

SCIENCE AND LITERATURE

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The Word of God and the Languages of Man

*Interpreting Nature in
Early Modern Science and Medicine*

*Volume 1
Ficino to Descartes*

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above, was not easily disengaged from the old ideal of an originative unity. Only a distant hope, this new ideal did help to open up the very scope of natural history and the investigation of natural phenomena. By allowing that the perfection and universality of truth—of true knowledge of nature—were not to be *rediscovered* through exegesis of texts and the Book of Nature, but rather were something to be *made* by mankind through our efforts and work, this new ideal—however tentatively and partially articulated—looked toward a new hermeneutics of nature. Just as the miracle of the Pentecost embraced the diversity of tongues and of mankind in an image of God's Apostles engaged in the work of creating a new Christian unity, those pious disciples of the Lord who choose to work upon God's Book of Nature can create a new order by de-in-scribing God's plan within the variety of His earthly creatures. This new Pentecostal narrative of man's fall and redemption hence pointed toward emphases upon human industry and the observation of nature in all its diversity—and away from a symbolic ordering of nature—that were to become a hallmark of the new science of Bacon, Galileo, Mersenne, Descartes, and Boyle in the seventeenth century.

Returning for a moment to Ashworth and to Laqueur, the parallelism and, indeed, the intimate relationship between language theory and natural history in the sixteenth and seventeenth centuries, together with their mutual legitimation through the work done in recasting cultural narratives, must not be forgotten in attempts to explain shifting models of sexuality or models for the practice of natural history. For, as in the case of the encyclopedic and comparative study of language in the sixteenth century, the sheer diversity of natural things that the discourse of encyclopedic, emblematic natural history uncovered (including the flora and fauna of the New World) tended to overwhelm and undermine the discourse of resemblance, correspondence, and symbolism and its underlying ideal of an originative unity. And yet, as was also the case in the study of language, this sheer diversity—the sheer weight of things and facts—was not of itself enough to transform the discourse of natural history. Instead, diversity in language as well as in nature had first to be reinscribed within transformed narratives. Only such new, legitimating narratives could work to delegitimize the relationship between the *verbum Dei* and nature that authorized the ideal and discourse of originative unity. By recasting stories of Babel, and the Pentecost, “man” was now authorized to study diversity—both in language and in nature—within the context of a new relationship between the languages of man and the Word of God.

Galileo, Mathematics, and the Language of Nature: De-in-scribing God's Book of Nature

The drift *away from* words and symbols—from symbolic and exegetical hermeneutic strategies like those deployed in the practices of the emblematic worldview—built upon newly recast cultural narratives to authorize new strategies for interpreting the text of nature. What these narratives and strategies had in common was a tendency to see that “text” as God's creation, but not as a simple reflection of His ideas and nature. God did not stamp some image of Himself upon things in nature, thus leaving a symbolic “trace” through which one could “read,” in the hierarchical and analogical pattern of all such traces, the true image of nature *and* of God. Rather, God writes—or inscribes—His Book of Nature in the language of things. Although emanating from God, things are marked by their alterity, their utter difference from the divine being. Still, as a divine text, the Book of Nature exhibits an order and regularity that are inherent in the very language with which God has inscribed nature. As early modern authors turn toward this nonsymbolic text of nature, we find them constructing new hermeneutic practices aimed at *de-in-scribing* nature, that is, at *describing* the order and regularity of God's visible text.

We shall turn, in the two following chapters, to a number of examples of deinscriptive hermeneutics. For now, I want to bring closure to this chapter by briefly illustrating the kind of new discursive strategies that such revised narratives and theories of language could authorize by turning to Galileo and his mathematical vision of the text of nature.

That Galileo's vision was mathematical is so well known to historians of science and, I would wager, to virtually all who have encountered the “Scientific Revolution” that it hardly seems necessary to note the fact.²⁷ Who has not heard Galileo's famous pronouncement that the Book of Nature “is written in the language of mathematics?” But what Galileo says, what he purports to establish when invoking this language of mathematics, is far richer and less well known than his famous dictum:

27. So fundamental is Galileo and his mathematical approach to the Book of Nature to the historiography of the “Scientific Revolution” that the literature on Galileo is vast. I shall note here only a few classic and fundamental studies and texts: Biagioli (1993); Burt (1954); Finocchiaro (1980, 1989); Koyré (1943, 1966); Maier (1949); McMullin (1967); Moody (1951); Randall (1961); Redondi (1987); Rossi (1971); Schmitt (1969); Shea (1977); Wallace (1981, 1984, 1986).

