

# Francis Bacon and the “Interpretation of Nature” in the Late Renaissance

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## ABSTRACT

The “interpretation of nature” (*interpretatio naturae*) is the leading idea in Francis Bacon’s natural philosophy. But by contrast with his ideas about method, induction, or experiment, the significance of the “interpretation of nature” has received very little scholarly attention. This essay tests the originality of Bacon’s idea by means of a focused survey of existing forms of Renaissance natural knowledge—Aristotelian and anti-Aristotelian natural philosophy, Galenic and Paracelsian medicine, natural magic, physiognomy, natural history—before turning to consider the much more prominent place of “interpretation” in the fields of Renaissance logic, revealed and natural theology, and law. It finds that Bacon’s application of the idea of “interpretation” to nature was highly original, but also that certain important aspects of his conception have analogies in Renaissance civil law. The essay concludes by exploring the implications of these findings for a recent body of scholarship in the history of the sciences that invokes the notion of the “interpretation of nature” to characterize pre-Baconian natural philosophy more generally.

A NUMBER OF RECENT STUDIES in the history of the sciences have come to the view that Renaissance natural philosophers took it as their goal to “interpret” nature. Peter Harrison, in particular, has argued that because “the business of interpretation is currently restricted in its application to words, texts, and other human artefacts,” we have overlooked the “universal hermeneutics” that, in “pre-modern times,” informed the study of “both the book of scripture and the book of nature.” This case is taken even farther in the ambitious work of Stephen Gaukroger, who tells us that there was an “intimate connection” in the Renaissance “between interpretation of Scripture and interpretation of nature” and, moreover, that “techniques of natural interpretation” were modeled on “techniques of scriptural interpretation.” Others have also developed this theme, and they

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too have used the rubric of the "interpretation of nature" to characterize their accounts of late Renaissance natural knowledge.<sup>1</sup>

Though these historians use the slogan of the "interpretation of nature" to characterize Renaissance natural science as a whole, it is a concept that is particularly associated with the English author Francis Bacon (1561–1625): a lawyer who rose to the pinnacle of his profession to become Lord Chancellor in 1618, but who devoted his vacations, and later his enforced retirement, to the reform of natural philosophy. "Interpretation of nature" appears in the title of almost all of Bacon's unpublished writings on natural philosophy from the start of the seventeenth century onward, culminating in the published *Novum organum, sive indicia vera de interpretatione naturae* ("The New Instrument; or, True Indications on the Interpretation of Nature" [1620]). Indeed, so persistent is the notion throughout Bacon's philosophical writings that we might go so far as to say that—rather than its subordinate ideas of method, induction, or experiment, which so preoccupied his nineteenth- and twentieth-century scholars—the idea of the "interpretation of nature" (*interpretatio naturae*) that governs them is in fact the central concept of Baconian natural philosophy.

The purpose of this study is accordingly to scrutinize this elusive idea of the "interpretation" of nature in the later sixteenth and early seventeenth centuries. Is it the case that Renaissance investigators of nature prior to Bacon subjected it to "interpretation," or was his use of the idea instead as original as he liked to suggest? More generally, what sort of things were in fact "interpreted" in the late Renaissance? To answer these questions, the first half of this study investigates whether the idea of "interpreting" nature can be found across the various different late Renaissance natural sciences. The second half then turns to consider the significance for Bacon of those disciplines in which "interpretation" certainly did play an important role: the professional fields of theology and law. Though Bacon's claim to originality in his conception of the "interpretation of nature" will turn out to be credible, the study concludes by offering some suggestions as to its inspiration.

#### BACON'S CONCEPTION OF THE "INTERPRETATION OF NATURE"

I begin, however, with an account of Bacon's conception of the "interpretation of nature." The close association of the idea of the "interpretation of nature" with Bacon should immediately present us with a puzzle. For, far from acknowledging its deep roots in contemporary forms of natural knowledge, Bacon himself insisted that his idea of *interpretatio naturae* was entirely novel. He first introduced the idea in print in *The Advancement of Learning* (1605), where he says that he will "propound" it "hereafter" but that he will not there "dwell too long, nor speake too great vpon a promise."<sup>2</sup> That promise was nonetheless realized fifteen years later in the *Novum organum*. Here, Bacon distinguishes magisterially between "two sources and dispensations" of knowledge. The first, which is

<sup>1</sup> Peter Harrison, *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge: Cambridge Univ. Press, 1998), p. 267; Stephen Gaukroger, *The Emergence of a Scientific Culture: Science and the Shaping of Modernity, 1210–1685* (Oxford: Oxford Univ. Press, 2006), Ch. 4: "The Interpretation of Nature and the Origins of Physico-Theology," on p. 139; James J. Bono, *The Word of God and the Languages of Man: Interpreting Nature in Early Modern Science and Medicine*, Vol. 1 (Madison: Univ. Wisconsin Press, 1995); and Eric Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575–1715*, trans. P. Mason (Leiden: Brill, 2010), Ch. 1: "The Interpretation of Nature."

<sup>2</sup> Francis Bacon, *The Advancement of Learning*, ed. Michael Kiernan (Oxford Francis Bacon, 4) (Oxford: Clarendon, 2000), p. 111 (second and later citations of the Oxford Francis Bacon texts will appear as **OFB**, with volume number).

something merely “impetuous and premature,” is concerned with “cultivating” existing sciences. It is the form of human reasoning “that is generally used,” and he calls it “*Anticipation of the Mind*” or “*Anticipations of Nature*.” The other form of reasoning, by contrast, is precisely what is “new” about the *Novum organum*. It is concerned “not just to cling to existing discoveries,” but to “penetrate further”; indeed, it will allow those who use it to “conquer nature in operation”; and it is this grand design that is called the “*Interpretation of Nature*.”<sup>3</sup>

These bold assertions notwithstanding, Bacon acknowledged on several occasions that it was far from easy to explain exactly what the “interpretation of nature” was.<sup>4</sup> In one sense, the developed doctrine is contained within the *Novum organum* in its entirety. But even this celebrated work constitutes only a small portion of the planned Part 2 of Bacon’s “Great Instauration” (*Instauratio magna*), and so a complete account of *interpretatio naturae* was destined for the parts that Bacon promised but never published—and almost certainly never wrote.<sup>5</sup> Nonetheless, certain key preoccupations do emerge from what Bacon produced. The art of interpreting nature is “a kind of logic,” though it differs “very much, indeed immeasurably, from the ordinary logic.”<sup>6</sup> It is accordingly “that form of reasoning which is drawn from things by proper means.”<sup>7</sup> By contrast with the common logic, which deals with the operations of the mind, the *ratio Interpretandi* “fixes its gaze upon the nature of things.”<sup>8</sup> Furthermore, it has two parts, one concerned with “extracting and fetching up axioms from experience,” the other “with deriving and drawing down new experiments from axioms”; moreover, “the key to *Interpretation*” is “true and legitimate *Induction*.”<sup>9</sup>

This vision of *interpretatio naturae* as it appears in the *Novum organum* is familiar enough, perhaps, to historians of the sciences. But the process by which Bacon arrived at this mature account has been much less thoroughly explored.<sup>10</sup> It evolved through several different versions and also gradually took its place within the development of a larger conception of a six-part *Instauratio magna* that would renew human knowledge. Possibly Bacon’s earliest surviving treatment of “interpretation,” therefore, is the English manuscript *Valerius Terminus of the Interpretation of Nature* (ca. 1603?). This already adum-

<sup>3</sup> Francis Bacon, *Novum organum* (“Praefatio” and Bk. 1, aphs. 26–33), in *Instauratio magna Part II: Novum organum and Associated Texts*, ed. and trans. Graham Rees, with Maria Wakely (Oxford Francis Bacon, 11) (Oxford: Clarendon, 2004), pp. 56–58 (Latin original) / 57–59 (English translation), 74–76 (Latin) / 75–77 (trans.) (although I have benefited from them, I have also allowed myself to modify OFB translations throughout).

<sup>4</sup> Bacon, *Novum organum* (Bk. 1, aph. 24), OFB 11, pp. 76 (Latin) / 77 (trans.). See also Francis Bacon, *Temporis partus masculus*, in *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis, and Douglas Denon Heath, 7 vols. (London: Longman, 1857–1861), Vol. 3, p. 529 (the volumes in this edition will hereafter be cited as **SEH**, with volume number).

<sup>5</sup> Book 2 of the *Novum organum* treats only the first (the *Instantiae Praerogativae*) of nine (!) further aspects of *interpretatio naturae*. See Bacon, *Novum organum* (Bk. 2, aphs. 21, 52), OFB 11, pp. 272, 446. For a subsequent promise of the completed work see Bacon, *De augmentis scientiarum* [1623] (Bk. 5, Ch. 2), SEH 1, p. 633.

<sup>6</sup> Francis Bacon, “Distributio operis,” OFB 11, pp. 28 (Latin) / 29 (trans.): “Ars . . . ex genere Logicae; licet plurimum, atque adeò immensum quiddam intersit.”

<sup>7</sup> Bacon, *Novum organum* (Bk. 1, aph. 26), OFB 11, pp. 74 (Latin) / 75 (trans.): “illam Rationem quae debitis modis elicitur à rebus.”

<sup>8</sup> *Ibid.* (Bk. 1, aph. 127), OFB 11, pp. 190 (Latin) / 191 (trans.): “rerum naturam intueatur.”

<sup>9</sup> *Ibid.* (Bk. 2, aph. 10), OFB 11, pp. 214–216 (Latin) / 215–217 (trans.): “primam, de educendis aut excitandis Axiomatibus ab Experienciâ; secundam, de deducendis aut deriuandis Experimentis nouis ab Axiomatibus. . . . *Inductio legitima, & vera, quae ipsa clauis est Interpretationis.*”

<sup>10</sup> See, however, Perez Zagorin, “Francis Bacon’s Concept of Objectivity and the Idols of the Mind,” *British Journal for the History of Science*, 2001, 34:379–393, esp. p. 392.

brates several of the themes of the *Novum organum*, including a version of the distinction between "Anticipacions" and "interpretacion."<sup>11</sup> Though it disclaims the ambition to "set downe a fourme of interpretacion" in its single worked investigation into the nature of whiteness, it does explain that the process of interpretation "doth in sorte equall mens wittes" and that it is, moreover, "the very naturall and directe intention, action and progression of the vnderstandinge deliuered from impedimentes"—both thoughts that are developed in the later *Novum organum*.<sup>12</sup>

One thought from the *Valerius Terminus* that does not reappear in Bacon's later published writings, however, is that the investigator of nature proceeds by means of a "formulary" of interpretation.<sup>13</sup> The title of Book 2 of the *Temporis partus masculus, sive de interpretatione naturae* ("The Masculine Birth of Time; or, On the Interpretation of Nature" [ca. 1603–1608?]), though the work itself was never written, similarly promises a treatment of the "Formula of Interpretation," and we will return to this interesting expression in due course.<sup>14</sup> In another treatise on the theme of "interpretation," the eloquent but unpublished *Prooemium de interpretatione naturae* ("A Preface on the Interpretation of Nature" [date uncertain]), Bacon counters the objection that he has no discoveries to show for himself with the assertion that "the legitimate interpretation of nature . . . ought to be kept separate and pure from all application to works."<sup>15</sup> He also makes the slightly desperate claim that "the formula of interpretation itself and the discoveries made by it will be more vigorous and better secured if confined among proper (*legitima*) and chosen people."<sup>16</sup>

A related perspective emerges from the similarly unpublished *Cogitata et visa de interpretatione naturae* ("Thoughts and Impressions on the Interpretation of Nature" [ca. 1607?]). Again Bacon explicitly shies away from explaining in detail the work he proposes "on the interpretation of nature and on nature herself."<sup>17</sup> But he does explain that in its place he has decided to "set forth Tables of Discovery," or "formulae" (that term again), "of a legitimate Inquisition."<sup>18</sup> The association set up here between *interpretatio naturae* and *inquisitio legitima* is reinforced in a number of other places, notably in the memorandum headed "Inquisitio Legitima" that Bacon made for himself in July 1608, and by several further unpublished *inquisitiones legitimae*.<sup>19</sup> In the late *inquisitiones* that seem to have been destined for Part 4 of the *Instauratio magna* Bacon dropped the designation

<sup>11</sup> Francis Bacon, *Valerius Terminus* (Ch. 15), SEH 3, p. 244 (checked against British Library, MS Harley 6463). On the dating of this treatise see Richard Serjeantson, "The Philosophy of Francis Bacon in Early Jacobean Oxford: With an Edition of an Unknown Manuscript of the *Valerius Terminus*," *Historical Journal*, 2013, 56:1087–1106.

