

Francis Bacon's Science of Magic

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

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For
Victoria Maud Weeks

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Abstract

This thesis seeks to explain how Francis Bacon promoted a materialist ontology whilst at the same time designating the goal of his inquiry into nature “true natural magic.” It attempts to establish the precise relationships among Bacon’s concepts of matter, inquiry and magic in terms of his novel conception of nature. Baconian matter forms the basis of Bacon’s substantive natural philosophy; it is highly potent and the unique source of operative power. In its unhampered or “free” state, nature takes the easiest and most economic route leaving a reservoir of unused possibility. To access the benefits of this unexploited potential, the Baconian mage experimentally and methodically deflects nature from its habitual course. Thus Baconian operational power is derived from constraining or binding nature so as to activate matter’s dormant powers. For Bacon, magic is the artful constraint of nature. Through harnessing the primitive and archetypal powers of matter, Baconian magic would achieve what the magical and alchemical traditions had attempted haphazardly. Magic constitutes the capstone of Bacon’s reform of natural philosophy and it relies fundamentally on a plenipotentary matter. The inquiry prepares and guides the mind in its efforts to achieve that goal. Although these themes are often fragmented by commentators, they form a coherent natural philosophical foundation for Bacon’s *Instauratio magna*. Their reintegration requires a return to Bacon’s texts. A close reading of Bacon’s works demonstrates a complex but internally coherent substantive philosophy. By placing Bacon’s materialism centre-stage, in conjunction with thorough and detailed exegesis, long-standing disputes over central Baconian concepts can be resolved.

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Abbreviations

The following abbreviations are used for the titles of Bacon's works, parts of works and plans.

<i>AC</i>	<i>Aphorismi et consilia</i>
<i>AL</i>	<i>Advancement of learning</i>
<i>ANN</i>	<i>Abecedarium nouum naturæ</i>
<i>CDNR</i>	<i>Cogitationes de natura rerum</i>
<i>CDSH</i>	<i>Cogitationes de scientia humana</i>
<i>CF</i>	<i>Calor et frigus</i>
<i>CHP</i>	<i>Catalogus historiarum particularium</i>
<i>CS</i>	<i>Commentarius solutus</i>
<i>CV</i>	<i>Cogitata et visa</i>
<i>DAS</i>	<i>De augmentis scientiarum</i>
<i>DFRM</i>	<i>De fluxu et refluxu maris</i>
<i>DGI</i>	<i>Descriptio globi intellectualis</i>
<i>DIN</i>	<i>De interpretatione naturæ sententiæ xii</i>
<i>DINP</i>	<i>De interpretatione naturæ præmium</i>
<i>DO</i>	<i>Distributio operis</i>
<i>DPAO</i>	<i>De principiis atque originibus</i>
<i>DSV</i>	<i>De sapientia veterum</i>
<i>DUK</i>	<i>Brief discourse touching the happy union of the kingdoms</i>
<i>DVM</i>	<i>De vijs mortis</i>
<i>Ess</i>	<i>The essayes or counsels, civill and morall</i>
<i>FL</i>	<i>Filum labyrinthi</i>
<i>GG</i>	<i>Gesta Grayorum</i>
<i>HDR</i>	<i>Historia densi & rari (Rawley's version)</i>
<i>HDR(M)</i>	<i>Historia densi & rari (manuscript version)</i>
<i>HGL</i>	<i>Historia grauis & leuis (aditus published in HNE)</i>
<i>HIDA</i>	<i>Historia & inquisitio de animato & inanimato</i>
<i>HIP</i>	<i>Discourse touching helps for the intellectual powers</i>
<i>HNE</i>	<i>Historia naturalis et experimentalis</i>
<i>HAS</i>	<i>Historia soni et auditus</i>

<i>HSMS</i>	<i>Historia sulphuris, mercurii et salis</i> (aditus published in <i>HNE</i>)
<i>HV</i>	<i>Historia ventorum</i> (published in <i>HNE</i>)
<i>HVM</i>	<i>Historia vitæ et mortis</i>
<i>IDM</i>	<i>Inquisitio de magnete</i>
<i>ILM</i>	<i>Inquisitio legitima de motu</i>
<i>ILM(CS)</i>	<i>Inquisitio legitima de motu</i> (in CS)
<i>IM</i>	<i>Instauratio magna</i>
<i>IVDI</i>	<i>Indicia vera de interpretatione naturæ</i>
<i>NA</i>	<i>New Atlantis</i>
<i>NO</i>	<i>Novum organum</i>
<i>PA</i>	<i>Prodromi sive anticipationes philosophiæ secundæ</i>
<i>PAH</i>	<i>Parasceve ad historiam naturalem</i>
<i>PhU</i>	<i>Phænomena universi</i>
<i>PID</i>	<i>Partis instaurationis secundæ delineatio & argumentum</i>
<i>RPh</i>	<i>Redargutio philosophiarum</i>
<i>SI</i>	<i>Scala intellectus sive filum labyrinthi</i>
<i>SS</i>	<i>Sylva sylvarum</i>
<i>SSWN</i>	<i>Sylva sylvarum</i> (working notes)
<i>TC</i>	<i>Thema cæli</i>
<i>TDL</i>	<i>Topica inquisitionis de luce et lumine</i>
<i>TPM</i>	<i>Temporis partus masculus</i>
<i>VT</i>	<i>Valerius terminus</i>

The following abbreviations are used for editions and translations of Bacon's works:

- BF* Farrington, Benjamin. *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964).
- Fowler Bacon, Francis. *Bacon's Novum Organum*, ed. Thomas Fowler, 2nd ed. (Oxford: Clarendon Press, 1889).
- Kitchin *Novum Organum: sive indicia vera de interpretatione naturæ*, ed. G. W. Kitchin (Oxford: Oxford University Press, 1855).
- LL* Bacon, Francis. *The Letters and Life of Francis Bacon*, ed. James Spedding, vols. 8-14 (London: Longman, Green, Reader and Dyer, 1861-74).¹
- OFB* Bacon, Francis, *The Oxford Francis Bacon*, general eds. Graham Rees and Lisa Jardine, 15 vols. (Oxford: Clarendon Press, 1996–).
- SEH* Bacon, Francis, *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis, and Douglas Denon Heath, vols. 1-7 (London: Longman, Green, Reader and Dyer, 1859-64).

References to work, edition, volume (in Roman numerals) and page number are given in footnotes. In the case of Latin works, I have cited the English translation of a passage. Where facing-page *OFB* translations are not available, I also give the location of the original after the corresponding reference to the translation. I have checked translations against the original. Where such translations obscure technical terms, I have either included the Latin phrase in square brackets in the text or given my own translation. Where no translation is available, translations are my own.

¹ In this edition of Bacon's works, the *Works* proper appear as volumes 1-7 and the *Letters* as volumes 8-14.

Chapter 1

Introduction

Bacon's language, like the secret things of Nature, will not unfold all its treasures to the hasty passer-by: he who will learn his full meaning and worth must first sojourn with him and become his friend.¹

I. "True natural magic"

This thesis seeks to explain how Francis Bacon promoted a materialist ontology whilst at the same time designating the goal of his inquiry into nature "true natural magic."² It attempts to establish the precise relationships among Bacon's concepts of matter, inquiry and magic in terms of his novel conception of nature. Paolo Rossi's seminal work – *Francis Bacon: From Magic to Science* – explored Bacon's indebtedness to major Renaissance figures who were heavily involved with the occult sciences of alchemy and magic.³ I argue that Rossi's title is misleading.

¹ G. W. Kitchin, *Novum Organum: sive indicia vera de interpretatione naturæ* (Oxford: Oxford University Press, 1855), xii.

² Bacon, *AL, OFB*, IV, 90. In the *Advancement of Learning* Bacon expresses his intention to "reviue and reintegrate the misapplied and abused Name of NATVRALL MAGICKE, which in the true sense, is but NATVRALL WISEDOME, or NATVRALL PRVDENCE: taken according to the ancient acception, purged from vanitie & superstition" (*AL, OFB*, IV, 80). See also *NO, OFB*, XI, 215.

³ Paolo Rossi, *Francesco Bacone: Dalla magia alla scienza* (Bari: Laterza, 1957). English translation: *Francis Bacon: From Magic to Science*, trans. Sacha Rabinovich (London: Routledge and Kegan Paul, 1968). See also Lynn Thorndike, "The Attitude of Francis Bacon and Descartes towards Magic and Occult Science," in *Science, Medicine and History: Essays on the Evolution of Scientific Thought and Medical Practice written in honour of Charles Singer*, ed. E. Ashworth Underwood (Oxford: Oxford University Press, 1953), 451-454. On Bacon and alchemy: Muriel West, "Notes on the Importance of Alchemy to Modern Science in the Writings of Francis Bacon and Robert Boyle," *Ambix* 9 (1961), 102-114; Stanton J. Linden, "Francis Bacon and Alchemy: The Reformation of Vulcan," *Journal of the History of Ideas* 35 (1974), 547-560; For a more recent claim that Bacon was heavily indebted to the alchemical tradition see William R. Newman, "Alchemical and Baconian Views on the Art/Nature Division," in *Reading the Book of Nature: The Other Side of the Scientific Revolution*, ed. Allen G. Debus and Michael T. Walton (Kirksville, MO: Sixteenth Century Journal Publishers, 1998), 81-90; *idem.*, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature*

Baconian reform was not intended as a transition from magic to science, but as a renovation of a corroded magic. Bacon says his task “will be like that labour of Hercules in purging the stable of Augeas, to separate from superstitious and magical arts and observations, any thing that is clean and pure natural, and not to be either contemned or condemned.”⁴ According to Bacon, the Persian Magi possessed wisdom “which was anciently defined to be the knowledge of things divine and human.”⁵ In *De augmentis* he states:

But I must here stipulate that magic, which has long been used in a bad sense, be again restored to its ancient and honourable meaning. For among the Persians magic was taken for a sublime wisdom, and the knowledge of the universal consents of things [*scientia consensuum rerum universalium*] ... I however understand it as the science which applies the knowledge of hidden forms to the production of wonderful operations; and by uniting (as they say) actives with passives, displays the wonderful works of nature [*Nos vero eam illo in sensu intelligimus, ut sit scientia quæ cognitionem Formarum Abditarum ad opera admiranda deducat; atque, quod dici solet, activa cum passivis conjungendo magnalia naturæ manifestet*].⁶

Why Bacon retained the term “magic” and why he advanced the view that the Persian Magi had possessed a universal knowledge are questions that have not been answered.⁷ The answers require a detailed investigation of Bacon’s complex substantive philosophy.

(Chicago: The University of Chicago Press, 2004), 256-271. On the various meanings of the term “occult,” see Brian Copenhaver, “Astrology and Magic,” in *The Cambridge History of Renaissance Philosophy*, ed. Charles B. Schmitt and Quentin Skinner (Cambridge: Cambridge University Press, 1988), 264-300. Copenhaver is one of the very few commentators who take seriously Bacon’s magic.

⁴ Bacon, *SS, SEH*, II, 641.

⁵ Bacon, *DAS, SEH*, IV, 362, cf. I, 568. Bacon is quoting Cicero, *Tusculanæ Quæstiones*, iv, 26.

⁶ Bacon, *DAS, SEH*, IV, 366-367, cf. I, 573. The phrase “*Nos vero*” indicates Bacon’s emphasis on the necessary condition for magical power, viz., the discovery of forms. The phrase “uniting actives with passives” is typically used to describe operative power in natural magic. Della Porta speaks of “the mutual and fit application of one thing to another,” *Natural magick, Thomas Young and Samuel Speed: London, 1658*, facsim. repr. (New York: Basic Books, 1957), 2. Agrippa says, “For the magicians, as very diligent searchers of nature, bringing the things which are prepared by nature, applying and setting active things to passive ones, very often bring forth effects before the time appointed by nature,” *Of the vanitie and vncertaintie of artes and sciences*, trans. James Sanford, ed. Catherine M. Dunn (California: California State University, 1974), 125. Bacon knows precisely how to structure his project in these terms, especially given the success of the natural magic literature.

⁷ For a contemporary genealogy of natural magic (where the Magi figure prominently in the ancient genealogy) see Della Porta, *Natural magick*, 2. According to Frances Yates, in some genealogies of

Baconian magic is a science of matter, where the goal is the systematic manipulation and transformation of bodies. Matter, for Bacon, is the unique principle of possibility. In *Valerius terminus* (speaking, as he puts it, “plainly and clearly”) Bacon describes the goal of knowledge and operative power as the “discovery of all operations and possibilities of operations from immortality (if it were possible) to the meanest mechanical practice.”⁸ Bacon’s restoration of magic is intended to achieve that goal. Success requires a double foundation: a theoretical understanding of matter’s hidden virtues and a true and certain method of inquiry.⁹ The relationship between these two foundational themes has not been examined. This pressing issue in Bacon scholarship was noted more than thirty years ago by Graham Rees who saw the need for a fuller understanding of the interaction between

the magical tradition it was customary to include the Persians among the originators. Ficino begins with the Persian Zoroaster and defends natural magic by pointing out that the ancient Chaldean, Persian and Egyptian priests practiced medicine on the basis of magic and astrology. Bruno ascribes a precedent to the Egyptians and Chaldeans, and second place to the Persian Magi; see Frances Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: The University of Chicago Press, 1964), 15, 58, 247.

⁸ Bacon, *VT, SEH*, III, 222. *Valerius Terminus of the Interpretation of Nature with Annotations of Hermes Stella* is an early work (1603) which was not published during Bacon’s lifetime. However, it seems likely he intended this work to be published because he made careful revisions to the manuscript, included a table of contents and even took the trouble to write out the full title wherever necessary (eighteen times in total). According to Spedding, “if he [Bacon] had been preparing the manuscript for the press or for a fresh transcript, he could not have done it more completely or carefully” (*SEH*, III, 209). Fulton H. Anderson comments, “the word ‘terminus’ probably indicates the ‘limits and ends’ to which investigation may proceed,” *The Philosophy of Francis Bacon* (Chicago: University of Chicago Press, 1948), 16; see also Benjamin Farrington, *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964), 38-39. The venerable name of “Hermes” in the title of *Valerius terminus* carries obvious magical significance. Bacon’s decision on the title is not merely a function of dedicatory etiquette and Bacon deliberately identifies James with Solomon and Hermes Trismegistus. For a discussion of James’ self-perception as the “hermetic king” and as the “British Solomon” descended from the House of David see Vaughan Hart, *Art and Magic in the Court of the Stuarts* (London: Routledge, 1994), 26. Hart also discusses others who in works dedicated to James call him “Ter Maximus.”

⁹ On the philological connections between method (*methodos*) and way (*odos*) see Neal Gilbert, *Renaissance Concepts of Method* (New York: Columbia University Press, 1960), 48-55. Gilbert comments that many Renaissance thinkers (Erasmus for example) used the term “methodos” to refer to a short way to acquire particular discursive skills, 107. This is not Bacon’s meaning; his “way” is long and tortuous. Hence the term “method” may not be the most appropriate to describe Bacon’s “legitimate inquiry” (see Appendix 2).

Bacon's theory of matter and the method.¹⁰ Considering that Bacon places his whole endeavour on the twin pillars of matter and a radical inquisitional programme, the oversight is baffling. This thesis seeks to correct this oversight.

Although Baconian magic has been ignored, Bacon's theory of matter has increasingly attracted scholarly attention.¹¹ Bacon's primary focus is the source of productive power which he perceives in matter's malleable potency. Baconian matter is appetitive, plenipotentary, infinitely fecund, *causa causarum* and eternal.¹² In Bacon's natural philosophy it is the *sine qua non* of all effects (natural and artificial). Baconian inquiry is a method of control and guidance that governs the way through nature's winding labyrinth.¹³ The goal of transmuting an infinitely malleable matter is the Baconian programme. The glory of magic is restored only through a theoretical understanding of matter and a rigorous adherence to a programme of inquiry. Bacon's science of magic is the terminus of an inquiry that includes a purgative and regenerative regime designed to establish the union of *res*

¹⁰ See, for example, Rees, "Matter Theory: A Unifying Factor in Francis Bacon's Natural Philosophy?" *Ambix* 24 (1977), 110-125.

¹¹ Much of this work builds on Graham Rees' groundbreaking studies of Bacon's natural philosophy and I refer to Rees' work throughout the thesis. For references to secondary literature on Bacon's matter theory (including Rees's) see Chapter 2, n. 6.

¹² There is now a substantial literature arguing vigorously for the continuing presence of an appetitive matter among supporters of the mechanical philosophy. John Henry holds that "the natural magic belief in the usefulness of an inductive knowledge of occult qualities of bodies and the necessarily experiential and observational discovery of precise effects of such occult virtues were all absorbed into the new natural philosophy of the seventeenth century," "Magic and Science in the Sixteenth and Seventeenth Centuries," in *Companion to the History of Modern Science*, ed. Robert C. Olby, G. N. Cantor, J. R. R. Christie, and M. J. S. Hodge (London: Routledge, 1990), 583-596, on 592. For comprehensive studies covering the diversity of matter theories in early modern Europe see Christoph Lüthy, John E. Murdoch, and William R. Newman, eds., *Late Medieval and Early Modern Corpuscular Matter Theories* (Leiden: Brill, 2001).

¹³ Analysis of Baconian inquiry is dominated by those who treat it as a "logic of discovery" or a nascent philosophy of science. See Rees' "Introduction" to *Novum organum* where he refers to the "anachronism" of treating Bacon as a philosopher of science, commenting that it was not Bacon's intention to explain the sciences "but to rebuild them" *OFB*, XI, xxxvii, n. 55. As an alternative to more traditional characterisations of the Baconian method, I use the term "cybernetic epistemology" to refer to Bacon's use of exclusions and negatives, and the complex procedures of feedback without which Baconian inquiry founders (see Chapter 3).

and *mens* (the mind and things).¹⁴ Strict conformity to the dictates of inquiry is maintained through binding the mind to “things themselves.”¹⁵ The concept of binding is a key element facilitating the derivation of inquisitional principles and operative power.¹⁶ Purgation involves an unbinding or severing of the mind from its spellbound fascination with useless or ersatz systems of philosophy.¹⁷ Unaided and left to itself, the mind deviates from engagement with things. This is why Book 1 of *Novum organum* addresses an impulse of the mind to continually deceive itself.¹⁸ Therapeutic recovery of the mind demands its “levelling” – in the sense of destruction – to purge it of its current habits. Book 2 of *Novum organum* presents strategies that guide the purified mind and serve as a secondary form of purgation by continually controlling the mind’s tendency to declination. Bacon portrays the mind in Platonic terms: bound to illusory systems, the mind is fixated on *idola* analogous to the way the captives in the Platonic cave fixate on what Bacon calls “the shadows of things.”¹⁹ Bacon’s destruction of the illusory theatre of knowledge prepares the way for hope. It overcomes the despair engendered by a sceptical tradition’s exposure of all systems of knowledge without offering instruments or assistance.

¹⁴ For the meaning of the terms *res* and *mens* see Chapter 3 and Appendix 1, n. i.

¹⁵ Bacon, *IM, OFB*, XI, 21.

¹⁶ On the term “inquisition” in Bacon’s writings see Kenneth William Cardwell, “Francis Bacon, Inquisitor,” in *Francis Bacon’s Legacy of Texts: ‘The Art of Discovery Grows with Discovery,’* ed. William A. Sessions (New York: AMS Press, 1990), 269-289.

¹⁷ This purgative regeneration of the mind is intended for epistemological and operative reform. Bacon’s moral regimen for the mind is presented in medical and agricultural metaphors that refer to a husbanding of the mind, which Bacon calls “the *Georgics of the Mind*” (*DAS, SEH*, V, 5, cf. I, 715). For a discussion of Bacon’s concept of “the *Georgics of the Mind*” see Ian Box, “Bacon’s Moral Philosophy,” in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 260-282, esp. 270-272, n. 10. On Bacon’s horticultural language see Michèle Le Doeuff’s, “Man and Nature in the Gardens of Science,” in *Francis Bacon’s Legacy of Texts*, 119-138. I discuss the connections between magic and Bacon’s conception of the human sciences in Chapter 6.

¹⁸ See Bacon, *NO, OFB*, XI, 53, where he says even the dialecticians (logicians) distrust “the mind’s inborn and spontaneous movements.”

¹⁹ Bacon, *DAS, SEH*, IV, 315, cf. I, 518. According to Bacon, “every one philosophises out of the cells of his own imagination, as out of Plato’s cave” (*HNE*, V, 131, cf. II, 14).

The two books of *Novum organum* contain in schematic form a programme to unbind the mind from its habitual absorption in and fascination with classical and theological traditions. Subtly altering the sceptical attack, Bacon represents traditional learning as purveying consolations or surrogates for the mind's inability to penetrate the darkness of matter and the intricate subtleties of nature.²⁰

In Bacon's philosophy there is a perfect homology between the mind's habitual fascinations and nature's habitual actions ("nature free"). Baconian inquiry begins through an interpretation of nature free, unfolding itself in its ordinary course. This is not for the purposes of mere description but as a point of departure to discover "what nature ... may be made to do."²¹ Nature free is overridden as the terminal object of the understanding and "nature bound" instituted as a new focus of inquiry. Nature bound deviates matter from its habitual routines to engender a new set of possibilities: the science of magic actualises a potential alternative universe.

Bacon's transformative science of magic demands that inquiry take the form of incursion into unexplored territory. The method involves a series of stages where the goal cannot be accessed directly because inquiry constructs the route as well as guiding the steps. The only signposts are given by experimental novelties and this is the key to Baconian inquiry: theorising on any other basis is, in Bacon's view, a mere moving in circles. This directional focus of Baconian inquiry constitutes a purposeful natural philosophy whose course is guided through *nova* – novel experiences, effects and works. *Nova* and purposive action are fundamental to Baconian inquiry, underpinning Bacon's optimistic belief that the goal (the

²⁰ On the key notion of "subtlety" in Bacon's philosophy see Rees, "Atomism and 'Subtlety' in Francis Bacon's Philosophy," *Annals of Science* 37 (1980), 549-571. For a discussion of Bacon's sources for this concept see Silvia A. Manzo, "Francis Bacon and Atomism: A Reappraisal," in *Late Medieval and Early Modern Corpuscular Matter Theories*, ed. Christoph Lüthy, John E. Murdoch and William R. Newman (Leiden: Brill, 2001), 209-244, on 211-213.

²¹ *NO, SEH, IV, 127, cf. OFB, XI, 214.*

actualisation of *nova*) exists and that it must be kept firmly in mind. Negatives and failures serve to return the wandering mind to things (*res*) and thus provide a form of recursive checking. Escape from habitual darkness demands the binding of nature and the purgation of the mind. For Bacon, nature bound *is* magic because it restores and realises the aims of the natural magicians. The discovery of forms promises a way out of the cave of nature free.²² Baconian magic accelerates time through actively focusing on the processes of generation and corruption.²³ These processes are vital to Baconian inquiry because they demonstrate movement away from and towards forms. Matter gives rise to unstable but dynamically sustained nodes of motions which constitute the qualities of heat, cold etc. Magic converts one thing into another by manipulating these conglomerations of simple motions. This is Baconian version or transmutation.

Regardless of similarities of expression, Bacon's programme should not be confused with that of contemporary natural magicians. Bacon presents contemporary magic in the following manner: as a pollutant that conflates nature and the divine; decayed into mere formalisms; full of unfounded hope and wild enthusiasms; and attended by partial and accidentally successful operations where few effects are produced and false explanations given.²⁴ In contrast, Bacon's intention is to obtain unlimited effects based on knowledge of true causes where the only criterion of truth is the production of *nova*. Bacon's assault on the occult sciences (and on current philosophical and theological systems) constitutes a purificatory exercise to level the

²² Richard Kennington rightly argues that "The ordinary course of nature is to Bacon's philosophy what the cave is to Plato's," *On Modern Origins: Essays in Early Modern Philosophy*, ed. Pamela Kraus and Frank Hunt (New York: Lexington Books, 2004), 46.

²³ See Bacon, *DPAO, OFB*, VI, 253 for the phrase "stealing a march on time." In *DPAO* Bacon describes the work of creation as an abridgment of time. God miraculously produces in an instant what nature would take endless ages to do. In the course of ages *nova* will surface; prodigies are signs of nature's hidden potential.

²⁴ Of "popular and degenerate magic," Bacon says, "in place of works [they] beget nothing else but empty hopes" (Bacon, *DAS, SEH*, IV, 367, cf. I, 573). I discuss the importance of hope in Chapter 3.

ground for a restoration of cleansed magic. William Rawley perfectly captures Bacon's view of the mind's fascination with the attractions of seductive philosophical systems:

And he [Bacon] knew well that there was no other way open to unloose men's minds, being bound and, as it were, maleficate by the charms of deceiving notions and theories, and thereby made impotent for generation of works, but only nowhere to depart from the sense and clear experience; but to keep close to it, especially in the beginning.²⁵

The contemporary fascination with magical and alchemical practices contributes, Bacon maintains, only to a muddying of the waters in which real potential is obscured by the raising of false hopes. The financial and psychological costs of unwarranted enthusiasms for potential material benefits from the occult can be seen in the following anecdote, recounted by Benjamin Farrington, concerning Bacon's uncle, Lord Burghley.²⁶ Burghley petitioned Sir John Kelly (a close associate of John Dee) to provide what he believed to be a "powder" capable of alchemical transmutation. Burghley asks that Kelly should send "in some secret box some such portion of his [Kelly's] powder as might be to her [Elizabeth] a sum reasonable to defray her charges for this summer for her navy which is now preparing for sea."²⁷ Such incidents would no doubt have incensed Bacon, being a nuisance and detraction from the seriousness of his own programme for the transmutation of

²⁵ Rawley, *SEH*, II, 335. On the importance of "binding" (*devinctio*) and its association with weaving, knots and textures in early medieval magic see Valerie I. J. Flint, *The Rise of Magic in Early Medieval Europe* (Oxford: Clarendon Press, 1991), 226-231. It is no accident that Bacon continually uses the concepts of weaving, knots, bindings and threads when referring to matter's elemental motions. For a fuller discussion of the concept of binding matter see Chapters 2 and 5. On the binding of the mind see Chapter 3.

²⁶ Benjamin Farrington, *The Philosophy of Francis Bacon*, 13-14.

²⁷ Burghley quoted in Conyers Read, *Lord Burghley and Queen Elizabeth* (London: Cape, 1960), 145-146. Unsurprisingly, Burghley ignored Bacon's letter of appeal for a special administrative post dedicated to philosophical reform and the rooting out of sham alchemists. The letter was written only a few months before Burghley appealed for alchemical financial aid (Bacon, *LL*, VIII, 108-109).

matter.²⁸ Yet commentators have been too peremptory in taking at face value Bacon's castigations of projects like Burghley's.

Aware of the fate of Bruno, the reputations of Agrippa and Paracelsus, and the popular conceptions of witchcraft and magic, Bacon strives for a cleansed natural magic to divorce it from popular Faustian images.²⁹ Regardless of how the notoriety of Agrippa and Paracelsus might tarnish the image of magic or alchemy, Baconian goals and magical aims coincide. Bacon does not possess a programme for a wholly new species of transformative power; the radical nature of his magical programme depends only on a novel means of inquiry that realises the power inherent in experimental practice. Moreover, Bacon's elevation of matter to a quasi-divine status is reminiscent of other materialists renowned for their magical interests.³⁰

There is no shortage of first-rate scholarly discussions on the relationship of early modern natural philosophy to the major traditions of the occult sciences.³¹

²⁸ Ben Jonson lampoons such gullible folly, see *The Alchemist*, ed. Elizabeth Cook (London: A & C Black, 1992). On courtly enthusiasms for magic see Vaughan Hart, *Art and Magic*; J. S. Mebane, *Renaissance Magic and the Return of the Golden Age* (Lincoln: University of Nebraska Press, 1989), esp. 169-171 where Mebane relates Johnson's play to Bacon's views on human nature.

²⁹ For Bacon's scathing comments on these individuals see Rossi, *Francis Bacon: From Magic to Science*, 31.

³⁰ On the basis of his elevated estimation of matter, Bacon believes he possesses a certain and infallible supporting ontological basis for magical operative success. In many ways his project to raise the status of matter bears a striking resemblance to the Brunonian elevation of matter to divine status. Paul Henri Michel notes that in *De la causa*, Bruno praises the medieval David of Dinant for having raised matter to the dignity of a "divine thing." In *De vinculis* Bruno also praises the Arab Avicbron for having dignified matter to the same degree; see Paul Henri Michel, *The Cosmology of Giordano Bruno*, trans. R. E. W. Maddison (London: Methuen, 1973), 44. For relevant Brunonian texts, see Robert de Lucca and Richard J. Blackwell, eds., *Cause, Principle and Unity* (Cambridge: Cambridge University Press, 1998).

³¹ See Keith Hutchinson, "What Happened to Occult Qualities in the Scientific Revolution?" *Isis* 73 (1982), 233-253; *idem.*, "Dormitive Virtues, Scholastic Qualities, and the New Philosophies," *History of Science* 29 (1991), 245-278; Ron Millen, "The Manifestation of Occult Qualities in the Scientific Revolution," in *Religion, Science and Worldview: Essays in Honour of Richard S. Westfall*, ed. Margaret J. Osler and Paul Lawrence Farber (Cambridge: Cambridge University Press, 1985), 185-216; Brian Copenhaver, "Natural Magic, Hermeticism, and Occultism in Early Modern Science," in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge University Press, 1990), 261-301.

However, the presence of elements from alchemy or natural magic in the Baconian corpus is not the issue here. In contrast to those who either dismiss entirely Bacon's magical project, or characterise it as a transitional moment in early modern natural philosophy, I maintain that these representations are historiographically incoherent. Bacon's absorption of occult traditions, minus the detritus of occult nonsense, is represented as paving the way for the construction of modern science.³² Mary Horton, for example, says that Bacon excluded the usual "rag-bag collection of superstitious beliefs" and launched "a diatribe against that ... trio of degenerate magic, alchemy, and astrology."³³ She asks what then is left in the category "magic," and was Bacon therefore "unwise" to label his operative science "magic"?³⁴ My claim is that Bacon's "true natural magic" is the terminus of a restorative and reformative venture *per se*. The neglect of Baconian magic may be plausibly attributed to the posthumous *fortuna* of Bacon's work and the subsequent rise of various species of "Baconianism."³⁵ But I suggest that among the principal causes of neglect are the following: the idea that Bacon is best characterised as a "transitional" figure; the occlusion of his substantive natural philosophy; and the prioritising of

³² Farrington echoes Rossi's view when he describes Bacon's project as the assembling of the sum total of artisanal knowledge or practical know-how to "facilitate the emergence of science out of craft knowledge," *The Philosophy of Francis Bacon*, 53. Bacon uses the familiar figure of Aaron's rod devouring the serpents of Pharaoh's magicians (Exodus, 7: 12) to signify the consumption of a corroded magic by a restored form. On this topos see John C. Briggs, *Francis Bacon and the Rhetoric of Nature* (Cambridge, Mass.: Harvard University Press, 1989), 138.

³³ Mary Horton "Bacon and 'Knowledge Broken': An Answer to Michael Hattaway," *Journal of the History of Ideas* 43 (1982), 487-504, on 490.

³⁴ *ibid.* Horton confuses the terms "magical" and "supernatural." Thus, she rejects any suggestion of "magical" elements in Bacon.

³⁵ In his monumental study, Charles Webster argues for connections between Puritanism and a utilitarian and practical ideology, now customarily referred to as "Baconianism," *The Great Instauration: Science, Medicine and Reform 1626-1660* (London: Duckworth, 1975). The relationship between that ideology and Bacon's actual works is at times obscured by historians. A concentration on "Baconian" ideologies tends to blur Bacon's distinction between the fruits of operative power and the pursuit of a deep knowledge of matter's hidden virtues. Throughout this thesis the term "Baconian" refers to the philosophical views of Bacon himself. A thorough overview of the *fortuna* of Baconianism can be found in Antonio Pérez-Ramos, *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition* (Oxford: Clarendon Press, 1988), 7-31.

context over a close reading of the Baconian corpus. As a corrective to those who characterise Bacon's programme as "transitional," the exposition of the Baconian corpus given here depicts Bacon's science of magic in terms of his self-awareness.

