on calling them Schemes, from the Latin *schema* or the Greek *σχῆμα* (*skhēma*) meaning “form.” [17] Hooke’s fidelity to the term *Scheme* might be read as mere terminological consistency. But it might also be interrogated as evidence of Hooke’s deep-seated anxiety about the artifice of images and as a sign of his efforts to dissimulate the identity of his schemata as such.

Although Hooke’s schemata remain images in fact, their presentation as forms accomplished two distinct, but related, goals, one practical and one ethical. Practically, as *Schemes*, Hooke’s illustrations acquired far greater epistemological power than they might as images. They become efficacious vehicles for what Steven

Shapin calls “the technology of virtual witnessing,” which “involves the production in a reader’s mind of such an image of an experimental scene as obviates the necessity of either its direct witness or its replication.” [18] The effectiveness of *Micrographia's* illustrations as media for virtual witnessing obtained, in large part, in the superior status Hooke awarded them as *Schemes*. The schemata remain mimetic; they are ultimately depictions, accurate as those depictions may be. Yet, by insisting on their formal integrity, Hooke separated the schemata from the agency of any artist (read: author), himself, who might distort or dilute them. Thus, Hooke’s *Schemes* served to erase, if not, at least, to obscure the role of Robert Hooke in their (re) production. The same Robert Hooke whose commanding, authorial ethos was omnipresent in *Micrographia's* text was, in *Micrographia's* *Schemes* no author at all, but merely an amanuensis copying the microscopic text of God’s creation in perfect simulacrum.

Ironically, however, Hooke’s schemata were hardly unaltered by his hand. While the microscopic details Hooke observed, described, and depicted were matters of anatomical and physiological fact, their presentation corresponded to an

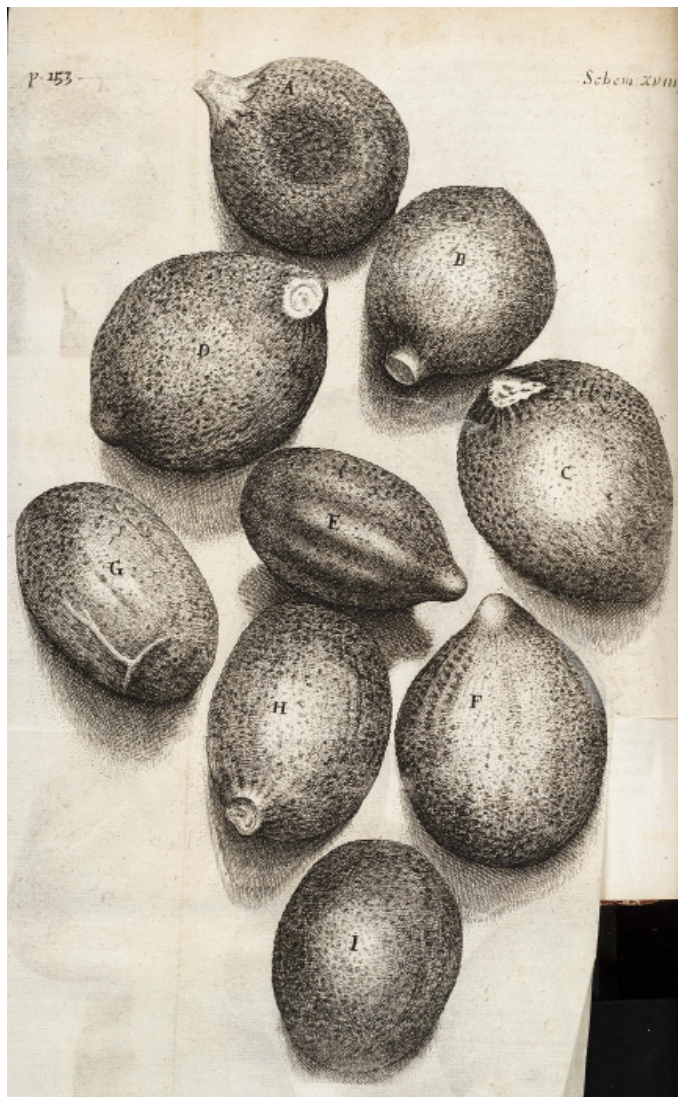


Figure 1. *Micrographia's* Scheme 13, a depiction of moss that expresses the formal characteristics of seventeenth-century naturalistic painting.