<sup>12</sup> Bacon, *Valerius Terminus* (Chs. 11, 19, 22), SEH 3, pp. 237, 250, 251.

<sup>13</sup> *Ibid.* (Ch. 17), SEH 3, p. 247.

<sup>14</sup> Francis Bacon, *Temporis partus masculus*, SEH 3, p. 528 (on the date see p. 523): "2 Lumen Naturae seu Formula Interpretationis" (checked against British Library, MS Harley 6463).

<sup>15</sup> Francis Bacon, *De interpretatione naturae prooemium*, SEH 3, p. 520: "Interpretationem naturae legitimam . . . ab omni applicatione ad opera puram ac sejunctam servari debere." Spedding dates this treatise to ca. 1603 (SEH 3, p. 507), yet I wonder whether it might not be from up to a decade or so later.

<sup>16</sup> Bacon, *De interpretatione naturae prooemium*, SEH 3, p. 520: "ipsam Interpretationis formulam, & Inventa per eandem, intra legitima & optata ingenia clausa, vegetiora & munitiora futura."

<sup>17</sup> Francis Bacon, *Cogitata et visa*, SEH 3, p. 619: "de Naturae interpretatione, atque de Naturâ ipsâ opus" (checked against Queen's College, Oxford, MS 280).

<sup>18</sup> *Ibid.*: "Tabulas inveniendj, siue legitimae Inquisitionis formulas."

<sup>19</sup> These are printed in James Spedding, *Letters and the Life of Francis Bacon*, 7 vols. (London: Longman, 1861–1874), Vol. 4, pp. 67–68. See also Francis Bacon, *Inquisitio legitima de motu* [1608], *ibid.*, pp. 68–73; Bacon, *Filum labyrinthi sive inquisitio legitima de motu*, SEH 3, pp. 623–640; and Bacon, *Sequela cartarum sive inquisitio legitima de calore et frigore*, SEH 3, pp. 641–652.

“*legitima*,”<sup>20</sup> but it did surface once in print in the “Plan” of the *Instauratio* that Bacon printed at the front of the *Novum organum*, where he spoke of a “Philosophy drawn from and established on” a “legitimate, chaste and rigorous form of inquisition.”<sup>21</sup>

Certain key points emerge from this account. In its earlier stages, Bacon’s conception of *interpretatio naturae* was associated with two connected ideas that he later dropped from its printed exposition in the *Novum organum*: the idea of a *formula* or “formulary” of interpretation; and the idea of a “legitimate inquisition” or even (once) a “legitimate interpretation.” Furthermore, and although he was willing on one early occasion to grant his predecessors the title of “interpreters of nature,”<sup>22</sup> Bacon was consistently at pains to assert the novelty, and even the secrecy, of his idea of the “interpretation of nature.”

Two questions arise in light of this analysis. First, from what resources did Bacon set about constructing his elusive yet foundational doctrine of the “interpretation of nature”? Second—and more far reaching—if this doctrine is as new as he claimed, how appropriate is it to use his rubric to characterize the late Renaissance study of nature as a whole?

#### PARS DESTRUENS: “INTERPRETATION” AND THE LATE RENAISSANCE STUDY OF NATURE

Let us therefore begin to explore the historical significance of Bacon’s idea of the “interpretation of nature” by focusing on the question of “nature”—that is, on the disciplines that took nature as the object of their investigations. In our period these were, above all, natural philosophy and medicine, but they also include a range of less institutionally secure pursuits, including natural magic and natural history. The question to be asked is whether the different sorts of people who studied nature in the generation before Bacon conceived what they were doing in terms of its “interpretation.” It is true that to tackle a question as broad as this one risks being rash. The late Renaissance study of nature was extremely various, and it would be absurd to suppose that all its forms can be comprehended within this necessarily concise study. All one can hope to do is offer some snapshots. But these snapshots can at least be focused, for from Bacon’s published and unpublished writings a canon emerges of those authors who most engaged him—albeit often negatively. Moreover, the encyclopedic approach taken here consciously attempts to do justice to Bacon’s own tendency to hypostasize different disciplines in his own writings—above all in the *Advancement of Learning*, but more specifically in the revealing early Latin treatments of the “interpretation of nature”: the *Temporis partus masculus*, *Cogitata et visa*, and *Redargutio philosophiarum*.<sup>23</sup>

Let us begin with the discipline of natural philosophy. Bacon’s own natural philosophy proposes that what is above all called for is to “interpret” nature. But what did other philosophers take themselves to be doing with nature? What were the central goals of late Renaissance natural philosophy as an endeavor? Across western Europe, and even in provincial and intellectually isolated England, the dominant framework of late sixteenth-

<sup>20</sup> *Historia & inquisitio de animato & inanimato, Inquisitio de magnete, and Topica inquisitionis de luce et lumine*, all in Francis Bacon, *The Instauratio Magna: Last Writings*, ed. and trans. Graham Rees (Oxford: Francis Bacon, 13) (Oxford: Clarendon, 2000), pp. 227–235, 237–241, 243–257.

<sup>21</sup> Bacon, “Distributio operis,” OFB 11, pp. 44 (Latin) / 45 (trans.): “Philosophiam, . . . ex . . . inquisitione legitimâ, & castâ, & seuerâ educitur & constituitur.”

<sup>22</sup> Bacon, *Temporis partus masculus*, SEH 3, p. 536: “isti Naturae Interpretes.”

<sup>23</sup> These texts are valuably translated in Benjamin Farrington, *The Philosophy of Francis Bacon* (Liverpool: Liverpool Univ. Press, 1964), although I have preferred to use my own renderings here.

century natural philosophy was, as Bacon acknowledged, Aristotelian.<sup>24</sup> Let us therefore set out by considering a pair of *bona fide* Aristotelians.

The most ambitious and prolific English Aristotelian in the generation before Bacon was the Oxford philosopher John Case (1539/1546–1600). In his treatise entitled *The Handmaid of Philosophy* (1599), Case offers a straightforward account of what he takes to be the goal of natural philosophy. Articulating a rather commonplace kind of account, Case asserts that the "general definition of philosophy" is simply "the fullest knowledge of all things, both human . . . and divine."<sup>25</sup> More specifically, natural philosophy in particular is the "science of natural bodies . . . together with their principles, accidents, and effects."<sup>26</sup> Charles Schmitt has offered some interesting suggestions about some ways in which Case's views on art and nature might be considered in a comparable light to Bacon's. But in respect of the goal of philosophy the two authors are quite different: neither in the *Handmaid* nor in Case's much more ambitious and interesting *Philosophical Touchstone* (licensed 1602) can I find any appeal to the "interpretation" of nature.<sup>27</sup>

We can confirm this preliminary impression that Aristotelian natural philosophy did not extend to the "interpretation" of nature by considering Case's much more influential contemporary, the Paduan professor Jacopo Zabarella (1532–1589), who was famous in his time as a logician and natural philosopher. Zabarella was very interested in the "duties of an interpreter" (*interpretis officia*) in philosophy, a subject he developed in an inaugural oration on Aristotle's *Physics* that he delivered in 1568. He stated there that it was the interpreter's role to be the "servant and minister of a certain author" (*servus et minister quidam auctoris*)—of an author, that is, not of nature itself. Zabarella returned to this theme in an oration on reading philosophy that he gave at Padua in 1585. Again he emphasized the philosophical value of Aristotle's writings—above all the *Posterior Analytics*—and the ways in which they should be interpreted; but again the work of "interpretation" is distinct from the work of striving "to penetrate the intimate nature of things" at which Aristotle, *qua* philosopher, excelled.<sup>28</sup> Hence when it comes to natural philosophy proper, Zabarella explains in his treatise *On Natural Things* (1590), "everyone agrees" that natural knowledge is "a speculative science, since its goal is not to do works, but to understand (or "know," *scire*) natural things."<sup>29</sup> Bacon, by contrast, was wholly opposed to this contemplative view of natural philosophy.

One reason why Bacon was so hostile to this kind of account is precisely because it was an Aristotelian model, reinforced above all by the demonstrative logic of the *Posterior*

<sup>24</sup> Bacon, *Cogitata et visa*, SEH 3, p. 601. On natural philosophy see further Ann Blair, "Natural Philosophy," in *Early Modern Science*, ed. Lorraine Daston and Katharine Park (Cambridge: Cambridge Univ. Press, 2006), pp. 365–406.

<sup>25</sup> John Case, *Ancilla philosophiae, seu epitome in octo libris physicorum Aristotelis* (Oxford, 1599), p. 6: "Communis definitio philosophiae est, vt sit omnium rerum tam humanarum . . . quam diuinarum, . . . amplissima scientia."

<sup>26</sup> *Ibid.*, p. 6: "scientia corporis naturalis . . . vnà cum eiusdem principijs, accidentibus, & effectis."

<sup>27</sup> John Case, *Lapis philosophicus seu commentarius in 8<sup>o</sup> libros physicorum Aristotelis in quo arcana physiologiae examinantur* (Oxford, [n.d.]). See also Charles Schmitt, *John Case and Aristotelianism in Renaissance England* (Kingston, Ont.: McGill–Queen's Univ. Press, 1983), pp. 191–216.

<sup>28</sup> Antonino Poppi, "Zabarella; or, Aristotelianism as a Rigorous Science," in *The Impact of Aristotelianism on Modern Philosophy*, ed. Riccardo Pozzo (Washington, D.C.: Catholic Univ. America Press, 2004), pp. 35–63, esp. pp. 38–40; and Mario Dal Pra, ed., "Una 'oratio' programmatica di G. Zabarella," *Rivista Critica di Storia della Filosofia*, 1966, 21:286–291, on p. 288: "intimam . . . rei naturam penetrare."

<sup>29</sup> Jacopo Zabarella, *De rebus naturalibus libri XXX* [1590] (Venice, 1607), col. 3 (Bk. 1, Ch. 2): "satis apud omnes constat, eam [sc. disciplina naturalis] esse scientiam speculatiuam, quum eius scopus non sit operari, sed scire res naturales."

*Analytics*. This was the most important part of Aristotle's logical *Organon* for many Renaissance natural philosophers, and it was worked over extensively in commentaries and monographs in the period. In this tradition, natural philosophical knowledge involved demonstrating a relationship between a cause and its effects and between effects and their cause, a procedure known as *regressus*.<sup>30</sup> The model of discovery in this central tradition of Renaissance natural philosophy involved no appeal to an idea of "interpretation."

It may justly be objected, however, that—with the exception of Julius Caesar Scaliger (1484–1558), from whom he borrows in the *Sylva sylvarum* (1626)<sup>31</sup>—Bacon was largely uninterested in Aristotelian natural philosophy, which had, in his view, been corrupted by logic and which left nature "well-nigh untouched and intact."<sup>32</sup> Bacon was much more positively engaged by his anti-Aristotelian predecessors and contemporaries. Of these, two of the most important were Bernardino Telesio and William Gilbert. Do either of these authors, the reading of whom perhaps did as much as anything to shape Bacon's own philosophical self-understanding, conceive of their philosophy in terms of the "interpretation" of nature?

Bernardino Telesio (1509–1588) has the honor of being the philosopher with whom Bacon engaged most extensively, above all in his unfinished manuscript treatise *De principiis atque originibus* ("On Principles and Origins" [ca. 1612?]). Bacon "thought well" of Telesio and acknowledged him "as a lover of truth, a man useful to the sciences, a corrector of certain doctrines, and the first of the new men [*novorum hominum primum*]."<sup>33</sup> But Bacon also notoriously regarded Telesio's work as "a kind of pastoral philosophy which contemplates the world calmly as if in idleness."<sup>34</sup> The goal of Telesio's *On the Nature of Things*, which Bacon read in its 1586 version, was accordingly not to "interpret" nature; it was to investigate it "according to its own principles" (*juxta propria principia*). Telesio explains the goals of his book as follows: "We propose to consider the world itself, and its separate parts, and the passions, actions, operations, and species of its parts, and of the things contained in it."<sup>35</sup> The key term here is to "consider" (or "gaze upon," *intueri*), not to "interpret."

Among his English contemporaries, William Gilbert (1544–1603) was the natural philosopher with whom Bacon engaged most explicitly, to the extent of obtaining a copy

<sup>30</sup> Nicholas Jardine, "Epistemology of the Sciences," in *The Cambridge History of Renaissance Philosophy*, ed. Charles Schmitt *et al.* (Cambridge: Cambridge Univ. Press, 1988), pp. 685–711; and Poppi, "Zabarella; or, Aristotelianism as a Rigorous Science" (cit. n. 28), p. 39.