II. Historiography and the occult

It is usual to treat the occurrence of occult materials in Bacon's works as incorporations and departures from those traditions. From the traditions of magic and alchemy, Bacon (so the argument goes) appropriated all that could be accommodated under the rubrics of utility, observation and experimentation, while rejecting the rest. This historiography has no specific interest in explaining why Bacon used the term "magic" to describe the fulfilment of his operative goals. The oversight is certainly not due to a neglect of the occult sciences and their roles in the emergence of modern science. On the contrary, there is now a substantial volume of scholarly work on this broad topic.³⁶ This salutary historiographical shift has caused Rossi himself to express reservations:

What started off as a useful corrective to the conception of the history of science as a triumphant progress, is becoming a retrospective form of historiography, interested only in the elements of continuity [between the hermetic tradition and modern science] and the influence of traditional ideas.³⁷

Historians of science have also taken seriously Rossi's claims for the important input to modern science of artisanal and technical craft knowledge.³⁸ Subsequently, historians of science have noted the apparently ubiquitous presence of the occult in the works of principal figures in early modern science. In this revisionist historiography, figures such as Boyle and Newton have been represented as deeply

³⁶ For an overview of this topic see Robert S. Westman, "Magical Reform and Astronomical Reform: the Yates Thesis Reconsidered," in *Hermeticism and the Scientific Revolution*, ed. R. S. Westman and J. E. McGuire, (Los Angeles: William Andrews Clark Memorial Library, 1977), 1-91; Charles B. Schmitt, "Reappraisals in Renaissance Science," *History of Science*, 14 (1978), 200-218.

³⁷ Rossi, "Hermeticism, Rationality and the Scientific Revolution," in *Reason, Experiment and Mysticism in the Scientific Revolution*, ed. M. L. Righini Bonelli and W. R. Shea (London: Macmillan, 1975), 257, quoted in Mordechai Feingold, "The Occult Tradition in the English Universities of the Renaissance: A Reassessment," in *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 73. However, Rossi's qualms notwithstanding, he is still rightfully regarded as a major contributor to highlighting unconsidered factors in the emergence of early modern science.

³⁸ For a wider discussion of the influence of the arts on science see Rossi, *Philosophy, Technology, and the Arts in the Early Modern Era*, trans., Salvator Attanasio (New York: Harper & Row, 1970).

immersed in alchemy and magic, and fully conversant with neo-Platonism and Hermeticism.³⁹ Boyle and Newton are not typically characterised as transitional figures, yet the case of Bacon is otherwise.

Bacon interpretation is almost entirely focused on reconciling his occult interests by means of his purported transitional status.⁴⁰ My principal objection to current Bacon historiography centres on this representation of Bacon as transitional figure. The neglect of Bacon's natural philosophy – and certainly of his science of magic – can be explained in terms of this ubiquitous trope. Bacon is often depicted as incongruously moving between the occult world of alchemical sympathies, animism and *spiritus*, and the emergent mechanical philosophy which (it is erroneously claimed) abandoned all appetitive virtues in its theory of matter.⁴¹ Rossi's scrupulous attention in recounting the details of Bacon's magical and

³⁹ See Lawrence M. Principe, *The Aspiring Adept: Robert Boyle and His Alchemical Quest* (New Jersey: Princeton University Press, 1998). On Newton's involvement in the hermetic and magical traditions see J. E. McGuire and P. M. Rattansi, "Newton and the Pipes of Pan," *Notes and Records of the Royal Society*, 21 (1966), 108-143; Newton's alchemical work is famously presented in Betty Jo Teeter Dobbs, *The Foundations of Newton's Alchemy, or 'The Hunting of the Greene Lyon'* (Cambridge: Cambridge University Press, 1975); *idem.*, *The Janus Face of Genius: The Role of Alchemy in Newton's Thought* (Cambridge: Cambridge University Press, 1991). None of these texts treat their subjects as transitional figures.

⁴⁰ Michael Hattaway describes Bacon as "Faustian" while attempting to explain the "interpenetration" of Bacon's "metaphysical" and "physical" outlook, "Bacon and 'Knowledge Broken': Limits for the Scientific Method," *Journal of the History of Ideas* 39 (1978), 183-197; for a response to Hattaway see Mary Horton, "Bacon and 'Knowledge Broken': An Answer to Michael Hattaway," 487-504. Horton rejects any suggestion of "magical" elements in Bacon and considers Hattaway's depiction of Bacon as "a thinker in transition" as providing "a model which has far more utility" than "Bacon the alchemist, mystic and 'magician,'" 487. Pérez-Ramos characterises Bacon's "form" as a notion transitional between the "substantial forms" of late Scholasticism and the "internal structures" of the Corpuscularians, *Francis Bacon's Idea of Science* 67, see also 174, n. 11. Joshua C. Gregory argues "Bacon is transitional between a hylozoistically or animistically tinged version of inanimate nature and the Cartesian mechanical version," "Chemistry and Alchemy in the Natural Philosophy of Sir Francis Bacon, 1561-1626," *Ambix* 2 (1938), 93-111, on 94. Thomas S. Kuhn calls Bacon "a transition figure between the magus Paracelsus and the experimental philosopher Robert Boyle," *The Essential Tension: Selected Studies in Scientific Tradition and Change* (Chicago: Chicago University Press, 1977), 54. Rees says "the interpretation word 'transition' is vacuous for several reasons, and not least that philosophers do not ... see *themselves* as slabs on a road from one place to another," *OFB*, XI, xxxii, n. 41, italics in original.

⁴¹ John Henry corrects this erroneous view, "Occult Qualities and the Experimental Philosophy: Active Principles in Pre-Newtonian Matter Theory," *History of Science* 24 (1986), 335-381.

alchemical debts has unfortunately contributed to this ill-conceived historical perception of Bacon.

The second major cause of the neglect of magic is the failure to detect within the Baconian corpus the theoretical and operative basis for a science of magic. Apart from Rees's work, there appears to be little interest in uncovering Bacon's substantive programme. Reviewing the English translation of Rossi's celebrated book, Dame Frances Yates comments that Rossi's "analysis of Bacon's reactions against the Renaissance magical tradition to which he was at the same time indebted have not been explored elsewhere in such depth."⁴² Almost three decades later, the bibliography to *The Cambridge Companion to Bacon* has less than a handful of titles concerned with Bacon and magic, and nothing whatsoever on Baconian magic.⁴³ The index contains three citations of the term "magic," including the analogue form "magician." The term is found in Rossi's contribution to the *Companion* and in Sachiko Kusukawa's article on "Bacon's classification of knowledge," where she recounts the division of operative natural philosophy into "mechanics" and "magic."⁴⁴ Continuing the now familiar trope of Bacon's selectivity, Kusukawa states that Bacon had two meanings of the term "magic": a good sense where "magic" signifies the "application of hidden forms to the production of nature" and an opprobrious sense referring to those engaged in "superstitious practices such as

⁴² Dame Frances Yates, "Bacon's Magic," in *Ideas and Ideals in the North European Renaissance*, vol. 3 (London: Routledge & Kegan Paul, 1984), 60-66, esp. 61.

⁴³ For bibliography see Markku Peltonen, *The Cambridge Companion to Bacon*, 335-364. Presumably it is now taken for granted that Rossi answered all possible questions relating to Bacon's connection with magic.

⁴⁴ Sachiko Kusukawa, "Bacon's Classification of Knowledge," *The Cambridge Companion to Bacon*, 47-74, esp. 59-61. Kusukawa describes Bacon's classification of operative knowledge into the main parts of "Mechanic" and "Magic" which correspond "to the Theoretical parts of Physic and Metaphysic respectively," 59.

alchemy and astrology” from which Bacon sought to divorce himself.⁴⁵ While Kusukawa provides some detail on the meaning of the term “mechanic” and its role within the Baconian sciences, she makes no further mention of the term “magic.” As an expression of the historiographical blindness to the importance of magic in Bacon’s vision, the oversight is worth considering in more detail.

From Kusukawa’s brief descriptions and from the given taxonomy of the Baconian sciences, the end of Bacon’s programme is magic. Natural philosophy offers knowledge of forms and so is a necessary condition for magical power. The Baconian classification therefore entails that an operator must already have attained the apex of natural knowledge. Moreover, no one disputes that Bacon proposes an inquiry into nature that will ultimately result in the capacity to purposefully transform matter. If power (the purposeful transformation of matter) is the fulfilment of the Baconian vision, then the science of magic (which is a science of power and control) is the culmination of Baconian reform. Yet apart from Rossi’s demonstration of the proximity between Bacon’s project and the occult traditions, the secondary literature has no direct analysis of Baconian magic.⁴⁶

In a recent overview of Baconian commentary, Brian Vickers displays extreme hostility to any suggestion that Bacon takes seriously the occult sciences.⁴⁷ It is helpful to compare the approaches of Rossi and Vickers to explain the oversight

⁴⁵ Kusukawa, “Bacon’s Classification of Knowledge,” 59. See Bacon, *DAS, SEH*, IV, 366-367, cf. I, 573.

⁴⁶ Julian Martin is an example of an astute reader who correctly interprets Bacon’s natural philosophy as a discovery of universal laws applicable to all domains (moral, legal and natural), *Francis Bacon, the State, and the Reform of Natural Philosophy* (Cambridge: Cambridge University Press, 1992). He quotes Bacon’s praise of the Persian magi as being in possession of those laws, but he writes of “affinities” and “similarities” between the laws of nature and the laws of politics, 168. According to Martin, “Bacon assumed there was a similarity between the nature of the common law and the laws of nature,” 168. Yet Bacon expressly condemns those who see the links in terms of mere “similitudes” (*SEH, DAS*, IV, 339, cf. I, 543). See Chapter 6 for further discussion of these themes.

⁴⁷ Brian Vickers, “Francis Bacon and the Progress of Knowledge,” *Journal of the History of Ideas* 53 (1992), 495-518, on 505-507.

of Bacon's substantive natural philosophy.⁴⁸ Rossi drew attention to conspicuous similarities between passages in Bacon and passages from the works of Agrippa, Della Porta, Cardano and Paracelsus (among others).⁴⁹ Using Agrippa's *De incertitudine et vanitate scientiarum*, Rossi highlights their shared aims: Agrippa's goals for natural magic are realised through the discovery of "the hidden and secret powers of nature."⁵⁰ These powers, although appropriated by artfully combining bodies, remain the prerogative of nature itself. Magic unites "actives" with "passives"; it anticipates the effects of things so as to make them appear miraculous; it concerns itself with the transformations of things, the attainment of eternal youth or immortality, and the production of new species. But the most important similarity is that ultimately magic derives all its operations from nature; it does not rely on supernatural aid, of either angelic or demonic form.⁵¹ This list corresponds with Bacon's understanding of what a science of magic should achieve.⁵² According to Rossi, Bacon also borrowed from the magical tradition the idea that science should be the servant of nature; that it should assist and imitate nature forcing it to yield to domination; and the overarching idea that knowledge brings power.⁵³ Rossi concludes that there is "an almost literal repetition of Agrippa's words" in Bacon's definition of magic.⁵⁴ Bacon's desire to see the occult sciences "reinstated as the ultimate aims of human effort" constitutes, for Rossi, "proof" that Bacon was

⁴⁸ Rossi, *Francis Bacon: From Magic to Science*, 1-35.

⁴⁹ *ibid.*, 18-20.

⁵⁰ Agrippa quoted in Rossi, *Francis Bacon: From Magic to Science*, 18.

⁵¹ *ibid.* I discuss the art-nature distinction in Bacon and how it impacts on his science of magic in Chapter 5.

⁵² Bacon, *NO, OFB*, XI, 139. Cf. the list of *Magnalia naturæ* appended to *The New Atlantis (NA, SEH, III, 167-168)*.

⁵³ Rossi, *Francis Bacon: From Magic to Science*, 21. On the Galenic phrase *ars ministra naturæ* and its links to alchemy and medicine, see Newman, *Promethean Ambitions*, 19, 141, 255.

⁵⁴ Rossi, *Francis Bacon: From Magic to Science*, 21.

“influenced” by Agrippa and other natural magicians.⁵⁵ Rossi also takes account of Bacon’s criticisms and reservations about these practices, but argues that these did not include a critique of the practical and experimental aspects of magic or alchemy.⁵⁶ In this way Rossi provides an impeccable historiography of appropriation and absorption of the occult that contributes to the emergence of modern science.

In contrast to Rossi’s excavation of the influences of the occult sciences on Bacon, Vickers is vociferously critical of those who locate Bacon within the magical tradition. He is particularly harsh on those who draw attention to Bacon’s critique of the “occult arts” but insist that it signifies only a plea for the reform of magic, not its outright rejection. For example, Brian Copenhaver (one of Vickers’ targets) states that Bacon was merely making “certain physical and metaphysical departures from the post-Ficinian theory of magic.”⁵⁷ Vickers rejects the claim that Bacon can, in any sense, be identified with this tradition. In particular, he directs his critique at Copenhaver’s interpretative procedures and his mistaken derivation of Baconian ideas. Tangentially, Vickers makes the salutary observation that gratuitous associations, constructed on a commonality of terminology, in texts dissimilar in other crucial respects, ought not to supply evidence for “the resemblance of Bacon’s magical ideas to their Neoplatonic ancestors.”⁵⁸ Vickers concludes, “Bacon’s oft-repeated criticisms of the occult tradition – magic, astrology, alchemy, ‘signatures,’

⁵⁵ *ibid.*, 22.

⁵⁶ *ibid.*, 27.

⁵⁷ Vickers, “Francis Bacon and the Progress of Knowledge,” 505. For Copenhaver’s views see “Astrology and Magic” in *The Cambridge History of Renaissance Philosophy*, ed. Charles B. Schmitt and Quentin Skinner (Cambridge: Cambridge University Press, 1988), 264-300. See also Vickers’ comprehensive survey of the terrain, “Analogy versus Identity: the Rejection of Occult Symbolism 1580-1680,” *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 95-164. For a brief but valuable discussion of the relationship between Ficinian, Telesian and Baconian concepts see D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (Notre Dame: University of Notre Dame Press, 1975), 199-202.

⁵⁸ Vickers, “Francis Bacon and the Progress of Knowledge,” 506. Vickers is certainly correct here; the bare resemblance of ideas in the Baconian corpus to external sources tells commentators very little about the substantive use of such materials.

and so on – for its delusory quality, its dishonesty, its appeal to human appetite for speedy profits without effort,” should lead us to “wonder why Copenhaver wants to link Bacon with the magical tradition.”⁵⁹ Nevertheless, Vickers (notwithstanding his important methodological point about mere similarities) cannot deal adequately with Bacon’s self-presentation and he is forced to apply retrospectively the anachronistic concept of scientific “mentality” to cover the Baconian ethos.⁶⁰ Vickers also suggests the notion of a “spectrum of beliefs and attitudes ... a continuum from ... absolutely magical to absolutely mechanistic poles, along which thinkers place themselves.”⁶¹ As a model for Bacon’s position, this is incoherent: it implies a policing of the boundaries which is contrary to the Baconian concept of exploration and open frontiers. Paradoxically, in spite of their obvious disagreements on the role of the occult sciences, Rossi, Vickers and Copenhaver share similar conclusions – they each represent Bacon’s project in terms inapplicable to Bacon’s stated intentions and at odds with the overall tenor of the Baconian programme. All three represent Bacon as engaging or disengaging with various decaying or emerging mentalities, thereby leaving aside the more pressing engagement of his own substantive philosophical programme. In that sense they typify an historiography that considers the builder’s choice and rejection of materials to be more important than the actual construction itself.

Thus Bacon’s substantive theories on matter, cosmogony and magical operation are unwittingly ignored by the very scholars who investigate the presence

⁵⁹ *ibid.*, 506-507.

⁶⁰ See Vickers, *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 11. In “Analogy versus Identity,” Vickers argues that the defining criterion of a magical outlook is the conflation of sign and signified, or the word and the thing. As a definitional stance this is debatable, especially as the natural magicians considered operational transformation as central. For Vickers, “the only remedy [to the occult] is a science built not on words but on the observation of reality, developing a proper scientific method,” “Analogy and Identity,” 103.

⁶¹ Vickers, “Analogy versus Identity,” 95.

of magical and alchemical elements in his works.⁶² The neglect of Bacon's natural philosophy has the knock-on effect that commentators disregard the precise connections between his science of magic and other main elements of his programme of reform.⁶³ Rossi's depiction of Bacon's goal as directed away from the cultural ethos of magic also facilitates a reading of Bacon's substantive contribution as minimal. His portrayal of Bacon as "influenced" by elements of the Renaissance magical traditions and the technical know-how of artisanal experience is followed by an almost total concentration on Bacon's theory of communication, rhetoric and methodical disposition, albeit to illuminate the contribution of myth and fable to Bacon's programmatic presentation.⁶⁴

Restoring the visibility of Bacon's natural philosophy and its culmination in magic requires much more than noting similarities of expression and charting influences and borrowings. Excellent surveys of the natural philosophical programmes of undoubted magicians such as Agrippa, Ficino and Bruno have long been available, which demonstrate that their goals are not, insofar as they seek material and psychological transmutations, different from Bacon's.⁶⁵ What separates

⁶² Part of the difficulty in explicating Bacon's views stems from his universal appropriation (and subversion) of traditional learning. Moreover, Bacon's negative attitude in one place is often countered by a positive attitude in another – and this is especially notable in his dealings with the occult.

⁶³ For example, Farrington interprets operative and transformative power (magic) in terms of the finished products of the mechanical arts, Farrington, *The Philosophy of Francis Bacon*, 51-55.

⁶⁴ Much of Rossi's book is taken up with Bacon's theory of rhetoric and communication. He deals adequately with Baconian matter but there is no discussion of how it relates to inquiry and, after an initial location of Bacon as responding to the magical and alchemical traditions, there is no further discussion.

⁶⁵ See C. I. Lehrich, *The Language of Demons and Angels: Cornelius Agrippa's Occult Philosophy* (Leiden: Brill, 2003), esp. 43-67; Marc Van Der Poel, *Cornelius Agrippa, The Humanist Theologian and His Declamations* (Leiden: Brill, 1997), 51-55; D. P. Walker, *Spiritual and Demonic Magic*, 201 where he discusses Bacon's comments on "fascination" and the imagination. Bacon refers to those who perceive "the secret passages of things, and specially of the Contagion that passeth from bodie to bodie, [they] doe conceiue it should likewise be agreeable to Nature, that there should be some transmissions and operations from spirit to spirit, without the mediation of the sences" (*AL, OFB, IV, 105*). He states that an inquiry should be undertaken "to raise and fortifie the imagination, for if the Imagination fortified haue power, then it is materiall to know how to fortifie and exalt it" (*loc. cit.*).

Bacon from these figures does not lie in his divergence from the magical tradition *tout court*, but in his radical claim that he alone has discovered the means to abolish error and deviation and to attain certainty of operation. Baconian magic rests on knowledge of forms and the Baconian doctrine of certainty is determined through a radical inquisitional procedure that has no counterpart in traditional operative magic. The Baconian magician is guaranteed full operative power only because he acts on certain knowledge: it is the uncertainty, obscurity and posturing of a corroded magic that the Baconian programme intends to rectify. This is why Bacon insists that the mind must unbind itself from its current fascinations and obsessions, and rebind itself to matter.

So far I have maintained that in drawing attention to Bacon's Renaissance preoccupations and arguing for unsuspected features of Bacon's philosophy, Rossi, Farrington and others have contributed to a view that regards Bacon's programme as nothing other than a seizure of useful empirical materials and operations.⁶⁶ This view is supported by Bacon's well-documented and scathing attacks on the occult traditions.⁶⁷ His repeated condemnations of the notion of mage or adept controlling

This takes place in a discussion of ceremonial magic where Bacon's only criticism is that it is not miraculous but requires "the price of Laboure" (*loc. cit.*). Michael Kiernan (in his commentary on this passage) says that Reginald Scot, in his *The discoverie of witchcraft* (1584), relates fascination to the power of the imagination in casting spells; it is "an extermination or expulsion of the spirits through the eies, approaching to the hart of the bewitched, and infecting the same" (*OFB*, IV, 303). The "Force of the imagination, either upon another body, or upon the body itself" is listed in the *Magnalia Naturæ* appended to *NA* (*NA*, *SEH*, III, 167); see also *SS*, *SEH*, II, 641. Kiernan also notes that fascination was the subject of an Oxford disputation in 1600 (*OFB*, IV, 303). Van Der Poel argues for the crucial importance of theology in Agrippa's programme as without faith (*fides*) the Agrippan magician is unprotected from demonic forces. The relationship between the psychological state of the Baconian investigator and inquiry into nature is complicated and entails consideration of the full extent of Bacon's materialism. Moreover, although superficial comparisons among Ficino, Agrippa, Bruno and Bacon should be resisted there are many overlapping features, especially on the connections between mind and magical binding or fascination. However, Bacon generally naturalises his inquiry. In the *Advancement of Learning*, for example, Bacon suggests a naturalised investigation into angels and demons (*AL*, *OFB*, IV, 79-80). On Bacon and imagination see Chapter 6.

⁶⁶ Rossi, *Francis Bacon: From Magic to Science*, xv.

⁶⁷ For a compendious list of Bacon's castigations of Paracelsian alchemists see Vickers, "Analogy versus Identity," 133-134. R. J. W. Evans claims that there is "still much of the Renaissance" in Bacon, in spite of what Evans takes to be Bacon's straightforward condemnations of magic and the

esoteric forces are also familiar.⁶⁸ The typical response (as we have seen) is to argue that Bacon's appreciation of magical and artisanal practices resulted from their common operative aims and even shared vocabularies and definitions. Bacon's supposed eclecticism encourages the historiography of influence and indebtedness. Bacon, it is argued, took the better remnants of outmoded traditions (contained in the works of the natural magicians, alchemists and artisans) as contributions to the emergence of modern science. Artisans (so the argument goes) already possessed desirable features that would contribute materially to the foundations of a nascent experimental and operative style of engagement with nature. However, interpretative problems arise when commentators encounter textual evidence demonstrating not only Bacon's interest in the practical aspects of magic, but an intense and substantive interest in the very "irrational" or "superstitious" materials that he elsewhere condemns.⁶⁹

I reject the view that Bacon's critique of existing magical practices indicates ambivalence towards an occult tradition. Bacon's attacks are generally directed at an absence of legitimate inquisitional procedures and at the ignorance of true causes,

occult, *Rudolf II and his World: A Study in Intellectual History 1576-1612* (Oxford: Clarendon Press 1973), 290.

⁶⁸ See Rossi, *Francis Bacon: From Magic to Science*, 27-35. In his comments to James I, Bacon shows no hesitation in associating himself with the Persian Magi. In *Novum organum* he refers to himself as "high-priest of the sense ... and learned interpreter of its oracles" (*NO, OFB, XI, 35*).

⁶⁹ To complicate matters further, there is the extensive use of myth in Bacon's writings, yet another indication of his Renaissance status. Bacon makes no distinction between obviously natural philosophical works and natural philosophy discussed through the medium of fable. For this reason, Rossi highlights the "absurdity" of classifying Bacon's *De sapientia veterum* as "mere 'literary exercises,'" *Francis Bacon: From Magic to Science*, 131. As the bearer of substantive claims, fable is treated here as a *bona fide* vehicle for the transmission of Bacon's philosophical claims. There are neither historiographical nor textual reasons for their later separation and it is incumbent on the commentator to acknowledge the importance of this genre for Bacon. On Bacon's classical sources see Charles W. Lemmi, *The Classic Deities in Bacon: A Study in Mythological Symbolism* (Baltimore: The Johns Hopkins Press, 1933) 49-61. The use of myth is ignored by those who place too much emphasis on *Novum organum*. For example, Horton considers that *Novum organum* and *De augmentis* "contain the core of Bacon's thinking on the scientific enterprise," "Bacon and 'Knowledge Broken,'" 488.

not at magic's material claims *per se*.⁷⁰ Furthermore, I maintain that Baconian reform is more correctly presented as an instauration of magic, rather than as an institutional and methodological preparative to the emergence of modern science.⁷¹ Bacon's works contain the answers to many of the issues raised here and, in spite of their fragmentary nature, they afford internally coherent reasons for Bacon's restoration of magic. On this basis, I propose a shift in historiographical focus away from delineating Bacon's borrowings, influences and appropriations of terms and categories. In his flagrant appropriation of terms and concepts from the works of his opponents, Bacon subverts their meanings for his own ends. There is hardly a traditional science or body of doctrine that he does not explore, commandeer and utilise in far-reaching revisions. This has led commentators to concentrate overmuch on uncovering Bacon's sources, to the neglect of reading for internal meaning, coherences and clues to further interpretation. Baconian exposition would improve greatly were Bacon's eclecticism interpreted as a synthesising and integrating programme rather than a patchwork of pilfered notions.⁷² I argue for a shift towards a rigorous reading of Bacon's texts, not to disclose his programmatic aims which are blatantly expressed at every turn, but to extract the details of his philosophical

⁷⁰ *Sylva sylvarum* clearly reveals Bacon's deep absorption in magical lore. Bacon himself describes *Sylva sylvarum* as "a high kind of natural magic" (*SS, SEH, II, 378*). Rees comments that scholars have overlooked the fact that *Sylva sylvarum* deals not simply with a "farrago of untested data and fabulous phenomena" but, as Bacon says, with those particulars that "do level point-blank at the invention of causes" (*SS, SEH, II, 507-508*). See Rees, "Matter Theory: A Unifying Factor in Francis Bacon's Natural Philosophy?" *Ambix* 24 (1977), 110-125, on 119. The considerable neglect of the *Sylva* by commentators is incomprehensible. It is described by many as a loose collection of incoherent and isolated observations pilfered from traditional histories such as Pliny's, Aristotle's *Problemata* and *Meteorology*, and especially from natural magicians such as Della Porta and Cardano (see Ellis, *SEH, II, 326*). Rees rejects this notion that the *Sylva* is "a hotch-potch of plagiarized scraps," "An Unpublished Manuscript by Francis Bacon: *Sylva Sylvarum* Drafts and Other Working Notes," *Annals of Science* 38 (1981), 377-412, on 377. He argues that "Bacon took great pains, acknowledged borrowings and drew heavily on his own extensive experimental and observational work," *loc. cit.* I return to the *Sylva* in Chapter 6.

⁷¹ Charles Whitney provides comprehensive discussion on the term *Instauratio*, "Francis Bacon's *Instauratio*: Dominion of and over Humanity," *Journal of the History of Ideas* 50 (1989), 371-390.

⁷² Oddly there are very few studies of Bacon's relationship to the figures he actually mentions such as Fracastoro, Telesio, Patrizi, Doni, Bruno, Severinus and Gilbert.

system, which are concealed and dispersed in the Baconian corpus.⁷³ In the following section I argue that a textual rather than a contextual approach facilitates this historiographical shift.

⁷³ Most scholars would of course claim to read Bacon's texts closely. For example, in chronicling the misunderstandings of Bacon's works, Vickers notes that "one major problem – which he [Bacon] shares with other philosophers – is that scholars do not pay accurate attention to what the texts actually say," "Francis Bacon and the Progress of Knowledge," 499. Yet Vickers dismisses Bacon's "speculative philosophy" as "a cut-and-paste job ... original only in its synthesis," "Bacon for Our Time," *Early Science and Medicine* 9 (2004), 144-162, on 162. This despite the fact that a large proportion of Book 2 of *Novum organum* is (as Rees says) "awash" with matter theory and cosmology (*OFB*, XI, lxxxiv). Rees notes that "It is as if scholars had tacitly agreed to ignore or discount what failed to suit their tastes or competence" (*OFB*, XI, lxxvii).

III. Towards a new Bacon historiography

Lamenting the disappointing uptake of Rees's work on Bacon's substantive natural philosophy, John Henry argues that were it not for "the power of prevailing historiographies ... Rees's work could and should have initiated a new Bacon historiography."⁷⁴ Here, I want to offer two reasons why there has been so little attempt to build on Rees's pioneering work. The first relates to the demands of close textual commentary, and the second to the rise in recent decades of a historiography that downgrades a search for explanation within the texts themselves and prioritises a wide-ranging contextual history.⁷⁵ Rees offered an interpretation of Bacon on the basis of materials contained in the Baconian corpus. There have been few efforts to continue that close reading.⁷⁶ The first question then is how to approach the reading of Bacon's texts.⁷⁷

⁷⁴ John Henry, review of Francis Bacon, "The *Instauratio Magna*: Last Writings," ed. Graham Rees, in *British Journal for the History of Science* 35 (2002), 108-110, on 109-110.

⁷⁵ In a recent collection, the editors comment that the old debate between "internalists" and "externalists" over historiographical merits is "dead," adding that "we are all cultural historians now," J. V. Field and Frank A.L. James, ed., *Renaissance and Revolution: Humanists, Scholars, Craftsmen and Natural Philosophers in Early Modern Europe* (Cambridge: Cambridge University Press, 1993), 3.

⁷⁶ One of the most thorough readings of Bacon is Antonio Pérez-Ramos, *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition* (Oxford: Clarendon Press, 1988). Pérez-Ramos meticulously charts Bacon's philosophical connections to the Aristotelian textbook traditions and to an emerging mechanical philosophy. He draws on these traditions to reinterpret crucial Baconian concepts such as "form." However, there is a tendency to lose sight of Baconian themes in a welter of influences and connections.

⁷⁷ This thesis is not an analysis of Bacon's stylistics or rhetorical theory. For detailed studies on Bacon's style and the rhetoric of communication see Karl R. Wallace, *Francis Bacon on Communication and Rhetoric: Or the Art of Applying Reason to Imagination for the Better Moving of the Will* (Chapel Hill: The University of North Carolina Press, 1943); Brian Vickers, *Francis Bacon and Renaissance Prose* (Cambridge: Cambridge University Press, 1968); Lisa Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge University Press, 1974); James Stephens, *Francis Bacon and the Style of Science* (Chicago: The University of Chicago Press, 1975); John C. Briggs, *Francis Bacon and the Rhetoric of Nature* (Cambridge, Massachusetts: Harvard University Press, 1989), who analyses the rich interplay of rhetorical, natural philosophical and spiritual themes in the Baconian corpus.

Appropriating the title of Bacon's *Sylva sylvarum*, John Briggs portrays current scholarly work on Bacon in apposite Baconian terms.⁷⁸ According to Briggs, "the trees we see in Bacon scholarship often diminish the forest."⁷⁹ This has produced a "forest of forests" and Briggs highlights "the need to return to [Bacon's] texts" because of the tendency to "lose touch with Bacon's particular ends and means."⁸⁰ Drawing inspiration from another Baconian conceit, Briggs comments on the way in which "the reading of Baconian texts resembles the Baconian reading of nature."⁸¹ Interpreting the labyrinth of nature requires recursive clues; similarly a reader of the Baconian corpus seeks directional signs and recursive guidance through the maze of Bacon's texts. These clues reside in the texts and, regrettably, Bacon offers little overt interpretative assistance. Whether the reader enters the labyrinth of the more discursive *Advancement of Learning* or the gnomonic and at times impenetrable density of the aphoristic *Novum organum*, Briggs is clearly correct that "Bacon trains his careful readers not to draw conclusions with ease."⁸² Taking his cue from Stanley Fish's interpretation of Bacon's *Essays*, Briggs depicts the reading of a Baconian text as an exercise in self-abnegation.⁸³ In line with the inquiry into nature, proximate and immediate returns from individual texts are relinquished and the reader must go "to and fro" within the Baconian corpus

⁷⁸ Briggs, *Francis Bacon and the Rhetoric of Nature*, 2.

⁷⁹ *ibid.*

⁸⁰ *ibid.*

⁸¹ *ibid.*, 13.

⁸² *ibid.*, 14.

⁸³ Stanley E. Fish, *Self-consuming Artefacts: The Experience of Seventeenth-Century Literature* (Berkeley: University of California Press, 1972), 78-155.

continually juxtaposing one text against another until Bacon's meanings or intentions are uncovered.⁸⁴

"Uncovering" or "disclosing" are apt terms for describing exegesis of Baconian texts. Texts that contain enfolded meanings must be explicated by interpreting and reinterpreting passages against insights already gained through a recursively increasing degree of familiarity or accessibility.⁸⁵ As Briggs says, "Ignorant readers hold the key to his [Bacon's] works if they can devote themselves to numerous rereadings."⁸⁶ Even in his non-aphoristic writings, Bacon's intended meanings call for effortful unpacking.⁸⁷ The effortlessness of Bacon's style and his apparently easy fluidity can carry the unwary reader smoothly over crucial details containing important natural philosophical insights. Moreover, these highly suggestive passages are often innocuously concealed in incongruous contexts.⁸⁸ Bacon deliberately disperses his intentions, especially in treating materials that

⁸⁴ Briggs, *Francis Bacon and the Rhetoric of Nature*, 14. This approach is at odds with a literary theory that denies access to authorial intentions and tends to defer textual meanings to a more general discursive cultural ethos. See Julie Robin Solomon, *Objectivity in the Making: Francis Bacon and the Politics of Inquiry* (Baltimore: Johns Hopkins University Press, 1998).