In Sarsi I seem to discern the firm belief that in philosophizing one must support oneself upon the opinion of some celebrated author. . . . Possibly he thinks that philosophy is a book of fiction by some writer, like the *Iliad* or *Orlando Furioso*, productions in which the least important thing is whether what is written there is true. Well, Sarsi, that is not how matters stand. Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about in a dark labyrinth.

. . . but now Sarsi expects my mind to be satisfied and set at rest by a little poetic flower that is not followed by any fruit at all. It is this that Guiducci rejected when he quite rightly said that nature takes no delight in poetry. That is a very true statement, even though Sarsi appears to disbelieve it and acts as if acquainted with neither nature nor poetry. He seems not to know that fables and fictions are in a way essential to poetry, which could not exist without them, while any sort of falsehood is so abhorrent to nature that it is as absent there as darkness is in light.²⁸

Galileo's "language of mathematics" is the thread that enables him to find his way through the labyrinth of nature; it is the lamp that sheds light on the truth, or rather the lamp of truth itself. Ostensibly a defense against the appeal to authorities in the world of seventeenth-century natural philosophy, Galileo's words are rhetorically shrewd and significant. Rather than argue the merits of Galilean "philosophy" compared

28. *The Assayer* (Galilei 1957:237–38). For the original text, Galilei (1896:232): "Parmi, oltre a ciò, di scorgere nel Sarsi ferma credenza, che nel filosofare sia necessario appoggiarsi all'opinioni di qualche celebre autore. . . ; e forse stima che la filosofia sia un libro e una fantasia d'un uomo, come l'Iliade e l'Orlando Furioso, libri ne' quali la mano importante cosa è che quello che vi è scritto sia vero. Sig. Sarsi, la cosa non istà così. La filosofia è scritta in questo grandissimo libro che continuamente ci sta aperto innanzi a gli occhi (io dico l'universo), ma non si può intendere se prima non s'impara a intendere la lingua, e conoscer i caratteri, ne' quali è scritto. Egli è scritto in lingua matematica, e i caratteri son triangoli, cerchi, ed altre figure geometriche, senza i quali mezzi è impossibile a intenderne umanamente parola; senza questi è un aggirarsi vanamente per un oscuro laberinto." This is followed (1896:234) by "Ma che in una questione massima e difficilissima, qual è il volermi persuadere trovarsi realmente . . . la mente mia debba quietarsi e restar appagata d'un fioretto poetico, al quale non succede poi frutto veruno, questo è quello che il Sig. Mario rifiuta, e con ragione e con verità dice che la natura non si diletta di poesie: proposizioni verissima, ben che il Sarsi mostri di non la credere, e finga di non conoscer o la natura o la poesia, e di non sapere che alla poesia sono in maniera necessarie le favole e finzioni, che senza quelle non può essere; la quali bugie son poi tanto abborrite dalla natura, che non meno impossibil cosa è il ritrovarvene per una, che il trovar tenebre nella luce."

with traditional "philosophy," that is, the relative merits of the *texts* written by Galileo and by his Scholastic opponents, Galileo instead cleverly alters the very grounds of the comparison. Philosophy, for Galileo, is no longer a discourse fashioned by human beings. Indeed, his very rhetoric depends upon the insinuation that the so-called philosophy of his Scholastic opponents is but the fabrication of human writers, like the authors of "the *Iliad* or *Orlando Furioso*." Rather than a product of limited, and distorting, human imagination, Galileo declares that philosophy is not a text written by humans at all! Rather, it is a text "written in this grand book, the universe."

Galileo rhetorically withdraws himself from the scene of writing, from active agency in the production of the text of philosophy, in order to claim a kind of authority for the "philosophy" he espouses that transcends human institutions and the limitations of human fabrication. Instead, Galileo makes the odd, and bold, claim that philosophy—that is to say, true knowledge ("science") of nature—is already constituted as a text prior to its articulation by humans. To defend his own achievements and the truth of his new philosophy, Galileo chooses to efface his role as author. Instead, he transfers authorship to a nonhuman agency: to nature itself and, by implication, to the author of nature Himself, God.

Certainly, we have seen that the trope of the Book of Nature is a commonplace throughout the Renaissance and seventeenth century.²⁹ Isn't Galileo, then, simply invoking a familiar topos? I believe that we witness in Galileo's text the appropriation and transformation of this familiar metaphor.³⁰ For, where earlier natural philosophers figured nature as a divine book whose *meaning* man must learn to interpret correctly, Galileo figures nature as an "open" text that he can read directly, without the need for interpretation! Man does need a key to this text—mathematics—but the text itself requires no interpretation: it requires only decoding, or what I have called de-in-scription.