<sup>31</sup> Francis Bacon, *Sylva sylvarum*, sig. Z2r (Decade 7, experiment 694). I have not found in Scaliger's *Exotericarum exercitationum liber quintus decimus, de subtilitate, ad Hieronymum Cardanum* (Paris, 1557) the suggestion that he regarded nature as being subject to "interpretation." While Ian Maclean has written of Girolamo Cardano and Scaliger as "interpreting" natural signs, he does not suggest that either of these authors explicitly used the term; see Ian Maclean, "The Interpretation of Natural Signs: Cardano's *De subtilitate* versus Scaliger's *Exercitationes*," in *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge Univ. Press, 1984), pp. 231–252.

<sup>32</sup> Bacon, *Cogitata et visa*, SEH 3, p. 601: "intactâ ferè ac illibatâ Naturâ."

<sup>33</sup> Francis Bacon, *De principiis atque originibus*, in Bacon, *Philosophical Studies, c. 1611–c. 1619*, ed. and trans. Graham Rees (Oxford Francis Bacon, 6) (Oxford: Clarendon, 1996), pp. 258 (Latin) / 259 (English). On this text see Rees, "Introduction," OFB 6, pp. xvii–cx, esp. p. xxix.

<sup>34</sup> Bacon, *De principiis atque originibus*, OFB 6, pp. 250 (Latin) / 251 (trans.): "Nam pastoralis quaedam videtur ista Philosophia, quae Mundum contemplatur placide, & tamquam per otium."

<sup>35</sup> Bernardino Telesio, *De rerum natura iuxta propria principia: Libri IX* [1586] (Naples, 1587), p. 2: "Mundum ipsum, & singulas eius partes, & partium, rerumque in eo contentarum passiones, actiones, operationes, & speties, intueri proposuimus." Regarding Bacon's reading of Telesio see Graham Rees, "Commentary," OFB 6, pp. 363–450, esp. pp. 423, 425–426, 429–430.

of, and critiquing, Gilbert's then-unpublished treatise *On the World*.<sup>36</sup> Gilbert's conception of natural philosophy emphasized both reasons and experiments (*rationes et experimenta*). He characterizes the endeavors of his predecessors in his treatise *On the Loadstone* (1600) in terms of their philosophizing "with a few vague and uncertain experiments" and "with reasons drawn from the hidden causes of things," and he speaks at the end of the book in terms of bringing an end both to his own "magnetic reasonings" and to his "experiments."<sup>37</sup> Gilbert's *On the World* suggests that his conception of philosophy involves opinions "about the different principles of things" and inquiry (in conventional Ciceronian terms) "into the divine and human causes of things."<sup>38</sup> Gilbert, again, does not speak of "interpreting" nature.

A further form of evidence will help press the case that, at this point, "interpretation"—though certainly preparative to philosophy—was not in fact regarded as being part of it. If we consult (as one may doubt that Bacon ever did) the comprehensive *Philosophical Lexicon* (1613) of the Marburg philosopher Rudolph Goclenius (1547–1628), we may be struck by the absence of any lemma for the term "interpretation" or its cognates; the same holds true for Goclenius's Herborn neighbor Johann Heinrich Alsted (1588–1638), in his less well known *Compendium of Philosophical Lexicons* (1626). For these authors, apparently, "interpretation" was not a term of strictly philosophical art. It is true that Bacon, who may be thought of (in one rather paradoxical light) as the last of the great Italian Renaissance philosophers of nature, inhabited a rather different philosophical world from that of these northern European Philippo-Ramists. But insofar as they are the culmination of more general tendencies among Protestant philosophers of the preceding century, their work may also strengthen our sense that, prior to Bacon, nature was not something philosophers went about "interpreting."<sup>39</sup>

If "interpretation" is not a task associated with the inquiries of late Renaissance natural philosophy, what about the discipline for which natural philosophy was the foundation: medicine? Bacon was greatly interested in medicine. He was fascinated by the problem of prolonging life and regarded the improvement of medicine as one of the primary goals of natural philosophy.<sup>40</sup> Though the natural philosophers did not do so, is it possible that late Renaissance physicians did engage in the "interpretation" of nature?

This question is in fact a more plausible one than it was for natural philosophy, for the reason that, though Galenic physicians were no less concerned to identify causes (in their case the causes of disease) than their philosophical counterparts, they were also extremely

<sup>36</sup> Suzanne Kelly, *The "De mundo" of William Gilbert* (Amsterdam: Hertzberger, 1965), pp. 13 n 5, 16; and Francis Bacon, *Descriptio globi intellectualis*, OFB 6, pp. 124, 154.

<sup>37</sup> William Gilbert, *De magnete, magneticisque corporibus, et de magno magnete tellure; physiologia nova, plurimis & argumentis, & experimentis demonstrata* (London, 1600), p. 6: "paucis experimentis vagis & incertis, ab abditis rerum causis petitis rationibus." *Ibid.*, p. 240: "nos magneticis nostris rationibus & experimentis hic finem & periodum imponimus."

<sup>38</sup> William Gilbert, *De mundo nostro sublunari philosophia nova* (Amsterdam, 1651), p. 2: "de principiis rerum." See also *ibid.*, on those "qui de divinarum humanarumque rerum causis inquirerent."

<sup>39</sup> Rudolph Goclenius, *Lexicon philosophicum* (Frankfurt, 1613); and J. H. Alsted, *Compendium lexici philosophici* (Herborn, 1626). See also Howard Hotson, *Commonplace Learning: Ramism and Its German Ramifications, 1543–1630* (Oxford: Oxford Univ. Press, 2007).

<sup>40</sup> Nancy Siraisi, "Medicine, 1450–1620, and the History of Science," *Isis*, 2012, 103:491–514. Regarding Bacon's interest in the problem of prolonging life see esp. Rees, "Introduction," OFB 6, pp. lxx–lxxix; and Graham Rees, "Introduction," in Francis Bacon, *The Instauratio magna Part III: Historia naturalis et experimentalis*, ed. and trans. Rees, with Maria Wakely (Oxford Francis Bacon, 12) (Oxford: Clarendon, 2007), pp. xvii–lviii, esp. pp. xlvi–lviii. On his view that the improvement of medicine was a primary goal of natural philosophy see Rees, "Introduction," OFB 6, pp. lxx–lxxix. See also Steven Shapin, "Descartes the Doctor: Rationalism and Its Therapies," *Brit. J. Hist. Sci.*, 2000, 33:131–154, esp. p. 134.



conscious that these causes were—in Jean Fernel’s term—“hidden” (*abditus*). The only way to know the causes of disease was, accordingly, to analyze the symptoms, or signs, that they produced. For this reason semiology was a central part of Renaissance medicine, and in the work of Ian Maclean we have an outstandingly thorough account of this far-reaching subject. The question we need to ask here is this: Did Renaissance doctors specifically regard themselves as “interpreting” medical signs? The absence of the term from Maclean’s study suggests that they did not. But let us explore the question with reference specifically to Jean Fernel (1497–1558), who was not only one of the most authoritative medical authors of the sixteenth century but whose writings were also well known to Bacon.<sup>41</sup>

In his treatise *Universal Medicine*, first published posthumously in 1567, Fernel defines the office of the physician. The doctor, he tells us, is “the servant equally of art and of nature”; his duty is to cure.<sup>42</sup> The second part of medicine, *pathologike*, is concerned with the diseases that threaten humans and with their causes, which are “revealed” (*demonstrare*) by signs. Using then the third part, *prognostike*, the doctor, “explaining signs” (*signa explicans*), is able to predict the future course of a disease.<sup>43</sup> Signs here demonstrate and are explained, but they are not “interpreted,” and the key term in Fernel’s lexicon of investigation is not “interpretation” but, rather, “analysis.”<sup>44</sup> A confirmation of this is that where Fernel does speak of “interpretation,” in his treatise *On the Hidden Causes of Things* (1548), it is in the context of interpreting a textual authority, such as Aristotle.<sup>45</sup>

There is, nonetheless, an interesting and potentially rather significant point to be made here about how Bacon proposes his vision of the interpretation of nature. Fernel speaks of the doctor as the servant (*minister*) of both art and nature. This seems to be a development of the then well-known sentiment in Hippocrates’ *Epidemics* that the doctor was the “servant of the art” of medicine, to which Fernel has added the idea of “nature.”<sup>46</sup> Bacon evidently took up this thought and modified it for his own purposes, for he begins the *Novum organum* with the strikingly similar sentiment that “man is the servant and interpreter of nature.”<sup>47</sup> The fact that Bacon has calqued the notion of “interpretation” onto an existing way of conceiving the physician’s role again tends to suggest the novelty of his application of “interpretation” to nature.

So far we have stuck to the high road of late Renaissance natural knowledge: the academic disciplines of natural philosophy and medicine. But there was more to the investigation of nature in this period than these institutionally privileged pursuits, and this is especially true for Bacon, who framed his own philosophy of works not against formal natural philosophy but against less orthodox though more “operative” forms of natural

<sup>41</sup> Ian Maclean, *Logic, Signs, and Nature in the Renaissance: The Case of Learned Medicine* (Cambridge: Cambridge Univ. Press, 2001). Regarding Bacon’s knowledge of Fernel’s writings see Bacon, *Temporis partus masculus*, SEH 3, p. 531; Rees, “Introduction,” OFB 6, pp. lxxv, lxxvi; and Rees, “Commentary,” OFB 6, p. 437.

<sup>42</sup> Jean Fernel, *Universa medicina*, 8th ed. (Geneva, 1604), sig. 2\*4r: “Medicus est artis perinde atque naturae minister.” On Fernel’s connection of natural philosophy and medicine see John Henry, “Why Jean Fernel (1497–1558) Became a Physician,” *Centaurus*, 2011, 53:193–220, esp. p. 215.

<sup>43</sup> Fernel, *Universa medicina*, sig. 2\*4r.

<sup>44</sup> Jean Fernel, *Physiologia*, ed. John Henry, trans. J. M. Forrester (Philadelphia: American Philosophical Society, 2003), pp. 14 (Latin) / 15 (trans.): “Haec summa est inuestigandi facultas, quam probatissimi quique Philosophi [*Analysin*], id est dissolutionem appellarunt” (Greek transliterated).

<sup>45</sup> Jean Fernel, *De abditis rerum causis libri duo* [1548], 2nd ed. (Venice, 1550), p. 93.

<sup>46</sup> Hippocrates, *Epidemics* 1.2. See further Maclean, *Logic, Signs, and Nature in the Renaissance* (cit. n. 41), p. 93.

<sup>47</sup> Bacon, *Novum organum* (Bk. 1, aph. 1), OFB 11, p. 64: “Homo Naturae minister, & *Interpres*” (emphasis added). See also Poppi, “Zabarella; or, Aristotelianism as a Rigorous Science” (cit. n. 28).

knowledge—the kind of forms pursued by the figures he identified in the *Novum organum* as “the Mechanic, the [practical] Mathematician, the Physician, the Alchemist, and the Magus.”<sup>48</sup> Let us therefore turn at this point from Galenic medicine to its legally less well protected counterpart: Paracelsianism.

We cannot do better than to take as a witness to Paracelsian ideas about nature the Danish physician Petrus Severinus (1542–1602)—the author who, in Bacon’s words, “eloquently reduced into an harmonie” the philosophy of Theophrastus Paracelsus.<sup>49</sup> As part of his *Idea of Philosophical Medicine* (1571), Severinus considers the duty of the physician and the *scientia* he practices. The physician should “investigate” (*investigare*) all the materials that nature provides to cure diseases and preserve health. Moreover, he “scrutinizes the whole Economy of Nature; he examines the decrees of Astronomers and Astrologers; he collects the reasonings of Meteorologists, Physicists, and Herbalists; he consults the principal Agriculturists and those skilled in Metallurgy, and he learns from their experiences and observations. He assiduously searches after the natures of Animals; and he comprehends all the Principles, Elements, and the fixed laws of Generation and Transplantation.” Severinus’s physician is evidently omniscient as well as eloquent, but one thing he does not do is “interpret” nature.<sup>50</sup>

As Graham Rees first showed, Bacon’s speculative cosmology was “semi-Paracelsian”; not for nothing did Bacon admire Severinus.<sup>51</sup> But there is another informal mode of natural knowledge that was of vital importance in shaping Bacon’s own approach to the study of nature: the tradition of natural magic. As is well known, he described his *Sylva sylvarum* as “a high kinde of *Naturall Magicke*,” and several of the experiments in that work are owed to the Neapolitan magus Giambattista Della Porta (1535–1615) and his treatise *Natural Magic* (1558–1589).<sup>52</sup> In the *Cogitata et visa* Bacon critiques the natural magicians’ emphasis on sympathies and antipathies—a preoccupation not only of Della Porta but also of Girolamo Fracastoro, for whom Bacon (rather unusually) expresses admiration.<sup>53</sup> But it does not appear to be from either Fracastoro or Della Porta that Bacon drew his conviction that nature had to be interpreted. For Della Porta, in the end, the art of natural magic is “nothing other than the contemplation (*contemplatio*) of the whole of nature,” an art that involves “bestowing and teaching the hidden qualities and properties

<sup>48</sup> *Ibid.* (Bk. 1, aph. 5), OFB 11, p. 66: “Mechanicus, Mathematicus, Medicus, Alchymista, & Magus.” See also Bacon, *Cogitata et visa*, SEH 3, pp. 591–593.