Figure 2. *Micrographia's* Scheme 18, a depiction of thyme seeds deliberately arranged and expertly rendered.

exaggerated visual rhetoric of order and stability informed by Hooke's mechanistic conception of nature and expressed by pictorial and compositional techniques borrowed from seventeenth-century artistic naturalism.[19] The engraving of moss (Scheme 13), for instance, betrays Hooke's debt to contemporaneous visual arts.[20] The special inclusion of a formal border frames the schema as a picture, while the extension of the moss fibers beyond and even over the frame accentuates their three-dimensionality, reproducing, albeit on a smaller scale, such a trompe l'oeil as might be expected on a Baroque canvas. Similarly, Scheme 18 captures thyme seeds in perfect stasis, their outlines briskly defined, their forms well-illuminated, and their shadows drawn in sharp contrast to highlight their lemon-like shapes.[21] Art historian Světlana Alpers notes the close similarities between such illustrations and the still-life paintings of the Dutch Golden Age. Indeed, Alpers's characterization of Hooke as the exemplar of a detail-oriented "descriptive impulse" in the seventeenth-century Northern European arts and sciences adequately explains Hooke's heuristic attachment to naturalism in his Schemes.[22]

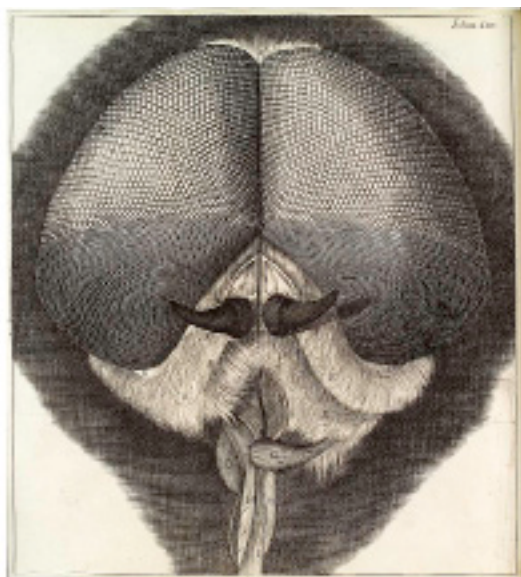


Figure 3. *Micrographia's* Scheme 24, a depiction of a dronedly displayed as calm and intact despite its prior dissection

But Hooke's reliance on artistic naturalism and the illusionistic techniques necessary to achieve it not only reflected a broader cultural agenda like that which Alpers and others describe, but also a rhetorical project that subtended the composition of *Micrographia*. In revealing a new, hitherto unseen level of creation (i.e., the microscopic), Hooke seized an opportunity to reinforce conceptions of the mechanical structure and fundamental order of the natural world. His uses of illusionistic perspective in his depiction of moss and of chiaroscuro (light-shadow modeling) in his illustration of thyme seeds, for instance, created an impression of a microworld organized according to the highest standards of realism that could be set for nature.[23] Further, by presenting his various flies and insects as intact, living organisms, rather than the mutilated and dismembered fragments they would have become following their dissection (procedures on which Hooke elaborates in great detail), Hooke strove to reconstruct microcosmic stability in

order to present the minute world as tranquil and unified. In Hooke's schemata, at least, the microworld achieves a discipline and calm long absent from the visible order of natural relations, be they anatomical and physiological or social and political. Moreover, by drawing once more upon established, external sources of philosophical and theological understanding, and reflecting in his Schemes a state of nature that those sources described, Hooke further retracted the shadow of his imperfect human hand from *Micrographia's* images, and therewith buoyed their status as special, visual capsules for microscopic components of the divinely-authored Book of Nature.[24] By presenting an orderly microcosmos, however constructed its order might be, Hooke presented a clear vision of nature consonant with the expectations of the seventeenth-century natural philosophy that would validate it.