Let me clarify this distinction, for it is a distinction central to Galileo's own rhetoric in the passage quoted above. Galileo fundamentally as-

29. On the "Book of Nature," see Curtius (1963: esp. chap. 16, "The Book as Symbol"); Eisenstein (1979: esp. "Part Three: The Book of Nature Transformed"); and Garin (1961). I have not seen Rothacker (1979).

30. See Bono (1990a) for discussion of the role of metaphor in changing scientific discourses. As this book suggests, metaphoric change and exchange are intimately connected with the function of narrative in scientific discourse. My current theoretical work explores connections among metaphor, narrative, and the "ecology" of sociocultural discourses and practices in "scientific culture"; this work will culminate in a book (Bono, in progress).

serts that philosophy is *not* a text produced by human authors. Unlike the texts of natural philosophy, medicine, or even magic produced earlier in the Renaissance, no human author needs to untangle the meaning of the Book of Nature. While earlier students of nature figured that book as a polysemous text written in symbolic and divine language that required etymological, symbolic, allegorical, cosmological, or moral exegesis,³¹ Galileo saw the Book of Nature differently. Whereas the polysemous text of this exegetical hermeneutics of nature required that individual human authors uncover hidden vectors of meaning that bound God's Book of Nature into a coherent and meaningful whole, Galileo figured the Book of Nature as a stubborn but self-revealing text that did not require human agency to construct its meaning. In short, in the old regime of an exegetical science of nature humans not only "read" the divine language stamped upon the Book of Nature but also exercised their imaginative and intellectual powers to create texts—books of, for example, natural philosophy—to capture through interpretation the multilayered, interwoven, *textual* meaning of things in nature. "Science"—the entire spectrum of natural philosophy, medicine, and magic—was enmeshed in "bookish" culture. And those who sought knowledge of nature were called upon to reimagine, represent, comment upon, and explicate the analogical multiplication and unfolding (*explicatio*) of the Word in the text of nature.³²

It is this regime of the Word and words in the understanding of nature that Galileo not only rejects, but ridicules. Indeed, his ridicule proves essential as, ironically, it rhetorically masks his own use of figurative thinking to produce the unlikely notion of a *philosophical* text without human author! So unlike the merely *fictive* texts of so-called philosophers—texts that indiscriminately mix nature with fables and poetry—is the real text of philosophy that all human imaginative agency is banished from it in the Galilean trope of philosophy as text of "this grand book," namely, the "universe." Here, in Galileo's assertion that "nature takes no delight in poetry," we find the complete reversal of the "emblematic world view."³³ Nature is not poetic, multilayered, polysemous, mysterious, arcane, and a congeries of resemblances and affinities—the stuff of fictive similes and metaphors. Such falsehoods are "abhorrent to nature" whose contours are in-

31. See such figures as Fernel, Paracelsus, Croll, Gesner, Aldrovandi, and the like discussed above.

32. The Latin term is, of course, Nicholas of Cusa's. For an introduction to Cusanus, see Cassirer (1963) and Watts (1982).

33. As courtier and client in search of patronage, Galileo was, of course, thoroughly enmeshed in the literary and poetic culture of Italy. See Biagioli (1990, 1993).

stead defined by the sharp, distinctly etched forms of "triangles, circles, and other geometric figures." The task of the true scientist gazing upon this open book of nature is thus utterly different from his exegetical counterpart's.

Here we discover the force of Galileo's metaphor of mathematics as the language of nature. For Galileo conceives that language as literal, not symbolic:³⁴ Nature is constructed mathematically, geometrically. As a book, nature is unlike any other known to man; it contains no ambiguities, no hidden and symbolic meanings, no fables or poetic senses to obscure the truth and, indeed, to mock truth by transforming it into the fleeting, subjective construct of scientist-as-exegete/interpreter. For the Book of Nature, unlike the Scriptures, is open to our gaze and not shrouded in figures and allegorical meanings meant to accommodate the simple and bar the ungodly.

Galileo does not *produce* the text of philosophy already written in the Book of Nature. Rather, as scientist, his task is to gaze upon that book and to decipher its characters. And once he has grasped its language—the fact that its characters are geometrical figures—Galileo merely uses the instruments at hand to deinscribe what God has legibly inscribed upon things in nature. Hence, Galileo's role—in his estimation—is not that of interpreter; he need not seek below the literal surface of the geometrical characters inscribed in nature for some deeper, hidden meaning. Nature—and philosophy, the "science" of nature—has only a literal sense to reveal to mankind: that is, the order and structure of things in their geometrical relationships to one another—the *how* of nature, not the mysterious, polysemous *why* of theology. Never mind that Galileo's very institution of this regime, this deinscriptive hermeneutics of nature, itself rests upon the figural: that nature is *like* geometry and mathematics; that geometry and mathematics are themselves man-made tools, metaphoric creations for the *measure*, for the *comparison*, of different things. Galileo's myth, his new narrative of man as reader of God's open book, requires that the very figural basis of his narrative be elided and presented, instead, as the literal configuration of nature itself (Wojciehowski 1990).