<sup>49</sup> Bacon, *Advancement of Learning*, OFB 4, pp. 92–93; see also the uncharacteristically generous assessment of Severinus in Bacon, *Temporis partus masculus*, SEH 3, p. 533.

<sup>50</sup> Petrus Severinus, *Idea medicinae philosophicae* (Basel, 1571), pp. 30–31, 36: “Medicus uerò indefesso studio, uniuersam totius Naturae Oeconomiam solus scrutatur: Astronomorum & Astrologorum decreta examinat: Meteorologicorum, Physicorum & Herbariorum rationes colligit: Agriculturae proceres & Metallicarum rerum peritos consulit, experientias ac obseruationes eorum addiscit: Animalium naturas sedulò inquirat: atque haec omnia Principijs, Elementis, & certis Generationum & Transplantationum legibus includit.” On Severinus’s science of medicine and its reception by Bacon see Jole R. Shackelford, *A Philosophical Path for Paracelsian Medicine: The Ideas, Intellectual Context, and Influence of Petrus Severinus, 1540–1602* (Copenhagen: Tusculanum, 2004), pp. 143–208, 257–264.

<sup>51</sup> Graham Rees, “Francis Bacon’s Semi-Paracelsian Cosmology,” *Ambix*, 1975, 22:81–101, 161–173.

<sup>52</sup> Bacon, *Sylva sylvarum*, sig. E2r (Dec. 1, exp. 93); and Graham Rees, “Bacon’s *Sylva sylvarum*: Prelude to Remarks on the Influence of the *Magia naturalis*,” in *Giovan Battista della Porta nell’Europa del suo tempo*, ed. Eugenio Garin and Maurizio Torrini (Naples: Guida, 1990), pp. 261–272.

<sup>53</sup> Giambattista Della Porta, *Magia naturalis libri viginti* (Frankfurt, 1591), pp. 15–17 (Bk. 1, Ch. 7); Girolamo Fracastoro, “De sympathia et antipathia liber I,” in *Opera omnia* (Venice, 1555), fols. 77r–104v; Bacon, *Cogitata et visa*, SEH 3, p. 603; and Francis Bacon, *Redargutio philosophiarum*, SEH 3, p. 571.

of things, and a knowledge (*cognitio*) of the whole of nature.”<sup>54</sup> It remains these rather traditional philosophical concepts of *contemplatio* and *cognitio*, not of “interpretation,” that frame Della Porta’s goals in the *Natural Magic*.<sup>55</sup>

Della Porta also contributed to another form of natural knowledge for which Bacon had a guarded respect: physiognomy. Unlike its sister doctrine—the interpretation of natural dreams—Bacon did not explicitly speak of physiognomy in terms of the “interpretation” of the natural signs furnished by the body. Nor, it appears, did Della Porta.<sup>56</sup> One physiognomic work in the sixteenth century did, however: a Latin version of a treatise by the second-century Sophist Marcus Antonius Polemo. The second edition of this treatise was published in Venice in 1552 in a collection of ancient medical works under the title “*Naturae signorum interpretatio*” (“The Interpretation of the Signs of Nature”).<sup>57</sup> This work constitutes a rare instance of the explicit application of the idea of interpretation to nature in the period, albeit via the intermediation of the well-established medical notion of “signs,” and it did so in that mode of Renaissance natural knowledge that may have been most willing to bring together natural signs with linguistic hermeneutics;<sup>58</sup> but it is not one that has an obviously broader significance for Bacon’s handling of the idea of the “interpretation of nature.”

There remains one prominent form of Renaissance natural knowledge to consider: natural history. Natural history plays a crucial role in Bacon’s Great Instauration. Furthermore, it might justly be thought to have a privileged place in any investigation of the idea of “interpreting nature” in the Renaissance, since it played that role in Michel Foucault’s influential 1966 *ébauch* of that period as one in which “resemblance” (*resemblance*) both “largely guided exegesis and the interpretation of texts” and also “made possible knowledge of things visible and invisible.”<sup>59</sup> Such sentiments perhaps still stand behind the view that the Renaissance was an age in which natural interpretation predominated; if they are correct, then if it is to be found anywhere we might expect to find the “interpretation” of nature pervading natural history.

A Baconian fragment of uncertain status rejects the important natural histories of Conrad Gessner (1516–1565) as arising “from many parts of Philology” but “few of Philosophy,”<sup>60</sup> and Gessner’s desire to identify God’s “solicitude and providence” (*cura et providentia*) for his animal creation within the book of Job may also have been a target in the *Novum organum*.<sup>61</sup> Gessner’s careful account of his natural historical practices in his *History of Animals* (1551) precisely explains his handling of *philologia* and, more

<sup>54</sup> Della Porta, *Magia naturalis*, p. 3 (Bk. 1, Ch. 2): “Nobis verò non nisi vniuersae Naturae contemplationem esse videatur. . . delitiscientium rerum qualitates, proprietates, ac totius Naturae cognitionem elargiens, docensque.”

<sup>55</sup> See, e.g., *ibid.*, pp. 24–25 (Bk. 1, Ch. 10).

<sup>56</sup> See Giambattista Della Porta, “Quid sit physiognomia,” in *De humana physiognomia* (Sorrento, 1586), p. 26 (Ch. 17). For Bacon’s expression of respect for physiognomy see Bacon, *De augmentis scientiarum* (Bk. 4, Ch. 1), SEH 1, p. 583.

<sup>57</sup> Marcus Antonius Polemo, “*Naturae signorum interpretatio*,” in *Meletii Philosophi de natura structuraque hominis opus* . . . , trans. Nicolaus Petreius (Venice, 1552), pp. 147–179. (I am grateful to Ian Maclean for this reference.)

<sup>58</sup> See further Ian Maclean, “The Logic of Physiognomy in the Late Renaissance,” *Early Science and Medicine*, 2011, 16:275–295, esp. pp. 288–289, 295.

<sup>59</sup> Michel Foucault, *Les mots et les choses* (Paris: Flammarion, 1966), p. 32; trans. as *The Order of Things* (London: Routledge, 1970), p. 19.

<sup>60</sup> Francis Bacon, “Cogitationes de scientia humana” [so-called], SEH 3, p. 191: “Gesnerus autem haereditatem historiae suae ex multis partibus Philologiae ex paucis Philosophiae [*sic*].” (This untitled treatise survives only in a bad eighteenth-century copy.)

<sup>61</sup> Conrad Gessner, *Historiae animalium lib. I* (Zurich, 1551), sig. β3v; see also note 88, below.

generally, how he has used his authors. Gessner even explicitly explains that, of the two interpretative tasks of "revealing an author's words and meaning" and "comparing similar passages," he has concentrated principally on the latter. But he does not associate this literary task of interpretation with "nature" or nature's animals.<sup>62</sup>

Bacon's sense of the field of natural history is further developed in his comment in the *Advancement of Learning* that "in naturall Historie, wee see there hath not been that choise and iudgment vsed, as ought to haue beene, as may appeare in the writings of *Plinius*, *Cardanus*, *Albertus*, and diuers of the Arabians, being fraught with much fabulous matter."<sup>63</sup> This critique, it must be said, did not prevent Bacon from drawing materials from the first two of these authors in his *Sylva sylvarum; or, A Naturall Historie*.<sup>64</sup> Moreover, and remarkably, he even seems to have derived the terms of this criticism from Cardano himself.<sup>65</sup> Like Zabarella, Cardano was rather interested in the practice of textual interpretation; but his most natural historical treatise, *On the Variety of Things* (1557), is not concerned to explain the variety of natural things in terms of *interpretatio*, and his other work that Bacon read closely, *On Subtlety* (1550–1560), is similarly not concerned with *interpretatio naturae* but, rather, with varieties of natural "subtlety" (*subtilitas*): "a certain process by which sensible things are grasped by the senses, and intelligible things by the intellect, but with difficulty."<sup>66</sup>

It has justly been observed that Bacon nowhere mentions the publications of the most ambitious contemporary exponent of natural history, Ulisse Aldrovandi (1522–1605).<sup>67</sup> Aldrovandi is celebrated for the generous scope of his conception of natural history; but it is notable that among the numerous topics under which he handles natural history—*Aequiuoca*, *Synonima*, *Genus*, *Differentiae*, *Locus*, *Cognominata*, *Denominata*, *Usus*, *Mystica*, *Hieroglyphica*, *Historica*, *Symbola*, *Numismata*, *Icones*, *Emblemata*, *Fabulae*, and *Apologi*—there is no place for *Interpretatio*.<sup>68</sup> Moreover, this copious and philological approach to natural history is precisely the kind that Bacon critiques in a well-known passage of the "Preparation for a Natural and Experimental History" that he printed with the *Novum organum*.<sup>69</sup>

Leaving aside Bacon's contemporaries, however, we must turn to ask about Pliny—the

<sup>62</sup> Gessner, *Historia animalium*, sigs. β1r–β3r (esp. sig. β1r): "Nam qui librum aliquem explicandum suscipiunt, duo praecipue curant, ut uerba & sensus authoris declarent, & aliorum similes locos conferant, quorum posterius . . . in hoc opere summo studio perfecti."

<sup>63</sup> Bacon, *Advancement of Learning*, OFB 4, p. 26; unchanged in Bacon, *De augmentis scientiarum* (Bk. 1), SEH 1, p. 456.

<sup>64</sup> Graham Rees, "An Unpublished Manuscript by Francis Bacon: *Sylva sylvarum* Drafts and Other Working Notes," *Annals of Science*, 1981, 38:377–412, esp. p. 389.

<sup>65</sup> Compare the suspiciously similar judgment passed by Cardano on Pliny and Albertus Magnus in *De subtilitate* [1550] (Lyon, 1580), p. 9.

<sup>66</sup> Girolamo Cardano, *De rerum varietate* (Basel, 1557); and Cardano, *De subtilitate*, p. 9: "Est autem subtilitas, ratio quaedam, qua sensibilia à sensibus, intelligibilia ab intellectu, difficilè comprehenduntur." Regarding Cardano's interest in the practice of textual interpretation see Maclean, *Logic, Signs, and Nature in the Renaissance* (cit. n. 41), pp. 224–225. On Bacon's close reading of *On Subtlety* see Paulo Rossi, *Francis Bacon: From Magic to Science* [1957], trans. Sacha Rabinovitch (London: Routledge, 1968), p. 219.

<sup>67</sup> Paula Findlen, "Francis Bacon and the Reform of Natural History in the Seventeenth Century," in *History and the Disciplines*, ed. Donald R. Kelley (Rochester, N.Y.: Univ. Rochester Press, 1997), pp. 239–260; this claim is made on p. 240.

<sup>68</sup> This list is drawn from Aldrovandi's account of his *methodus* in his first major natural historical publication, the *Ornithologiae hoc est de avibus historie* (Bologna, 1599), sig. 59r; he also speaks here of his duty as a philosopher being to *perscrutare* the hidden secrets of nature (sig. 49v). See also William B. Ashworth, "Natural History and the Emblematic World View," in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge Univ. Press, 1990), pp. 303–332, esp. pp. 313–316.