⁸⁵ Briggs sums up this approach: "What matters here is that one not overlook, in a spirit of supposedly sophisticated skepticism, the possibility that Bacon's works are various mirrors of one another, some darker than the rest," *Francis Bacon and the Rhetoric of Nature*, 12.

⁸⁶ Briggs, *Francis Bacon and the Rhetoric of Nature*, 10.

⁸⁷ On Bacon's taxonomy of writing methods and especially his "acroamatic" style see Wallace, *Francis Bacon on Communication and Rhetoric*, 19-20; Stephens, *Francis Bacon and the Style of Science*, 137-139. The acroamatic style is aimed at disciples or initiates – "ad Filios" – and is therefore exclusive. On "Acroamatic" see Bacon, *DAS, SEH*, IV, 450, cf. I, 664-665.

⁸⁸ For example, in Book 3 of *De augmentis* Bacon notes how "Democritus and Epicurus, when they proclaimed their doctrine of atoms, were tolerated so far by some of the more subtle wits; but when they proceeded to assert that the fabric of the universe itself had come together through the fortuitous concurrence of atoms, without a mind, they were met with universal ridicule" (*DAS, SEH*, IV, 365, cf. I, 571). But at the end of Book 4 of *De augmentis*, he refers to "Metaphysic" as "itself a part of Physic, or the doctrine concerning nature" (*DAS, SEH*, IV, 404, cf. I, 613). Earlier (in Book 3) he stated that "Physic supposes in nature only a being and moving and natural necessity; whereas Metaphysic supposes also a mind and idea. For that which I shall say perhaps comes to this" (*DAS, SEH*, IV, 346, cf. I, 550). Bacon has effectively removed mind (final causes) from natural philosophy (hence there is no mention of final causes in *Novum organum*).

require caution.⁸⁹ In summarising the approach required to read Bacon, Briggs cites a contemporary author who explains how to read those authors who “disperse” their meanings:

If in one place the Author write darkly, in some other place some particular thyng maie bee found that ioyned with the other may explicate the meanyng, for they disperse their meaning in seuerall places, to the ende they would be vnderstode onely of the deligent and painfull reader and not of the vnworthie.⁹⁰

Briggs stipulates that Bacon’s texts should be approached by searching for “hints of the writer’s intent placed in disparate passages.”⁹¹

Contrasted with this strategy of moving among the texts of the Baconian corpus is the approach taken by Rossi who argues for an evolutionary or developmental reading of Bacon.⁹² Adopting the view that Bacon changed his mind many times, Rossi argues that to discover Bacon’s final position it is essential to chart apparent changes. An example of this approach can be found in Silvia Manzo’s wide-ranging study of Baconian matter where she plots Bacon’s changing attitudes towards atomism.⁹³ In contrast to Rossi and Manzo, my own reading of Bacon has

⁸⁹ The traditional trope of dispersed intentions – writing *sparsim* – is nicely framed in the following comment by Agrippa: “You therefore sons of wisdom and learning, search diligently in this book, gathering our dispersed intentions, which in divers places we have propounded and what is hid in one place we make manifest in another, that it may appear to you wise men. For, for you only have we written ...” quoted as the epigraph in Leirich, *The Language of Demons and Angels*, iii. In *De augmentis*, Bacon includes a section entitled “*doctrina de Occasionibus Sparsis*” (“Doctrine concerning Scattered Occasions” (*DAS, SEH, V, 35, cf. I, 749*). Bacon draws his authority from Solomon.

⁹⁰ R. B[ostocke?], *The difference betwene the ancient phisicke and the Latter phisicke*, 1585, li, quoted in Briggs, *Francis Bacon and the Rhetoric of Nature*, 14. Briggs adds that “hints of the writer’s intent [are] placed in disparate passages, which can be joined together by an interpreter who forces himself to disregard a desire for ready clarity in order to decode the whole,” 14. See also Bacon’s comments on the ancients and reserved doctrine (*VT, SEH, III, 248*).

⁹¹ Briggs, *Francis Bacon and the Rhetoric of Nature*, 14.

⁹² See Rossi, *Francis Bacon: From Magic to Science*, 85-96.

⁹³ Silvia Manzo, “Francis Bacon and Atomism: A Reappraisal,” in *Late Medieval and Early Modern Corpuscular Matter Theories*, ed. Christoph Lüthy, John E. Murdoch and William R. Newman (Leiden: Brill, 2001). The problems with a developmental view can be seen in Manzo’s claim that the early *Cogitationes de natura rerum* offers evidence for Bacon’s one-time support for particulate atomism. This disregards the important discussion of motion in *CDNR*. Bacon states: “the business [of natural philosophy] is, by proper methods and a course of application suitable to nature, to acquire

not revealed modifications that impinge on central Baconian themes. On the contrary, Bacon tends, from his earliest philosophical writings to the later *Novum organum* and *De augmentis*, to repeat identical themes, dispersed throughout his published and unpublished works, and in a variety of literary genres. At one time deploying fable, at another the oracular and didactic style typical of the transmission of secret knowledge associated with alchemical or magical elites, at others the Solomonic aphoristic adage, and at others the moral and political device of the hortatory essay, Bacon returns again and again to the same themes: the powers and virtues of matter; the unity of all things (including knowledge); and the need for a radical regenerative programme for the mind.

Furthermore, this heterogeneity of materials and styles can be found in single texts, which renders Briggs's reference to the "explicitly scientific works" of Bacon meaningless.⁹⁴ It would be impossible to delineate the Baconian philosophical corpus in this way, more especially (as Briggs fully realises) because of Bacon's fusing of fable, theological doctrine, moral, psychological and natural philosophical materials in individual works. For example, Briggs concludes his superb study with a reading of the thousandth and last observation of *Sylva sylvarum* where Bacon discusses magical fascination and divination, and the potential use of the controlled faculty of the imagination to operate on minds via action at a distance.⁹⁵ Bacon explains how this is possible: all human minds "came forth out of one divine

the power of exciting, restraining, increasing, remitting, multiplying, and calming and stopping any motion whatever in a matter susceptible of it; and thereby to preserve, change, and transform bodies ... For it is most certain that by how much the more simple motions are discovered, by so much will the power of man be increased" (*CDNR, SEH, V, 426, cf. III, 22*). Bacon's emphasis on motion over material *mimima* never alters throughout the Baconian corpus and remains a constant theme in both cosmogonical and operative contexts. In the *New Atlantis* (1626), the Father of Solomon's House describes the goal of their foundation as "the knowledge of Causes, and secret motions of things" (*NA, SEH, III, 156*).

⁹⁴ Briggs, *Francis Bacon and the Rhetoric of Nature*, 14.

⁹⁵ Briggs, *Francis Bacon and the Rhetoric of Nature*, 253-254; Bacon, *SS, SEH, II, 672*; See, *SS, SEH, II, 654-656* for experiments relating to the power of the imagination.

limbus.”⁹⁶ Briggs comments that Bacon has transformed the old “white magic” into a “science of influence” and identifies the power of “influence” with the “rational will.”⁹⁷ This leaves unexplained the natural philosophical basis for the “science of influence” which is grounded in action at a distance and the magical concept of binding which only makes sense in terms of Bacon’s cosmogony. Bacon’s account of the imagination is entirely consistent with his notion of appetitive matter.⁹⁸

Admittedly, Bacon’s coherent natural philosophy is difficult to piece together from the Baconian corpus. The texts are unfinished and the programme itself fragmented and presented piecemeal. Moreover, the philosophical texts do not contain systematic treatments of any Baconian themes.⁹⁹ Hence exegesis involves a tortuous and convoluted exercise in extracting Bacon’s enfolded meanings. Briggs is correct to characterise Baconian texts as reflections of the enfolded character of

⁹⁶ Briggs substitutes the “created from” for “came forth,” *Francis Bacon and the Rhetoric of Nature*, 253. The term *limbus* refers to a border that surrounds anything – a belt, band, girdle. Bacon’s use of the term calls to mind his interpretation of the fable of Cœlum. Cœlum signifies “the origin of things” and Bacon says, “By Cœlum is meant the concave or circumference [*concauum sive ambitum*] which encloses all matter” (*DSV*, VI, 723, cf. 649).

⁹⁷ Briggs, *Francis Bacon and the Rhetoric of Nature*, 254.

⁹⁸ Briggs is among the very few who have taken seriously this invaluable Baconian text. In a recent paper surveying “natural history” in the period of the “Scientific Revolution,” William Ashworth states that “Bacon never wrote a natural history ... [the] *Sylva Sylvarum* is in reality a heterogeneous collection of random observations and suggestions for further inquiry,” “Natural History and the Emblematic World View,” in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge University Press, 1990), 303-332, on 322. For extensive discussion on magical binding see Bruno’s *De magia* and *De Vinculis in genere* in *Cause, Principle and Unity*, ed. and trans. Robert de Lucca and Richard J. Blackwell (Cambridge: Cambridge University Press, 1998), 103-142, 143-176.

⁹⁹ This can be seen in efforts to extract the eponymous “Baconian method” from texts that *de facto* provide minimal systemic presentation of “Baconian method.” J. R. Milton, in the opening page of his well known paper, “Induction before Hume,” describes Bacon as the “first really systematic thinker on induction,” *British Journal for the Philosophy of Science* 28 (1987), 49-74, on 49. But when he gets to Bacon’s views on induction, things are not quite so straightforward. Although Milton recites Bacon’s attack on simple enumerative induction, his account of Bacon’s “method of exclusion” is treated against a Baconian background of “a considerable body of metaphysics,” 58. Milton quite correctly states that there is a “one-to-one relation between the observable natures of bodies and the forms which are their causes,” 58. Milton concludes that without this metaphysical support, Bacon will suffer his own criticisms of traditional induction; that is to say, without the “metaphysics” the “method” is incoherent. On Baconian induction see Pérez-Ramos, *Francis Bacon’s Idea of Science*, 239-269.

Baconian nature; reading and inquiring are perfect analogues.¹⁰⁰ To tease out systematically the dispersed interconnections among central themes in Bacon's programme requires careful and precise readings of the texts. Attempts to shortcut or outmanoeuvre Bacon's labyrinthine dispersals, or to avoid the density of his Latin terminology and the need for constant cross-referencing among the full range of his works, will be sure to encounter enigmas that confound and bewilder the reader so as to make interpretation a seemingly hopeless exercise.

Much of the fragmentation in the secondary literature and failure to resolve Bacon's disconnected texts into a coherent and tenable programme is a hermeneutic failure rather than carelessness on Bacon's part, a failure that can only be repaired through a change in how commentators read Bacon's works.¹⁰¹ Nietzsche's apt remarks on reading aphoristic writing could equally be applied to the full range of Baconian works and are worth citing here:

People find difficulty with the aphoristic form: this arises from the fact that today this form is *not taken seriously enough*. An aphorism, properly stamped and moulded, has not been "deciphered" when it has simply been read; rather, one has then to begin its *exegesis*, for which is required an art of exegesis ... To be sure, one thing is necessary above all if one is to practice reading as an *art* in this way, something that has been unlearned most thoroughly nowadays ... something for which one has almost to be a cow and in any case *not* a "modern man": *ruminatio*.¹⁰²

¹⁰⁰ In 1593, the decade of his earliest literary efforts, Bacon's mother despaired of his enfolded writing. In a letter to Anthony Bacon she writes: "I send herein your brother's [Francis's] letter. Construe the interpretation. I do not understand his enigmatical folded writing" (*LL*, VIII, 245).

¹⁰¹ Rees poses the question "why do most [people] seem to have stopped reading Bacon?" (*OFB*, XI, xxxviii). There are those who maintain that the Baconian project is coherent and systematic. Briggs cites Stanley Fish and R. S. Crane who, in Briggs' terms, "argued that the coherence of Bacon's complex, life-long project is evident even in the microcosm of his seemingly fragmentary and popular *Essays*," *Francis Bacon and the Rhetoric of Nature*, 12. My own study of Baconian magic and natural philosophy fully supports this claim and is in agreement with Briggs's claim that "Bacon's works are various mirrors of one another," *Francis Bacon and the Rhetoric of Nature*, 12.

¹⁰² Friedrich Nietzsche, *On the Genealogy of Morals*, trans. Douglas Smith (Oxford: Oxford University Press, 1996), 10. Perhaps Bacon would have appreciated Nietzsche's comment that "if this text strikes anyone as unintelligible and far from easy listening, the blame, as I see it, does not necessarily rest with me," 9.

Given the above caveats on reading Bacon, it is odd that the aphoristic *Novum organum*, a text as enfolded and dense as any of Bacon's writings, should have been seized on as a paradigmatic model for Bacon's restorative programme. There are very few present-day Bacon scholars who would disagree with Rees's comment that "no definitive reconstruction" of Bacon's thought is possible through focusing solely on *Novum organum*.¹⁰³ It is not an exaggeration to claim that *Novum organum* is impenetrable unless it is interpreted in the light of other texts in the Baconian corpus. Regardless of an increasing tendency to incorporate the full range of Bacon's texts, Fulton H. Anderson's comments on *De sapientia veterum* retain the force of the original indictment:

The work is unquestionably one of the most significant contributions to philosophy in the history of English thought. Its almost complete neglect by commentators is among the strangest phenomena in the history of philosophical exegesis.¹⁰⁴

The focus on *Novum organum* is partly responsible for a neglect of Bacon's more substantive work on natural philosophical themes. In order to correct the imbalance,

¹⁰³ Graham Rees, assisted by Christopher Upton, *Francis Bacon's Natural Philosophy: A New Source. A Transcription of Manuscript Hardwick 72a with Translation and Commentary* (Chalfont St. Giles: The British Society for the History of Science, 1984), 72.

¹⁰⁴ Anderson, *The Philosophy of Francis Bacon*, 5. *De sapientia veterum* was first published in Latin in 1609. Spedding included it among the "literary" rather than the "philosophical" writings. Anderson was the first to call attention to the unjustified neglect of *De sapientia* as a source for understanding Bacon's philosophy. Much of the discussion of *De sapientia* has focused on the question of whether Bacon really believed that classical mythology was a consciously devised allegorical presentation of "ancient wisdom." Rossi presents a complex account of the alleged stages in the evolution of Bacon's attitude towards classical myth, concluding that when Bacon wrote *De sapientia* he accepted the myths as allegorical, *Francis Bacon: From Magic to Science*, 73-134. Charles Lemmi thinks Bacon was in two minds on the subject, *The Classic Deities in Bacon: A Study in Mythological Symbolism* (Baltimore: The Johns Hopkins Press, 1933), 41-45. Timothy Paterson argues that *De sapientia* "was a deliberate and self-conscious attempt to present Bacon's own thoughts in the guise of a feigned recovery of a lost ancient wisdom," "Bacon's Myth of Orpheus: Power as a Goal of Science in *Of the Wisdom of the Ancients*," *Interpretation: A Journal of Political Philosophy* 16 (1989), 427-444, on 432-433. See also Lawrence Lampert, *Nietzsche and Modern Times: A Study of Bacon, Descartes, and Nietzsche* (New Haven: Yale University Press, 1993), 21-26; Stephens, *Francis Bacon and the Style of Science*, 137-153.

Rees suggests that it is the *Novum* which requires an explanation, not what he calls the “speculative philosophy.”¹⁰⁵

There are forceful historiographical reasons for my decision to adopt a close reading of the Baconian corpus. I am not suggesting that context is unimportant or that ideas are free-floating entities possessed of an independence from their societal and intellectual backgrounds. However, as the purpose of this thesis is to clarify Baconian concepts, I have confined my exposition almost exclusively to the Baconian corpus. There is much in Bacon that can be helpfully explicated by contextually relevant exposition and excellent work in that vein already exists. Moreover, there is plausibility in the contextualist’s defence that understanding requires a background or at least a dialectical interplay between context and text. But in Bacon’s case I maintain that the concentration on context, without an absolutely clear grasp of central concepts, has misled and misdirected many commentators who overlook important and necessary aspects of his philosophy. And as much as context informs any reading, there is a tendency to subscribe to what Dominick LaCapra calls the “rhetoric of contextualisation”: an historiographical ruse that can easily preclude the need for a precise understanding, and can serve as an excuse for avoiding the rigours of close textual and philological analysis.¹⁰⁶ My

¹⁰⁵ Rees, “Francis Bacon’s Biological Ideas: A New Manuscript Source,” in *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 297-314, on 308.

¹⁰⁶ Dominique LaCapra and Steven Kaplan, eds., *Modern European Intellectual History: Reappraisals and New Perspectives* (Ithaca: Cornell University Press, 1982), 14. Gordon Leff’s comments in defence of his reading of William of Ockham appositely describe my own approach. Leff states, “I have sought to see his [Ockham’s] thought whole, in its own terms, not in pedigrees or, save in passing, by its subsequent effects,” *William of Ockham: The Metamorphosis of Scholastic Discourse* (Manchester: Manchester University Press, 1975), xiii. Leff goes on to say that a thinker’s “outlook” ought to be understood before relating it to anything else. Guido Giglioni remarks that “many early modern texts have ceased to talk because their voices have been silenced by a uniform, monotonous, and conformist jargon made up of war cries, slogans and catchphrases,” “The Genesis of Francis Glisson’s Philosophy of Life” (unpubl. Ph.D. diss., Johns Hopkins University, 2002), 2.

main objection is to the growing tendency among recent scholars to override the scholarly demands of close reading in favour of the current contextualist fashion.¹⁰⁷

This raises interesting historiographical and exegetical issues given Bacon's own quite substantial dealings both synchronically and diachronically with the history of thought. From his acknowledged admiration for the pre-Socratics to his wholesale absorption of scholastic and Renaissance views on nature, Bacon subverted and appropriated all knowledge as contributions to a single programmatic aim, viz., the unification of knowledge. My claim is that the concentration on sources (although illuminating) is insufficient and has left much of Bacon's philosophy obscure or in some cases untouched. Bacon is fully in control of his deployment of sources and they are always strategically governed by his overall intentions. Moreover, I have taken seriously Bacon's perception of himself as *Protopirum* (trailblazer).¹⁰⁸ In Bacon's terms, "there is no thought to be taken about precedents, for the thing is without precedent."¹⁰⁹ This is not to deny that interpretation can be enhanced through comparisons: in the case of Baconian matter and magic, for example, there is much to be gained from Brunonian comparisons.¹¹⁰ But whilst acknowledging the historical functions that context serves, the aim here is

¹⁰⁷ Whilst recognising that strategic thinkers such as Bacon and Descartes are moulded by their historical environments, Lampert argues that they create context rather than reflect it, *Nietzsche and Modern Times*, 62.

¹⁰⁸ Bacon, *NO, OFB*, XI, 170.

¹⁰⁹ Bacon, *DINP, LL*, X, 87, cf. *SEH*, III, 518.

¹¹⁰ The connections between Brunonian and Baconian concepts require a full examination, especially with regard to matter, binding and the emergence of the concept of a law of nature. Richard Kennington, in a series of insightful essays on Bacon, remarks that "the concept of a law of nature in the seventeenth century, [is a subject] upon which the history of science appears to be remarkably silent," in *On Modern Origins: Essays in Early Modern Philosophy*, ed. Pamela Kraus and Frank Hunt (New York: Lexington Books, 2004), 42. See also Jane Ruby, "The Origins of Scientific 'Law,'" *Journal of the History of Ideas* 47 (1986), 341-359; Edgar Zilsel, "The Genesis of the Concept of Physical Law," *The Philosophical Review* 51 (1942), 245-279; John Henry, "Metaphysics and the Origins of Modern Science: Descartes and the Importance of Laws of Nature," *Early Science and Medicine* 9 (2004), 73-114; Milton, "Laws of Nature," in *The Cambridge History of Seventeenth-Century Philosophy*, ed. Daniel Garber and Michael Ayers, vol. 1 (Cambridge: Cambridge University Press, 1998), 680-701.

to remain focused on Bacon's texts, against which all my interpretations have been tested. When Baconian terms such as "nature," "induction," "experiment," or "form" are treated independently of Bacon's substantive philosophical background, the results often distort rather than extract his intended meaning.

What emerges from a close reading of the Baconian corpus is the inseparability of major themes. In response to Briggs and others who detect paradoxes among Baconian themes, I suggest searching for coherence rather than reconciling the paradoxical which is often driven more by the commentator's perspective than by Bacon's. This is evident in Briggs' incisive concentration on the religious and spiritual character of Bacon's project. The ubiquitous presence of Solomon, Moses and Paul leads Briggs to construct an historiography of complex layerings of paradoxical tensions.¹¹¹ However, when we distinguish the deployment of these materials (the use to which they are put in the presentation of Bacon's programme) from the goal of his programme, then Bacon's appropriation of an inheritance of commonplace materials can be safely distinguished from his ultimate goal of transmuting natural bodies to provide a wholly new nature. What is liable to be lost in the former exercise is the breadth of Bacon's vision.¹¹²

¹¹¹ Many political philosophers do not take Bacon's professed Christianity seriously. For example, Jerry Weinberger holds that "Bacon's impiety is enormous," *Science, Faith, and Politics: Francis Bacon and the Utopian Roots of the Modern Age: A Commentary on Bacon's Advancement of Learning* (Ithaca: Cornell University Press, 1985), 99. Paterson argues that "belief in the essentially Christian inspiration and intention of Baconian science is ... the single greatest contemporary obstacle to understanding Bacon's ... political philosophy as a whole," "On the Role of Christianity in the Political Philosophy of Francis Bacon," *Polity* 19 (1987), 421. On the idea that Bacon's "Holy War" was directed at theology see Lampert, *Nietzsche and Modern Times*, 67-69; see also Howard White, *Peace among the Willows: The Political Philosophy of Francis Bacon* (The Hague: Martinus Nijhoff, 1968). In a recent paper Briggs expresses doubts about the extent of Bacon's religious sincerity, "Bacon's Science and Religion," in *The Cambridge Companion to Bacon*, 172-199, esp. 194, 196.

¹¹² More sceptically, Charles Whitney states that it makes little difference whether Bacon's faith was "fervent, mild or non-existent," what matters is that Bacon's "program of discovery and the way he presents it owe something to the continuing vitality of religious images, values, ideas of change, and forms of expression," *Francis Bacon and Modernity* (New Haven: Yale University Press, 1986), 32. Thus it is the deployment of Bacon's language and conceptual borrowings that are important in

Finally, I have adopted (and adapted it by extension to all Bacon's Latin works) G. W. Kitchin's advice to students of Bacon:

The student will do well first to read all this [*Novum organum*] rapidly, and in the English; so as to obtain a general conception of Bacon's style of thinking and of his object: then he may take the Latin Text, (for no translation can do justice to it, or stand in its stead); and read it carefully and thoughtfully.¹¹³

Given that Bacon takes great care in his deployment of terms, his texts must be read in the original. As Lisa Jardine rightly points out, "translations tend to conceal recurrences of some of Bacon's favourite coinages, both within and between these works."¹¹⁴ Recurrences of particular terms function as signposts – enabling the reader to navigate the labyrinth of Bacon's philosophy. When these threads are traced through the whole range of his works and the relevant passages juxtaposed, a coherent programme begins to emerge. In the following chapters I have endeavoured to heed Rossi's criticisms of recent Bacon scholarship:

Perhaps Francis Bacon was right: it is impossible to eradicate all the idols from men's minds (IV, 27). Among the idols we have so far been unable to eradicate are undoubtedly the following: the propensity not to read the original (particularly Latin) texts; the tendency to reduce the philosophies of the past to some seemingly brilliant slogans; the construction on the basis of these of mythical philosophical portraits.¹¹⁵

It is hoped that this thesis goes some way towards righting these wrongs. Current conceptions of Bacon's project suffer from ill-imposed historiographical categories. I suggest that paying very close attention to the Baconian corpus contributes productively towards a more fruitful historiography.

understanding the substance of his work. For a revisionist alternative to this historiography see Stephen A. McKnight, *The Religious Foundations of Francis Bacon's Thought* (Columbia: University of Missouri Press, 2006), 3.

¹¹³ G. W. Kitchin, *Novum organum: sive indicia vera de interpretatione naturæ* (Oxford: Oxford University Press, 1855), xii.

¹¹⁴ Lisa Jardine, "Experientia Literata or *Novum Organum*? The Dilemma of Bacon's Scientific Method," in *Francis Bacon's Legacy of Texts: 'The Art of Discovery Grows with Discovery,'* ed. William Sessions (New York: AMS Press, 1990), 47-67, on 65, n. 25.

¹¹⁵ Rossi, "Bacon's Idea of Science," in *The Cambridge Companion to Bacon*, 25-46, on 45. Rossi's specific target is Peter Urbach's *Francis Bacon's Philosophy of Science: An Account and a Reappraisal* (La Salle: Open Court, 1987).

Chapter 2 concentrates on Baconian matter. I introduce several themes that aid in understanding Bacon's operational goals. These include the binary concept of nature free and nature bound, and the magical notion of "binding." The term "binding" refers to constraints imposed on matter's habitual tendencies (nature free). In Bacon's cosmogony it refers to the self-constraint of matter's inordinate power, as a condition for the production of organised worlds. It therefore forms the bridge between cosmogonical and human productive acts. The concept of nature bound is the basis for Bacon's science of magic.

In Chapter 3, I examine Bacon's strategies for achieving the union of the human mind (*mens*) and matter (*res*). I argue that Aphorism 1 of Book 1 of *Novum organum* contains an enfolded prescription for the union of *res* and *mens*. The route to this union is generated by Baconian inquiry. Unless the mind undergoes continual realignment with things, systematic transmutation of matter is impossible. I show how themes central to inquiry – negativity, exclusion, binding, etc. – reflect Bacon's materialist cosmogony. My exposition expands current notions of Baconian method. I suggest that inquiry is justifiably characterised as a recursive, or "cybernetic" epistemology.

Chapter 4 highlights the complexity of Baconian experiment and its role in furthering the ascent of the mind to forms. Thus it examines the union between *res* and *mens* as it relates to operation. Baconian experiment has received little scholarly attention. This is surprising given Bacon's reputation as its most vociferous early modern proponent. I argue that experiment is the clue (or guiding thread) through nature's labyrinth. Operating recursively, experiment upholds the connection between the mind and things. As a paradigm experimental science, mechanics exhibits the productive subtlety of matter's inherent powers. Thus it is an essential stage in Baconian inquiry.

Chapter 5 investigates Bacon's doctrine of forms. Baconian forms are the essential operational means to unlimited transformative power. They are the *sine qua non* of his science of magic. They move the investigator beyond the inquiry into what nature does, to what nature can be made to do. I argue that Bacon's cosmogony is the interpretative key to his somewhat opaque doctrine of forms. To extract a coherent account of Baconian forms from the scattered discussions in Bacon's works is demanding. Many scholars have abandoned exposition on the grounds that the concept is hopelessly incoherent. I disagree: to render the notion coherent it must be placed within his overall speculative system.

In Chapter 6, I offer tentative conclusions on Bacon's vision for the universal explication of all action – natural, civic and religious – in material terms. Bacon's unity of the sciences, I argue, was a recovery of Persian magic, a universal science dedicated to exploring the unity of all things and promising power over minds and bodies. Discovery of the forms relating to the human sciences of politics, ethics and religion would make possible the control and ultimate governance of human appetites and passions. I conclude this chapter with a brief examination of Bacon's self-presentation to underscore the radical nature of Bacon's synthesis. I also highlight commentators' scandalous neglect of his *Sylva sylvarum*.

Chapter 2

Principles and Origins

I know not whether this inquiry I speak of concerning the first condition of seeds or atoms be not the most useful of all; as being the supreme rule of act and power [*actus et potentiae*], and the true moderator [*moderatrix*] of hope and works.¹

In an essay entitled “Bacon’s Reform of Nature,” Richard Kennington asks what is the origin of “the concept of mastery of nature?”² His answer leads to a consideration of the natural philosophical origin of modernity and its coincidence with a reformation in conceptions of nature. More precisely, this transformation in the concept of nature was, Kennington says, attended principally by an increasing concentration on matter, the rise of the modern notion of scientific law and an identification of truth with utility, encapsulated in the marriage of knowledge with power.³ In many such essays, Kennington sets out to demonstrate that “modern origins” should be attributed particularly to Bacon and Descartes.⁴ It is now customary to acknowledge that Bacon deserves special consideration in this transformation because it was, as Kennington puts it, “he who addressed [these

¹ Bacon, *CDNR, SEH*, V, 423, cf. III, 18.

² Richard Kennington, *On Modern Origins: Essays in Early Modern Philosophy*, ed. Pamela Kraus and Frank Hunt (New York: Lexington Books, 2004), 3.

³ Kennington, *On Modern Origins*, 5, argues that the “goal of utility” found in Bacon’s *Advancement of Learning* is replaced by “mastery of nature” in *Novum organum*. On Bacon’s concept of law see Chapter 5. Kennington has little to say on the institutional and social reforms associated with the burgeoning interest of early modern thinkers in natural philosophy. These do not appear to have formed part of his historical concerns.

⁴ Kennington, *On Modern Origins*, 1. He says “No one doubts that Bacon is the progenitor of Cartesian mastery of nature,” *ibid.* See also Laurence Lampert, *Nietzsche and Modern Times: A Study of Bacon, Descartes, and Nietzsche* (New Haven: Yale University Press, 1993), 146.

issues] not only first but more fully than anyone after.”⁵ The specific issue addressed in this chapter is Baconian matter and its role in Bacon’s reform of nature. Very few commentators give adequate (or even schematic) attention to Baconian matter and its foundational role in the early modern re-conceptions of nature.⁶ The specific intention of this chapter is to address this oversight: in the absence of an in-depth study of Baconian matter, expositions of Bacon’s revision of nature and its possibilities for human utility rest on insecure foundations. As Graham Rees says, “Bacon’s natural philosophy cannot be epitomized, simplified, or put in a nutshell.”⁷ By giving detailed attention to Bacon’s natural philosophy, long-standing interpretive disputes over central Baconian themes (hitherto dismissed as incoherent) can be resolved.

Bacon’s materialism was not merely a philosophical response to the dominant Aristotelian natural philosophy of the schools. It was, I argue, more a strategic apologia on the part of matter, an elevation of matter’s status to supreme power. This constituted a mode of persuasion rather than a detailed philosophical engagement with scholasticism. It was intended to effect a general alteration in

⁵ Kennington, *On Modern Origins*, 3.

⁶ I am particularly indebted to Graham Rees’ seminal work on Bacon’s matter theory. Rees first drew attention to this aspect of Bacon’s programme in “Francis Bacon’s Natural Philosophy” (unpubl. Ph.D. diss., University of Birmingham, 1970). See also *idem.*, “Francis Bacon’s Semi-Paracelsian Cosmology,” *Ambix* 22 (1975), 81-101; *idem.*, “Francis Bacon’s Semi-Paracelsian Cosmology and the *Great Instauration*,” *Ambix* 22 (1975), 161-173; *idem.*, “Matter Theory: A Unifying Factor in Bacon’s Natural Philosophy,” *Ambix* 24 (1977), 110-125; *idem.*, “Atomism and ‘Subtlety’ in Francis Bacon’s Philosophy,” *Annals of Science* 37 (1980), 549-571. See also Rees’ detailed introduction and commentary in *The Oxford Francis Bacon*, ed. Graham Rees and Lisa Jardine, 15 vols. (Oxford: Clarendon Press, 1996–), esp. vols. VI and XIII; On Bacon’s natural philosophy see Maxwell Primack, “Francis Bacon’s Philosophy of Nature” (unpubl. Ph.D. diss., Johns Hopkins University, 1962); *idem.*, “Outline of a Reinterpretation of Francis Bacon’s Philosophy,” *Journal of the History of Philosophy* 5 (1962), 123-132. On the foundational role of matter theory in Baconian cosmology see Stephen Gaukroger, “The Role of Matter Theory in Baconian and Cartesian Cosmologies,” *Perspectives on Science* 8 (2000), 201-222. For an excellent overview of the controversies surrounding the question of Bacon’s affiliation to traditional atomist views see Silvia Manzo, “Francis Bacon and Atomism: A Reappraisal,” in *Late Medieval and Early Modern Corpuscular Matter Theories*, ed. Christoph Lüthy, John E. Murdoch, and William R. Newman (Leiden: E. J. Brill, 2001), 209-244.