Perhaps this elided figure and unarticulated conviction are why

34. I want to acknowledge the important work of Professor Dolora Wojciehowski of the University of Texas at Austin, who kindly permitted me to see a chapter, "The Will to Read: Galileo and the Book of Nature," from her forthcoming book. She provides a careful and compelling analysis of Galileo's desire for a literal language of nature, and of his own thoroughgoing implication in figurative language. My own analysis complements hers, but Dr. Wojciehowski provides a far more detailed analysis, with judicious use of examples, than I can attempt here.

Galileo thought that he could demarcate for theologians the boundaries of the Word of God. The Book of Nature with its divinely inscribed language of mathematics produces, and creates in man, *only* a literal sense. The Book of Nature tells us only about nature; it reveals only *how* nature carries out God's commands. It tells us nothing about God's intentions or about heaven. For the latter, we need His other book, the Scriptures, whose language perforce must be of a different order: layered, symbolic, filled with metaphors figuring what must always remain mysterious and cannot be "open," but which man can only hope to grasp through interpretation, much like a poem or a fable:

For the Holy Scripture and nature derive equally from the Godhead [*Verbo divino*], the former as the dictation of the Holy Spirit and the latter as the most obedient executrix of God's orders; moreover, to accommodate the understanding of the common people it is appropriate for Scripture to say many things that are different (in appearance and in regard to the literal meaning of the words) from the absolute truth; on the other hand, nature is inexorable and immutable, never violates the terms of the laws imposed upon her, and does not care whether or not her recondite reasons and ways of operation are disclosed to human understanding.³⁵

Unlike Scriptures, the language of nature is not accommodated to man, according to Galileo. Nature's book, while open to mankind's gaze, requires work to understand, not the work of exegesis, of interpretation, but, in its stead, the work required to achieve linguistic competence in its foreign, mathematical tongue. Galileo would surely add the work of observation and experimentation which alone can turn the leaves of nature's book to expose its characters to our view. Galileo's new deinscriptive hermeneutics of nature, while effacing its own status as interpretive practice, enacts a desire to enshrine a new strategy for reading the text of nature literally, if laboriously.

35. Galileo Galilei, "Galileo's Letter to the Grand Duchess Christina (1615)," in Finocchiaro (1989:93). For the original text, Galilei (1895:316): "perchè, procedendo di pari dal Verbo divino la Scrittura Sacra e la natura, quella come dettatura dello Spirito Santo, e questa come osservantissima essecutrice de gli ordini di Dio; ed essendo, di piu, convenuto nelle Scritture, per accommodarsi all'intendimento dell'universale, dir molte cose diverse, in aspetto e quanto al nudo significato delle parole, dal vero assoluto; ma, all'incontro, essendo la natura inesorabile ed immutabile, e mai non trascendente i termini delle leggi impostegli, come quella che nulla cura che le sue recondite ragioni e modi d'operare sieno o non sieno eposti alla capacità degli uomini."

7

The Reform of Language and Science

Sir Francis Bacon's Adamic Instauration and the Alphabet of Nature

But the more difficult and laborious the work is, the more ought it to be discharged of matters superfluous. . . . First then, away with antiquities, and citations or testimonies of authors; also with disputes and controversies and differing opinions; everything in short which is philological. . . . And for all that concerns ornaments of speech, similitudes, treasury of eloquence, and such like emptinesses, let it be utterly dismissed. Also let those things which are admitted be themselves set down briefly and concisely, so that they may be nothing less than words.

—Sir Francis Bacon, *Parasceve*

For God forbid that we should give out a dream of our own imagination for a pattern of the world; rather may he graciously grant to us to write an apocalypse or true vision of the footsteps of the Creator imprinted on his creatures [ac veram visionem vestigiorum et sigillorum creatoris super creaturas scribamus].

—Sir Francis Bacon, *The Great Instauration*

Discovering the true "pattern of the world" qualifies as a "difficult and laborious" sort of "work" for Bacon—the kind of work that requires humans to turn away from philology, etymology, and the exegesis of language and symbols that inhabit his all too fecund imagination and ensnare his intellect with mere images: fictions. Bacon, of course, was not the first to try negotiating the turn from words to things (think only of Paracelsus), but few before him claimed to have as detailed a map to avoid plunging recklessly off course. The Lord Chancellor was nothing if not shrewd in his estimation of the causes of others' mishaps.