<sup>69</sup> Francis Bacon, *Parasceve*, OFB 11, p. 456.

only author, in his view, who had “embraced Natural History according to its worth,” but who nonetheless “treated it unworthily.”<sup>70</sup> It is notable that there is in fact one passage toward the end of Pliny’s *Historia naturalis* that conjoins the terms “*natura*” and “*interpretatio*.” It occurs in a discussion of two obelisks in Rome. Their inscriptions, says Pliny, “contain the interpretation of matters of nature in the Egyptians’ philosophy” (*rerum naturae interpretationem Aegyptiorum philosophiae* [sic] *continent*)—or indeed, as it was rather freely translated by Philemon Holland in 1601, they “containe the interpretation of Nature.”<sup>71</sup> Moreover, beyond the similarity of phraseology there is an interesting further connection with Bacon’s own *Novum organum* here, for in the “Praefatio” to that work he had compared the use of conventional logic with trying to move “some gigantic obelisk” with one’s bare hands alone—by contrast with his own New Instrument, through which the matter would be accomplished “as if by a machine” (*veluti per machinas*). As Graham Rees pointed out, it is likely that Bacon specifically has in mind here the transportation of the Vatican obelisk to the new Piazza di San Pietro in 1586, expensively performed and then expensively documented by the papal architect Domenico Fontana. Although the Vatican obelisk contains no hieroglyphics, Pliny discusses it immediately after the two that do.<sup>72</sup>

Could Bacon’s conception of the “interpretation of nature” derive from this lonely hint in Pliny? He certainly knew the *Historia naturalis* well, and it is certainly possible that the passage sowed a seed. But we should not forget that Bacon’s own discussion of hieroglyphics denies as being “of small fruite” the implication that they might bear any natural or Platonic “*Similitude* or *Congruitie*” with the notions they express.<sup>73</sup> Nor should we ignore the point (which may perhaps be found a pedantic one) that Pliny speaks of the Egyptians’ *rerum naturae interpretationem*, not of their *interpretationem naturae* itself.

Whatever it was that informed Bacon’s vision of the “interpretation” of nature, however, there may be a reason why we should not in fact expect natural history to have done so. For though *historia naturalis* in its specifically Baconian conception came to be fundamental “for the building up of philosophy,” Bacon did not count it among the operative natural disciplines, and this, together with natural history’s rather precarious disciplinary existence in the Renaissance, may be why he does not include it in his critical surveys of existing natural disciplines in the early *Temporis Partus Masculus* and *Cogitata et visa*.<sup>74</sup> Nor did he include practitioners of natural history among those who had “concerned themselves with Nature (in respect of Works)” in the *Novum organum*.<sup>75</sup> As such, *historia naturalis*, the province of the third part of the *Instauratio magna*, remains

<sup>70</sup> Bacon, *De augmentis scientiarum* (Bk. 2, Ch. 2), SEH 1, p. 497: “Historiam Naturalem solus pro dignitate complexus est; . . . indignis modis tractauit.”

<sup>71</sup> Pliny, *Naturalis historiae libri trigintaseptem*, ed. Paulo Manuzio (Venice, 1559), col. 929 (Bk. 36, Ch. 9; modern editions assign this passage to Ch. 14 and read “*philosophia*”); and Pliny, *The Historie of the World*, trans. Philemon Holland (London, 1601), p. 576.

<sup>72</sup> Bacon, “Praefatio,” in *Novum organum*, OFB 11, p. 54; Graham Rees, “Introduction,” OFB 11, pp. xix–cxiii, esp. p. 1; Domenico Fontana, *Della trasportatione dell’obelisco Vaticano* (Rome, 1590), fols. 1r–36v; and Pliny, *Naturalis historiae*, ed. Manuzio, cols. 929–930 (Bk. 36, Ch. 11).

<sup>73</sup> Bacon, *Advancement of Learning*, OFB 4, p. 120. See also the extended treatment in *De augmentis scientiarum* (Bk. 6, Ch. 1), SEH 1, pp. 652–654, discussed by Rhodri Lewis, *Language, Mind, and Nature* (Cambridge: Cambridge Univ. Press, 2007), pp. 13–17.

<sup>74</sup> Francis Bacon, *Phaenomena universi* [ca. 1611], OFB 6, p. 2; and Bacon, “Distributio operis,” OFB 11, p. 36. On the place of natural history in the Renaissance see Brian Ogilvie, *The Science of Describing* (Chicago: Univ. Chicago Press, 2006); Ogilvie also lays out Bacon’s evolving conception of natural history (p. 258).

<sup>75</sup> Bacon, *Novum organum* (Bk. 1, aph. 5), OFB 11, p. 66: “se immiscere Naturae (quoad Opera).”

separated from *Interpretatio naturae*, the goal of the second part.<sup>76</sup> Pliny's passing remark notwithstanding, it seems that natural historians join other Renaissance students of nature in not subjecting it to "interpretation."

The result of this investigation into the late Renaissance study of nature, for all that it has necessarily been partial and selective, is nonetheless striking. In our forays across all the forms of natural knowledge we have considered—natural philosophy, medicine, natural magic, physiognomy, natural history—we have largely drawn a blank. Not even in Renaissance alchemy, it seems, was "interpretation" a recognized term of art.<sup>77</sup> None of these modes of late Renaissance natural knowledge, at least as represented by the limited (though not arbitrary) selection of authors we have considered, precisely invokes a notion of the "interpretation of nature." Indeed, it must be confessed that, in order to try to find authors who might have conceived of "interpreting" nature prior to Bacon, I have even resorted to that lowest form of historical scholarship: the electronic word search. But aside from throwing up the single *locus* in Pliny, and also one further instance to be discussed below, even this vile and ignorant mode of research has revealed no established Renaissance tradition of speaking of the "interpretation of nature."<sup>78</sup> Scarcely any author before Bacon, so far as I have found, even invokes the idea of the "interpretation of nature," let alone places it, as he did, at the very heart of his science of nature.

#### PARS CONSTRUENS: SOME CONTEXTS FOR THE "INTERPRETATION" OF NATURE

So far we have been developing the *pars destruens*: the negative side of the case. We have suggested that "interpretation" was not a concept that was generally applied to the study of nature in the century or so prior to Bacon. But it is now time to turn to the more positive side of the argument, to ask in what intellectual spheres or disciplines in the Renaissance we do explicitly encounter the notion of "interpretation." It is significant, though not surprising, that these are all disciplines that, in one form or another, concern themselves with language.

The first sense of "interpretation" to consider is one that can be dispatched fairly swiftly. "*Interpretatio*" in Renaissance Latin (like "interpretation" in Renaissance English) could sometimes simply mean "translation" from one language into another. Is Bacon's idea of *interpretatio naturae* one that involves translation? Evidently it is not. None of the procedures that Bacon elaborates in the *Novum organum* or its precursors implies an analogy with the act of linguistic translation. Bacon has a different and more ambitious sense of "interpretation" in mind.

Nor is the next sense in which the term "*interpretatio*" was used immediately more promising. Throughout the Middle Ages and Renaissance, *interpretatio* played a significant role in Aristotelian logic. The third constituent treatise of Aristotle's *Organon*, called in Greek *Peri hermenias*, was known in the Latin tradition by the title *De interpretatione*. The sense of "interpretation" in this context is essentially linguistic; "interpretation" is equivalent to "enunciation." A succinct definition was offered by the Italian Protestant philosopher Giulio Pace (1550–1635) in his *Institution of Logic*, published at Cambridge

<sup>76</sup> But see Peter Anstey, "Francis Bacon and the Classification of Natural History," *Early Sci. Med.*, 2012, 17:11–31, esp. p. 28.

<sup>77</sup> There is again no lemma for "*interpretatio*" in Martin Ruland, *Lexicon alchemiae sive dictionarium alchemisticum* (Frankfurt, 1612).

<sup>78</sup> It is a mode of research complicated, in Latin, by the need to account for variation of word order and inflection.

in 1597, twenty years after Bacon himself had left that university: “INTERPRETATION is an articulate utterance signifying by convention the thoughts of the soul. It is said to be ‘articulate’ insofar as it has a sequence of syllables, which are not found in whistling, or the barking of dogs, and other such utterances. It is said to be ‘conventional’ . . . because it does not arise from nature, but from the judgment of human beings.”<sup>79</sup>

Now it is worth reiterating here the obvious but important point that an author who entitles his central work of philosophy a *Novum organum* wishes himself to be compared with Aristotle and wishes his philosophy to be compared with Aristotle’s own logical *Organon*. Moreover, there was a strong association between logic and language in our period.<sup>80</sup> Logic was a crucial tool for the interpretation of texts and in the management and adjudication of interpretative controversies more generally. Yet it seems clear that Bacon had no wish to relate his theory of *interpretatio naturae* precisely to the specific Aristotelian logical concept of *interpretatio*. Besides, as we have already noted, it was not the doctrines of the Philosopher’s *De interpretatione* that were most prominent in the late Renaissance study of nature but, rather, those of his *Posterior Analytics*.

And so we come to the primary and also the most complex sense of *interpretatio* in the late Renaissance, which is also the sense that remains most familiar today. Here, “interpretation” is the process of explaining or expounding or explicating a text of obscure or uncertain meaning.<sup>81</sup> This sense of “interpretation” involves language: not in its Aristotelian capacity as the raw material of logical propositions, but in its more elaborate capacity as an obscure text whose meaning requires exegesis. There were two disciplines—or, rather, professions—that were concerned with this activity above all in the late Renaissance: theology and law.

Interpretation was a central part of the profession of theology or divinity, for the reason that (as was regrettably acknowledged) the sacred Scriptures were not so plain as they might be and therefore required explication. Moreover, it was worth interpreting Scripture precisely because it was sacred, and hence many points of doctrine and discipline, to say nothing of salvation, turned upon it. Thus theology was the faculty that perhaps generated the greatest quantity of explicit reflection on the goals and procedures of interpretation. It was also the field that generated the largest body of interpretative literature in practice, as anyone who has explored the enormous body of early modern biblical commentary will be aware.

What were the goals of interpretation for the theologians? They were of course far too numerous to be comprehended succinctly here. But we can identify certain key preoccupations. The most ambitious defense of Protestant interpretative procedures in Bacon’s England was William Whitaker’s *Disputation on Sacred Scripture* (1588), aimed at Cardinal Bellarmine. In his fifth disputation Whitaker turns specifically to the question of biblical interpretation. Though we have not found naturalists speaking about interpretation, it is notable that the theologian Whitaker does use several of the philosophical terms we have already encountered to characterize the act of interpretation. In particular, the “interpretation of Scripture” (*inter-*

<sup>79</sup> Giulio Pace, *Institutiones logicae* (Cambridge, 1597), sig. 13r–v: “INTERPRETATIO est vox articulata ex instituto sensa animi significans. Articulata dicitur: quoniam habet articulos syllabarum, quae non reperiuntur in sibilio, & canis latratu, & similibus vocibus. Ex instituto dicitur . . . quod non est à natura, sed hominum arbitrio positum.” See further R. W. Serjeantson, “The Passions and Animal Language, 1540–1700,” *Journal of the History of Ideas*, 2001, 62:425–444.

<sup>80</sup> See further Lewis, *Language, Mind, and Nature* (cit. n. 73), pp. 106–108; and Hannah Dawson, *Locke, Language, and Early-Modern Philosophy* (Cambridge: Cambridge Univ. Press, 2007), pp. 13–40.

<sup>81</sup> See, e.g., Johann Altensteig, *Lexicon theologicum* (Cologne, 1576), s.v. “interpretatio”: “dicitur alicuius obscuri & aenigmatici sermonis facta declaratio.”

*pretatio Scripturae*), for Whitaker, involves scrutinizing (*scrutare*), seeking for (*quaerere*), and investigating (*investigare*) the words of the Bible. The goal of a proper scriptural interpretation, for Whitaker, was to expound a meaning that cohered with the "sense" of the "intention and meaning" of its author, who is of course the Holy Spirit.<sup>82</sup>

In his account of the "true & sound Interpretation of the Scriptures" in the *Advancement of Learning*, Bacon broadly concurs with this kind of Reformed theory. The overriding thought that informs his account is that the Bible differs from "all other books" by virtue of its divine authorship. It is notable that at one point in his discussion Bacon makes a comparison between natural philosophy and divinity: "as in nature, the more you remove your selfe from particulars, the greater peril of Error you doe incur: So, much the more in Diuinitie, the more you recede from the Scriptures by inferences and consequences, the more weake and dilute are your positions."<sup>83</sup>

But this is merely a simile, of the sort that any divine who had studied natural philosophy as part of the undergraduate arts course might have essayed in a sermon. It does not imply any methodological derivation of Bacon's natural philosophy from his background in divinity. The "interpretation" of the Bible, precisely because it was regarded as such a wholly exceptional book, remained very firmly focused on the words of Scripture.