⁷ Rees, *OFB*, XI, 560.

cultural attitudes. To work with nature – to minister and obey nature as Bacon framed it – is ultimately to work with and obey the oracles of matter.⁸ Knowledge of matter's hidden powers (or motions) is the key to Bacon's Instauration.⁹ Without this knowledge the Baconian investigator is powerless, lacking answers to nature's sphinx-like riddles. The capacity to interpret these is the essential propaedeutic to mastery over nature. Hence the Baconian interpreter will hold the key to nature's hidden motions.

Kennington's claim that the goal of mastering nature "determines the principles of Bacon's reform of nature" is oddly phrased.¹⁰ It is perhaps closer to the mark to say that the principles demonstrate that such mastery is possible. However, it is true that mastery implies knowledge and knowledge implies mastery.¹¹ As Bacon puts it, "he who understands his subject is master of his end."¹² This chapter explicates this claim at the level of primordial matter. The justification for a re-examination of Baconian matter derives from Bacon's self-proclaimed efforts to

⁸ See *NO*, *OFB*, XI, 64, aphorisms 1 and 3.

⁹ Spedding rightly argues that Bacon "saw that all the active operations of nature were modes of motion, and concluded that if we could thoroughly understand the nature of motion, we should at once have the key to her secret processes, and therewithal the command over her powers; which was the true end and aim of knowledge," *SEH*, III, 624. However, he suggests that "the doctrine of motion was ultimately remitted to a subordinate place in the *Novum Organum* among the Prerogatives of Instances," 514. This is clearly not the case. As Rees points out, "If we read the *Abecedarium* back into *Novum organum*, the nineteen simple motions considered in the account of the instances of wrestling are among the primary objects of the Baconian natural-philosophical enterprise," *OFB*, XI, 560.

¹⁰ Kennington, *On Modern Origins*, 3.

¹¹ On the influence of the maker's knowledge tradition on Bacon's programme see Antonio Pérez-Ramos, *Francis Bacon's Idea of Science and the Maker's Knowledge Tradition* (Oxford: Clarendon Press, 1988), 59. On my reading of Bacon, Pérez-Ramos' claim that "The capacity of (re)producing Nature's 'effects' was perceived as the epistemological guarantee of man's knowledge of the natural processes in the external world" is an inversion of the Baconian programme. Baconian magic – the production of effects – involves "the Deduction of Forms to Works," *DAS*, *SEH*, V, 121, cf. I, 838. On Bacon's doctrine of forms and their role in his science of magic see Chapter 5. Bacon distinguishes between works which require knowledge of forms and works which merely require knowledge of works (*experientia literata*). The former "are called *Epistemides*, that is, daughters of knowledge, which do not come into actuality otherwise than through knowledge and pure interpretation since they comprise nothing obvious," my trans., *SEH*, III, 788.

¹² Bacon, *DSV*, *SEH*, VI, 757, cf. 679.

raise its ontological import. He was strident in his annunciation that matter was the key to his reform of natural philosophy. The elevation of matter to plenipotentiary (full of powers) status is the natural philosophical foundation of his Great Instauration. If matter holds the key to all things possible, then Bacon's all-encompassing programme follows logically from its foundational natural philosophical principles. While many commentators have remained at the level of philosophical or discursive analysis, I argue that it is more fruitful to link the Baconian goal of dominion over nature with the intricacies of what was to be the very stuff of that reform – the *sine qua non* of human operative power – an infinitely fecund matter which lent itself to human manipulation. Matter, I argue, is at the root of the Baconian vision of a natural philosophical society orientated toward “the effecting of all things possible” or, as Descartes has it, the production of an “infinity of artifices.”¹³ This chapter explores the ways in which Bacon sought programmatically to raise the status of matter to the point where shifting nature from its so-called ordinary course seemed possible.

¹³ Bacon, *NA, SEH*, III, 156. See René Descartes, *Discourse on Method, Optics, Geometry, and Meteorology*, trans. Paul J. Olscamp (Indianapolis: The Bobbs-Merrill Co., 1965), 50. Descartes comments that this will follow when we know the “force and action” of “bodies” as “distinctly” as we know “the different skills of our artisans.”

I. Bacon's ontology

A. Baconian matter

Bacon's most detailed account of primary matter is found in *De principiis atque originibus secundum fabulas Cupidinis & Cæli. Sive Parmenidis et Telesii & præcipue Democriti philosophia tractata in fabula de Cupidine*.¹⁴ The work is, as Rees says, "one of Bacon's most inscrutable."¹⁵ According to Rees, "the *De principiis* lacks a context – an introduction perhaps, or a custom-built cabin in some larger literary vessel."¹⁶ I argue that Bacon provides a context for *De principiis atque originibus* in *De augmentis*. There he subjoins an appendix to Physic which he terms "*Dogmas of Ancient Philosophers*" (*Placita Antiquorum Philosophorum*).¹⁷ He says "it will be good to peruse the several differing systems of philosophy, like different glosses upon nature; whereof it may be that one is better in one place and another in another."¹⁸ Among the ancient philosophers, Bacon mentions Parmenides and Democritus.¹⁹ Modern doctrines may also be included, such as "that of Telesius of Consentium, who revived the philosophy of Parmenides, and so turned the

¹⁴ Bacon, *OFB*, VI, 196. *DPAO* remained unpublished at the time of Bacon's death and Rees suggests "it was very probably composed in or just after 1612," *ibid.*, xxv.

¹⁵ *ibid.*, xxix.

¹⁶ *ibid.*, xxx.

¹⁷ Bacon, *DAS, SEH*, IV, 357, cf. I, 562. Specifically, *Placita Antiquorum Philosophorum* is appended to the branch of Physic that deals with "nature united or summary." See also "The New World of Sciences, or Desiderata," where it is listed among the contents of Book III (*DAS, SEH*, V, 121, cf. I, 838).

¹⁸ Bacon, *DAS, SEH*, IV, 359, cf. I, 563.

¹⁹ *ibid.*

weapons of the Peripatetics against themselves.”²⁰ But the philosophies must be presented “dissected and dismembered” (*concisa et dissecta*).²¹ He explains, “when a philosophy is entire, it supports itself, and its doctrines give light and strength the one to the other; whereas if it be broken, it will seem more strange and dissonant.”²² Much of the inscrutability of *De principiis atque originibus* derives from this mode of delivery.

The main theme of this work is to establish the principles from which the current scheme of nature arises: “We ask what in reality the primary and most simple entities are from which the rest are derived.”²³ Bacon posits a single principle, viz., matter: on this unique and self-sufficient cause all possible states are dependent. His account interweaves traditional metaphysical and natural philosophical terminology with the ancient myths in what he calls a “philosophy of the parable.”²⁴ In particular, he compares and contrasts his reading of the parable with the philosophy of Democritus and Telesio. Bacon also deals with the fables of Cupid and Cœlum in *De sapientia veterum* and I shall refer to both accounts here.²⁵

²⁰ Bacon, *DAS, SEH*, IV, 359, cf. I, 564.

²¹ *ibid.*

²² *ibid.*

²³ Bacon, *DPAO, OFB*, VI, 209.

²⁴ Bacon, *DPAO, OFB*, VI, 203. Bacon makes no distinction between obviously natural philosophical works and natural philosophy discussed via the medium of fable. Thus Spedding’s and Ellis’ neglect to include *DSV* among the philosophical section of the works is puzzling. F. H. Anderson rightly protests: “The work is unquestionably one of the most significant contributions to philosophy in the history of English thought. Its almost complete neglect by commentators is among the strangest phenomena in the history of philosophical exegesis,” *The Philosophy of Francis Bacon*, 57. Cf. Rossi, *Francis Bacon: From Magic to Science*, trans. Sacha Rabinovitch (London: Routledge and Kegan Paul, 1968), 131. As the bearer of substantive claims, fable is therefore treated here as a bona fide vehicle for the transmission of Bacon’s philosophical claims. There are neither historiographical nor textual reasons for their later separation and it is incumbent on the commentator to acknowledge the importance of this genre in Baconian exposition. On Bacon’s classical sources see Charles W. Lemmi, *The Classic Deities in Bacon*, 49-61.

²⁵ *DSV* was first published in 1609. According to Rees, “the interpretation of the fable of Cœlum is not extant in *DPAO*, but there is a short interpretation in *DSV* ... where it *precedes* the interpretation of Cupid,” *OFB*, VI, 417, cf. xxviii-xxxi. Although Bacon does not appear to have much to say about Cœlum in *DPAO*, his discussion of principles allows the astute reader to piece together his account of

It ought to be emphasised at this point that the result is an extreme form of materialism, notwithstanding that Bacon's matter is appetitive.²⁶ In *De sapientia veterum* we are told that Cupid – the most ancient of all the Gods – signifies the atom and by this figuration Bacon underwrites his debt to Democritus whose atoms were eternal but whose cosmic systems (worlds) were transient. As we shall see, however, this does not entail that Bacon can be cast in the role of proto-mechanical philosopher.

1. The potency-substratum distinction

In his explication of the fable of Cupid, Bacon distinguishes between Cupid and his power. It should be noted from the outset that the various distinctions that Bacon makes do not refer to distinct entities but only to properties of the unique principle of matter. Cupid therefore signifies “matter itself, its power [*vis*] and nature.”²⁷ Bacon considers matter from two points of view: potency and substratum.²⁸ This dual aspect of Bacon's natural philosophy is noted by Rossi:

origins. Bacon's discussion of the origins of the world cannot be separated from his discussion of principles.

²⁶ On the theological implications of Bacon's concept of matter see Guido Giglioni, “The Darkness of Matter and the Light of Nature: Notions of Matter in Bacon and Comenius and their Theological Implications,” *Acta Comeniana* 17 (2003), 9-31; Silvia Alejandra Manzo, “Holy Writ, Mythology, and the Foundations of Francis Bacon's Principle of the Constancy of Matter,” *Early Science and Medicine* 4 (1999), 114-126. It is not my purpose here to deal with the theological ramifications of Bacon's portrayal of an omnipotent matter.

²⁷ Bacon, *DPAO, OFB*, VI, 199.

²⁸ The notion that “this principle, called matter, can be considered in two ways: first, as potency; second, as substratum” is found in Giordano Bruno, *Cause, Principle and Unity*, 65; cf. *De la causa, principio e uno* in *Opere di Giordano Bruno e di Tommaso Campanella*, ed. A. Guzzo and R. Amerio (Milan and Naples: R. Ricciardi, 1956), 369. Benjamin Farrington rightly argues that “If Bacon had a philosophical precursor it was ... Bruno,” *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964), 27. There is strong evidence that Bacon appropriated many features that are peculiarly characteristic of Bruno's matter theory: his notion of the atom; enfolded matter; nature as artistic production; the apophatic doctrine of matter; bodies as a union of opposites stabilised by a bond (*vinculum*); and law as a unifying principle. On Bacon and Bruno see Reid Barbour, “Bacon, Atomism, and Imposture: The True and the Useful in History, Myth and Theory,” in *Francis Bacon and the Refiguring of Early Modern Thought: Essays to Commemorate The Advancement of*

When Bacon identifies *simple natures* and *virtues*; when he conceives motion as an active virtue corresponding to the appetites and inclinations of matter; when he grants to all substances the power of perception, he is consistent with his theories of the *Cogitationes* and of the Cupid fable in *De sapientia veterum*. But when, in the *De principiis*, he stresses the realistic nature of the principles of things, he moves away from the typically vitalistic significance he had hitherto assigned to Cupid, and asserts his faith in a doctrine of reality based on a geometrico-mechanicist definition of the first principles. Only an analysis of Bacon's doctrine of forms could explain this coexistence of dynamic and mechanistic conceptions of reality.²⁹

I argue that only a detailed analysis of Baconian matter can explain this dual perspective: this is a prerequisite to understanding the Baconian doctrine of forms.

The potency-substratum distinction is a constant feature of Bacon's characterisations of matter. The treatment of Bacon's natural philosophy merely from the perspective of substratum has given rise to the misleading view that he was a proto-mechanical philosopher.³⁰ Figure 2.1 illustrates how key concepts in Bacon's natural philosophy arise out of one or other of these perspectives. Cupid signifies both the atom itself (substratum) and its power (potency). The latter aspect refers to "*the natural motion of the atom ... the original and unique force [vis antiquissima et unica] that constitutes and fashions all things out of matter.*"³¹

Learning (1605-2005), ed. Julie Robin Solomon and Catherine Gimelli Martin (Aldershot: Ashgate, 2005), 17-43, on 31-36. More work needs to be done on Bacon's debt to the Italian naturalists.

²⁹ Rossi, *Francis Bacon*, 126. See also Ellis' preface to the philosophical works: "In stating the doctrine of simple motions, [Bacon] speaks as if all phenomena were to be explained by means of the desires and instincts of matter, every portion of which is more or less consciously sentient. But in other passages we find what at first appears to be a wholly different view, namely that phenomena are to be explained by the site, form, and configuration of atoms or ultimate particles, capable of neither desire nor fear, and in all their motions simply fulfilling the primary law impressed on them by Providence," *SEH*, I, 55.

³⁰ See Rossi, *Francis Bacon*, 124-126; Pérez-Ramos, *Francis Bacon's Idea of Science*, esp. 97-105, 115-132; R. H. Kargon, *Atomism in England from Hariot to Newton* (Oxford: Oxford University Press, 1966), 43-44; M. B. Hesse, "Francis Bacon," *DSB*, vol. 1 (New York: Charles Scribner's Sons, 1970), 372-377; *idem.*, "Francis Bacon's Philosophy of Science," in *Essential Articles for the Study of Francis Bacon*, ed. Brian Vickers (Hamden, Connecticut: Archon Books, 1968), 114-139; Charles T. Harrison, "Bacon, Hobbes, Boyle and the Ancient Atomists," *Harvard Studies and Notes in Philology and Literature* 15 (1933), 191-218; Peter Urbach, *Francis Bacon's Philosophy of Science* (La Salle, Illinois: Open Court, 1987), 72-82; Stephen Gaukroger, *Francis Bacon and the Transformation of Early-Modern Philosophy* (Cambridge: Cambridge University Press, 2001), 181-188. For an alternative treatment of this topic see Graham Rees, "Atomism and 'Subtlety' in Francis Bacon's Philosophy," *Annals of Science* 37 (1980), 549-571; Reid Barbour, "Bacon, Atomism, and Imposture: The True and the Useful in History, Myth, and Theory."

³¹ Bacon, *DSV*, *SEH*, VI, 729, cf. 655. See also *DPAO*, *OFB*, VI, 200.

Potency	Substratum
motion / <i>vis</i> / appetite of the atom	atom
sum of simple motions / form	<i>schematismus</i>
the great sum	the great schematism

Fig. 2.1. The potency-substratum distinction

2. Primary matter and the *via negativa*

According to the fable, Cupid is “quite without a parent.”³² Bacon identifies “the familiar and almost universal trope that parent and child denote cause and effect.”³³ On Bacon’s reading of the fable, primary matter has no cause – “for nothing came before this very thing.”³⁴ Bacon designates matter “the cause of causes, itself causeless” (*causa causarum, ipsa incausabilis*).³⁵ An important corollary follows: if matter is causeless then it cannot be known via causes. Traditionally, knowledge must be the result of an inquiry into the Aristotelian four causes of generation and corruption. Accordingly, in scholastic natural philosophy the pursuit of knowledge must terminate in causes. However, if Cupid is represented in the parable as “*sine causa*,” then knowledge of his ultimate nature is not possible in this mode.³⁶ Because Cupid figures matter, matter is unknowable in its ultimate essence: “there

³² Bacon, *DPAO, OFB*, VI, 197.

³³ Bacon, *DPAO, OFB*, VI, 199. Rees notes that “there is no reference to the tropis familiare in what Comes says about Cupid, although Comes does mention Cupid in relation to Chaos,” 417.

³⁴ Bacon, *DPAO, OFB*, VI, 199.

³⁵ Bacon, *DPAO, OFB*, VI, 198.

³⁶ Bacon, *DPAO, OFB*, VI, 198.

was no efficient or anything prior to it in the order of nature [*nec aliquid Naturæ notius*], and consequently neither genus nor form.”³⁷ Insofar as matter is unknowable, we have reached what Bacon calls “the ultimate force and positive law of nature” (*ultimam Naturæ vim & legem positivam*).³⁸ Bacon has transferred the traditional *via negativa* explication of the nature of God to the inaccessible nature of *materia prima*.³⁹ Thus we can have no knowledge of “this [primary] matter and its power [*vis*] and operation,” even though we have demonstrated its necessary existence.⁴⁰ In Bacon’s account “it is a thing positive and beyond rational explanation” (*res positiva est & surda*).⁴¹

That matter is *sine causa* is, Bacon says, “the greatest thing of all.”⁴² The converse of this, the greatest corruption in philosophy, is to search for causes for matter: the principles of things must be embraced “as if they were articles of experimental faith.”⁴³ This is why Democritus is praised over all other philosophers: not only does Democritus set the causal terminus in the atom (matter) but he likewise, according to Bacon, utilised the *via negativa* in discussing the ultimate nature of matter:

³⁷ Bacon, *DPAO, OFB*, VI, 199.

³⁸ Bacon, *DPAO, OFB*, VI, 198. Bacon identifies matter’s appetitive power with the summary law of nature. This “highest law of essence and nature ... cuts and passes right through the vicissitudes of things,” *DPAO, OFB*, VI, 201.

³⁹ Cf. my trans., *DIN, SEH*, III, 788: “But God is like only to himself, without trope. Therefore expect no sufficiency of light from [natural philosophy] for learning about him.” On Bacon’s apophatic doctrine of matter see Michael McCanles, “The New Science and the *Via Negativa*: A Mystical Source for Bacon’s Empiricism,” in *Francis Bacon and the Refiguring of Early Modern Thought*, 45-68; Charles Whitney, “Cupid Hatched by Night: The ‘Mysteries of Faith’ and Bacon’s Art of Discovery,” in *Ineffability: Naming the Unnamable from Dante to Beckett*, ed. Peter S. Hawkins and Anne Howland Schotter (New York: AMS Press, 1984), 51-64. I deal with Bacon’s way of inquiry and the *via negativa* in Chapter 3.

⁴⁰ *DPAO, OFB*, VI, 199.

⁴¹ *DPAO, OFB*, VI, 199.

⁴² *DPAO, OFB*, VI, 199.

⁴³ *DPAO, OFB*, VI, 199.

Democritus made the admirable claim that atoms or seeds, and their virtue, were quite different from anything subject to the senses, but that they were remarkable for being things whose nature was entirely dark and secret [*cæca & clandestina*].⁴⁴

Like the atoms of Democritus and Lucretius, Bacon's atoms are very different from the sensory qualities of things: "atoms are not like fiery sparks, drops of water, bubbles of air, specks of dust, nor tiny amounts of spirit or ether."⁴⁵ Moreover, they cannot be incorporated into the traditional categories of all existents, nor can they be described under the usual qualities (for example, the four Aristotelian qualities): their form is not "something heavy or light, hot or cold, dense or rare, hard or soft, such as are found in larger bodies".⁴⁶ Bacon is emphatic that the categories and traditional qualities are themselves derived from *materia prima*, itself not describable in these terms. The same negative approach applies to the motion of the atom which is likewise incomprehensible:

Nor, similarly, is the natural motion of the atom either that motion of falling bodies which is called natural, or the motion opposite to it (percussion), or the motion of expansion and contraction, or of impulse and connection, or of the rotation of the heavenly bodies, or any of the other motions of larger bodies simply.⁴⁷

According to Bacon, "the parable preserves the heterogeneity and exclusion throughout, in both substance [substratum] and motion [potency]."⁴⁸ It is at this point Bacon claims that the parable philosophy and the philosophy of Democritus differ. While Democritus correctly terminates the search for principles in matter, he incorrectly gives to the atom the motions of larger bodies (principally the descent of the heavy and ascent of the light). In contrast, the parable preserves the

⁴⁴ Bacon, *DPAO, OFB*, VI, 201. The phrase "cæca & clandestina" is from Lucretius. Bacon cites this passage later: "At primordia gignundis in rebus oportet | Naturam clandestinam cæcamque adhibere," 202. Cf. Lucretius, *De rerum natura*, I: 778-780.

⁴⁵ Bacon, *DPAO, OFB*, VI, 203.

⁴⁶ Bacon, *DPAO, OFB*, VI, 199.

⁴⁷ Bacon, *DPAO, OFB*, VI, 203.

⁴⁸ Bacon, *DPAO, OFB*, VI, 201.

heterogeneity of the atom with regard to both substratum and potency. However, although as the fountain of all things matter is unknowable, what issues from it is knowable and this is the foundation of Bacon's programme to actualise inherent possibilities. Bacon contrasts the essential unknowable nature of matter with its actions or powers, which are an emanation from it. These emanative powers or virtues are the constitutive elements and the origins of all natural bodies.

Because Bacon is concerned to elevate matter's status from an abstraction to an actual being, he argues that actual phenomenal bodies must terminate in an actual being possessing all reality in a superlative way. He states:

a clearly irresistible necessity drives men's thoughts (if they want to be consistent) to the atom, which is a true entity [*Ens*], having matter, form, dimension, place, resistance, appetite, motion and emanation. Likewise, amid the destruction of all natural bodies, it remains constant and eternal. For since the corruptions of the greater bodies are so many and various, it is absolutely necessary that that which remains as an unchanging centre should be something either potential or extremely small; but it is not potential ... Thus are we left with the idea that this immutable thing is extremely small.⁴⁹

The question of the cause or origin of the atom is regarded by Bacon as a non-question in that there is no explanation in terms of causation of that which is causeless. However, having reached the limits of the exclusionary account of matter's existence (by means of the *via negativa*), he turns to its positive attributes. To facilitate the imagination's grasp of matter as an actual being, he must first destroy the traditional scholastic representation of matter as pure potential. He depicts pure potential as no more than an abstraction: the argument rests on the doubtful ontological status of abstractions. The parable of Cupid also elaborates on matter's accessible properties, that is, the properties of primary matter which permit the mind to grasp it as an actual being rather than a mere potentiality. Hence the parable contributes to Bacon's strategic philosophical narrative. It allows him to

⁴⁹ Bacon, *DPAO, OFB*, VI, 253.

undermine the scholastic abstraction and secure a supreme role for a plenipotentiary matter. Having considered the kinds of demonstrations that are “possible with regard to primary matter,” he proceeds “to *Cupid* himself, that is, primary matter, and its properties [*dotes*].”⁵⁰

3. Primary matter and its properties

In the fable, matter’s emergence from primordial darkness to become a distinct being with definite qualities is figured by Cupid’s birth “from an egg laid by Night.”⁵¹ The figure of Cupid stands for those properties which are accessible to the human mind. There is no ontological difference between matter in the chaos and matter in the world system (the great schematism). The appetitive power of primary matter in the chaos is such that it spontaneously systematises itself into sustainable structures. Bacon is adamant that primary matter (although obscure in its chaotic essence) will eventually produce positive being; something which contains the seeds of the phenomenal world. The “certain” features of Cupid signify the deepest levels of matter: motion, cohesive power and action at a distance.⁵² Bacon’s admiration for Democritus rests on his willingness to reach these ultimate levels.⁵³ Democritus also lends credibility because he “agrees in most things with the authority of the most ancient times.”⁵⁴

When drawing on the authority of the ancients, Bacon generally favours the pre-Socratics who almost all held to a view of active matter:

⁵⁰ Bacon, *DPAO, OFB*, VI, 205.

⁵¹ Bacon, *DPAO, OFB*, VI, 197.

⁵² Bacon, *DPAO, OFB*, VI, 207.

⁵³ See Rees, “Atomism and ‘Subtlety’ in Francis Bacon’s Philosophy,” *Annals of Science*, 37 (1980), 549-571.

⁵⁴ Bacon, *DPAO, OFB*, VI, 207.

almost all the ancients, *Empedocles, Anaxagoras, Anaximenes, Heraclitus and Democritus*, though differing in other respects about primary matter, were as one in maintaining that matter was active, had some form and imparted its form, and had the principle of motion within itself. Nor would it be possible for anyone to think otherwise, unless he wanted to abandon experience altogether. Thus all these latter submitted their minds to the nature of things [*mentem rebus submiserunt*].⁵⁵

In his efforts to elevate matter, Bacon downplays the role of forms and shifts matter to centre stage. He argues that forms have gained their superior explanatory role because of their appeal to the human intellect. Forms “strike” the intellect more “forcibly” than “either matter or action.”⁵⁶ They are considered to be more “manifest and firm” than either of the latter principles which bear connotations of flux and process.⁵⁷ Consequently matter is made redundant, a mere “fantasy matter” (*Materia phantastica*), void of any potency. Forms contribute the required properties and virtues.⁵⁸ Obviously Bacon’s rejection of form is not a rejection *tout court*: Plato and Aristotle are guilty only of giving “all the best parts” to forms whereas in Bacon’s account matter has the lead role.⁵⁹

Bacon castigates those who attempt to satisfy the intellect’s craving for comprehension and distinctness. Through appeals to satisfy the imagination, scholastic depictions of pure matter as mere potential have obscured the essential property of any element. The first entity must be more real than anything which follows from it:

⁵⁵ Bacon, *DPAO, OFB*, VI, 209.

⁵⁶ Bacon, *DPAO, OFB*, VI, 207.

⁵⁷ Bacon, *DPAO, OFB*, VI, 207.

⁵⁸ Bacon, *DPAO, OFB*, VI, 206.

⁵⁹ Bacon, *DPAO, OFB*, VI, 207. The theatrical imagery is interesting given the leading role of matter. On the use of the imagery of drama and actors in a natural philosophical context see Joe Shackleford, “Seeds with a Mechanical Purpose: Severinus’ Semina and Seventeenth-Century Matter Theory,” in *Reading the Book of Nature: The Other Side of the Scientific Revolution*, ed. Allen G. Debus and Michael T. Walton (Kirkville: Sixteenth Century Journal Publishers, 1998), 15-44, esp. 24-26.

The primary entity ought to exist no less really than those that flow from it [*ex eo fluunt*], and in some ways more. For it is self-subsisting [*Authupostatus*], and other things subsist through it.⁶⁰

Scholastic matter, Bacon says, is the product of “categories and suchlike dialectical notions” involving mere abstractions such as “form and privation.”⁶¹ Given the discursive origins of this notion of matter, Bacon suggests that we dismiss the Aristotelian and Platonic arguments as a whole, rather than engage with them piecemeal. We should, he insists, recognise that abstract matter is “the matter of disputations, not of the universe.”⁶² In contrast, “One who philosophizes rightly and in an orderly manner must dissect nature and not abstract from it.”⁶³ Thus it is not philosophical argument that is required but actual engagement with “things themselves” (*res*).⁶⁴

We are gradually being led by Bacon’s narrative to see matter as a truly independent entity, the only being which has the quality of self-subsistence. If matter is a true substance – independent, uncaused and unique – then matter contains in seminal form everything which will subsequently emanate from it, including form and motion:

Primary matter [*materia prima*] is united with the primary form [*forma prima*], and also with the first principle of motion [*principio motus primo*], as we find it ... But the former three things must in no way be torn apart [*discerpenda*] but only distinguished [*distinguenda*].⁶⁵

While Bacon makes a distinction in reason between substratum (matter) and potency (form and motion), these two cannot be separated in reality. Bacon further sanctions his account of matter by relating it to the opening chapters of Genesis. He glosses

⁶⁰ Bacon, *DPAO, OFB*, VI, 209.

⁶¹ Bacon, *DPAO, OFB*, VI, 209.

⁶² Bacon, *DPAO, OFB*, VI, 209.

⁶³ Bacon, *DPAO, OFB*, VI, 209.

⁶⁴ On the relationship between *res* and *mens* see Chapter 3.

⁶⁵ Bacon, *DPAO, OFB*, VI, 209.

(some might say distorts) the Creation story as a contribution to matter's eternity: "For it is not written that God in the beginning created matter, but that he created the Heaven and Earth."⁶⁶ This entails that matter was before the beginning and fits well with the tenor of the fable. Bacon's cosmogonical account relates that primary matter has form but can be formed or unformed "in the whole" (*secundum toto*).⁶⁷ When primary matter is formed in the whole, there is system; when it is unformed in the whole, there is chaos. Cupid (primary matter with form), through his organising power, produces system (matter formed in the whole). In Bacon's dense formulation, "Chaos [the mass of matter] is formless, *Cupid* [primary matter] is a certain person."⁶⁸ This explains why chaos is depicted as "coeval" (*coævus*) with Cupid: chaos is simply the mass of matter prior to the emergence of system.⁶⁹ Turning to Genesis again, Bacon notes that before the six days works there was earth and water (matter with form) even though "on the whole the mass was unformed."⁷⁰

In addition to those who have denied definite properties to Cupid, there are those who have attempted to clothe him and Bacon also undertakes to explicate the ancient systems of those "who get it wrong (but in the opposite way)."⁷¹ He rejects those who clothe Cupid in forms such as, fire, air and water (he notes that no one has suggested earth as a candidate for ultimate principle). These latter principles are not irreducible elements and matter itself possesses no discernable form but contains all forms. In his account of the four ancient schools, Bacon favours the atomists who hold that "the principle of things is one in substance, a principle fixed and

⁶⁶ Bacon, *DPAO, OFB*, VI, 211.

⁶⁷ My trans., Bacon, *DPAO, OFB*, VI, 210.

⁶⁸ My trans., Bacon, *DPAO, OFB*, VI, 208.

⁶⁹ Bacon, *DPAO, OFB*, VI, 196.

⁷⁰ Bacon, *DPAO, OFB*, VI, 211.

⁷¹ Bacon, *DPAO, OFB*, VI, 211.

invariable, but who deduce the diversity of entities from the different magnitudes, shapes and positions of that same principle.”⁷² Bacon’s prioritisation of this school does not indicate his acceptance and support of a proto-mechanical philosophy. Of the four schools discussed, atomism is considered the best in a relative sense. That is, it is the best in so far as it depicts Cupid “as he really is, native and naked.”⁷³ Thus it attributes no qualities to matter in its primal being: the atom retains its heterogeneity both in terms of material substratum and in terms of potency. Its properties bear no resemblance to the properties of larger bodies. In Bacon’s view, Democritus deserves the title “magus” because he recognised an active primary atom which was the source of all forms yet in itself possessed no discernable form.⁷⁴ In Democritus’ account, the atom (unclothed primary matter) was the invariable principle of things.

Cupid’s naked and natural condition signifies the capacity of primary matter to manifest itself clothed in infinite forms while simultaneously retaining its essential fixed properties. Erecting a principle on the basis of common sensory experience entails the impossibility of explicating how an element with limited properties can account for the multifarious changes in nature. How can it both generate everything and sustain itself? Currently, he laments, there is no explanation of this mode of behaviour:

They do not find out, indeed they do not even invent anything to explain by what appetite or provocation, or by what cause, means or leading, that principle of theirs degenerates from itself, and on the other hand recovers itself again.⁷⁵

⁷² Bacon, *DPAO, OFB*, VI, 211.

⁷³ Bacon, *DPAO, OFB*, VI, 211.

⁷⁴ Bacon, *DPAO, OFB*, VI, 204.

⁷⁵ Bacon, *DPAO, OFB*, VI, 223.

Moreover, bodies do not return to these purported principles. For example, “putrefaction itself does not at all reduce things to pure and crude water.”⁷⁶ Hence Bacon holds that “by far the greatest error” of those who clothe Cupid is that “they constitute a principle corruptible and mortal.”⁷⁷ For Bacon, it is a necessary condition of an element that all things emerge from it and return to it, leaving it undiminished and unaffected in its essential nature. We shall see that Baconian matter can (in Bacon’s view) explain the “diversity of entities”: it derives from matter’s inherent and unalterable productive power.⁷⁸

4. Bacon’s critique of Bernardino Telesio

As the full title indicates, *De principiis atque originibus* contains a lengthy critique of Bernardino Telesio’s *De rerum natura*.⁷⁹ Bacon acknowledges that “it may perhaps hardly seem worth while going to so much trouble to controvert Telesio’s philosophy.”⁸⁰ However, he identifies Telesio as “a corrector of certain doctrines [*Placitorum*], and the first of the new philosophers.”⁸¹ According to Bacon, Telesio has turned the reasoning of the Peripatetics against them. Bacon describes him as

⁷⁶ Bacon, *DPAO, OFB*, VI, 223-225.