Conclusion

The foremost achievement of *Micrographia* is, thus, rhetorical. Although his treatise contributed invaluable to anatomical, physiological, and microscopical knowledge, Hooke's simultaneous self-presentation as the illustrious, involved author of his book and as the humble, marginal amanuensis of God's creation (i.e., nature) established enduring conventions for the exhibition of that knowledge. Hooke's portrait of the Royal Society, description of its methodology, and publicization of its philosophic exploits, not least among the recognized accomplishments of *Micrographia*, hinged as much on Hooke's rhetoric as on the coherence and utility of the knowledge he gathered.[25] On the one hand self-emphasizing and, on the other, self-effacing, Hooke's composite ethos ensured that *Micrographia* would be received as a true account of a theretofore unseen stratum of creation, both for Hooke's integrity as an experimental philosopher and for his personal distance from the artifices of experimentation. Rather than self-defeating and contradictory, Hooke's ethical synthesis was self-reinforcing and robust. To read *Micrographia* as a rhetorical artifact is to reveal the interplay between credibility and objectivity in the presentation and, even, construction of empirical knowledge—an interplay that lies at the heart of the methodologies and sensibilities of modern science. For, ultimately, Hooke's dependence on rhetoric did not so much cripple his scientific project as it did constitute its very essence.

References

- [1] Robert Hooke, *Micrographia: or Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses. With Observations and Inquiries Thereupon*, facsim. ed.. (1665; repr., Lincolnwood, Ill: Science Heritage, 1987).
- [2] Hooke, *Micrographia*, ii-iii.
- [3] Steven Shapin, "Who was Robert Hooke?," in Robert Hooke: New Studies, eds. Michael Hunter and Simon Schaffer (Woodbridge, Suffolk: Boydell Press, 1989), 256.
- [4] Hooke, *Micrographia*, iv.
- [5] Ibid.
- [6] Ibid., xxxii.
- [7] Ibid.
- [8] Ibid., xxxi.
- [9] Ibid., 105.
- [10] Ibid., xviii.
- [11] Ibid., 177.
- [12] See Michael Hunter and Simon Schaffer, "Introduction," in

Robert Hooke: New Studies, eds. Hunter and Schaffer, 1-19.

[13] Hooke, *Micrographia*, 193.

[14] *Ibid.*, 198.

[15] *Ibid.*

[16] Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England*, Science and Its Conceptual Foundations (Chicago: The University of Chicago Press, 1995), 381.

[17] Oxford English Dictionary, 2nd ed., s.v. "scheme" (Oxford: Oxford University Press, 1989).

[18] Steven Shapin, "Pump and Circumstance: Robert Boyle's Literary Technology," *Social Studies of Science* 14, no. 4 (1984): 491.

[19] Hooke's interest in naturalism and basic familiarity with it may be explained by his apprenticeship to royal portraitist Peter Lely and to his life-long appreciation of the pictorial arts. See Lisa Jardine, *The Curious Life of Robert Hooke: The Man Who Measured London* (London: HarperCollins, 2003); Janice Neri, "Between Observation and Image: Representations of Insects in Robert Hooke's *Micrographia*," *Studies in the History of Art* 69 (2008): 82-107.

[20] Hooke, *Micrographia*, 130a.

[21] *Ibid.*, 160b-c.

[22] Světlana Alpers, *The Art of Describing: Dutch Art in the Seventeenth Century* (Chicago: The University of Chicago Press, 1983), 84-86.

[23] See Eileen Reeves, "The New Sciences and the Visual Arts," in *A Companion to Renaissance and Baroque Art*, eds. Babette Bohn and James M. Saslow (Oxford: Wiley Blackwell, 2012), 316-335.

[24] The natural theology upon which Hooke drew was widespread and popular especially in England. Its exemplars, many of them Hooke's peers in the Royal Society, included John Wray (*The Wisdom of God Manifested in the Works of the Creation*, 1691) and William Derham (*Physico-theology, or a Demonstration of the Being and Attributes of God*, 1713).

[25] On Hooke's later influence, see John T. Harwood, "Rhetoric and Graphics in *Micrographia*," in *Robert Hooke: New Studies*, eds. Hunter and Schaffer, 119-148; Jardine, *The Curious Life of Robert Hooke: The Man Who Mapped London*; Shapin, "Who was Robert Hooke?"