We should not rule out altogether, however, the thought that interpreting the Bible might, in some way, have led Bacon's contemporaries, or at least one of them, to the idea of also "interpreting nature." I am aware of one—though only one—late Renaissance student of nature before Bacon who uses—though only once—the locution "interpretation of nature." This exception has been reserved for this discussion of the interpretation of Scripture because that was also his goal. The author is the Spanish royal physician Francisco Vallès (Franciscus Vallesius; 1524–1592), and his book is *On Sacred Philosophy; or, On Those Things That Are Written about Physics in the Holy Scriptures* (1582). The goal of Vallès's book is to defend the thought that the Bible contains "truths of natural philosophy as well as other disciplines." As such, it belongs to a tradition that Ann Blair, following Daniel Morhof, has christened "Mosaic Physics."<sup>84</sup>

Notwithstanding the case that Vallès wants to make about the Bible's utility for understanding natural philosophy, he is clear that this is very far from being its primary purpose.<sup>85</sup> Hence he begins his work with a caveat. Most people, he says, have wanted to interpret the natural references in the Bible as if they had nothing to do with nature *per se* but, rather, related to the salvation of the soul. (Vallès would evidently have been rather taken aback by the modern assertion that sixteenth-century commentaries on Genesis are a genre in which "the prime concern is knowledge of nature."<sup>86</sup>) Moreover, even he—Vallès goes on to say—is persuaded that "this divine eloquence, written by friends of God

<sup>82</sup> William Whitaker, *Disputatio de Sacra Scriptura* (Cambridge, 1588), pp. 2, 305 (Bk. 5, Ch. 2): "Sed quid est sensus Spiritus sancti? quae eius mens est ac sententia, cum qua omnes nostrae interpretationes congruere ac convenire debent?" On Whitaker see further Jean-Louis Quantin, *The Church of England and Christian Antiquity* (Oxford: Oxford Univ. Press, 2009), esp. p. 49.

<sup>83</sup> Bacon, *Advancement of Learning*, OFB 4, pp. 186, 189, 187.

<sup>84</sup> Ann Blair, "Mosaic Physics and the Search for a Pious Natural Philosophy in the Late Renaissance," *Isis*, 2000, 91:32–58, on p. 50.

<sup>85</sup> See also Kathleen M. Crowther, "The Mosaic Physics of Levinus Lemnius and Francisco Valles," in *Nature and Scripture in the Abrahamic Religions: Up to 1700*, ed. Jitse van der Meer and Scott Mandelbrote (Leiden: Brill, 2008), pp. 397–428, esp. pp. 413–414.

<sup>86</sup> Gaukroger, *Emergence of a Scientific Culture* (cit. n. 1), p. 133. The assertion might have gained support from Gerhard Dorn's *De naturae luce physica, ex Genesis desumpta, juxta sententiam Theophrastus Paracelsi . . . tractatus* (Frankfurt, 1583), esp. p. 22: "Disputazione haudquaquam indiget, Spiritum Dei veram nos docere Physicam ex ore Moysis in sacra Genesi." But this reflects a specifically Paracelsian tradition, arising (as Dorn makes clear;



inspired by the Holy Spirit, is not really intended for the interpretation of nature” (*ad naturae interpretationem*).<sup>87</sup> Vallès has been talking immediately above about “interpreting” the sacred books “as if they had nothing to do with nature,” and perhaps it is this that helps him slip into speaking of the rather different matter of the “interpretation of nature.”

We do not know whether Bacon knew Vallès’s popular book. But we can be sure that he was not sympathetic to his general endeavor. In the *Novum organum* Bacon attacks those “moderns” who, “in the height of folly,” have “tried to build natural philosophy on the first chapter of Genesis, and on the book of *Job*, and other sacred Scriptures.”<sup>88</sup> And in the course of his treatment of biblical interpretation at the close of the *Advancement of Learning* Bacon criticizes at length “the Schoole of *Paracelsus*, and some others, that have pretended to finde the truth of all naturall Philosophy in the Scriptures; scandalizing and traducing all other Philosophie: as Heathenish and Prophane.”<sup>89</sup> There is a question (as so often with Bacon) about who exactly the target of this broad attack is: most scholars have simply emphasized the Paracelsian connection in general, while Michael Kiernan has very plausibly proposed one particular Paracelsian, Gerhard Dorn, author of a treatise entitled *On the Physical Light of Nature Drawn from Genesis* (1583).<sup>90</sup> Ann Blair in turn has suggested the tradition of “Mosaic philosophy,” including Vallès; while from this tradition Arnold Williams specifically proposed Lambert Daneau’s *Physica Christiana* (1576–1580), which certainly has the evangelical agenda Bacon criticizes.<sup>91</sup> It seems unlikely, therefore, that Bacon’s conception of *interpretatio naturae* developed from a passing hint dropped in a book written in a genre he so forcefully rejected.

It is high time, however, to bring up a consideration that has been lurking in the background of this argument since it opened. The Bible was not the only one of God’s books in the Renaissance period. The Almighty was also the author, *qua* Creator, of the “book of nature” (*liber naturae*). The book of nature has been found to be a significant, and perhaps even a prominent, image in the late Renaissance. Did it therefore lead those who invoked it to speak of “interpreting” nature?

Answering this question leads us away from revealed theology (which rested, at least in principle, on the interpretation of Scripture) and into a different sphere: that of natural theology. Natural theology in the late Renaissance is a fluid and complex subject that has been much less well studied than its later anglophone heir.<sup>92</sup> But we can begin to address it by considering what was perhaps the most significant exposition of this theme for late Renaissance Europe, Raymond Sebond’s (d. 1436) *Book of the Creatures*, generally

see p. 9) from Paracelsus’s *Ad Athenienses* (Cologne, 1564); and even Dorn is at pains to explain (p. 11) that his “physical” treatment of Genesis is distinct from the *interpretationes* of the theologians.

<sup>87</sup> Francisco Vallès, *De sacra philosophia, sive de iis quae physice scripta sunt in libris sacris* (Turin, 1587), p. 1: “Ego diuina haec eloquia, minimè ad naturae interpretationem scripta esse, à viris Dei amicis, sancto afflatis spiritu, mihi persuado.” (I owe this particular reference to <http://books.google.com/>.)

<sup>88</sup> Bacon, *Novum organum* (Bk. 1, aph. 65), OFB 11, pp. 102 (Latin) / 103 (trans.): “nonnulli ex modernis summâ leuitate itâ indulserunt, vt in primo capitulo Geneseos, & in libro *Iob*, & alijs Scripturis sacris, Philosophiam naturalem fundare conati sunt.”

<sup>89</sup> Bacon, *Advancement of Learning*, OFB 4, p. 188.

<sup>90</sup> Michael Kiernan, “Commentary,” OFB 4, pp. 205–362, esp. p. 360. On Dorn see note 86, above. Among commentators who have emphasized the Paracelsian connection see Harrison, *Bible, Protestantism, and the Rise of Natural Science* (cit. n. 1), p. 140; Graham Rees, “Commentary,” OFB 11, pp. 487–591, esp. pp. 518–519; and William Poole, *The World Makers* (Oxford: Peter Lang, 2010), p. 12.

<sup>91</sup> Blair, “Mosaic Physics and the Search for a Pious Natural Philosophy in the Late Renaissance” (cit. n. 84), p. 42; and Arnold Williams, *The Common Expositor: An Account of the Commentaries on Genesis, 1572–1633* (Chapel Hill: Univ. North Carolina Press, 1948), p. 176.

<sup>92</sup> But see Ann Blair, *The Theater of Nature: Jean Bodin and Renaissance Science* (Princeton, N.J.: Princeton Univ. Press, 1997).

known in the sixteenth century as the *Theologia naturalis*. Though this book was written in the mid 1430s, its frequent republication and translation—not least by Michel de Montaigne—in the later sixteenth century strongly attest to its currency in Bacon's lifetime. Moreover, when Bacon invokes the "two books" analogy, he uses Sebond's characteristic locution of the *Volumen Creaturarum*.<sup>93</sup> Sebond accordingly speaks of there being the "highest concord and agreement between the book of nature, or of the creatures, and the book of the Bible." The book of nature, furthermore, speaks to us (*dicere*) of what we ought to believe about God in himself prior to any other kind of proof.<sup>94</sup> And Sebond insists that humankind ought to "exercise" (*exercitare*) itself "both in the creatures of God and in the word of God."<sup>95</sup> But we do not find him specifically speaking here of the need to "interpret" the book of the creatures.

This situation changes slightly once we enter the world of Second Reformation natural theology, here represented by Johann Heinrich Alsted's own *Theologia naturalis* (1615). Alsted is concerned in the first part of his book with the knowledge of God and in the latter part with "reading the book of nature." We have already seen from Alsted's *Philosophical Lexicons* that he did not appear to regard "interpretation" as part of the office of the philosopher *per se*, but he is clear here that his account of natural theology is distinct from philosophy—and especially metaphysics.<sup>96</sup> Is Alsted therefore willing to speak of "interpretation" in respect of the book of nature? The answer is that very largely he is not. The terms in which he speaks of the book of nature are of "reading" (*legere*) it and of being "instructed" (*erudire*) by it.

There is, however, one curious occasion on which Alsted offers a slightly different thought. He is addressing the question of whether the reader of the book of nature ought also to read the writings of good philosophers. Developing a neat Aristotelian pun, he explains that the leaves of nature's codex should be opened not by the hands, but by traveling through its different regions on foot; and for this reason "a pupil in this School will be peripatetic." But Alsted does then go on to concede that philosophers themselves have also turned over the pages of this book: "because true philosophers are interpreters of nature, or nature-consults (*interpretes naturae seu naturae consulti*)."<sup>97</sup> This appearance of the locution "interpreters of nature" is striking, but we should note that it is expressed in very self-consciously figurative language. What Alsted is implying is that nature should be to philosophers as the law is to jurisconsults (*jurisconsulti*). He evidently liked these legal analogies, because in a notable earlier image he had transposed Creation onto the component parts of the *Corpus juris civilis*.<sup>98</sup> Alsted's occasional legal images are witty and well handled. Nonetheless, they do not seem to imply any deeper vision, either on his part or on that of the tradition he is developing, of nature as the object of

<sup>93</sup> Bacon, *De augmentis scientiarum* (Bk. 1), SEH 1, p. 469. Compare Bacon, *Advancement of Learning*, OFB 4, p. 37.

<sup>94</sup> Raymond Sebond, *Theologia naturalis* (Venice, 1581), fol. 200r (Ch. 221): "summa concordia, summa conuenientia inter librum naturae, seu creaturarum, & inter librum Bibliae."

<sup>95</sup> *Ibid.*, fol. 210v (Ch. 216): "Ergo homo debet seipsum exercitare tam in creaturis Dei, quàm in uerbis Dei."

<sup>96</sup> J. H. Alsted, *Theologia naturalis* ([Frankfurt], 1615), p. 8. See further Charles Lohr, "Metaphysics and Natural Philosophy as Sciences: The Catholic and Protestant Views in the Sixteenth and Seventeenth Centuries," in *Philosophy in the Sixteenth and Seventeenth Centuries: Conversations with Aristotle*, ed. C. Blackwell and S. Kusukawa (Aldershot: Ashgate, 1999), pp. 280–295, esp. pp. 290–293. For a contemporary English reader of Alsted's book see David Colclough, "Silent Witness: The Politics of Allusion in John Donne's Sermon on Isaiah 32:8," *Review of English Studies*, 2012, 63:572–587, esp. pp. 581–582.

<sup>97</sup> Alsted, *Theologia naturalis*, p. 247: "discipulus in hac Schola erit peripateticus . . . veri philosophi sunt interpretes naturae seu naturae consulti."

<sup>98</sup> *Ibid.*, sig. d2r.

“interpretation”—and besides, Bacon had conceived his brainchild of *interpretatio naturae* some time before Alsted published the *Theologia naturalis*.

It is the case, however, that on one particular occasion Bacon did yoke together the conventional image of the book of nature with his new vision of “interpretation.” In the third part of the *Instauratio magna*, the *Historia naturalis et experimentalis* (1622), he described the “Book of the Creatures” (*Volumen Creaturarum*) as being “that speech and language” (*ille Sermo, & Lingua*) that men should learn; they should “spare no effort in eliciting and unraveling its interpretation.”<sup>99</sup> This imagery, of God’s creatures and the heavens as “visible words” (*paroles visibles*), may also be found in Calvinist writings such as the *Troisième tome de l’academie françoise [sic]* (1590) of the Huguenot court philosopher Pierre de la Primaudaye (1546–1619); but the primary thought animating la Primaudaye’s account is that this language “should speake to euery one” (*parloyent à vn chacun*) and is therefore “most easie to be vnderstood” (*plus facile à entendre*).<sup>100</sup> Bacon’s constant conviction, by contrast, is a quite different one: that nature is obscure—and hence that it requires “interpretation.” Moreover, it is striking how isolated this imagery of the “language” of nature is in Bacon’s writings. In none of the unpublished writings in which he developed it, nor indeed in the *Novum organum* itself, does Bacon set out from this apparently obvious starting point. Hence, while the image of the book of nature serves here as an effective means to illustrate Bacon’s novel idea of the “interpretation of nature,” it does not seem to have been the stimulus for it.<sup>101</sup>

The interpretative procedures of theology, therefore, whether natural or revealed, do not appear to offer the key to Bacon’s idea of the “interpretation of nature” that some scholars have suggested they should.<sup>102</sup> Instead, there is somewhere even more promising to look, which is hinted at by Alsted’s jurisprudential imagery, and it is to this that we should at last turn. For besides theology, the other great interpretative discipline of the late Renaissance was law.<sup>103</sup> The law, moreover, was Bacon’s own profession.