⁷⁷ Bacon, *DPAO, OFB*, VI, 225.

⁷⁸ Bacon, *DPAO, OFB*, VI, 211.

⁷⁹ According to Rees, “Bacon seems to have used the 1586 edition of *De rerum natura*,” *OFB*, VI, 423.

⁸⁰ Bacon, *DPAO, OFB*, VI, 259.

⁸¹ Bacon, *DPAO, OFB*, VI, 259. Bacon adds that he is not concerned “with Telesio as such, but him as a restorer [*instauratore*] of the philosophy of Parmenides,” 259. According to Bacon, “the speculation was excellent in Parmenides and Plato (although in them it was but a bare speculation), ‘that all things by a certain scale ascend to unity,’ *DAS, SEH*, IV, 362, cf. I, 567. In Bacon’s account, the unique principle of matter is a unifying principle – hence he identifies the appetitive power of the atom with the summary law of nature. Bacon’s forms unify the simple natures: “it is absolutely certain that [heat, redness or death] however unlike and foreign to each other, come together [*coire*] in the form or law which governs heat, redness or death,” *NO, OFB*, XI, 257. On Bacon’s doctrine of forms see Chapter 5.

“better at knocking down than building up” (*destruendo quam astruendo melior*).⁸² However, just as the *Novum organum* comprises a *pars destruens* designed to purge the mind of “received philosophies and doctrines,” so too does Bacon’s account in *De principiis atque originibus*.⁸³ Telesio’s philosophy supplies this “refutation of Theories.”⁸⁴ Bacon’s detailed critique of Telesio’s system serves as the launch pad for his programme of reform.

Briefly (following Bacon’s reading), the active principles of Telesio are heat and cold: matter is an inactive or passive and receptive principle, similar to the prime matter of Aristotle. But Telesio’s matter (unlike Aristotelian matter) has actual being and not merely potential being. In Telesio’s account, matter is the corporeal principle of things and heat and cold are incorporeal. Matter supplies passive corporeal mass and is subject to both principles. The various qualities are all derived from the active powers of heat and cold. Light is a springing forth “of dissipated heat, which, multiplied by coming together [*coëundo multiplicatus*], becomes robust and perceptible.”⁸⁵ Cold gives rise to darkness. Rarity and density are “the textures and as it were the webs [*telas*] of heat and cold” (or the operations

⁸² Bacon, *DPAO, OFB*, VI, 224.

⁸³ Bacon, *NO, OFB*, XI, 173: “And here too I should draw the destructive part [*pars destruens*] of my *Instauration* to a close, a part perfected in the three refutations, namely the refutation of *Native Human Reason* left to itself; the refutation of *Demonstrations*; and the refutation of *Theories*, or of received philosophies and doctrines.” I have discussed Bacon’s refutation of demonstrations with regard to *prima materia*; Telesio’s philosophy supplies the refutation of theories.

⁸⁴ See Jean-Marie Pousseur, “Bacon, a Critic of Telesio,” in *Francis Bacon’s Legacy of Texts: ‘The Art of Discovery Grows with Discovery,’* ed. William Sessions (New York: AMS Press, 1990), 105-117. Pousseur asks, “What new status can [Bacon’s] principles assume in the new physics?” According to Pousseur, “nothing, in the *Novum Organum* or in the *De Augmentis*, allows a direct answer to that difficult question”, 115. I argue that the answer to that question is given in *De principiis atque originibus*. There Bacon raises the ontological status of matter: *materia prima* is the unique principle that gives rise to all the variety of things. See also Karl Schuhmann, “Telesio’s Concept of Matter,” in *Selected Papers on Renaissance Philosophy and on Thomas Hobbes*, ed. Piet Steenbakkers and Cees Leijenhorst (Dordrecht: Kluwer Academic Publishers, 2004), 99-116.

⁸⁵ Bacon, *DPAO, OFB*, VI, 225.

of heat and cold, with heat thinning and cold thickening).⁸⁶ These various interactions result in a fourfold division of the two major contrary principles (“for heat and cold are the source [*fons*], the other things emanations”).⁸⁷ Telesio’s “primary connatural qualities, heat, light, tenuity and mobility, and ... the quaternion opposed to them” constitute his philosophy of principles (see figure 2.2).⁸⁸ In Telesio’s cosmogony “the seats and stages of the first conjugation are placed in the heaven, stars and especially in the Sun, of the second in the Earth.”⁸⁹ The “four coessential and conjugate natures are,” he insists, “always together and inseparable [*perpetuo concomitantes & inseparabiles*].”⁹⁰ Hence

the heaven, from its perfect and complete heat and its highly unfolded matter [*materia maxime explicata*], is very hot, light, rarefied and mobile. The Earth, on the contrary, from its complete and unrefracted cold and extreme contraction of matter [*materia maxime contracta*], is very cold, dark, dense, utterly immobile and dreads motion exceedingly.⁹¹

This notion of unfolded and contracted matter (with its related tendency to motion or rest) will play a crucial role in Bacon’s natural philosophy.

⁸⁶ Bacon, *DPAO, OFB*, VI, 225-227.

⁸⁷ Bacon, *DPAO, OFB*, VI, 227. In Telesio’s account the “four coessential and conjugate natures are ... always together and inseparable,” *ibid.*

⁸⁸ On the role of bi-quaternion theory in Bacon’s natural philosophy see, Rees, “Francis Bacon’s Semi-Paracelsian Cosmology,” *Ambix* 22 (1975), 81-101; *idem.*, “Francis Bacon’s Semi-Paracelsian Cosmology and the *Great Instauration*,” *Ambix* 22 (1975), 161-173; *idem.*, “Matter Theory: A Unifying Factor in Bacon’s Natural Philosophy,” *Ambix* 24 (1977), 110-125; *idem.*, *OFB*, VI, xlii-xliv.

⁸⁹ Bacon, *DPAO, OFB*, VI, 227.

⁹⁰ Bacon, *DPAO, OFB*, VI, 227.

⁹¹ Bacon, *DPAO, OFB*, VI, 227. Bacon subscribes to the view that the earth is “*primum frigidum*.” In *SS* he notes that this was the opinion of the author of *De primo frigido*; it was also “the opinion of Telesius, who hath renewed the philosophy of Parmenides” (*SS, SEH*, II, 370).

Heat	Cold
Light	Darkness
Rarity	Density
Mobility	Immobility

Fig. 2.2. Telesio's bi-quaternion theory

Bacon pays particular attention to Telesio's account of the border between the heavens and the earth. This is the Earth's crust, the region of strife and mutability where contraries are at war. The above natures

have the appetite and faculty of constantly generating, multiplying and spreading themselves in all directions, of occupying the whole mass of matter, of mutually attacking and invading one another, of dislodging and ejecting one another from their proper seats and establishing themselves in them, and besides of perceiving and apprehending the force [*vim*] and actions of another nature as well as their own and, by means of such perception, of moving and adjusting themselves; and from this contest every sort of entity, action and virtue is derived.⁹²

Although Telesio attributes the above appetites to incorporeal natures, Bacon says "in some places he seems, though briefly and with hesitation, to assign to matter some power [*dotis*] of its own."⁹³ According to Bacon, Telesio intimates that matter "is neither increased nor diminished by forms and active entities, but consists of a universal sum."⁹⁴ He also refers the motion of gravity or descent to it and "throws in something about the blackness of matter."⁹⁵ Telesio then (on Bacon's reading) dreams up "the way in which such fruitful and manifold [*fœcunda & multiplex*]

⁹² Bacon, *DPAO, OFB*, VI, 231-233.

⁹³ Bacon, *DPAO, OFB*, VI, 233.

⁹⁴ Bacon, *DPAO, OFB*, VI, 233.

⁹⁵ Bacon, *DPAO, OFB*, VI, 233.

generation of entities can be induced and brought forth by this wrestling match [*certamine & lucta*].”⁹⁶ Each principle “desires, strives and fights wholly to destroy the other, and to impress itself and its own nature on matter.”⁹⁷ Even in situations of apparent concord between things, this is no more than “lack of power” (*omnino per impotentiam*).⁹⁸ In Telesio’s system, there are no “laws of alliance [*leges fœderis*] or concord.”⁹⁹ According to Telesio, “in virtue and action everything more or less comes not from the regulation [*moderamine*] of the intensive power (which strongly desires a certain wholeness) but from the strike and curb [*ictu & fræno*] of the opposite nature.”¹⁰⁰ There is “absolutely no flag ... under which (as in Peripatetic doctrine) things look after each other and conspire as if by some treaty [*concordia*].”¹⁰¹ For Telesio, “all generation, and therefore every effect in a natural body is accomplished by conquest and subjugation, not by compact or covenant [*non pacto aut fœdere*].”¹⁰² Bacon points out that “This is nothing new, since *Aristotle* also pointed out this very thing in the doctrine of *Empedocles*, namely that though *Empedocles* had made strife and friendship the efficient principles of things, in his explanation of causes he nevertheless almost always uses hostility, as if the other principle had slipped his mind.”¹⁰³ In contrast, Bacon’s system utilises the principles of both strife and friendship: the presence of chaos or system is determined by the balance of *discordia* and *concordia*.

⁹⁶ Bacon, *DPAO, OFB*, VI, 233.

⁹⁷ Bacon, *DPAO, OFB*, VI, 235.

⁹⁸ Bacon, *DPAO, OFB*, VI, 234.

⁹⁹ Bacon, *DPAO, OFB*, VI, 235.

¹⁰⁰ My trans., *DPAO, OFB*, VI, 234.

¹⁰¹ Bacon, *DPAO, OFB*, VI, 247-249.

¹⁰² Bacon, *DPAO, OFB*, VI, 249.

¹⁰³ Bacon, *DPAO, OFB*, VI, 247-249.

Bacon subscribes to Telesio's view that "the *Quantum* of Nature is eternal": "the sum of matter remains forever constant, and is not increased or diminished."¹⁰⁴ However, Bacon believes that a "formidable mental blunder, and a truly amazing one at that" has infected conventional philosophic wisdom – namely, that matter's essential nature is passive.¹⁰⁵ To characterise it as "deprived of all active virtue" has, he says, in so far as it is an error, no equivalent.¹⁰⁶ He is speaking here specifically of the power of resistance, which is ultimately matter's appetitive virtue to maintain its being. In Bacon's view this "is no passive virtue but on the contrary by far the most powerful of all, completely unconquerable, and as it were nothing but fate and necessity [*& veluti merum fatum, & necessitas*]."¹⁰⁷ Telesio's mistake is that

He acknowledges a certain and definite mass of matter, but is blind to the virtue by which it maintains its quantity, and (sunk in the bottomless pit of Peripatetic darkness) ranks it as an accessory when it is the most important thing of all, shaking one body, moving another, solid and adamantine in itself, and that from which decrees of possible and impossible spring with inviolable authority [*atque unde decreta & possibilis & impossibilis emanant autoritate inviolabili*].¹⁰⁸

Matter's absolute status as universal cause (*causa causarum*) lies in its multiplicative potential: matter hides within its folds the power to bring into being all potential worlds. Hence Bacon describes the atom as "the supreme rule of act and power [*actus et potentiae*], and the true moderator of hope and works."¹⁰⁹ In its generative capacity this enfolded power is explicated in a process which Bacon calls the multiplication (*multiplicatio*) of the power of the atom.¹¹⁰ Bacon's concept of enfolded matter lies at the heart of his cosmogony: "in the atom's body exist the

¹⁰⁴ Bacon, *AL, OFB*, IV, 77; *DPAO, OFB*, VI, 259.

¹⁰⁵ Bacon, *DPAO, OFB*, VI, 259.

¹⁰⁶ Bacon, *DPAO, OFB*, VI, 259.

¹⁰⁷ Bacon, *DPAO, OFB*, VI, 259-261.

¹⁰⁸ Bacon, *DPAO, OFB*, VI, 261.

¹⁰⁹ Bacon, *CDNR, SEH*, V, 423, cf. III, 18.

¹¹⁰ Bacon, *DPAO, OFB*, VI, 200; See also Bacon, *DSV, SEH*, VI, 655.

elements of all bodies, and in the atom's motion and virtue exist the beginnings of all motions and virtues."¹¹¹

¹¹¹ Bacon, *DPAO, OFB*, VI, 203. Bruno has the notion of enfolded matter: "Hence, every potency, every act which, in the principle, is (so to speak) enfolded [*complicatio*], united and unique, is unfolded [*esplicato*], dispersed and multiplied in other things," *Cause, Principle and Unity*, 66; cf. *Opere di Giordano Bruno e di Tommaso Campanella*, 371.

B. Simple motions

The primordial act of creation entails a process of unfolding the atom's power so that it becomes manifold. It is Cupid's appetitive power which draws the primary particles together and from the multiplication of this combinative power "all the variety of things arises and comes into being [*conflatur*]."¹¹² Bacon's use here of the term *conflare* is deliberate: it refers to the process of fusing whereby the resulting bodies are entirely dissimilar from their primordial constituents:

For there is no doubt but that the seeds of things, though equal, as soon as they have thrown themselves into certain groups and knots [*turmas et nodos*], completely assume the nature of dissimilar bodies, till those groups or knots are dissolved.¹¹³

The virtues (dense/rare, heavy/light, hot/cold etc.) of larger bodies "are products of composition and combination [*conflatae*]."¹¹⁴ It would be a gross mistake to identify this process with a mere mechanical configuration of particles. Bacon conceives of the groups and knots which emerge as conglomerations of "simple motions" (*motus simplices*) unfolded out of matter's absolute power.¹¹⁵ Hence he speaks of the need to understand the "nodi et globi motuū, and how they concurre and how they succeed and interchaung."¹¹⁶ Motions are spun together like threads – they are "connected together, complicated, continued, alternated, curbed, and repeated."¹¹⁷ The virtues of larger bodies are congeries of simple motions: "Surely as the words or terms of all languages, in an immense variety, are composed of a few simple letters,

¹¹² Bacon, *DPAO, OFB*, VI, 201.

¹¹³ Bacon, *CDNR, SEH*, V, 422, cf. III, 18.

¹¹⁴ Bacon, *DPAO, OFB*, VI, 203.

¹¹⁵ Bacon, *ANN, OFB*, XIII, 190.

¹¹⁶ Bacon, *Commentarius solutus, LL*, XI, 69.

¹¹⁷ Bacon, *ANN, OFB*, XIII, 203.

so all the actions and powers of things are formed by a few natures and original elements of simple motions.”¹¹⁸

Matter, according to Bacon, “is so adorned, prepared and formed that every virtue, essence, action and natural motion may be the consequence and emanation of it.”¹¹⁹ In his cosmogony, all motions and virtues stem from the atom by means of a process of unfolding: “Between the boundaries of dense and rare there exists a fold in matter [*Plica Materiæ*] by which it can curl up and unwind itself [*se complicat & replicat*] without a vacuum.”¹²⁰ The first unfolding gives rise to what he calls the “cardinal virtues.”¹²¹ The cardinal virtues of dense/rare, heavy/light, hot/cold, tangible/pneumatic and volatile/fixed are listed in *Abecedarium nouum naturæ* and depicted as *explicationes* (unfoldings).¹²² The first unfolding of matter gives rise to the above primordia of the “schematisms of matter” (*schematismi materiæ*). Schematism refers to matter conceived from the point of view of substratum – “the warp and the woof” of matter; simple motion refers to matter conceived from the point of view of potency (see figure 2.1).¹²³ The simple motions “emanate” (*emanare*) from the schematisms of matter.¹²⁴ The antithetic pairs denote polarising

¹¹⁸ Bacon, *CDNR, SEH*, V, 426, cf. III, 22.

¹¹⁹ Bacon, *DPAO, OFB*, VI, 209.

¹²⁰ Bacon, *HDR, OFB*, XIII, 163. When describing “Motus contractionis, sive hyles minorans interius, sive restrictionis” in *Commentarius solutus* Bacon adds “A l’Italienne” at the end of the sentence, see British Library Add. MS 27278, f. 20^v. Spedding comments that “This is what the letters look like; but can hardly be what they were meant for,” *LL*, XI, 71. I have consulted the manuscript and it is “A l’Italienne” (in Bacon’s hand). This is unsurprising given that Bruno and Telesio explain the contraction of matter in terms of a *plica materiæ*.

¹²¹ Bacon, *NO, OFB*, XI, 472; See also *DO, OFB*, XI, 38.

¹²² My trans., Bacon, *ANN, OFB*, XIII, 174-176.

¹²³ Bacon, *SS, SEH*, II, 619. On Bacon’s concept of latent schematism see Chapter 4. See also Rees, “Bacon’s Philosophy: Some New Sources with Special Reference to the *Abecedarium Nouum Naturæ*,” in *Francis Bacon: terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell’Ateneo, 1984), 223-244, on 238-244.

¹²⁴ Bacon, *ANN, OFB*, XIII, 202.

tensions (i.e. opposing simple motions) in cosmological space.¹²⁵ The “deepest” schematisms of matter are the sulphur/mercury schematisms.¹²⁶ Because Bacon conceives of dense/rare and sulphur/mercury as polarising tensions which run through all cosmological space, he designates dense/rare “*Explicatio Alpha*” and sulphur/mercury “*Schematismus Omega*.”¹²⁷ The motions which emanate from the sulphur/mercury schematisms determine the primary natures of things listed by Bacon as the “oily and watery, fat and crude, inflammable and non-inflammable, flamy and airy, stellar and pure ethereal, and finally ... sulphur and mercury.”¹²⁸ These through further combination give rise to further schematisms – fluid/stable, moist/dry, hard/soft, fragile/tensile etc. – which through combination give rise to this world (the great schematism).

The result in phenomenal terms is that ordinary macroscopic bodies are nodes of complicated motions which have attained relative stability. There is no absolute fixity at any stage of Baconian matter other than the atom which is “a principle fixed and invariable.”¹²⁹ Bacon’s notion of a fixed principle and an ever-changing flux of phenomenal being lies at the heart of his matter theory. Robert Ellis suggests that

In the interval between writing this tract [*De principiis atque originibus*] and the *Novum Organum* Bacon’s opinions seem to have undergone some change, as he has there [in *Novum organum*] condemned the atomists for asserting the existence of “*materia non fluxa*,” an obscure phrase, but which appears irreconcilable with the expression ... “*fixum et invariabile*.”¹³⁰

¹²⁵ Compare this with Thomas McEvilley’s discussion of Anaximander’s *apeirōn*: “the pairs of opposites unfold themselves out from it [the infinite] into separate polarities and recombine with one another to make the variety of forms,” *The Shape of Ancient Thought: Comparative Studies in Greek and Indian Philosophies* (New York: Allworth Press, 2002), 31-32.

¹²⁶ Bacon, *ANN, OFB*, XIII, 189.

¹²⁷ Bacon, *ANN, OFB*, XIII, 174, 191.

¹²⁸ Bacon, *ANN, OFB*, XIII, 191.

¹²⁹ Bacon, *DPAO, OFB*, VI, 211.

¹³⁰ Ellis, *SEH*, III, 73. See Bacon, *NO, OFB*, XI, 212.

On my reading, Bacon is entirely consistent. Ellis fails to distinguish between Bacon's "fixed and invariable" principle of things (the atom) and the endless flux of simple motions. Bacon accepts Heraclitus' notion of a process "by which things flowed and ebbed [*fluerent & refluerent*], like the tide, from variety to unity, and from unity to variety."¹³¹ Bacon's natural philosophy posits a flux of simple motions which has its source in a fixed and unalterable substratum – the "unchanging centre" (*centrum immutabile*).¹³²

In Bacon's account, the simple motions continually wrestle with one another for ascendancy:

Some [simple motions] are absolutely invincible; some are stronger than others and bind, curb and organise them; some cast themselves further than others; some by time and speed steal a march on others; some cherish, strengthen, enlarge and speed up others.¹³³

According to Bacon, "there is no true rest [*Quiès*] in wholes or parts save in outward appearance."¹³⁴ Rather, "that which is thought to be [rest] is the effect of some hindrance, prevention and equilibrium of motions."¹³⁵ Apparent rest occurs when nodes of simple motions are locked in a state of dynamic tension. He compares rest to a man who is pinned to the ground in a wrestling match:

If someone is pinned to the ground in a wrestling bout [*luctam*], and bound hand and foot, or held down otherwise, and yet with all his strength still struggles to get up, his resistance [*Nixus*] is no less because it gets him nowhere.¹³⁶

¹³¹ Bacon, *DPAO, OFB*, VI, 219. Bacon writes, "It is the flux of matter and the inconstancy of the physical body that requires Induction; that thereby it may be fixed, as it were, and allow the formation of notions well defined," *LL*, XIV, 377. On induction see Chapters 3, 4 and 5.

¹³² Bacon, *DPAO, OFB*, VI, 252.

¹³³ Bacon, *NO, OFB*, XI, 413-415.

¹³⁴ Bacon, *NO, OFB*, XI, 417.

¹³⁵ Bacon, *CDNR, SEH*, V, 429, cf. III, 25.

¹³⁶ Bacon, *NO, OFB*, XI, 417.

Bacon takes this notion of a wrestling match from Telesio.¹³⁷ The schematisms of matter are products of these dynamic tensions. *Schematismus* is a descriptive term for matter which can keep its form because the simple motions are locked in a state of dynamic tension. Hence Bacon also denotes the schematisms of matter as the “forms of the first class.”¹³⁸ As mentioned, schematism refers to matter viewed from the point of view of substratum. From the point of view of potency, schematisms are locked nodes of simple motions. Bacon conceives of these states of dynamic tension as “bonds” (*vincula*).

When the simple motions are not locked in dynamic tension (i.e. when there is no bond) change occurs. Hence Bacon conceives of nature’s processes as fluctuating “sums of motions” (*summæ motuum*).¹³⁹ Corruption, putrefaction, growth, alimention etc. are nodes of motions which lack dynamic stability. Bacon also lists conservation as a sum because it too comprises a node of motions, albeit with dynamic stability:

Nowhere do we come across conservation that can keep things unaltered in a straightforward way, but we do find one that can retard, blunt, and balance motions and changes for the worse with other motions and changes of a wholesome kind.¹⁴⁰

The “great sum” (*summa magna*) comprises all these lesser sums – in other words, all nature’s processes.¹⁴¹ Hence Bacon describes this as “the great sum ... concerning the vicissitudes of things.”¹⁴² In *De Interpretatione Naturae Sententiæ XII*, Bacon expresses this same thought when he speaks of “the true, eternal and

¹³⁷ However, Bacon’s system has a role for consent (see Chapter 5).

¹³⁸ Bacon, *ANN, OFB*, XIII, 191. On the Baconian doctrine of forms see Chapter 5.

¹³⁹ Bacon, *ANN, OFB*, XIII, 202.

¹⁴⁰ Bacon, *ANN, OFB*, XIII, 207.

¹⁴¹ Bacon, *ANN, OFB*, XIII, 220.

¹⁴² Bacon, *ANN, OFB*, XIII, 220.

most simple motions of nature, from whose ordered and most calculated progress this infinite variety of both the present age and of every age emerges.”¹⁴³

¹⁴³ My trans., Bacon, *DIN, SEH*, III, 787.

II. Creation *ex chao*

Matter – as the principle from which all things are generated – underpins Bacon’s discussion of the origins of the world, that is, the current system of things. In the beginning there was chaos, “a confused [*inconditam*] mass or congregation of matter.”¹⁴⁴ We have seen that Cupid and chaos should not be taken as terms for distinct entities. In the beginning there is *materia prima* and its appetitive power (signified by Cupid). The chaos refers to matter’s lack of form *in toto*: in the whole, chaos is dark, mysterious and incomprehensible. However, Cupid is a person with identifiable characteristics by which Bacon intends that the *materia prima* has form within this chaos. While there is chaos, matter is unformed *in toto* but there can be attempts at worlds. In Bacon’s terms, “the agitations and motions of matter produced at first imperfect and ill-compacted structures of things, that would not hold together, – mere attempts at worlds [*imperfectas et male cohærentes rerum compages produxisse, et veluti tentamenta mundorum*].”¹⁴⁵ The motions of matter produced *compages* which did not cohere and nothing held its form. During this time, matter’s productive power is unrestrained, hence nothing lasts. Things are generated and immediately devoured. For Bacon, chaos refers to a time of “continual and transitory changes” *in toto*.¹⁴⁶ As he puts it, “For so long as in the universal frame of matter discord was stronger than concord and prevailed over it,

¹⁴⁴ My trans., Bacon, *DPAO, OFB*, VI, 199.

¹⁴⁵ Bacon, *DSV, SEH*, VI, 723, cf. 649.

¹⁴⁶ Bacon, *DSV, SEH*, VI, 724, cf. 649.

there could be no change except of the whole together [*mutatio per totum necessario facta est, atque in ipsa fabrica integrali*].”¹⁴⁷

But there comes a point when concord becomes “powerful and predominant.”¹⁴⁸ Cupid’s “principal and peculiar power [*Vis*] is effective in uniting bodies; and the keys of ether, land and sea were also entrusted to him.”¹⁴⁹ Cupid’s appetitive power gave rise to the Earth, or as Bacon’s gloss has it, “in process of time a fabric was turned out which could keep its form.”¹⁵⁰ According to Bacon, the generation of the Earth marks the establishment of schematism or system:

The most ancient wisdom set down the Earth next to Chaos, and made it first the parent, then the bride of Cœlum, from which union all things have sprung. But it is not therefore to be understood that the ancients had ever established the Earth as the principle of essence, but as the principle, or rather origin, of schematism or system.¹⁵¹

Given that chaos represents matter unformed *in toto*, the first act of order, as a result of Cupid’s cohering power, is to bring this totality under a primary system. This formation of matter *in toto*, Bacon calls “the great schematism” (*schematismus magnus*).¹⁵² The Earth is described as the parent of Cœlum because the generation of the Earth is the cause of system. The presence of chaos or system is determined by the balance of *discordia* and *concordia*. When *discordia* is prevalent, matter is unformed *in toto*. Upon the formation of the Earth, *concordia* becomes prevalent. The great schematism is a balance of contrary powers, a polarity anchored at both ends (dense Earth/rare Heaven). There is a dynamic balance of opposing forces.

¹⁴⁷ Bacon, *DSV, SEH*, VI, 724, cf. 650.

¹⁴⁸ Bacon, *DSV, SEH*, VI, 724, cf. 650.

¹⁴⁹ Bacon, *DPAO, OFB*, VI, 197.

¹⁵⁰ Bacon, *DSV, SEH*, VI, 723, cf. 649.

¹⁵¹ Bacon, *DPAO, OFB*, VI, 211-213.

¹⁵² Bacon, *DPAO, OFB*, VI, 250. See also *ANN, OFB*, XIII, 220.

Bacon suggests the Earth as the anchor of the system must be immobile, otherwise “the System comes apart and disperses.”¹⁵³

Matter’s appetitive power is a source of both *concordia* and *discordia*. Hence, the fable of Cupid pertains to the “cradle” (*cunabula*) of nature.¹⁵⁴ Matter has a restless desire to change but while *concordia* has the upper hand, this destructive *impetus* is repressed:

With regard to the audacity of Pan in challenging Cupid to fight, it refers to this, – that matter is not without a certain inclination and appetite to dissolve the world and fall back into the ancient chaos; but that the overswaying concord of things (which is represented by Cupid or Love) restrains its will and effort [*malitia et impetus*] in that direction and reduces it to order. And therefore it is well for man and for the world that in that contest Pan was foiled.¹⁵⁵

The contest between Pan and Cupid refers to that between *discordia* (Pan) and *concordia* (Cupid). The stability of the world depends upon Cupid’s winning this fight. The great schematism will be preserved for so long as *concordia* is dominant. Following the establishment of the great schematism when the world became “settled in respect of its mass and moving force [*vi*],” there was a period of lesser chaos.¹⁵⁶ The “*common bond of the System*” constrains matter’s destructive impulses, binding the great schematism with an adamantine chain:

The same thing is alluded to in that other circumstance of the catching [*implicato*] of Typhon in a net: because however it be that vast and strange swellings (for that is the meaning of Typhon) take place occasionally in nature, – whether of the sea, or the clouds, or the earth, or any other body – nevertheless all such exuberances and irregularities are by the nature of things caught and confined [*implicat et coërcet*] in an inextricable net, and bound down as with a chain of adamant [*et veluti catena adamantina devincit*].¹⁵⁷

¹⁵³ Bacon, *TC, OFB*, VI, 179.

¹⁵⁴ Bacon, *DSV, SEH*, VI, 655.

¹⁵⁵ Bacon, *DSV, SEH*, VI, 712-713, cf. 639.

¹⁵⁶ Bacon, *DSV, SEH*, VI, 724, cf. 650.

¹⁵⁷ Bacon, *DSV, SEH*, VI, 713, cf. 639-640.

The “inextricable net” is “*the common bond of the System*” (*commune vinculum Systematis*) which binds down the destructive force of matter, preventing the great schematism from relapsing into chaos.¹⁵⁸ Bacon suggests that “things settled at last into a more durable state of consent and harmonious operation.”¹⁵⁹ In the end, there was “repose” (*otium*).¹⁶⁰

Bacon draws attention to “the opinion of Democritus that the world might yet relapse into its ancient confusion and intervals of no government.”¹⁶¹ The import of the fable of Cœlum is, as Bacon says, the eternity of matter and the transience of worlds. In *De principiis atque originibus* he states:

Were there only one principle of things, it ought to provide a nature equally inclined towards the generation of things and to their dissolution. For the nature of a principle is that things should resolve themselves into it as readily as they should be produced out of it [*Tam enim est principii, ut res in illud solvantur, quam ut res ex illo gignantur*].¹⁶²

Bacon has identified Cupid as “the original and unique force” (*vis antiquissima et unica*) and so Cupid must have a tendency both to give birth to things and to dissolve things.¹⁶³ We have seen that Baconian matter does indeed have “an appetite to dissolve” as well as an appetite to procreate. The balance of *concordia* or *discordia* is the pivot upon which the world turns.

Once the world has form *in toto*, “change proceeds part by part only, the total fabric remaining entire and undisturbed [*inconcussa*].”¹⁶⁴ The transition from change through the whole to change through the parts constitutes the change from chaos to system. In *De sapientia veterum*, Bacon says Cupid himself “out of chaos begot all

¹⁵⁸ Bacon, *TC, OFB*, VI, 192.

¹⁵⁹ Bacon, *DSV, SEH*, VI, 724, cf. 650.

¹⁶⁰ My trans., Bacon, *DSV, SEH*, VI, 650.

¹⁶¹ Bacon, *DSV, SEH*, VI, 724, cf. 650.

¹⁶² Bacon, *DPAO, OFB*, VI, 223.

¹⁶³ My trans., Bacon, *DSV, SEH*, VI, 655.

¹⁶⁴ Bacon, *DSV, SEH*, VI, 724, cf. 650.

things, the gods included.”¹⁶⁵ Cupid’s appetitive power is eternally present in the chaos and matter, “by the power originally given to it” (*ex vi primo indita*), gathers and turns itself into the great schematism.¹⁶⁶ *De principiis atque originibus* begins with the statement that Cupid himself “mingled with Cœlum begat both the gods and all things” (*cum cœlo mistus, & Deos & res universas progenuit*).¹⁶⁷ Cupid himself has the power to fashion all things out of chaos but in order for his generative (rather than destructive) power to be expressed, system or schematism is required. Cœlum signifies system and the union of Cupid (matter’s power) and Cœlum (system) gives rise to all things.¹⁶⁸ We will see in Chapter 5 that the artful manipulation of bodies involves a recapitulation of the original binding activity of Cupid.

¹⁶⁵ Bacon, *DSV, SEH*, VI, 729, cf. 655.

¹⁶⁶ Bacon, *DPAO, OFB*, VI, 252.