Renaissance lawyers spoke of *interpretatio* often and in multiple contexts, and here again we have a rich guide in Maclean’s account *Interpretation and Meaning in the Renaissance*. The Renaissance jurists canvased there spoke of “extensive” versus “intensive” interpretation, and they distinguished between “signification,” which is the true or proper sense of the word, and “interpretation,” which is an expansion or limitation of that sense.<sup>104</sup> They considered interpretation, in short, in respect of words rather than things, insofar as (as the authoritative figure of Andrea Alciato put it) “words signify, things are

<sup>99</sup> Francis Bacon, *Historia naturalis*, OFB 12, p. 10: “In Interpretatione autem eius eruendâ, atque enucleandâ, nulli operae parcant.” Compare Bacon, “Distributio operis,” OFB 11, pp. 40 (Latin) / 41 (trans.).

<sup>100</sup> Pierre de la Primaudaye, *The Third Volume of the French Academy*, trans. R. Dolman (London, 1601), pp. 148–149. (I am grateful to one of the anonymous *Isis* referees for this reference.)

<sup>101</sup> Pace Karl Popper, *Conjectures and Refutations* [1963] (London: Routledge, 2002), p. 18. Guido Giglioli, “Reading Nature without Making a Book of It: Francis Bacon’s *Novum organum*,” in *Mémoires / Misbooks: Études sur l’envers et les travers du livre*, ed. P. Hummel (Paris: Philologicum, 2009), pp. 55–70, by contrast, concurs.

<sup>102</sup> Even the millennial interpretation of Steven Matthews, *Theology and Science in the Thought of Francis Bacon* (Aldershot: Ashgate, 2008), finds that Bacon wished to distinguish natural philosophy from natural theology (pp. 110–114).

<sup>103</sup> Ian Maclean, “Evidence, Logic, the Rule, and the Exception in Renaissance Law and Medicine,” *Early Sci. Med.*, 2000, 5:227–257, esp. pp. 243–244.

<sup>104</sup> Ian Maclean, *Interpretation and Meaning in the Renaissance: The Case of Law* (Cambridge: Cambridge Univ. Press, 1992), pp. 87–178. Some goals of legal *interpretatio* are concisely delineated by Andrea Alciato in his influential treatise *De verborum significatione*, Bk. 2, §31. See Alciato, *De verborum significatione libri IIII: Eiusdem in titulum XVI Lib. L Digestorum commentarii* (Lyon, 1572), p. 71.

signified."<sup>105</sup> Here, then, is an immediate contrast with Bacon. His "interpretation of nature" is specifically concerned not with words (which give rise to the Idols of the Market) but with "things themselves" (*res ipsae*).<sup>106</sup>

Hence one should not suppose that there are likely to be any really direct parallels between the lawyers' theories of interpretation and Bacon's recommendations for the interpretation of nature. Like his contemporaries, Bacon knew that the world of words and the world of things were quite distinct. But there are nonetheless some suggestive correspondences to be found between the two intellectual realms, correspondences that I now turn to outline. Doing so enables us to extend our investigation of Bacon's terminology of *interpretatio* to certain other technical terms that he also associates closely with that procedure.

As we saw at the outset of this account, an important related aspect to the *interpretatio naturae*, at least in its earlier conceptions, involved what Bacon calls "legitimate inquisition" (*inquisitio legitima*). Now the idea of *inquisitio*, like that of *interpretatio*, could also be a legal one. In his *Dictionary of Civil and Canon Law*, the French jurist Pardoux Duprat (1520–1569) explained that an "inquisition" is "an office purely of a judge, which ought to be exercised in the investigation of a crime, to preserve good morals."<sup>107</sup> We might therefore go on to ask whether Renaissance lawyers ever spoke, like Bacon, specifically of a "legitimate" inquisition. I have not found that they do—exactly. But they come quite close. Writers disagree over the detailed nature of the *inquisitio*, but it seems to have been generally agreed that an inquisition could not proceed without what were called "legitimate indications" (*indicia legitima*).<sup>108</sup> One needed a reason (*causa*) to institute an *inquisitio*; and so, as Duprat goes on, "Observe only what is required to investigate a legitimate cause, lest you should believe old-womanish rumors to be enough to injure a man's reputation, condition, or life."<sup>109</sup> The same kind of thought, though without the misogyny, is offered by the *Dicaeologica* (1617) of Johannes Althusius (1557/1563–1638), a methodical compendium of existing civilian legal learning, which notes that an inquisition that is "lacking in its legitimate form" is null and void.<sup>110</sup> Althusius similarly speaks of the need for a judgment as to whether the *indicia* that give rise to an *inquisitio* "are legitimate and sufficient."<sup>111</sup>

Renaissance lawyers do not seem, then, to have spoken precisely about the "legitimate inquisitions" that Bacon wrote about in a philosophical vein; but they did speak about the rather similar "legitimate indications" that give rise to inquisitions. Moreover, the appearance of *indicia* in this legal context should make us prick up our ears, for just as we met *interpretatio* in the title of Bacon's *Novum organum*, so too we also met there the idea of *indicia*—and specifically of *indicia vera de interpretatione naturae*. So in "*indicium*," too,

<sup>105</sup> Alciato, *De verborum significatione libri III*, p. 176 (commentary on the *Digest*, 50.16): "Verba significant, res significantur." Nonetheless, and drawing attention to his own authorship of the most important emblem book of the Renaissance, Alciato goes on to point out that sometimes *res* such as hieroglyphs also signified in their own right.

<sup>106</sup> On the *Idola Fori* see Bacon, *Novum organum* (Bk. 1, aph. 44), OFB 11, p. 80.

<sup>107</sup> Pardoux Duprat, *Lexicon juris civilis et canonici* (Lyon, 1580), s.v. "*inquisitio*": "INQUISITIO est merum officium iudicis, quod exercere debet ad inuestiganda delicta, vt boni mores conseruentur."

<sup>108</sup> *Ibid.*: "sine legitimis indicis specialem inquisitionem non procedere."

<sup>109</sup> *Ibid.*: "Solum id obserua, quid requiratur ad legitimam inquirendi causam, ne credas aniles rumores sufficere ad laedendam hominis famam, conditionem, vel vitam."

<sup>110</sup> Johannes Althusius, *Dicaeologica* [1617] (Frankfurt, 1649), p. 638: "Inquisitio igitur . . . formâ suâ legitimâ carens, non tenet, sed nulla est."

<sup>111</sup> *Ibid.*: "an indicia sint legitima & sufficientia."

we have another term to add to the nexus of concepts that are accumulating around *interpretatio*.

What is an *indicium*? Like “*interpretatio*,” the term does not appear in Goclenius’s specifically philosophical lexicon. But it does appear in several legal lexicons of the late Renaissance, including those of Pardoux Duprat and Simon Schard, where it is defined as “a sign . . . of a crime, or of something else that is sought . . . an aid to proof.”<sup>112</sup> Perhaps the foremost theorist of legal *indicia* in Bacon’s time was Jacopo Menochio (1532–1607), who treated them at length in his massive *Commentary on Presumptions, Conjectures, Signs, and Indications* (1587–1590). Menochio endorses the association we have already seen between *indicia* as the grounds for *inquisitio*.<sup>113</sup> He also offers a full account of what *indicia* are. Following the authoritative commentator Baldus de Ubaldis, Menochio distinguishes between a “half-full” (*semi-plenum*) indication—a form of presumption that “strongly moves the mind to credit or discredit something”—and a “full” (*plenum*) indication, which is even better, for it is “the demonstration of a thing by a different sign, by which the mind relies on something just as if it existed.”<sup>114</sup>

This is not to argue that Bacon’s own philosophical doctrine of *indicia vera* is straightforwardly that of the civilians. But his use of their terminology provokes the strong suspicion that he is developing his ideas about “inquisition,” “indication,” and ultimately perhaps even “interpretation” from the civilian law of evidence.<sup>115</sup> Moreover, to this developing web of legal terminology in Bacon’s philosophy of science we can add a further node, which we also encountered at the beginning of this account: the persistent references in Bacon’s unpublished early writings to a “formulary” or *formula* of interpretation. A *formularius* in late medieval Latin was precisely a “lawyer who was skilled in *formulae*,” and *formulae* in the law that Bacon knew were the set terms in which indictments or *actiones* were brought against those charged with crimes.<sup>116</sup>

There is, finally, a little-noticed passage in one of Bacon’s unpublished writings that might clinch this case for a legal origin for the *interpretatio naturae*. In the volume of *Writings in Natural and Universal Philosophy* (1653) that Isaac Gruter printed from the manuscripts supplied to him by Bacon’s executor William Boswell (d. 1650) there appears a little-studied treatise entitled *Filum labyrinthi, sive inquisitio legitima de motu*. In this short treatise Bacon makes a rare explicit analogy between legal processes and the study

<sup>112</sup> Simon Schard, *Lexicon juridicum*, s.v. “*indicium*”: “INDICIVM est signum, siue demonstratiuum domicilium delicti, vel alterius rei, de quo vel de qua quaeritur, & adminiculum probationis.”

<sup>113</sup> Jacopo Menochio, *De praesumptionibus, conjecturis, signis et indicis, commentaria* [1587–1590], 2 vols. (Turin, 1594), Vol. 1, sig. d4r, s.v. “*inquisitione in generale*.” He notes that to institute a “general” inquisition merely “light” *indicia* are enough. See further Adolfo Giuliani, “Civilian Treatises on Presumptions, 1580–1620,” in *The Law of Presumptions: Essays in Comparative Legal History*, ed. Richard Helmholz and David Sellar (Berlin: Duncker & Humblot, 2009), pp. 21–72.

<sup>114</sup> Menochio, *De praesumptionibus*, Vol. 1, fol. 4v (Bk. 1, quest. 7, nos. 15–16): “Nam & Baldus . . . scripsit, indicium esse duplex, semiplenum, seu dubitativum, & plenum siue indubitatum. Est indicium semiplenum (inquit Baldus) praesumptio fortiter mouens animum ad aliquid credendum, vel discredendum . . . Plenum vero indicium (inquit idem Baldus) est demonstratio rei per signa differentia, per quae animus in aliquo tanquam existente quiescit.”

<sup>115</sup> Compare James Franklin, *The Science of Conjecture: Evidence and Probability before Pascal* (Baltimore: Johns Hopkins Univ. Press, 2001), pp. 217–218.

<sup>116</sup> *Oxford English Dictionary*, s.v. “formulary, *n.* and *adj.*” See also Francis Bacon, *Certaine Obseruations Made Vppon a Libell* [1593], in Bacon, *Early Writings, 1584–1596*, ed. Alan Stewart with Harriet Knight (Oxford Francis Bacon, 1) (Oxford: Clarendon, 2012), p. 407: “in the practice of all lawes the formularies [*sc.* of indictments] have bine few & certaine and not varied accordinge to euerie particuler case.” See also Schard, *Lexicon juridicum* (cit. n. 112), s.v. “*formulas*”; and Duprat, *Lexicon juris civilis et canonici* (cit. n. 107), s.v. “*formulae*.”

of nature: "Just as those civil judgments are most incorrupt and honest where least oratory and obfuscation (or even eloquence) is condoned, but instead almost all the time and effort is employed on witnesses; so, in the same way, the best judgments about Nature are achieved when things are deduced by numerous and evident testimonies of experience, rather than by the presentation of aggressive or plausible speeches or disputations." The "testimonies of authors," Bacon goes on, are bound up with desires and inducements; but the "testimonies and answers" of things, though they are sometimes cryptic and obscure, are always sincere and uncorrupted.<sup>117</sup> This passage does not explicitly invoke the idea of "interpretation." But it does suggest very strongly that Bacon's vision of natural investigation had its origin in the processes of legal *inquisitio*. If this is so, then Bacon's general theory of the "interpretation of nature" may perhaps also be regarded as having a significantly legal foundation. (See Figure 1 and frontispiece.)

### CONCLUSION

Before Bacon's intervention, it appears that "interpretation" was not in fact an activity practiced upon nature either by natural philosophers, or by learned Galenic physicians, or by their Paracelsian counterparts, or by natural magicians, or even by alchemists. They preferred to conceive of their natural investigations in terms of cognition, explanation, and analysis, not in terms of the textual procedure of "interpretation." And while the range of authors canvassed here is necessarily limited—though they are often those we know Bacon to have read—the results have been sufficiently unanimous as to lead us to presume that no large-scale tradition explicitly concerned with "interpreting" nature is likely to emerge from the various different Renaissance modes of studying nature. It seems likely, therefore, that it is Bacon himself who popularized later invocations of the "interpretation of nature."

More generally, we have ruled out "interpretation" in its logical or philological senses of "enunciation" or "translation" as models for what Bacon is doing. We have identified theology and law as the intellectual realms in which interpretation was most widely practiced, albeit on words rather than on the things of nature. Perhaps the most surprising finding concerns the "book of nature" (*liber naturae*). Though authors certainly spoke of "reading" this "book" before Bacon, they do not seem to have subjected it to "interpretation." By contrast, in the realm of law we have found a number of suggestive parallels between specifically civilian legal procedures and the terminology that Bacon associates with his idea of interpreting nature. Not only Bacon's use of *interpretatio* itself, but also the closely associated concepts of *indicia*, *inquisitiones*, and *formulae*, seem to have their origins in the law.

The results of the research presented here therefore tend to support the long-standing suggestion that Bacon's knowledge of the law might have helped shape his philosophy of science. Among recent scholars the rather different work of Harvey Wheeler and Julian

<sup>117</sup> Francis Bacon, *Filum labyrinthi, sive inquisitio legitima de motu*, SEH 3, p. 636 (Bacon, *Scripta* [1653], sig. T4r–v): "Ac veluti in iudiciis civilibus ea maxime incorrupta & recta sunt, ubi minimum oratorum licentiae & turbis, aut etiam Eloquentiae conceditur: sed omnis fere opera & tempus in testibus consumitur. Eodem modo & de Natura judicia exercentur optima, cum nec pugnaci nec probabili orationi aut disputationi maximae partes tribuuntur, sed Experientiae testimoniis evidentibus & coacervatis res conficitur. Nam certe in Authorum testimoniis libido & stimulus versatur: rerum autem testimonia & responsa, interdum obscura & perplexa, sed semper sincera & incorrupta sunt." On the sources of Gruter's volume see Rees, "Introduction," OFB 6, pp. lxx–xcv.



**Figure 1.** Law overcoming Nature, represented as Pan. Detail from the title page of Pardoux Duprat, *Lexicon iuris civilis et canonici* (Lyon: Guillaume Rouillé, 1567). (Reproduced courtesy of the Master and Fellows of Gonville and Caius College, Cambridge.)

Martin, in particular, comes to mind.<sup>118</sup> But this account has differed from the ones offered by them in emphasizing the significance of the civil law rather than the common law, reflecting the fact that in his desire to “reduce and perfect” English law into a “Digest”—to be a Tribonian to James I’s Justinian—Bacon similarly drew his inspiration from the rule-governed civil law rather than the comparatively formless common law.<sup>119</sup>

<sup>118</sup> Harvey Wheeler, “Science out of Law: Francis Bacon’s Invention of Scientific Empiricism,” in *Toward a Humanistic Science of Politics*, ed. Dalmas H. Nelson and Richard L. Sklar (Lanham, Md.: Univ. Press America, 1983), pp. 101–143, esp. pp. 107–115; Wheeler, “The Invention of Modern Empiricism: Juridical Foundations of Francis Bacon’s Philosophy of Science,” *Law Library Journal*, 1983, 76:78–120; and Julian Martin, *Francis Bacon, the State, and the Reform of Natural Philosophy* (Cambridge: Cambridge Univ. Press, 1992), pp. 141–171. For other work suggesting that Bacon’s knowledge of the law might have helped shape his philosophy of science see W. S. Holdsworth, *A History of English Law*, 3rd ed., 15 vols. (London, 1922–1965), Vol. 5, p. 239. See also John Henry, *Knowledge Is Power: How Magic, the Government, and an Apocalyptic Vision Inspired Francis Bacon to Create Modern Science* (Cambridge: Icon, 2002), p. 133; Rose-Mary Sargent, “Scientific Experiment and Legal Expertise: The Way of Experience in Seventeenth-Century England,” *Studies in History and Philosophy of Science*, 1989, 20:19–45, esp. p. 29; and Barbara J. Shapiro, *A Culture of Fact: England, 1550–1720* (Ithaca, N.Y.: Cornell Univ. Press, 2000), pp. 107–112.

<sup>119</sup> Francis Bacon, *Offer of a Digest* [1622], in Spedding, *Letters and the Life of Francis Bacon* (cit. n. 19),

The broader implications of the case offered here extend beyond our understanding of Francis Bacon alone. As we have seen, a number of scholars have proposed that the "interpretation of nature" was a fundamental mode of natural knowledge in the Renaissance. Both Peter Harrison and James Bono assert, in somewhat different ways, that the prevalence, as they see it, of the image of the "book of nature" means that medieval and Renaissance natural philosophers had a "hermeneutic" approach to their subject.<sup>120</sup> Yet one is struck by the simple observation that in reading these scholars' work one cannot find them quoting any writer before Bacon who actually uses the expression "interpretation of nature." It may perhaps be objected that this is a purely philological point: that although late Renaissance authors did not use the term itself, yet they were nonetheless working with the idea. As will be evident, I am doubtful about this. But even if it holds, we are left with the disquieting thought that if this hermeneutic approach to nature was so very pervasive, why then did these authors not simply speak about it by means of the hermeneutic expression—"interpretation"—with which they were most familiar?

I now leave aside Bono, whose arguments are sometimes unclear and whose handling of evidence is not always wholly convincing.<sup>121</sup> But Harrison is a different matter, for he has developed an ambitious thesis across a number of publications about the role of "Protestant and humanist" biblical interpretation in what he calls "the rise of natural science." For Harrison, it was the application of specifically Protestant principles of biblical interpretation to the study of nature that brought about the "revolutionary changes that took place over the course of the sixteenth and seventeenth centuries."<sup>122</sup> Moreover, it is Bacon who, in an odd twist, plays an important role in Harrison's case for this new *noninterpretative* approach.<sup>123</sup> Yet this would appear to have the matter just the wrong way round. On the basis of the research laid out here, Bacon is remarkable for being the first Renaissance philosopher to articulate an explicitly "interpretative" vision of nature (and possibly the last, too).<sup>124</sup>

We may be more doubtful still about the even stronger version of the Harrison thesis that Stephen Gaukroger has offered us. Gaukroger goes beyond the idea of scriptural exegesis to make the much more general inference that *because* sixteenth-century natural philosophers were often led to offer interpretations of authoritative texts (above all those of Aristotle), *hence* they were also inclined to regard nature as something that was itself to be interpreted.<sup>125</sup> But this does not follow. Renaissance philosophers did not often

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Vol. 7, p. 363. I here concur with Gaukroger, *Emergence of a Scientific Culture* (cit. n. 1), p. 360. For a judicious account of Bacon's allegiance to civilian versus common law principles, and his ultimate philosophical synthesis of both, see Daniel Coquillette, *Francis Bacon* (Edinburgh: Edinburgh Univ. Press, 1992), esp. pp. 99–117, 239–256, 282–288.

<sup>120</sup> Peter Harrison, "The 'Book of Nature' and Early Modern Science," in *The Book of Nature in Early Modern and Modern History*, ed. K. van Berkel and A. Vanderjagt (Leuven: Peeters, 2006), pp. 1–26; and Bono, *Word of God and the Languages of Man* (cit. n. 1).

<sup>121</sup> See, e.g., James J. Bono, "The Two Books and Adamic Knowledge: Reading the Book of Nature and Early Modern Strategies for Repairing the Effects of the Fall and of Babel," in *Nature and Scripture in the Abrahamic Religions*, ed. van der Meer and Mandelbrote (cit. n. 85), pp. 299–339, esp. p. 301, where the "Interpreter" invoked from Edward Topsell's *Historie of Four-footed Beastes* (London, 1607), sig. A3r, turns out simply to denote what would now be called a translator.

<sup>122</sup> Peter Harrison, "Hermeneutics and Natural Knowledge in the Reformers," in *Nature and Scripture in the Abrahamic Religions*, ed. van der Meer and Mandelbrote, pp. 341–362, on p. 353. See also Harrison, *Bible, Protestantism, and the Rise of Natural Science* (cit. n. 1), esp. pp. 266–268.

<sup>123</sup> Harrison, "Hermeneutics and Natural Knowledge in the Reformers," p. 354. See also Harrison, *Bible, Protestantism, and the Rise of Natural Science*.

<sup>124</sup> I therefore join Scott Mandelbrote, "Early Modern Biblical Interpretation and the Emergence of Science," *Science and Christian Belief*, 2011, 23:99–113, in finding reasons to be doubtful about Harrison's larger thesis.

<sup>125</sup> See Gaukroger, *Emergence of a Scientific Culture* (cit. n. 1), p. 136, on "the idea that methods employed



confuse the interpretation of words (*verba*) with the investigation of things in themselves (*res ipsae*). To suppose otherwise would be to ignore the dominance of the Aristotelian doctrine of linguistic conventionalism in our period.<sup>126</sup> If one believed, as almost all philosophers at this point did, that the relationship between words and things was conventional rather than natural, then there is no reason to suppose that the same principles should apply in investigating human or divine words, on the one hand, and natural things, on the other. Words only provided testimony, of greater or lesser authority, about the workings of nature; the “inartificial” evidence they offered was of a different kind from the “artificial” evidence of things themselves.<sup>127</sup>

These are points that derive from Renaissance logic, and logic was widely held to regulate philosophical inquiry in this period. This is as much as to say that the broad assumptions of Renaissance logic, especially as derived from the *Posterior Analytics*, are much more important in the natural philosophy of the period than Harrison or Gaukroger, or even Bono, might allow. The thought that naturally follows from this observation is that an author perhaps had to be brave—or foolhardy—enough to be willing to reject outright the legacy of Renaissance logic in order to come up with the idea that nature might require to be “interpreted,” rather than “contemplated” or “analyzed.” And Bacon, the author of a “new” *Organon*, was indeed this brave—or this foolhardy.

I suggest, in short, that the idea that nature might be “interpreted” was alien to the mental world of the late Renaissance—alien, that is, until Bacon proposed it. It was texts that were to be interpreted, not nature; and indeed, until Bacon yoked the idea to nature, “interpretation” was not even a goal of late Renaissance philosophy *per se* (for all that interpreting authoritative texts certainly was something done in the course of pursuing those goals). Indeed, we may go further. It seems likely that the idea that one might “interpret” nature would have been regarded by many of Bacon’s contemporaries as a solecism: the sort of solecism, perhaps, that helped motivate the polite but comprehensive hostility of a former natural philosophy lecturer in the Oxford schools, Sir Thomas Bodley, to the *Cogitata et visa de interpretatione naturae*; or the sort of lawyer’s solecism that provoked the derisive charge of that good Aristotelian William Harvey: that Bacon “writes philosophy like a Lord Chancellor.”<sup>128</sup>

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in interpreting scripture might be the appropriate model for natural interpretation” and on how “it is striking how natural philosophy was pursued on exclusively textual lines in the scholastic tradition.”

<sup>126</sup> As J. M. van der Meer and R. J. Oosterhof have also emphasized: “God, Scripture, and the Rise of Modern Science (1200–1700): Notes in the Margin of Harrison’s Hypothesis,” in *Nature and Scripture in the Abrahamic Religions*, ed. van der Meer and Mandelbrote (cit. n. 85), pp. 363–396, esp. p. 391.

<sup>127</sup> R. W. Serjeantson, “Testimony and Proof in Early-Modern England,” *Stud. Hist. Phil. Sci.*, 1999, 30:195–236. See further Ian Maclean, “Foucault’s Renaissance *Episteme* Reassessed: An Aristotelian Counterblast,” *J. Hist. Ideas*, 1998, 59:149–166.

<sup>128</sup> Thomas Bodley to Francis Bacon, 19 Feb. 1607/8, in Bacon, *The Remaines* (London, 1648), pp. 80–87; and John Aubrey, *Brief Lives*, ed. A. Clark, 2 vols. (Oxford, 1898), Vol. 1, p. 299. On Bodley see Anthony Wood, *Athenae Oxonienses*, ed. P. Bliss, 4 vols. (London, 1813–1820), Vol. 2, col. 125. On Harvey see Charles Schmitt, “William Harvey and Renaissance Aristotelianism: A Consideration of the *Praefatio* to the *De generatione animalium* (1651),” in *Humanismus und Medizin*, ed. R. Schmitz and G. Keil (Weinheim: Chemie, 1984), pp. 117–138; and Roger French, *William Harvey’s Natural Philosophy* (Cambridge: Cambridge Univ. Press, 1994).