¹⁶⁷ My trans., Bacon, *DPAO, OFB*, VI, 196. Ellis proposes substituting *chao* for *cælo* and this emendation is confirmed by Spedding and Rees (*SEH*, III, 67, 79; *OFB*, VI, 196). I reject their grounds for making this correction. Spedding notes that “this [Ellis’s] conjecture is confirmed by the corresponding passage in the *De Sap. Vet.*, where for *cum cæolo mistus* we have *ex chao*,” *SEH*, III, 67, n. 3. In *DSV* Bacon states: “And himself [Cupid] out of Chaos begot all things, the gods included [*Ipse autem ex Chao et deos et res universas progenuit*]” (*DSV, SEH*, VI, 729, cf. 655). However, Bacon’s use of the phrase “mingled with” (“*cum ... mistus*”) in *DPAO* determines that the term *chao* is inappropriate here. It makes sense for Bacon to say that Cupid begot all things *ex chao* because Love is the organising principle. But it does not make sense for him to say that Cupid mingled himself *cum chao* because chaos and Cupid are not distinct entities – chaos merely refers to *materia prima* (Cupid) unformed *in toto* (*DPAO, OFB*, VI, 197). Moreover, it is unsurprising that Bacon should mention Cœlum in the opening of *DPAO* which treats of principles and origins “*According to the Fables OF CUPID AND CÆLUM*” (*DPAO, OFB*, VI, 197, emphasis in original). In *DSV*, the fables of Cupid and Cœlum are treated separately.

¹⁶⁸ Interestingly, Barbara Carmen Garner points out that for Natalis Comes (whose *Mythologia* was well known to Bacon), “Creation ... is both *ex chao* and *ex nihilo*. Chaos is ordered by divine will (Mercury) and brings forth Coelus, who in turn becomes a creator. Coelus brings forth strife and friendship, the two forces necessary to generation, and Saturn (Time) is created. Then God intervenes directly to bring forth the elements *ex nihilo* and subsequently various unions take place. The whole of this creation, including chaos, is known as Pan or universal nature,” “Francis Bacon, Natalis Comes and the Mythological Tradition,” *Journal of the Warburg and Courtauld Institutes* 33 (1970), 264-297, on 267. In Bacon’s account, God’s intervention is notably lacking.

III. Nature free and nature bound

One termination of the unfolding of matter manifests as the current world, haphazardly arrived at and sustained by habit. This is nature “free” (*libera*), Bacon says, “follow[ing] her ordinary course of development [*cursu consueto se explicans*]; as in the heavens, in the animal and vegetable creation, and in the general array of the universe.”¹⁷¹ He conceives of nature as rising to a point like a pyramid:

Individuals, which lie at the base of nature, are infinite in number; these are collected into Species, which are themselves manifold; the Species rise again into Genera; which also by continual gradations are contracted [*contrahuntur*] into more universal generalities, so that at last nature seems to end as it were in unity [*ut tandem natura tanquam in unum coire videatur*].¹⁷²

This unity of nature is the primary impulse or desire of *materia prima* to cohere, giving rise to the infinity of individual things through a process of unfolding. The germinal elements of everything that can possibly be are contained in enfolded matter. The move from the one to the many, characterised by the pyramidal figure, involves a successive constraint on the absolute power of primary matter in so far as it is a unity. This move, although a contraction in terms of potency, entails a concomitant outward expansion of generative power. We have seen how this restraint on matter’s potency occurs via a process of binding. The multiple powers of matter, already inherent in the unformed chaos, are organised and restrained by Cupid’s primary quality, viz., love or desire. It becomes Cupid’s function, through this binding capacity, to maintain a dynamic tension within the great schematism. This dynamic tension also pertains to individual bodies where stability is always a

¹⁷¹ Bacon, *DAS, SEH*, IV, 295, cf. I, 496.

¹⁷² Bacon, *DAS, SEH*, IV, 321, cf. I, 525.

matter of the dominance of some motion (or motions) over others. Putrefaction, for example, illustrates how at the local level this tension is altered through an upheaval in the internal dynamics among the motions of individual bodies, while at the cosmic level the great schematism retains coherence.

The most significant feature of Bacon's discussion of principles lies in the possibility of an "alternative universe ... of things."¹⁷³ The cosmogonical process of binding the absolute power of matter, the fount of all things, entails that not all things are produced. Successive limitations constituting the current *fabrica* of nature leaves infinite possibilities requiring alternative limitations on matter. It is this concept of possibility which marks out Bacon's material monism as distinct from other renaissance matter theorists. The point can be brought out more clearly by examining once again Bacon's critique of Telesio. His detailed and positive exposition of Telesio's system culminates in a crucial departure from it. Telesio faltered when he considered the structure of the world "*simpliciter*."¹⁷⁴ For this reason, Bacon calls Telesio's philosophy a "pastoral philosophy" – the result of calm consideration on the actual state of things as if the actual state were the only possible state.¹⁷⁵ Telesio mistakenly considered the world "as if in idleness."¹⁷⁶ His greatest error, says Bacon, is that "he sets up such a system as may seem eternal, and supposes neither Chaos nor changes in the great schematism."¹⁷⁷ In the foregoing discussion, I have maintained that chaos is central to Bacon's cosmogony because it exhibits matter's unrestrained powers. In that condition no system can possibly be sustained. Hence a limitation of this primordial power is necessary if matter is to

¹⁷³ Bacon, *PAH, OFB*, XI, 455.

¹⁷⁴ Bacon, *DPAO, OFB*, VI, 250.

¹⁷⁵ Bacon, *DPAO, OFB*, VI, 251. See also *AL, OFB*, IV, 93.

¹⁷⁶ Bacon, *DPAO, OFB*, VI, 251.

¹⁷⁷ Bacon, *DPAO, OFB*, VI, 251.

produce any system at all: the current system is not a teleological necessity but only one possible state. Telesio considered matter to be ultimate but saw the world in terms of finality. In contrast, Bacon argues that “a person who philosophizes according to the sense alone may assert the eternity of matter but deny the eternity of the world as we see it.”¹⁷⁸ This is of course Democritus’ view and the view which Bacon expresses in his interpretation of the fable of Cœlum. Telesio’s philosophy applies only to the ordinary course of nature – the current system of things. The powers of matter, Bacon insists, are not fully utilised in this world, leaving a remainder of endless possibilities. Bacon is attempting a radical transformation of the concept of nature itself. Nature’s ordinary course (the current world) represents only a single facet of the possible faces which nature could present. This leads to the striking tenet that forms the cornerstone of Bacon’s programme, namely, that the artful manipulation of bodies involves a recapitulation of the original binding activity of Cupid. In Bacon’s programme, art refers to the shifting of the current system out of its habitual course in order to actualise hidden facets of nature. In brief, art for Bacon is the operative analogue of the primary cosmogonical contraction exercised in Cupid’s restraining and binding of matter’s absolute potency.

Indications of the hidden facets of nature are evidenced by the occurrence of marvels. Hence in *The Advancement of Learning* Bacon says he wants “a substantiall and seuere Collection of the HETEROCLITES, or IRREGVLARS of NATVRE” because these are “workes of Nature, which haue a Digression, and Deflexion from the ordinary course of Generations, Productions & motions.”¹⁷⁹ These illustrations of deviation are important in his natural history programme

¹⁷⁸ Bacon, *DPAO, OFB*, VI, 251.

¹⁷⁹ Bacon, *AL, OFB*, IV, 63.

because, as he puts it, bordering instances are useful for “leading the intellect from what does exist to what may exist.”¹⁸⁰ Marvels or “Pretergenerations” are of particular interest to Bacon because they demonstrate that matter’s powers can come into play even in fixed systems.¹⁸¹ He concludes that marvels are the result of “impediments.”¹⁸² These impediments are additional limits, caused by a self-binding occurrence in matter’s activities, giving rise to unusual manifestations – signs that nature has left its customary pathways. In other words, nature acts in such a way as to limit its own power. For the Baconian investigator, marvels offer immediate sensory confirmation that nature’s fecundity extends beyond its ordinary course and that the dynamical network of motions is not irrevocably stabilised and is therefore capable of further distortion via human operative power.

However, it is the mechanical arts which indicate the true extent of matter’s potential. Telesio’s account of the world would have been “likely,” Bacon says, if nature were considered in isolation, that is, removed from the effects of men and the mechanical arts which both “vex matter.”¹⁸³ A clear example of the connection between binding and operative possibility can be seen in Bacon’s analogy between Proteus’ deployment of his unused powers when bound and nature’s capacity to “transform itself” into new species when vexed.¹⁸⁴ Left to his own devices, the pastoral Proteus conforms to Telesio’s “pastoral” account:

¹⁸⁰ Bacon, *NO, OFB*, XI, 301.

¹⁸¹ Bacon, *PAH, OFB*, XI, 454.

¹⁸² Bacon, *DGI, OFB*, VI, 100.

¹⁸³ Bacon, *DPAO, OFB*, VI, 251.

¹⁸⁴ On Bacon’s interpretation of the Proteus myth see Newman, *Promethean Ambitions*, 263-265; Peter Pesic, “Wrestling with Proteus: Francis Bacon and the ‘Torture’ of Nature,” *Isis* 90 (1999), 81-94; Briggs, *Francis Bacon and the Rhetoric of Nature*, 32-40, 142-150; Lemmi, *The Classic Deities in Bacon*, 91-98. None of these accounts relate the Proteus myth to Bacon’s wider programmatic aims, viz., his concept of nature bound as a complement to nature free.

Proteus...was herdsman to Neptune [*Neptuno pastorem*] ... [and] it was his custom every day at noon to count his flock of seals then go to sleep. And if any one wanted his help in any matter, the only way was first to secure his hands with handcuffs, and then to bind him with chains [*vinculis constringeret*]. Whereupon he on his part, in order to get free, would turn himself into all manner of strange shapes – fire, water, wild beasts, &c., till at last he returned again to his original shape.¹⁸⁵

In Bacon's philosophical reading of the myth, Proteus unconstrained represents the ordinary course of nature, that is, "nature free." The current world, sustained by habit, is signified by Proteus' custom of counting his flock then going to sleep. The ordinary course of nature's regularities preserves its otiose state. Bacon's reference to Telesio's system as merely a "pastoral" philosophy makes sense because the latter focused solely on matter's lazy, habitual course. As Bacon puts it,

The herd or flock of Proteus, seems to be nothing else than the ordinary species of animals, plants, minerals, etc. in which matter may be said to diffuse and use itself up; insomuch that having once made up and finished those species it seems to sleep and rest [*dormire et quiescere*] as if its task were done; without applying itself or attempting or preparing to make any more. And this is what is meant by Proteus counting his herd and then going to sleep.¹⁸⁶

In Telesio's account, matter rests "as if its task were done" and hence the world terminates in a finality. In contrast, Bacon suggests that this world, the ordinary course of nature, manifests a single aspect of nature's multifaceted possibility. Matter's powers are not used up, hence

If any skilful Servant of Nature shall bring force to bear on matter, and shall vex it and drive it to extremities as if with the purpose of reducing it to nothing, then will matter (since annihilation or true destruction is not possible except by the omnipotence of God) finding itself in these straits, turn and transform itself into strange shapes [*in miras rerum transformationes et effigies se vertit*].¹⁸⁷

¹⁸⁵ Bacon, *DSV, SEH*, VI, 725, cf. 651.

¹⁸⁶ Bacon, *DSV, SEH*, VI, 725, cf. 651.

¹⁸⁷ Bacon, *DSV, SEH*, VI, 726, cf. 652.

The eternity of matter implies neither further creation nor destruction of its original quantum. It is a fundamental principle of Bacon's vision that this quantum will make further use of its hidden powers when vexed or "bound" (*constricta*).¹⁸⁸

The significance of the central Baconian concept of nature bound, as a complement to nature free, has been utterly overlooked. Nature bound refers to the shifting of nature out of its ordinary course. Bacon maintains that nature limits its operations so that its manifestations arrange themselves in customary or habitual modes of action, leaving other pathways unused. This notion underpins the following passage:

Natural is ... set against artificial; these are potentialities for being but by a particular efficient, namely by nature itself or by the hand of man. For it is not possible for the majority of artificial bodies to exist except by the hand of man [*Non enim possibile est vt pleraque artificialium existant nisi per manum hominis*].¹⁸⁹

The precise formulation of Bacon's words is important: the alternative universe that he has in mind comprises novel bodies which cannot "exist *except* by the hand of man" (my emphasis). In figure 2.3 the dark grey area on the left represents the ordinary species of animals, plants, minerals, etc. – those produced by nature free. The light grey area of overlap comprises imitations of nature (*imitationes naturæ*) – bodies which can be produced both by nature free and by the hand of man (nature bound). For example, pure gold can both be found in sands (in which case it belongs to the category of *naturalia*) and be refined by a furnace (in which case it belongs to the category of *artificialia*). Hence, all the bodies represented by the circle on the left can exist without human intervention. This is why Bacon says that "it is not possible for the *majority* of artificial bodies to exist except by the hand of man" (my

¹⁸⁸ Bacon, *DGI, OFB*, VI, 98.

¹⁸⁹ My trans., *ANN, OFB*, XIII, 218. I have given a literal translation to bring out Bacon's use of the partitive genitive. The majority of the class of artificial bodies depend upon man's intervention for their existence. Only a small subset of the class of artificial bodies (the *imitationes naturæ*) do not depend upon man's intervention.

emphasis). There is a small subset of artificial bodies (for example, refined gold, artificial rainbows etc.) which can also come to exist as natural productions without human intervention.¹⁹⁰ However, it is the unshaded part of the diagram which Bacon is interested in – the large number of artificial bodies which cannot “exist *except* by the hand of man” (my emphasis). Without man’s intervention, these bodies will never come into being. True *nova* lie outside of nature’s ordinary course – as Bacon puts it, “the *magnalia* of nature generally lie out of the common roads and beaten paths.”¹⁹¹ The fact that Bacon considers these bodies to be both great works of nature and *artificialia* is crucial. By paying strict attention to Bacon’s formulations, disputes over Bacon’s stance on the art-nature relationship can be resolved. For Bacon, artificial bodies are simply bodies produced by nature bound, that is, nature constrained by art. His operative science of magic (Bacon’s designation) is a science of deviation. This science engages in the systematic production of heteroclitics or marvels through the precise application of impediments resulting in things which lie outside nature’s habitual paths. In *Novum organum* he says, “nature of herself

¹⁹⁰ There is a crucial issue here concerning the status of *imitationes naturæ* in terms of the relationship between human knowledge and operative power. Following Pérez-Ramos, Newman argues that producing such imitations as the artificial rainbow and artificial gold “is the foundation of Bacon’s famous maker’s knowledge, for it is the identity of the natural and the artificial product that allows man to certify his knowledge of the former’s causes by creating the latter,” (*Promethean Ambitions*, 261). On my reading of Bacon, knowledge of forms is proven only by systematically producing *nova*, “things of the kind which neither the vicissitudes of nature, nor hard experimenting, nor pure accident could ever have actualised, or human thought dreamed of” (Bacon, *NO, OFB*, XI, 203). Although imitations play a crucial role in the Baconian programme, they do not fulfil the criterion of true *nova*. As I discuss in Chapter 5, imitations demonstrate knowledge of material and efficient causes: “by the knowledge of Phisicall causes, there cannot faile to followe, many indications and designations of new particulars, if men in their speculation will keepe one eye vpon vse & practise. But these are but Coastings along the shoare, *Premendo littus iniquum*” (*AL, OFB*, IV, 89; cf. Horace, *Od. II. x. 3*). According to Bacon, knowledge of material and efficient causes “carrieth men in narrow and restrained waies, subiect to many accidents of impediments, imitating the ordinarie flexuous courses of Nature.” In contrast, knowledge of forms “doth enfranchise the power of Man vnto the greatest libertie, and possibilitie of workes and effects” (*AL, OFB*, IV, 85). For the view that Bacon envisioned man’s domination over nature, not imitation of nature, see Benjamin Farrington, *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964), 27-29. For an alternative reading, see Peter J. Zetterberg, “Echoes of Nature in Salomon’s House,” *JHI* 43 (1982), 179-193.

¹⁹¹ Bacon, *DAS, SEH*, IV, 420, cf. I, 632.

supplies these sparingly, but what she may do when her folds have been shaken out ... time will show.”¹⁹²

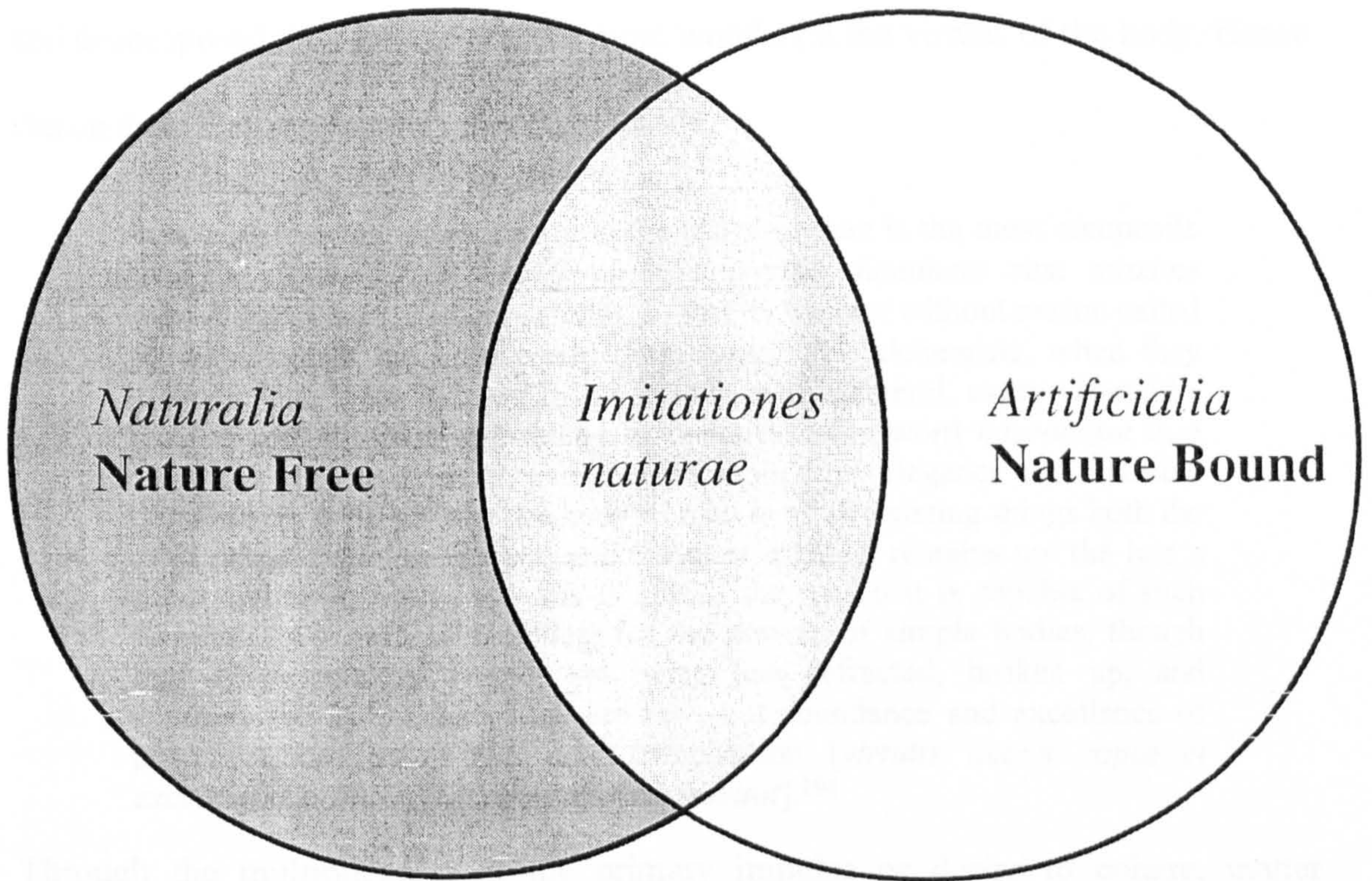


Fig. 2.3. The relationship between *naturalia* and *artificialia*

¹⁹² Bacon, *NO*, *SEH*, IV, 245; cf. *OFB*, XI, 442.

At the level of matter's hidden or occult powers, unused possibility denotes, for Bacon, unrealised combinations of motions. The simple motions are "composed, decomposed, and composed again in manifold ways."¹⁹³ The production of new species depends upon producing new combinations of motions. The more composed and decomposed the motions are, the more wonderful the virtues of the body. Hence Bacon describes man as the most mixed body:

It is most true that of all things in the universe man is the most composite [*omnium rerum quas universum complectitur hominem rem maxime compositam esse et decompositam*], so that he was not without reason called by the ancients the little world. For though the Alchemists, when they maintain that there is to be found in man every mineral, every vegetable, &c., or something corresponding to them, take the word *microcosm* in a sense too gross and literal, and have so spoiled the elegance and distorted the meaning of it, yet that the body of man is of all existing things both the most mixed [*maxime mistum*] and the most organic, remains not the less a sober and solid truth. And this is indeed the reason it is capable of such wonderful powers and faculties; for the powers of simple bodies, though they be certain and rapid, yet being less refracted, broken up, and counteracted by mixture, they are few; but abundance and excellence of power resides in mixture and composition [*virtutis autem copia et excellentia in mistura et compositione habitat*].¹⁹⁴

Through the multiplication of the primary impulse or desire to cohere, matter expresses its creative tendency via the combining and recombining of its primordial powers. Until all possible combinations have been tried out, matter's potential has not been realised. In the creation of the world, Cupid "has very little providence; but directs his course, like a blind man groping, by whatever he finds nearest."¹⁹⁵ In other words, the primordial powers randomly combine. The ordinary species of things were formed when nodes of motions haphazardly fused in dynamic tension. Thus it is through "the aggregation and control [*dispensatione*] of the simple motions" that the production of *nova* is achieved.¹⁹⁶ The creation of new species –

¹⁹³ Bacon, *CDNR, SEH*, V, 426, cf. III, 21.

¹⁹⁴ Bacon, *DSV, SEH*, VI, 747, cf. 671.

¹⁹⁵ Bacon, *DSV, SEH*, VI, 731, cf. 656.

¹⁹⁶ Bacon, *ANN, OFB*, XIII, 203.

trivially, as Bacon laments, signified by the term “art” – depends upon reconfiguring these nodes of motions.

Bacon’s vision was nothing less than a harnessing of nature’s appetitive power in order to create *nova opera* (new works) by discovering new ways of binding nature, restricting its inherent power, and thereby causing it to transform itself into new schematisms:

We should investigate those appetites and inclinations of things by which all that variety of effects and changes which we see in the works of nature and art is made up and brought about [*conflatatur et emergit*]. And we should try to enchain Nature, like Proteus; for the right discovery and distinction of the kinds of motions are the true bonds of Proteus. For according as motions, that is incentives and restraints [*incitationum et cohibitionum*], can be spurred on or tied up [*stimuli et nodi adhibentur*], so follows conversion and transformation of matter itself.¹⁹⁷

Discovery of the “true bonds of Proteus” – the simple motions – is the key to nature’s metamorphic potential. For Bacon, art is nothing other than a goading and a holding in restraint of sums of motions. The phrase “incentives and restraints” is an apt and succinct description of Cupid’s appetitive power. Cupid both excites and goads whilst restraining and holding back in stabilised structures (schematisms). In the artful manipulation of bodies, matter’s power is constrained. The simple motions are the locus of all power because change supervenes on motion. Hence Bacon describes “the transformation [*versionis*] or metamorphosis of bodies” as “a really noble and rare sum [of simple motions] ... a most powerful effect in nature and one by which human power is ... raised to the highest degree.”¹⁹⁸ The key to matter’s appetitive power is knowledge of forms – the laws determining matter’s behaviour.¹⁹⁹ This terminus of knowledge can be seen in the following passage:

¹⁹⁷ Bacon, *CDNR, SEH*, V, 425, cf. III, 20-21.

¹⁹⁸ Bacon, *ANN, OFB*, XIII, 209.

¹⁹⁹ Knowledge of consenting bodies requires knowledge of forms. For a detailed treatment of Bacon’s doctrine of forms see Chapter 5. However, it should be emphasised that a Baconian form is

For the principles, fountains, causes, and forms of motions, that is, the appetites and passions of every kind of matter, are the proper objects of philosophy; and therewithal the impressions or impulses of motions, the restraints and reluctations, the passages and obstructions, the alternations and mixtures, the circuits and series; in a word, the universal process of motions.²⁰⁰

Although Bacon uses the scholastic term “motion” (*motus*) to refer to the causes of change, he is very clear on how his concept of motion differs from the scholastic notion. Bacon’s science of magic is nothing less than total understanding and control of motions so that it becomes possible

By proper methods and a course of application suitable to nature [*ministerium naturæ convenientia*], to acquire the power of exciting, restraining, increasing, remitting, multiplying, and calming and stopping any motion whatever in a matter susceptible of it; and thereby to preserve, change, and transform bodies.²⁰¹

The scholastics (in Bacon’s view) deal only with observable changes (generation, corruption etc.) and regard these as expressions of motion. In Bacon’s account phenomenal change is a consequence of sums of motions: these sums of motions are conglomerations of simple motions. Cataloguing the observable properties, the end points of change, is merely a description of nature’s effects. In order to produce effects we must deal directly with the simple motions – the fundamental appetites of bodies. According to Bacon, the scholastics reflect solely on the “static principles – *whence* [*ex quibus*] – and not the moving ones – *whereby* [*per quæ*] – things occur.”²⁰² The former, he argues, refer to measures of change, the latter to the process of change itself:

These things [generation, corruption etc.], if you examine them more deeply and carefully, are the measure of motion, and periods or courses and as it

not a recipe. For Bacon, a form describes the limitation of nature’s power which gives rise to a given simple nature.

²⁰⁰ Bacon, *CDNR, SEH*, V, 426, cf. III, 21-22.

²⁰¹ Bacon, *CDNR, SEH*, V, 426, cf. III, 22.

²⁰² Bacon, *NO, OFB*, XI, 105 (italics in original).

were tasks of motions; not real differences [*veræ differentiæ*]; for they point out what has been done, but scarce intimate the manner of doing it.²⁰³

The scholastic “generalities” concerning motion “are nothing but spectres and appearances that float and play on the surface of things, as on water.”²⁰⁴

In contrast, the object of Bacon’s inquiry is knowledge of “the ways and means of ... mutations and transformations” of things.²⁰⁵ The Baconian investigator seeks out knowledge of how specific arrangements of matter (schematisms) have come about: which simple motions bring about which conjunctions of properties. In Bacon’s view, knowledge of material configurations without knowledge of “by what force [*qua vi*] or in what manner they come together” is useless.²⁰⁶ By way of illustration he asks, “is a man who knows the simple ingredients of treacle, able for certain to make that compound?”²⁰⁷ Principles that tell us merely “of what [*ex quibus*] things are made up [*conflentur*] and consist” are, he says, “dead principles.”²⁰⁸ In Bacon’s vivid imagery, we should investigate nature’s “living faculties and powers,” not her “corpse.”²⁰⁹ We will see in Chapter 5 that Bacon identifies form with *natura naturans* (nature creating).²¹⁰ The natural philosopher “should investigate those appetites and inclinations of things by which [*a quibus*] all that variety of effects and changes ... is made up and brought about [*conflatur et emergit*].”²¹¹ Knowledge of the simple motions which lie at the “root” (*radix*) of

²⁰³ Bacon, *CDNR, SEH*, V, 425-426, cf. III, 21.

²⁰⁴ Bacon, *CDNR, SEH*, V, 425, cf. III, 20.

²⁰⁵ Bacon, *CDNR, SEH*, V, 424, cf. III, 19.

²⁰⁶ Bacon, *CDNR, SEH*, V, 424, cf. III, 19.

²⁰⁷ Bacon, *CDNR, SEH*, V, 424, cf. III, 20.

²⁰⁸ Bacon, *CDNR, SEH*, V, 424, cf. III, 19-20.

²⁰⁹ Bacon, *CDNR, SEH*, V, 424, cf. III, 20.

²¹⁰ Bacon, *NO, OFB*, XI, 200.

²¹¹ Bacon, *CDNR, SEH*, V, 425, cf. III, 20.

manifest properties will permit man to direct change.²¹² This is the real import of the purported Baconian phrase “knowledge is power.”²¹³ The simple motions and their hidden possibilities constitute the material basis of Bacon’s programme: “It is most certain,” he says, “that by how much the more simple motions are discovered, by so much will the power of man be increased ... and strengthened for the production of new works [*nova opera*].”²¹⁴

²¹² Bacon, *DAS, SEH*, IV, 356; cf. I, 560.

²¹³ In *NO* Bacon says “Human knowledge and power come to the same thing, for ignorance of the cause puts the effect beyond reach,” *OFB*, XI, 65.

²¹⁴ Bacon, *CDNR, SEH*, V, 426, cf. III, 22. Rees notes that “The process of assimilating these [simple motions] ... to our knowledge of [Bacon’s] philosophy still has some way to go, and ought to come high on the list of suitable cases for further investigation,” *OFB*, XI, lxxxix. Chapter 5 elaborates on the role of Bacon’s doctrine of simple motions in his programme of reform.

IV. Conclusion

In the epigraph to this chapter, Bacon tentatively singles out the inquiry into “the first condition of seeds or atoms” as “the most useful of all.” The atom (primary matter) is nothing less than “the supreme rule of act and power, and the true moderator [*moderatrix*] of hope and works.” *Moderatrix* denotes that which rules, governs and directs. Bacon could not have chosen a more apt description of plenipotentiary matter: the term demonstrates the superlative position to which he raises the atom. In his efforts to draw out the potential hidden within nature’s folds, Bacon’s elevation of matter would not only have upset theological orthodoxies – there was also, as he points out in *Novum organum*, an endemic scepticism regarding the powers of human cognition and the powers of art. In the preface, he contrasts “the arrogance of dogmatism” with “the hopelessness of *Acatalepsy*.”²¹⁵ The “more ancient of the Greeks,” that is, the pre-Socratics, “wisely steered a middle course” between this Scylla and Charybdis.²¹⁶ This chapter demonstrates the foundational importance Bacon attaches to matter and its properties. The middle course between dogmatism and scepticism could not be achieved through philosophical disputation but only by strategically leading the mind to grasp the potential contained in matter.

Bacon’s main criticism of Telesio’s system illustrates the role that the restoration of matter’s potency played in Bacon’s programme. Although Telesio’s account of the primordial principles was close to the mark, he made the fatal error of treating this universe as the only possible universe. Bacon refers to Telesio’s system as merely a “pastoral philosophy” – the philosophy of an idle spectator. Bacon is

²¹⁵ Bacon, *NO*, *OFB*, XI, 53.

²¹⁶ Bacon, *NO*, *OFB*, XI, 53. On Scylla and Charybdis see *DSV*, *SEH*, VI, 754-755, cf. 676-677.

attempting a radical transformation of the concept of nature itself. Nature's ordinary course represents only a single facet of nature's multifaceted potential. It is the production of an alternative universe that Bacon's account of principles and origins is intended to further. Likewise, Bacon's emphasis on motions rather than ultimate material minima was intended to rescue the science of magic and its search for occult powers.

Bacon's critique of Telesio highlights the extreme optimism generated by bringing matter into the limelight. In his engagement with Telesio, Bacon notes that Telesio "finishes up in despair and wishful thinking"²¹⁷ He focuses on Telesio's lament that "although both the power and amount of heat, and the disposition of matter" can be known "grossly and in the round" it remains the case that their "exact and precise relations" are "beyond the threshold of human inquiry."²¹⁸ However, in spite of his despair, Telesio "does not stop hoping and praying."²¹⁹ Bacon quotes a lengthy passage from *De rerum natura* concluding with Telesio's plea:

If only people who have the time and better minds, and the chance to investigate the nature of things in perfect tranquillity, would find this [the powers and gradations of matter] out, so that men may not only get to know all but pretty well become masters of all!²²⁰

This is one of the few places where Bacon quotes an author extensively. Telesio has inadvertently summed up the Baconian goal of mastery of nature. Knowledge of the true nature of things will lead to dominion over nature. *De principiis atque originibus* strategically elevates matter, persuading the reader that "in these very things [the powers and gradations of matter] ... we ... find the very summit of

²¹⁷ Bacon, *DPAO, OFB*, VI, 247.

²¹⁸ Bacon, *DPAO, OFB*, VI, 247.

²¹⁹ Bacon, *DPAO, OFB*, VI, 247.

²²⁰ Bacon, *DPAO, OFB*, VI, 247.

human knowledge and power.”²²¹ The source of Bacon’s optimism is, I argue, his belief in a plenipotentiary matter.

We have seen that Bacon’s portrayal of a plenipotentiary matter necessitated an attack on Aristotelian concepts, not solely as a philosophical response, but as a strategic move in drawing attention to matter as the unique source of operative power. Matter’s powers (the simple motions) constitute the raw materials out of which he constructs his systematic science of magic. Bacon regarded the study of motion in terms of discursive distinctions as futile. The Baconian operator seeks to manipulate the simple motions. In Bacon’s terms, human power derives from nature’s reservoir of unused possibility. The dichotomy of nature free and nature bound was Bacon’s answer to despair, beautifully explicated in the myth of Proteus. The cosmogonical fables of Cupid and Cœlum depict nature as an emanation from prime matter – nature continues in its ordinary course for so long as the relatively stable webs (schematisms) of its cosmological structures can be sustained. This cosmic theme also contributes to Bacon’s optimism. As we shall see in Chapter 5, the creative power of human artifice recapitulates the natural generative processes which gave rise to the current order of nature. In brief, Bacon’s goal was to access the occult storehouse of matter’s powers by means of the artful manipulation of matter itself – the ground of all possibility.

²²¹ Bacon, *DPAO, OFB*, VI, 247.

Chapter 3

Res and Mens

Man, the minister and interpreter of nature, does and understands only as much as he has observed, in things or in the mind [*re vel mente*], concerning the order of nature; beyond that he has neither knowledge nor power.¹

This chapter examines a hitherto neglected area in Baconian commentary, viz., the relationship between Bacon's material ontology and the so-called method.² Having outlined Bacon's conception of matter in Chapter 2, here I argue that Baconian matter determines the characteristics of the mind, and the procedures necessary for an inquiry into nature. Alongside his radical concept of nature, Bacon proposed a regenerative and therapeutic reform of the human mind. This purgative programme is intended to curb the mind's unlimited freedom through binding it to "things themselves" (*ipsissimæ res*).³ In its free condition, the mind is spellbound; it finds all things – its self-constructions and matter – "as it were enchanted" (*incantata*).⁴ Baconian purgation is aimed at breaking the spell.

¹ My trans., Bacon, *NO*, *OFB*, XI, 65 (Book 1, aphorism 1); "*Homo Naturæ minister, & Interpres, tantum facit, & intelligit, quantum de Naturæ Ordine, re vel mente, obseruauerit, nec amplius scit, aut potest,*" 64. For a discussion of issues relating to the translation of this aphorism, see Appendix 1, endnote 1. For Bacon, *res* refers to the *ipsissimæ res*, that which is "*existens,*" "*interius*" and "*in ordine ad uniuersum*" (*NO*, *OFB*, XI, 236). Bacon is not talking about "the observation of the external world" in the sense of "things, facts, effects in the Universe" but the essences of things (Cf. Kitchin, 8). For other instances of the *res-mens* pairing see *IM*, *OFB*, XI, 2, 6; *DO*, *OFB*, XI, 36; *NO*, *OFB*, XI, 270, 442; *DPAO*, *OFB*, VI, 208; *RPh*, *SEH*, III, 583; *TPM*, *SEH*, III, 538.

² Rees rightly points out that "Bacon never used the term [method] in *Novum organum* or anywhere else, to mean 'scientific method,'" *OFB*, XI, lxxii. According to Rees, "method means *rhetorical method*," *OFB*, XIII, 278. See also Lisa Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge University Press, 1974), 171-173.

³ Bacon, *IM*, *OFB*, XI, 21.

⁴ My trans., Bacon, *DIN*, *SEH*, III, 786.

Part I considers Bacon's critique of the mind free, his destructive attack on "Native Human Reason left to itself."⁵ This corresponds to the "*pars destruens*" of his Instauration (Book 1 of *Novum organum*), with its attendant emphasis on the purgation of the mind.⁶ In Part II, I examine Bacon's constructive moves for the regeneration of the human mind. Section IIA focuses on Bacon's reasons for hope and the ontological grounds for the mind's corrigibility. Hope, for Bacon, forms part of a network of assumptions, and these are given detailed examination to demonstrate further that his conception of matter must be taken in earnest. Section IIB deals with the concept of negativity – its role in disciplining the mind, and its function in the purgative and governing aspects of inquiry. This analysis continues the Baconian conception of matter as unknowable and ties Bacon's purgative programme to his appropriation of terms and concepts from *via negativa* theology. The aim of this chapter is to extend Bacon's programmatic vision beyond customary concentration on logical reform. It is odd that a single moment in Baconian inquiry, namely induction, should have come to designate that programme.⁷ Bacon's exposé of how the unaided mind is unfit for an engagement with things goes far beyond a reform in logical technique.⁸

⁵ Bacon, *NO, OFB*, XI, 173 (italics in original).

⁶ Bacon, *NO, OFB*, XI, 172. Bacon states: "And here too I should draw the destructive part of my *Instauration* to a close, a part perfected in the three refutations, namely the refutation of *Native Human Reason* left to itself; the refutation of *Demonstrations*; and the refutation of *Theories*, or of received philosophies and doctrines" (*NO, OFB*, XI, 173).

⁷ The literature on Baconian induction and the logical aspects of the method is vast. For a comprehensive overview, see Mary Horton, "In Defense of Francis Bacon: A Criticism of the Critics of the Inductive Method," *Studies in the History and Philosophy of Science* 4 (1973), 241-278; Mary Hesse, "Francis Bacon's Philosophy of Science," in *Essential Articles for the Study of Francis Bacon*, ed. Brian Vickers (Connecticut: Archon Books, 1968), 114-139.

⁸ Commentators usually address this topic when dealing with Bacon's "refutation of philosophies" alongside his doctrine of the idols. Since the literature on these topics is huge, I do not offer an overview here. For an historical overview of the doctrine of the idols, see W. H. O'Briant, "The Genesis, Definition, and Classification of Bacon's Idols," *Southern Journal of Philosophy* 13 (1975): 347-357. See also Perez Zagorin, "Francis Bacon's Concept of Objectivity and the Idols of the Mind," *British Journal for the History of Science* 34 (2001), 379-393.

Baconian inquiry depends for its success on a constant interplay between truth and error – it is essentially a programme of error-correction. In the opening of his *Instauratio magna*, Bacon states that “he knew for a fact that the human intellect was the author of its own difficulties.”⁹ These difficulties prevent the mind’s “commerce” (*commercium*) with things, a union that Bacon regards as incomparably the greatest of all “earthly” ventures.¹⁰ In his dedication to James I, Bacon highlights both the novelty and the ancient lineage of his proposals: “And the things I speak of are certainly quite new in their very kind, but are framed on an extremely ancient archetype, i.e. the very world itself, and the nature of things and of the mind [*Naturâ Rerum & Mentis*].”¹¹ These two elements – *res* and *mens* – are the only possible partners in inquiry. However, before the mind can unite with the “world itself,” it must undergo purgative preparation. Our minds, Bacon says, “need healing before they can be exercised; the site must be cleared away before it can be built upon.”¹² Bacon’s therapeutic goal is nothing less than a total regeneration of the mind through a discipline that enforces constant governance and direction.

Baconian reform begins from the certainty of things and the uncertainty of the mind. Bacon discounts claims that certainty is attained through the *sine qua non* of logic (the formal machinery of the mind), whose function is to analyse the validity and soundness of argumentative schemes. Furthermore, Bacon considers formal systems of demonstration as mere verbal distraction: valid or legitimate inquiry should focus on things (*res*), not discourse (*verba*). Even as remedial

⁹ Bacon, *IM*, *OFB*, XI, 3.

¹⁰ Bacon, *IM*, *OFB*, XI, 3. The opening of *Instauratio magna* and the corresponding opening aphorism of *Novum organum* state (in a densely enfolded form) the purpose of *Novum organum*. As Rees puts it, these “very brief introductory aphorisms ... crackle like lightning and cut like steel,” *OFB*, XI, 1.

¹¹ Bacon, *IM*, *OFB*, XI, 7. See A. C. Howell, “*Res et Verba*: Words and Things,” *ELH* 13 (1946), 131-142.

¹² Bacon, *RPh*, *BF*, 109, cf. *SEH*, III, 563.

devices, Bacon insists that existing dialectical or logical remedies aim only to correct discursive errors.¹³ To return the focus to things, requires far more than verbal piecemeal corrective measures: there must be, as Bacon puts it, “*a wholesale Instauration of the sciences, arts and all human learning, raised again on proper foundations.*”¹⁴ The proper foundations, as aphorism 1 of *Novum organum* makes clear, are the human mind (*mens*) and things (*res*).¹⁵ In proposing a unique route to things, Bacon’s Instauration demolishes existing methods of certainty; he must therefore offer the mind a reassurance of certainty in its inquiry. Thus along with a doctrine of error, Bacon also provides a criterion of truth. In Baconian terms, truth is not discovered through discursive argumentation but depends on operative (experimental) criteria grounded in the production of *nova* – novel experiences, effects and works.¹⁶ The mind accesses truth via Baconian matter and its possibilities: certainty derives from operation, not from demonstration.¹⁷ Baconian reform repudiates existing criteria of truth because they have divorced themselves

¹³ Bacon recognises that the syllogism was intended as a therapeutic contribution to the mind’s desperate need to prevent “the fluctuations and dizziness [*vertigines*] of the understanding” generated by the bewildering array of things (*DAS, SEH, IV, 429, cf. I, 641*). However, logic, according to Bacon, is an attempt to respond to the symptoms of the mind’s illness; it fails to address the cause of disease, viz., matter’s sheer obscurity and the mind’s tendency to anticipate.

¹⁴ Bacon, *IM, OFB, XI, 3* (italics in original).

¹⁵ See epigraph, p. 89.

¹⁶ Pérez-Ramos discusses Bacon’s criterion of truth in terms of “maker’s knowledge.” He refers to it as a “constructivist criterion of truth” and I will comment on this in Chapter 5. See Pérez-Ramos, *Francis Bacon’s Idea of Science and the Maker’s Knowledge Tradition* (Oxford: Clarendon Press, 1988), esp. chapter 10, 106-108.

¹⁷ In *DO* Bacon states: “the end set down for this science of mine is not the discovery of arguments but of arts; not what agrees with principles but the principles themselves, not probable reasons but pointers to works in embryo. And different aims beget different effects. For one aims to beat an opponent in debate; the other to bend nature to works [*Illíc enim aduersarius Disputatione vincitur & constringitur; hic Naturá, Opere*]” (*OFB, XI, 29*). In my view the final line of this passage has been wrongly translated. It should read: “For through the one an opponent is bound and constrained by argument; through the other, by nature and action.” The phrase “*vincitur & constringitur*” occurs in Cicero’s *Tusculan Disputations*. For example, “*illa pars animi vinciatur et constringatur amicorum custodiis*,” 2, 21, 48. According to Lewis and Short, this is “a favorite trope of Cicero;” hence Bacon would have had it in mind, *A Latin Dictionary* (Oxford: Clarendon Press, 1879), 439-440. Moreover, in Roman law the head of the household was obliged to bind and constrain a lunatic of the family. Bacon conceives of the method as a means of binding the lunatic mind to nature.

from the source (things themselves). I will deal with the criterion of truth in Chapter 4; here I concentrate on Bacon's doctrine of error.

The Baconian doctrine of error targets the imagination (*phantasia*) as the principal cause of error. Although the causes of error and delusion run deep, they are not incorrigible and Bacon assumes that the mind, protected from impediments generated by the imagination, possesses potentially the capacity to interpret nature. Interpretation is a natural progression of the understanding, which Bacon contrasts with what he calls "anticipation."¹⁸ Bacon aptly describes the haphazard interpretations and confident anticipations of the ungoverned mind:

Take a man who understands only his own vernacular. Put into his hands a writing in an unknown tongue. He picks out a few words here and there which sound like, or are spelled like, words in his own tongue. With complete confidence he jumps to the conclusion that their meaning is the same, though as a rule this is very far from true. Then, on the basis of this resemblance, he proceeds to guess the sense of the rest of the document with great mental exertion and equal licence.¹⁹

However, the declination into error is through accidental causes only: "all Anticipation is but a deflexion or declination by accident."²⁰ This is an extremely important assumption on Bacon's part because otherwise the Baconian assault on traditional learning is no different from the sceptical attacks which it also seeks to circumvent. Without the belief in the purged mind's fitness for the task, all hope would have to be abandoned.

¹⁸ In the preface to *Novum organum* Bacon states: "Let there then (since it is favourable and fortunate for both) be two sources and two dispensations of learning, and likewise two tribes or clans of thinkers or philosophers ... [and] let there be one policy for cultivating the sciences but another for discovering them ... And so that I may be better understood, and make matters more familiar by giving them names, I have grown used to calling the one policy or way *Anticipation of the Mind*, the other the *Interpretation of Nature*" (*NO, OFB, XI, 57-59*). Bacon does not hide his contempt for the former when he says, "to those who are better pleased by the former [Anticipation] from haste or the concerns of civil life or because they lack the mental capacity to take in and embrace the latter (which will necessarily be the case for most people), I hope that they achieve their ambitions in what they are doing and get what they are after" (*NO, OFB, XI, 59*).

¹⁹ Bacon, *TPM, BF, 69*, cf. *SEH, III, 536*.

²⁰ Bacon, *VT, SEH, III, 251*.

According to Bacon, there are only two paths to knowledge. The first way “rushes up [*advolat*] from the sense and particulars to axioms of the highest generality,” and from these principles it judges things which are discovered in middle axioms.²¹ The problem, as Bacon perceives it, is that our general principles (the most general axioms) are based on consensual acceptance of ill formed notions. Additionally, while our judgements are deductively obtained, the middle axioms are already a product of the known and so nothing new can be discovered in this way.²² The second way (Bacon’s way), is to begin from the senses and particulars and step-by-step to navigate the middle ground (the source of new knowledge) in an “unbroken ascent” arriving finally at general axioms.²³ Bacon calls the former the “*Anticipation of the Mind*” and the latter the “*Interpretation of Nature*.”²⁴ On a superficial reading, it is easy to identify the latter with current notions of eliminative induction. But much more needs to be incorporated into a discussion of the nature of Baconian inquiry. Michel Malherbe’s superb reading connects Bacon’s “critique of logic” with his reform of human nature.²⁵ While Malherbe offers an account of

²¹ Bacon, *NO, OFB, XI, 71*.

²² Bacon claims that the syllogism is not a method of “invention” but only of “judgment” (*DAS, SEH, IV, 428-429, cf. I, 640-641*). These terms constitute the main divisions of renaissance dialectical theory and are closely related to the three divisions in rhetorical theory – invention, judgement and disposition. Bacon’s inductive approach combines invention and judgement: to discover (invent) the thing is to judge and one cannot judge without finding. See Michel Malherbe, “Bacon’s Method of Science,” in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 75-98, esp. 79-81. Pérez-Ramos provides a concise account of the syllogistic notion of “middle terms.” The middle term is “the one linking the terms of the conclusion to a term in both premises,” *Francis Bacon’s Idea of Science*, 118. For Bacon’s criticisms of the use of middle terms see *DO, OFB, XI, 31*.

²³ Bacon’s attack on the Aristotelian logic concentrates on the leap from particulars to principles without traversing the middle ground. The inductive programme is designed to establish the intermediate steps by focusing on “middle axioms” (*NO, OFB, XI, 71, 161*).

²⁴ Bacon, *NO, OFB, XI, 59* (italics in original). See n. 18.

²⁵ I am indebted to Malherbe’s brilliant discussion of Baconian logic. Malherbe refers to Bacon’s “altogether other ambition” than that of Aristotelian logic, viz., “of renewing, from its roots, human nature itself,” “Bacon’s Critique of Logic,” in *Francis Bacon’s Legacy of Texts: ‘the Art of Discovery Grows with Discovery,’* ed. William Sessions (New York: AMS Press, 1990), 69-87, on 69; See also,

Bacon's formal reasons for the abandonment of Aristotelian logic, his discussion of the logical aspects of Baconian method takes seriously the reformation of the mind. He also emphasises that comparisons between the "old logic" and the "new" are made all the more problematic given that Bacon considered his method and the method of the Aristotelians to be incompatible due to the "radical originality" of his reforms.²⁶

Whatever position is taken on Baconian induction, it is often forgotten that Bacon identifies the process of induction with the natural capacities of the mind, which utilises a gathering and distilling procedure in its everyday encounter with things. According to Bacon, "the mind does of herself by nature manage and act an induction much better than logicians [contemporary Aristotelian logicians] describe it."²⁷ Bacon takes this natural capacity as the basis from which the declination of the mind originates, partly through the mind's impositions and partly through the bewildering display of matter's fecundity. The restoration of a natural logic of induction is best explained by locating it within Bacon's conception of the whole process of inquiry. As Bacon nowhere provides adequate discussion of what his logic is, and on the grounds that Baconian inquiry not only exposes error but utilises it as a positive governing procedure, I have chosen to label Baconian inquiry a "cybernetic" epistemology.²⁸

idem., "Bacon's Method of Science," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 75-98.

²⁶ Malherbe, "Bacon's Critique of Logic," 69.

²⁷ Bacon, *DAS, SEH*, IV, 410, cf. I, 620.

²⁸ This is given by the term's etymology – from the Greek Κυβερνήτης (*kybernetes*, steersman, governor, pilot, or rudder – the same root as government). Bacon's feedback strategy cannot be predetermined but is responsive to specific contexts. This, according to Bacon, is what is absent in traditional systems of dialectic. For this reason, commentators should be cautious in translating Baconian inquiry into more familiar but ill fitting formalised or methodical moulds. The classical sceptical notion of "zetetic inquiry" is more appropriate and closer to Baconian inquisitional procedures than modern conceptions of eliminative induction. Given that Baconian inquiry is heuristic, it could be appropriately named a "zetetic heuristic." There are many classical sources for

Bacon's way of inquiry is lengthy, convoluted and above all recursive: what Bacon envisages is a constant zigzagging between the purified mind and things (operation on nature). In contrast to a typical axiomatic system, there is no linear progression from a minimal set of self-evident axioms and definitions to certain or even highly probable propositions.²⁹ Baconian inquiry is guided by dependable markers or guidelines that offer continual assurances that the inquirer is on the right path. If such markers cease, one has strayed from the path. Because at any juncture error and misdirection is possible, these signs compensate in the cybernetic sense of correcting through a feedback system. Bacon's way of inquiry "fixes its gaze not only on the motion and discourse of the mind (as the common logic does) but also on the nature of things."³⁰ Bacon's winding way mirrors nature's labyrinthine windings:

to the human intellect reflecting on it, the fabric of the universe looks in its construction like a labyrinth, where we find everywhere so many blind alleys, such deceptions and misleading signs and such oblique and intricate convolutions and knots of nature.³¹

Baconian inquiry employs a feedback method of cybernetic control that operates on the principle of continual approximation. Nature's pathways are convoluted, hence there is no direct route to her hidden powers (*res*). Given that the term "cybernetic" denotes recursive governance, and in view of its ancient provenance, I thought it appropriate to Baconian inquiry.

the term "cybernetic." For Greek sources, see Homer, *Odyssey*, Bk. 11, line 10; Sophocles, *Oedipus Tyrannus*, 922; Euripides, *Suppliants*, 879; Aeschylus, *Suppliant Women*, 769; Plato, *Gorgias*, 511d, where he speaks of the "steersman of the soul"; Aristotle, *Politics*, 1279a. For the Latin equivalent *gubernator*, see Caesar, *De bello civili*, 1, 58, 1; Cicero, *Epistulae ad familiares*, 2, 6; Suetonius, *De vita Caesariis*, 10, 4; Plautus, *Miles gloriosus*, 4, 4, 40. This list is found in Flo Conway and Jim Siegelman, *Dark Hero of the Information Age: In Search of Norbert Wiener, the Father of Cybernetics* (New York: Basic Books, 2005) 372-373.

²⁹ The standard work on method is N. W. Gilbert, *Renaissance Concepts of Method* (New York: Columbia University Press, 1960).

³⁰ Bacon, *NO, OFB*, XI, 191.

³¹ Bacon, *IM, OFB*, XI, 18.

What are the grounds for Bacon's optimism? For Bacon, the goal is attainable because inquiry takes for granted consent between the senses and the hidden causes of phenomenal traits (or qualities) in matter. The process of exclusion involves a narrowing of the range within which the target can be found.³² Because there are no direct routes through nature's winding labyrinth, the Baconian inquirer requires continual signs which are given more by error and negative instances than by successes. As Bacon puts it, "wherever a case is established of negation, privation, or exclusion, there is some light given towards forms."³³ These negative instances are fed back into an interpretative loop whose output (in the form of axioms) provides further operative guidance, encouragement and direction. This error-correcting and self-targeting system of inquiry is the basis for Bacon's optimism. The senses and the hidden causes of qualities (the forms and schematisms of matter) are already engaged – experience testifies to that union. For Bacon, declination into error is merely an accident. The legitimate inquiry is an *Organon* precisely because it is an instrument of self-governance, in the way a geometer's compass continually corrects the wavering and uncertain movements of the hand.

The several themes examined in this chapter uncover the rationale behind Baconian inquiry. The reasons for binding the mind to things are twofold and derive not only from the mind's tendency to error but from Bacon's materialism. Bacon asserts that the need for governance comes "not just from the recesses of the mind but from the very innards of nature" (*non tantum ex Mentis penetralibus, sed etiam*

³² Ellis unwittingly describes the cybernetic nature of Baconian inquiry when he states: "And this process [of exclusion] when carried far enough will of necessity lead us to the truth; and meanwhile every step we take is known to be an approximation towards it. Ordinary induction is a tentative process, because we chase our quarry over an open country; here it is confined within definite limits, and these limits become as we advance continually narrower and narrower" (*SEH*, I, 35).

³³ Bacon, *DAS, SEH*, IV, 419, cf. I, 631.

ex Naturæ visceribus).³⁴ Bacon's restored science of magic constrains nature's uncontrolled and unstructured power. This extends to the human mind: the source of error is the uncontrolled power of the imagination. Bacon describes the unpurified mind as driven by a "mad impulse" (*malesanus impetus*).³⁵ Legitimate inquiry applies appropriate restraints, binding and weighting down the mind's imaginative leaps to protect it from its fascination with idols and pure discursivity. Baconian inquiry provides the thread (*filum*) which guides "the frail and crippled faculty of human intellect ... through a labyrinth."³⁶ Its sole purpose is to "lead [men] to the things themselves [*ad res ipsas*]."³⁷

Rather than focusing on eliminative induction, I offer a reinterpretation of the Baconian method as the investigative instrument for overcoming the separation of *res* and *mens*. Graham Rees has drawn attention to what appears to be a "contradiction between the speculative and methodological" aspects of Bacon's programme.³⁸ Rees correctly inverts the traditional emphasis and suggests "that it is the existence of the method rather than the speculative philosophy that needs explaining."³⁹ He also proposes that the problem of how matter and method are linked in Bacon's programme, which "has so far proved singularly resistant to treatment," could prove tractable if the questions were correctly framed.⁴⁰ This chapter attempts to lay the necessary groundwork for answering some of Rees'

³⁴ Bacon, *DO*, *OFB*, XI, 32.

³⁵ Bacon, *NO*, *OFB*, XI, 55.

³⁶ Bacon, *PhU*, *OFB*, VI, 5-7.

³⁷ Bacon, *IM*, *OFB*, XI, 21.

³⁸ Rees, "Matter Theory: A Unifying Factor in Francis Bacon's Natural Philosophy?" *Ambix* 24 (1977), 110-125, on 121.

³⁹ Rees, "Francis Bacon's Biological Ideas: A New Manuscript Source," in *Occult and Scientific Mentalities in the Renaissance* ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 297-314, on 308.

⁴⁰ *ibid.*

questions: I concur with Rees that the prioritisation of method over matter has seriously misled commentary thus far. Chapter 4 will examine in more detail Bacon's concept of experiment as the operative means to govern and maintain the union of *res* and *mens*.

I. The mind free: the separation of *res* and *mens*

The cognitive goal of Bacon's legitimate inquiry is knowledge of "the real dividing lines of nature" (*veras Sectiones Naturæ*).⁴¹ Bacon cites the well-known passage from Plato's *Phædrus*: "he who knows well how to define and divide, is to be counted as a god."⁴² However, the unaided understanding is "no match for the subtlety of nature" and therefore the mind imposes imaginary divisions on nature.⁴³ The mind free, says Bacon, "sets up distinctions between things according to the measure of man and not according to the measure of the universe" (*constituant lineas rerum ex analogiâ Hominis, & non ex analogiâ Vniuersi*).⁴⁴ The success of Bacon's project depends on rectifying the mind so that it mirrors the order of the universe; this will prevent it from "mingl[ing] its own nature with the nature of things."⁴⁵ Only then, as Malherbe puts it, will "the boundaries drawn by the mind fade away in favor of the true divisions of things such as they are prescribed by nature itself."⁴⁶ The greatest obstacle to this is the "mad impulse" of the mind under the tyranny of the imagination. The reign of the imagination (*phantasia*) forms the core of Bacon's doctrine of error.⁴⁷

⁴¹ Bacon, *NO, OFB*, XI, 311. Bacon is referring to the Platonic aim "to be able to cut up each kind according to its species along its natural joints, and ... not to splinter any part, as a bad butcher might do," *Phædrus* 265E, trans. Alexander Nehamas and Paul Woodruff (Indianapolis and Cambridge: Hackett Publishing Company, 1995), 64.

⁴² Bacon, *NO, OFB*, XI, 289 (italics in original).

⁴³ Bacon, *NO, OFB*, XI, 69.

⁴⁴ Bacon, *NO, OFB*, XI, 359.

⁴⁵ Bacon, *NO, OFB*, XI, 81.

⁴⁶ Michel Malherbe, "Bacon's Method of Science," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 75-98 on 96.

⁴⁷ John M. Cocking rightly notes that "Bacon uses *imaginatio* and its associated words for 'good' imagination and *phantasia* and its derivatives for its vicious use in thinking, or its comparatively

In Book 1 of *Novum organum*, Bacon discusses the imagination's incapacitating effects on the understanding, rendering the mind enslaved to *Idola* and false notions which are subsequently entrenched in the human understanding.⁴⁸ According to Bacon, the causes of these idols are "either extrinsic or innate."⁴⁹ Whereas the former causes can be expunged with difficulty, the latter are ineradicably rooted in the mind and must be constantly restrained. This internal disposition of the mind accounts for its being the source of its own difficulties and is what gives the mind its "corrupt complexion."⁵⁰ The genesis of the corruption can be found in a basic human desire to "satisfy the mind," a desire catered to by the faculty of the imagination.⁵¹ The faculty of the imagination feeds this need by

trivial use in poetry," "Bacon's View of Imagination," in *Francis Bacon: terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell'Ateneo, 1984). See also Marta Fattori and M. Bianchi eds., *Phantasia-Imaginatio: V° colloquio internazionale del lessico intellettuale Europeo* (Rome: Edizioni dell'Ateneo, 1988).

⁴⁸ Bacon, *NO, OFB, XI, 78*. The imagination is an innate faculty but its rule is accidental, not necessary. However, its dispositional qualities are so powerful that they effectively generate an intrinsic impediment and a continual source of error. Bacon is not antagonistic to the imagination *per se*, but to its uncontrolled freedom. In other contexts he expresses keen interest in the possibility of using the imagination in the magic of "fascination." On the binding of thoughts see *SS, SEH, II, 642, 654, 655, 659, 668*.

⁴⁹ Bacon, *DO, OFB, XI, 35*. On the distinction between *Idola Adscititia* and *Idola Innata*, see Spedding, *SEH, I, 116-117*.

⁵⁰ Bacon, *DO, OFB, XI, 35*.

⁵¹ Bacon's account of the imagination is given its most detailed treatment in *De augmentis*. However, this work can be mistakenly read as containing a systematic Baconian psychology. This is due to Bacon's appropriation of existing terms, which he subverts and utilises for his own ends. Scholars are indebted to Wallace's extensive explication of Bacon's scattered discussions on human "psychology." See Karl R. Wallace, *Francis Bacon on the Nature of Man: The Faculties of Man's Soul* (Urbana: University of Illinois Press, 1967), esp. chapter 5, "Imagination," 69-95. Wallace also offers an in-depth treatment of the function of the imagination in persuasive communication, see *Francis Bacon on Communication and Rhetoric: or, the Art of Applying Reason to Imagination for the Better Moving of the Will* (Chapel Hill: the University of North Carolina Press, 1943). Wallace's close reading of Bacon's works demonstrates that there are in fact significant divergences from traditional faculty psychology in Bacon's thought. Because of Bacon's departures from tradition, Wallace is forced to remark habitually on Bacon's ambivalence, reticence, and even silence. He strives to fill Bacon's lacunae with background materials drawn from a disparate range of contemporary psychological treatises covering a wide time span. Thus Wallace's assumption that Bacon can be situated within the confines of faculty psychology tends to obscure Bacon's distinctive take on human psychology by reducing all views to a generic faculty psychology, when it is doubtful that such an entity can be historically validated over such an extensive period. For alternative readings, see John M. Cocking, "Bacon's View of Imagination," in *Francis Bacon: terminologia e fortuna nel XVII secolo* ed. Marta Fattori (Rome: Edizioni dell'Ateneo, 1984), 43-58; Eugene P.

deviating the mind from everyday experience to look for “a more ample greatness, a more perfect order, and a more beautiful variety than it can anywhere (since the Fall) find in nature.”⁵² This tendency (Bacon claims) is especially prevalent in religion and the writing of poetry. Hence Karl Wallace suggests that we can obtain “further insight” into the imagination’s activities through an examination of Bacon’s account of poetry.⁵³

In terms of the subject matter of poetry, there is no constraint on the imagination – as it is not bound to things, it can fictively combine and separate elements of nature at pleasure.⁵⁴ As Bacon puts it,

The imagination: which beeing not tyed to the Lawes of Matter; may at pleasure ioyne that which Nature hath seuered: & seuer that which Nature hath ioyned, and so make vnlawfull Matches & diuorses of things.⁵⁵

In contrasting poetry and history, Bacon states that “Poesy seems to bestow upon human nature those things which history denies to it” in order “to satisfy the mind with the shadows of things when the substance cannot be obtained.”⁵⁶ The imagination constructs satisfying fantasies rather than undergoing the discipline of things themselves. Whether it deals with history or nature, the work of the imagination inclines the mind to unbind itself from things and to find solace and comfort in the fantastic and shadowy world of illusion. According to Bacon, the mind willingly co-operates due to an internal striving that seeks in poetry a flight

McCreary, “Bacon’s Theory of the Imagination Reconsidered,” *Huntington Library Quarterly* 36 (1973), 317-326; John L. Harrison, “Bacon’s View of Rhetoric, Poetry, and the Imagination,” in *Essential Articles for the Study of Francis Bacon*, ed. Brian Vickers (Hamden, Connecticut: Archon Books, 1968), 253-271.

⁵² Bacon, *DAS, SEH*, IV, 315-316, cf. I, 518.

⁵³ Wallace, *Francis Bacon on the Nature of Man*, 76-78.

⁵⁴ McCreary notes that it is the “creative impulses” of the imagination which present Bacon with his “most serious” obstacle, “Bacon’s Theory of the Imagination Reconsidered,” 317-326. Bacon regards the imagination as the source of the mind’s uncontrolled theorising, a consequence of the imagination’s absolute freedom to speculate.

⁵⁵ Bacon, *AL, OFB*, IV, 73.

⁵⁶ Bacon, *DAS, SEH*, IV, 315, cf. I, 518.

from the everyday: in philosophy this striving leads to hastily constructed explanations. The imagination frees the mind from the bonds of nature and, abrogating reason's power, it governs the combination of images supplied by the senses. Thus the imagination overrules what Bacon in *Novum organum* calls "*the tribunal of the intellect*."⁵⁷ As Wallace says, the cause of this is a tendency of the human mind to attain to "a more perfect nature than pure reason, operating alone can discover."⁵⁸ Bacon explains how the mundane spectacle of human and natural history lacks "sufficient grandeur" and "wearies the mind with satiety of ordinary events, one like another."⁵⁹ To overcome this dissatisfaction, the human mind allows the imagination to provide a more grandiose spectacle which raises the mind so that it approximates the divine. Under the influence of dramatic poesy, the imagination "raises the mind and carries it aloft, accommodating the shows of things [*rerum simulacra*] to the desires of the mind."⁶⁰ Bacon's perception of the power of poetry demonstrates the potential influence of the imagination: "Dramatic poesy, which has the theatre for its world, would be of excellent use if well directed. For the stage is capable of no small influence both of discipline and corruption."⁶¹ Wallace appears to take at face value Bacon's statement that poetry "may be fairly thought to partake somewhat of a divine nature."⁶² But from the overall tenor of the passage there can be little doubt that in this particular case Bacon offers a cause of error, whilst at the same time indicating the potential arising from the tendency of the imagination to

⁵⁷ Bacon, *NO, OFB*, XI, 217 (italics in original).

⁵⁸ Wallace, *Francis Bacon on the Nature of Man*, 77. According to Bacon, "The human intellect is constitutionally prone to supposing that there is more order and equality in things than it actually finds" (*NO, OFB*, XI, 83). Bacon attributes this to "the evenness [*æqualitate*] of the substance of the human spirit" – a Telesian notion (*NO, OFB*, XI, 89).

⁵⁹ Bacon, *DAS, SEH*, IV, 316, cf. I, 518.

⁶⁰ Bacon, *DAS, SEH*, IV, 316, cf. I, 519.

⁶¹ Bacon, *DAS, SEH*, IV, 316, cf. I, 519.

⁶² Bacon, *DAS, SEH*, IV, 316, cf. I, 519.

free the mind from things.⁶³ Thus what is important here is that Bacon regards the autonomy of the imagination as furthering the desire in human nature for things more “agreeable to the spirit of man.”⁶⁴ In this way the imagination motivates the mind’s separation from things. Reason and history, however, have the effect of “buckling and bowing down the mind to the nature of things.”⁶⁵ Thus Bacon’s doctrine of error has its genesis in human nature, and particularly in an inherent human need to always go further than the reality of things permits.

This genetic explanation for the mind’s insanity is a consequence of Bacon’s doctrine of the soul. In *De augmentis* Bacon confidently proclaims that the best division of the soul’s functions is into memory, imagination and reason.⁶⁶ These map onto the disciplines of history, poetry and philosophy respectively. According to Bacon, there can be no other divisions. These three are master categories under which all sciences (theological, natural, civic and moral) are to be partitioned. When functioning unimpeded, the mind respects the boundaries of these general categories. The breakdown occurs when the imagination, as Bacon says, “usurps no small authority in itself.”⁶⁷ As a spur to action, the imagination legitimately and necessarily acts as a messenger between reason and the passions – the end must be imagined before the action is considered worthwhile. But the imagination, responding to the mind’s inherent desires to amplify its powers, turns from its legitimate role as messenger into that of tyrant. To reinforce his depiction of the

⁶³ Bacon’s claims that poetry and religion are governed by the imagination would indicate that theology is antithetical to any inquiry into nature. Hence it is unsurprising that Bacon repeatedly urges a separation of philosophy and theology: “In the final place I advise you, my son, of what needs above all to be done, namely that, with mind illumined and sober, you separate the interpretation of things divine and natural and do not allow these in any way to be joined together” (my trans., *DIN, SEH*, III, 788).

⁶⁴ Bacon, *DAS, SEH*, IV, 315, cf. I, 518.

⁶⁵ Bacon, *DAS, SEH*, IV, 316, cf. I, 519.

⁶⁶ See Bacon, *DAS, SEH*, IV, 292-293, cf. I, 494-495.

⁶⁷ Bacon, *DAS, SEH*, IV, 406, cf. I, 615.

capacity for usurping power possessed by the imagination, Bacon cites Aristotle's apt analogy:

For it was well said by Aristotle, "That the mind has over the body that commandment which the lord has over a bondman; but that reason has over the imagination that commandment which a magistrate has over a free citizen," who may come also to rule in his turn.⁶⁸

Thus the body will (in so far as it can) respond to the mind's commands and this relationship is fixed. But the imagination's sphere of activity is neither fixed nor bound to reason: their roles can easily be exchanged so that the tribunal of the imagination replaces the tribunal of reason.⁶⁹ Wallace maintains that Bacon regards the imagination as "normally" under the "restraint of reason."⁷⁰ On Wallace's reading, it is only "occasionally" that the imagination will "slip off its shackles" from whence it "springs up, free and powerful."⁷¹ Wallace is referring to rhetorical contexts where the passions are aroused or attenuated by powerful speech. However, Bacon considers the unbounded domination of the imagination to be the norm. According to Bacon, it exercises a governing force in cognitive as well as emotive matters, clearly illustrated by the state of traditional learning. Thus the role of the imagination is not confined to moving the passions to practical action in morals or in

⁶⁸ Bacon, *DAS, SEH*, IV, 406, cf. I, 615; Aristotle, *Pol.* i, 3.

⁶⁹ Bacon has the senses registering directly to memory, whereas it was traditional to have them report via the imagination to reason or memory. Bacon insists that memory is an accurate register of the senses' reports. The understanding can then work directly on the memory. For a general discussion of faculty psychology see Katherine Park and Eckhard Kessler, "The Concept of Psychology," in *The Cambridge History of Renaissance Philosophy* ed. Charles B. Schmitt and Quentin Skinner (Cambridge: Cambridge University Press, 1988), 455-463; see also Katherine Park, "The Organic Soul," in *The Cambridge History of Renaissance Philosophy*, 464-484. On Bacon's divisions of the soul, see Wallace, *Francis Bacon on the Nature of Man*, 12-14; Grazia Tonelli Olivieri, "Galen and Francis Bacon: Faculties of the Soul and the Classification of Knowledge," in *The Shapes of Knowledge from the Renaissance to the Enlightenment*, ed. Donald R. Kelley and Richard H. Popkin (Dordrecht: Kluwer Academic Publishers, 1991), 61-81.

⁷⁰ Wallace, *Francis Bacon on Communication and Rhetoric*, 31.

⁷¹ Wallace, *Francis Bacon on Communication and Rhetoric*, 31. Bacon's various discussions of rhetoric are complex and relate to different contexts. Here, Bacon is defending rhetoric against the attacks of Plato. For a general overview of Bacon's views on rhetoric see Brian Vickers, "Bacon and Rhetoric," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996) 200-231.

civic duty; it also holds sway in intellectual matters. Consequently, unless the imagination is subjected to stringent constraints, progress in inquiry is impossible.

McCreary (unlike Wallace) detects that the method is linked to restraining the imagination's absolute freedom:

The restraints and bonds Bacon wants to impose on imagination do not arise merely from contemporary theories of hierarchical faculty psychology that he undoubtedly shared, but from his full realization that imagination as the source of human freedom, spontaneity, and unpredictability would be a prime suspect.⁷²

McCreary suggests that Bacon has a more sustained attack on the imagination than Wallace admits: the mind, unprotected and unconstrained by methodical containment, is always subject to the tyranny of the imagination. Commentators are often dismayed when Bacon apparently seeks to curtail the imagination's influence in acts of creativity in the physical sciences and tend to shift the discussion onto the role of the imagination in rhetorical and persuasive contexts. Granted, Bacon's account of its persuasive power in rhetorical contexts is unambiguous:

it is no small dominion which imagination [*phantasia*] holds in persuasions that are wrought by eloquence; for when by arts of speech men's minds are soothed, inflamed, and carried hither and thither, it is all done by stimulating the imagination [*phantasia*] till it becomes ungovernable, and not only sets reason at nought, but offers violence to it, partly by blinding, partly by incensing it.⁷³

As Wallace explains, Bacon clearly acknowledges that rhetorical power is essential in soothing "the sauage and vnreclaymed desires" of men, and in maintaining social

⁷² McCreary, "Bacon's Theory of the Imagination Reconsidered," 318. McCreary concentrates on what he calls Bacon's "legal and monarchical analogies," where the imagination is characterised as an errant and radical subject, 318. According to McCreary, Bacon uses these analogies to "frame all of human experience," 318. McCreary's agenda is not a close reading of Bacon's texts. His main purpose is to defend the role of the imagination in forming "hypotheses," and the "significant function" that it plays in "scientific method," 322. McCreary offers a critique of Bacon's constraints on imaginative theorising: he grasps Bacon's project to restrain and bind the imagination but objects to it. McCreary ignores the fact that in Baconian psychology, subjection to the imagination is a form of intellectual slavery, entirely at odds with Bacon's emphasis on the senses, and hence no basis for framing solid axioms.

⁷³ Bacon, *DAS, SEH*, IV, 406, cf. I, 615.

and political stability.⁷⁴ In addition, Bacon himself makes significant use of fables and parables, and has substantive roles for the imaginative devices of analogy and metaphor. Clearly, in a rhetorical context the imagination functions in moving the will to good or harmonious action so long as reason dominates. But when it comes to the internal dynamics of the mind, the relationship between reason and imagination is (as Aristotle says) not one of bondsman to master, but of free citizen to magistrate. In that relationship the free citizen can at any time become master regardless of whether the context is rhetorical or cognitive. Bacon imposes strict limits on the activity of the imagination: it must be confined to areas where it can exercise its freedom and where it does not matter that “it commonly exceeds the measure of nature.”⁷⁵ In its legitimate domains it can legislate: in nature’s realm, the freedom of the imagination engenders in the mind the wild and ungovernable spontaneity of a lunatic. The only reason this insanity escapes general notice is that all under its sway are mad in the same way. Thus in castigating this condition of contemporary learning, Bacon states that “even if men went mad in the same copycat way, they could still agree among themselves well enough.”⁷⁶ Consequently, institutions of learning sustain this shared cultural insanity.

In order to understand the severity of the mind’s self-imposed impediments, it is necessary to consider briefly Bacon’s characterisation of the fervent adherence to traditional knowledge, and why he treats it as a form of insanity. The tyranny of the imagination and the spellbinding effect of its fantasies give rise to a combination of pointless philosophical systematising and inflated pride. Bacon states:

⁷⁴ Bacon, *AL, OFB*, IV, 38-39; Wallace, *Francis Bacon on Communication and Rhetoric*, 32, esp. n. 14. Wallace is drawing particularly on the fable of Orpheus who through the power of sweet music quells the savagery of warring animals. See also Bacon, *DSV, SEH*, VI, 720-722, cf. 646-648.

⁷⁵ Bacon, *DAS, SEH*, IV, 292, cf. I, 494.

⁷⁶ Bacon, *NO, OFB*, XI, 75.

I add further that the more intelligent a man is, if he too soon deserts the light of nature, that is to say, the enquiry into particulars and the evidence drawn therefrom, the more steeply does he plunge into the obscure and tortuous recesses and caverns of the imagination [*in obscuriores et magis perplexos phantasiarum recessus et quasi specus*] and the more difficult does he make it to get out.⁷⁷

In the preface to his *Instauratio magna*, Bacon castigates those who have done “terrible damage” to philosophy through overconfidence, ambition and pride.⁷⁸ It is at the juncture of philosophical nonsense and pride that Bacon best depicts human folly: this is the point at which current institutional madness exhibits its worst excesses. Whereas the imagination is the source of erroneous philosophical materials, it is not the sole problem. In his view, “the real truth is that the obstacle to the course I propose lies not in its obscurity or difficulty but in pride [*superbia*].”⁷⁹ In seeking a union with things, Bacon reserves particular contempt for “one kind” of pride, the “disdain of dwelling and being conversant much in experiences and particulars, specially such as are vulgar in occurrency, and base and ignoble in use.”⁸⁰ This intellectual vice acts contrary to what is most needful, and diverts the mind from things onto “higher mysteries of pride” that ostentatiously exhibit more “dignity and solemnity” because they remove the mind from “familiar actions.”⁸¹

According to Bacon, these higher mysteries

have less affinity with arts mechanical and illiberal, in that they are not so subject to be controuled by persons of mean observation, in that they seem to teach men that they know not, and not to refer them to that they know. All which conditions directly feeding the humour of pride, particulars do want. That the majesty of generalities, and the divine nature of the mind in

⁷⁷ Bacon, *RPh*, *BF*, 118, cf. *SEH*, III, 572.

⁷⁸ Bacon, *IM*, *OFB*, XI, 53.

⁷⁹ Bacon, *RPh*, *BF*, 120, cf. *SEH*, III, 574.

⁸⁰ Bacon, *VT*, *SEH*, III, 250.

⁸¹ Bacon, *VT*, *SEH*, III, 250.

taking them (if they be truly collected, and be indeed the direct reflexions of things,) cannot be too much magnified.⁸²

Driven by pride, the mind's insane defence of useless systems of learning is under the control of the affections (or passions).⁸³ Error is not only a constitutional effect since it arises from pride in imaginative fantasy. Yet in Bacon's account these factors (albeit powerful) are accidental: "interpretation is the very natural and direct intention, action, and progression of the understanding delivered from impediments ... all Anticipation is but a deflexion or declination by accident."⁸⁴ The link between pride and imagination, and the resulting insanity and declination of the mind is the substance of Bacon's doctrine of error. The spell of the mind's own productions must be broken.

Bacon opposes pride with humility, pride's moral counterpart. In *Redargutio philosophiarum* he states:

In the verdict they pass on me they will be right to deny that anything I have done is great. But they will be wrong if they ascribe to daring what is due to humility, to humility, I say, and to the absence of that human pride which has ruined all by conferring the title sacred upon certain fleeting meditations instead of reserving it for the divine signature on things ... only on this account do I hold myself happy and well-deserving of the human

⁸² Bacon, *VT, SEH*, III, 251. We will see in Chapter 4 that the history of mechanical arts plays a crucial role in Bacon's "natural and experimental history ... for the building up of philosophy" (*PAH, OFB*, XI, 451).

⁸³ Ian Box comments that even intellectual shortcomings "really amount to moral failings more than methodological errors," "Bacon's moral philosophy," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 260-282, on 279-280. According to Box, Bacon's method was intended for moral recovery and he explores the medical "metaphors" used in Bacon's account of the mind's illness. However, Box's account does not address the ontological root of the mind's problems and he therefore fails to perceive the extent of the mind's declination. Instead, he concentrates on the vice of indolence and sees the method as a way to overcome this. But he notes that the "methodological directives prescribed in the *Novum organum* are not only rules to guide investigation, but serve equally as a moral and intellectual discipline, a kind of 'mental hygiene' for the diseased mind," 280. Bacon refers to the mind's moral governance as "Georgics of the Mind," drawing on Virgil's account of husbandry in the *Georgics*, 3, 289 (see Bacon, *DAS, SEH*, VII, 5, cf. I, 715). In a similar vein, James Stephens highlights the degree of reform required for the recovery of the mind when he points out that Bacon wished to prepare men "to enter the kingdom of knowledge intellectually in a 'naked' state," *Francis Bacon and the Style of Science* (Chicago: The University of Chicago Press, 1975), 58.

⁸⁴ Bacon, *VT, SEH*, III, 251.

race, that I have shown the power inherent in a true and proper humbling of the human spirit.⁸⁵

The characteristic of humility in natural inquiry perfectly mirrors its spiritual counterpart, in that both are paradoxically the grounds for enhanced power. The regeneration of the mind requires a self-acknowledged ignorance on the part of the inquirer involving the eradication (or levelling) of currently held views. According to Bacon, under this regime of humiliating purgation the mind can be made receptive to things:

In the present mental climate I cannot safely entrust the truth to you. Your understandings must be prepared before they can be instructed; your minds need healing before they can be exercised; the site must be cleared before it can be built upon ... Undoubtedly, sons, there is in the human soul some portion of our understanding, however preoccupied and beset, which welcomes truth, and there is a path which leads down thereto by a gentle incline.⁸⁶

I have taken pains to emphasise Bacon's perception of the severity of the problem because commentators tend to overlook Bacon's complete lack of faith in the mind "left to itself."⁸⁷ As he puts it, "Men are very far from realising how strict and disciplined a thing is research into truth and nature, and how little it leaves to the judgement of men."⁸⁸

Notwithstanding Bacon's critique of the spell of traditional learning and the mind's resulting madness, he expresses a high level of hope drawn from the certainty of things. Traditionally, scepticism (the philosophical counterpart to cognitive pride) had opposed the inflated claims of dogmatism but in such a way that its critique terminated in the abandonment of all hope. As we saw in Chapter 2, Bacon presents his method as a "middle way" (*via media*) to protect the mind from both the excesses of dogmatism and the pits of sceptical despair:

⁸⁵ Bacon, *RPh, BF*, 132-133, cf. *SEH*, III, 585.

⁸⁶ Bacon, *RPh, BF*, 109, cf. *SEH*, III, 563.

⁸⁷ Bacon, *NO, OFB*, XI, 55.

⁸⁸ Bacon, *RPh, BF*, 119, cf. *SEH*, III, 573.

My way and the reasoning of those who maintained *Acatalepsy* are rather alike in their beginnings but end up being very far apart and opposite to each other. For the latter insist simply that nothing can be known, whereas I say that not much in nature can be known by the way now in use. But thereafter they destroy the authority of the sense and intellect, whereas I think up and furnish helps for them.⁸⁹

In following this middle way, Bacon praises the pre-Socratics who “wisely steered a middle course between the arrogance of dogmatism and the hopelessness of *Acatalepsy*.”⁹⁰ Their merit lay in their refusal to argue the point, thinking it better to test it by “involving themselves with nature” (*Naturæ se immiscere*).⁹¹ However, he claims that ultimately they too invested “everything in ... ceaseless mental activity and agitation.”⁹² The problems generated by unaided mental activity – “the mind’s inborn [*natiuum*] and spontaneous movements” – underlie Bacon’s praise for those who recognised that “props for the intellect” such as dialectic were essential.⁹³ However, “this remedy comes too late.”⁹⁴ Dialectic is the work of the mind after it “has been invaded by the habits, hearsay and depraved doctrines of daily life, and beset by the emptiest of *Idols*.”⁹⁵ In Bacon’s terms, “the art of dialectic bolts the stable door too late and cannot recapture the horse”; it “entrenches” error and illusion rather than extirpating it.⁹⁶ In opposition to existing methods, Bacon sets

⁸⁹ Bacon, *NO, OFB*, XI, 79. On the method as *via media* see *DSV, SEH*, VI, 754-755, cf. 676-677.

⁹⁰ Bacon, *NO, OFB*, XI, 53. According to Liddell and Scott, the term ἀκαταληψία is found in the sceptical writings of Sextus Empiricus, and refers to the incomprehensibility of things, *A Greek-English Lexicon*, compiled by Henry George Liddell and Robert Scott (Oxford: Oxford University Press, 1861), 38.

⁹¹ Bacon, *NO, OFB*, XI, 53.

⁹² Bacon, *NO, OFB*, XI, 53.

⁹³ Bacon, *NO, OFB*, XI, 53.

⁹⁴ Bacon, *NO, OFB*, XI, 53.

⁹⁵ Bacon, *NO, OFB*, XI, 55 (italics in original).

⁹⁶ Bacon, *NO, OFB*, XI, 55.

forth his “one way to ... sanity.”⁹⁷ We must, he proclaims, begin afresh the work of the mind and curtail the mind’s freedom from the outset. As he puts it,

There remains but one way to health and sanity: to do the whole work of the mind all over again, and from the very outset to stop the mind being left to itself but to keep it under control, and make the matter run like clockwork [*ac Mens, iam ab ipso principio, nullo modo sibi permittatur, sed perpetuò regatur; ac res, veluti per machinas, conficiatur*].⁹⁸

To prevent the free play of the mind (and encourage hope), Bacon offered his New Organon – a machine or instrument to aid the mind in a task so vast that neither individually, nor severally through a union of many minds, could it accomplish anything of worth in its naked state.⁹⁹ To drive home this point, he compares attempting to undertake work for the intellect with “the naked force of the mind” to men attempting a hopeless task – the moving of a huge obelisk “with their bare hands.”¹⁰⁰ A spectator would regard the latter as an “act of madness.”¹⁰¹ Those engaging in such a task would be considered “madder still” if they tried to overcome physical obstacles purely by the addition of more men, irrespective of how athletic they were.¹⁰² In the same way, Bacon says, men’s reliance on the native intellect (regardless of the mental gymnastics of traditional learning) is a mark of insanity. The uniting of individual powers (mental or physical) unregulated and without proper instruments is the height of folly. In true Erasmian style, Bacon humiliates

⁹⁷ Bacon, *NO, OFB*, XI, 55.

⁹⁸ Bacon, *NO, OFB*, XI, 55.

⁹⁹ On the relationship between hope and the Bacon’s Organon see Michèle Le Doeuff, “Hope in Science,” in *Francis Bacon’s Legacy of Texts: ‘The Art of Discovery Grows with Discovery,’* ed. William Sessions (New York: AMS Press, 1990), 9-24. Le Doeuff argues for a close connection between hope and the negative instance where the latter performs a “rectification ... which partakes of the very nature of the soul,” 18.

¹⁰⁰ Bacon, *NO, OFB*, XI, 55.

¹⁰¹ Bacon, *NO, OFB*, XI, 55.

¹⁰² Bacon, *NO, OFB*, XI, 55. Rees says “Bacon surely has in mind the obelisk in St Peter’s Square, and probably Fontana’s images of the engineering that set it up,” *OFB*, XI, li.

the mind and his portrayal of human posturing has the ultimate intention of elevating its powers.¹⁰³

Through paying attention to Bacon's perception of the severity of the mind's pathological condition, it becomes apparent that the methodological function of *Novum organum* has a centrally important role in regenerating the human understanding. Bacon nowhere proposes an independently objective *Organon* that automatically generates truth. The purified mind is a necessary component in legitimate inquiry and by referring to his method as a "machine of the intellect," Bacon is not suggesting that it produces results independently of the condition of the investigator's mind.¹⁰⁴ The need for intellectual aids arises from Bacon's belief that "little [should] be left to sharpness and force of wits."¹⁰⁵ The corollary of this is that all "wits and intellects be put on much the same footing [*ferè exæquet*]."¹⁰⁶ Commentators have seized upon Bacon's notion of levelling men's wits as a form of democratic practice on the cognitive level. For example, Mary Hesse states "once the method is learned ... men's wits are leveled; anyone can do science."¹⁰⁷

¹⁰³ See Desiderius Erasmus, *The Praise of Folly and Other Writings: A Norton Critical Edition*, ed. and trans. Robert M. Adams (New York: Norton, 1989).

¹⁰⁴ Bacon, *ANN, OFB, XIII, 173; ILM(CS), SEH, III, 625*.

¹⁰⁵ Bacon, *NO, OFB, XI, 97*.

¹⁰⁶ Bacon, *NO, OFB, XI, 97*.

¹⁰⁷ Mary Hesse, "Francis Bacon's Philosophy of Science," in *Essential Articles for the Study of Francis Bacon*, ed. Brian Vickers (Hamden, Connecticut: Archon Books, 1968), 123. In the 1857 General Preface to Bacon's Philosophical Works, Robert Ellis writes: "Absolute certainty, and a mechanical mode of procedure such that all men should be capable of employing it, are ... two great features of the Baconian method. His system can never be rightly understood if they are neglected," *SEH, I, 23-24*. In contrast, Farrington rightly says, Bacon's reference to levelling men's wits has "caused much misunderstanding. He did not think every Tom, Dick, or Harry could be a scientist. The constitution of Solomon's House in his *New Atlantis*, and passage after passage in his other writings, make clear how rare a thing in his opinion a great scientist was," *BF, 119*. That Bacon has a doctrine reserved for the "sons of science" is clear from many passages. For example, in *TPM* he speaks of tables which are "a compliment reserved to some of the choicer spirits among you whom I hope to win thereby" (*BF, 69, cf. SEH, III, 535*). See also *VT, SEH, III, 248*. In the final aphorism of Book 1 of *Novum organum*, Bacon says that he has "purged, raked and levelled [*æquatá*] the seed-bed of the mind" (*NO, OFB, XI, 173*). This seems to capture Bacon's meaning of the term "levelling."

However, Bacon's programme is not egalitarian; the purported levelling of men's wits is merely a side-effect of his remedy for the "corrupt complexion" of the mind.¹⁰⁸ As the familiar Baconian analogy states: "For in the same way that much depends on steadiness and practice if you want to draw a straight line or perfect circle by hand alone, and little or nothing if you use a ruler or compasses, so it is with the view that I take."¹⁰⁹ Just as the compass disables uncontrollable physiological movements, Bacon's method regulates the "mind's inborn and spontaneous movements." Because Bacon's method leaves "little or nothing" to the mind, it disables men's natural inclinations and governs and directs the will to act for future goals rather than immediate ends. The mind is too eager and, as a result, the understanding is subject to a dominating abuse by the passions which persuade the will to assent to more pleasing and immediate goods. This is important and is often overlooked in accounts of Baconian psychology: the imagination and the passions are as much at work in rational knowledge as they are in the moral and civic. The tendency for private passions to dominate even in rational knowledge lies behind Bacon's statement that "the disabling of man's knowledge (entertained in Anticipations) is well to be allowed."¹¹⁰ In natural knowledge, the term "anticipations" is used by Bacon to refer to "the voluntary collections that the mind maketh of knowledge; which is every man's reason."¹¹¹ In Stephens' terms this is because the "arts of logic and rhetoric had conspired to equip it [the understanding] with false forms, more pleasing and more easily grasped than reality itself."¹¹²

¹⁰⁸ Bacon, *DO*, *OFB*, XI, 35.

¹⁰⁹ Bacon, *NO*, *OFB*, XI, 97.

¹¹⁰ Bacon, *VT*, *SEH*, III, 244.

¹¹¹ Bacon, *VT*, *SEH*, III, 244.

¹¹² Stephens, *Francis Bacon and the Style of Science* (Chicago: The University of Chicago Press, 1975), 58. The best discussion of Bacon's complex relationship among the three main functions of

Anticipations are all the more dangerous when they masquerade as rational, and receive further sanctions from the prevailing formalisms of logic. The power of the imagination to dictate to reason, through its fantastic distortions of reality represented in false systems of philosophy, is thus on a par with the power of the imagination to govern passionate action through rhetorical persuasions.¹¹³

The compass and rule analogies are persuasive devices intended to illustrate the futility of attempting to inquire into the truth of things by the force of the naked understanding. The obelisk analogy signifies that the naked intellect is powerless notwithstanding that it gives the appearance of action. Its unaided actions are like the ranting of a lunatic whose manic strivings are futile. Like the lunatic, the unaided mind is at the mercy of some inner ungovernable passion. Before the mind can be corrected from its "corrupt and deeply-rooted habits," we must (Bacon insists) recognise that its current condition entails that we do not "command" ourselves but are subject to the tyranny of the imagination.¹¹⁴ Reason has submitted to idols whereas it ought to have "submitted ... to things."¹¹⁵ Only by subjecting itself to "harsh laws and extreme discipline" can the mind be made "receptive to things."¹¹⁶ As Rossi says, "the products of the 'free' mind are but idols, namely ineffectual and arbitrary opinions ... only where the human mind forsakes its state of arbitrary freedom (i.e., the state of being 'left to itself') and learns to make use of specific techniques of inquiry, will it be able to arrive at the knowledge of natural facts in

the mind (the will, memory and reason) is found in Wallace, *Francis Bacon on the Nature of Man*, for a summary see 153-164.

¹¹³ Brian Vickers calls this ceaseless strife among the mind's faculties "psychomachia," "Bacon and Rhetoric," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 220. In Chapter 6 I relate this internal warring of the appetites to Bacon's doctrine of simple motions.

¹¹⁴ Bacon, *NO, OFB*, XI, 61.

¹¹⁵ Bacon, *NO, OFB*, XI, 85, 171.

¹¹⁶ Bacon, *IM, OFB*, XI, 3.

their objective form.¹¹⁷ The central concern of Book 1 of *Novum organum* is therefore to persuade the mind to “forsake its state of arbitrary freedom.” To “make ready” the mind, Bacon in Book 1 of *Novum organum* delivers the “destructive part of my *Instauration*, that comprises the three refutations: “the refutation of *Native Human Reason* left to itself; the refutation of *Demonstrations*; and the refutation of *Theories*, or of received philosophies and doctrines.”¹¹⁸ I have concentrated here on Bacon’s refutation of native human reason to show that it demands not merely logical reorientation but a humiliating regime of correction. In the following section I shall analyse Bacon’s grounds for hope.

¹¹⁷ Rossi, *Philosophy, Technology, and the Arts in the Early Modern Era*, trans. Salvator Attanasio (New York: Harper & Row, 1970), 160.

¹¹⁸ Bacon, *NO, OFB*, XI, 173.

II. The mind bound: the union of *res* and *mens*

A. Bacon's metaphysical assumptions

In an early paper Rees comments that "Bacon's metaphysical assumptions have never been investigated either singly or collectively, in the context of Bacon's philosophy."¹¹⁹ Elsewhere Rees justifiably raises the question, "why did Bacon bother to write the *Novum organum* at all if he believed he already possessed the makings of a creditable and credible body of positive science?"¹²⁰ I propose that these separate questions must be combined into the single question of how Bacon's metaphysical assumptions underpin the method of *Novum organum*. I argue that a distinction should be maintained between Bacon's metaphysical assumptions (his cosmogony) and what Rees calls Bacon's "semi-Paracelsian cosmology."¹²¹ According to Rees,

¹¹⁹ Rees, "Matter Theory: A Unifying Factor in Francis Bacon's Natural Philosophy?" *Ambix* 24 (1977), 110-125, on 113. When Rees raised the question of Bacon's metaphysical assumptions, he proposed to deal "only with those assumptions which provide clues to the question posed," 114. The particular question posed is: "what relationship obtains between the entities of the semi-Paracelsian bi-quaternion theory and the other elements of the matter theory – notably the attached spirits?" 113. In an earlier paper Rees argued that "the bi-quaternion theory was an 'elaboration' of Bacon's 'basic theory of matter,'" 113. See "Bacon's Semi-Paracelsian Cosmology," *Ambix* 22 (1975), 81-101. Here he says "Subsequent reflection on Bacon's *metaphysical assumptions* led me to see that the bi-quaternion theory is not an 'elaboration' but ... the main structural features upon which everything else in the theory of matter hangs," 113. Insofar as the bi-quaternion theory is part of Bacon's cosmogony, I agree with Rees' latter statement.

¹²⁰ Rees, "Francis Bacon's Biological Ideas: A New Manuscript Source," in *Occult and Scientific Mentalities in the Renaissance*, ed. Brian Vickers (Cambridge: Cambridge University Press, 1984), 297-314, on 308.

¹²¹ Rees defines metaphysical assumptions as "assumptions about what is 'real' or 'relevant' in the flux of experience with which the natural philosopher is confronted. They determine his basic choices – about, for instance, what principles of explanation are appropriate, what entities exist in the universe or what governs the relationship between those entities," "Matter Theory: A Unifying Factor in Bacon's Natural Philosophy?" 114. In Bacon's case there is one unique principle, viz., matter. Hence Bacon's metaphysical assumptions are ontological assumptions, i.e. they refer to the ultimate attributes of matter.

Francis Bacon's natural philosophy may be viewed as a single philosophy with two aspects or as two philosophies each with its peculiar character ... On the one hand, his philosophy appears as a programme for constructing a body of scientific knowledge that would yield practical benefits ... On the other, it appears as a strange corpus of theory, a speculative recreation ... In its first guise Bacon's philosophy appears as a set of methodological recommendations ... In its second manifestation Bacon's philosophy comprehends a complete but provisional system of knowledge about the workings of nature.¹²²

What Rees calls "Bacon's speculative philosophy" seems to straddle both cosmogony and cosmology. I hold that Bacon's cosmology is an elaboration of his cosmogony and that the distinction is crucial if we are to answer Rees' question on the relationship between matter and method. This section is taken up with outlining Bacon's metaphysical assumptions and their relationship to his method.

Before examining the signs along Bacon's tortuous way of inquiry, it is necessary to have some understanding of the grounds for Bacon's optimism underpinning the constructive part of his method (outlined in Book 2 of *Novum organum*). Bacon's grounds for hope rest on various ontological assumptions: the unity of matter; his concept of radiative or emanative matter; his doctrine of consent; and his view that the senses are linked by rays to matter's hidden powers.¹²³ This set of assumptions forms the basis for the relationship between Bacon's theory of matter and his way of inquiry. Thus Baconian optimism is based on a set of ontological assumptions that motivate hope. We have seen that Bacon directed his destructive attack on current learning through exposing what he considered a *de facto* sickness, or insanity, of the mind. Bacon's disclosure of the mind's pathological state should

¹²² Rees, *OFB*, VI, xxxvi.

¹²³ We will see that Bacon's concept of a single principle viz., matter – the unique source of operative power – underlies his other assumptions. This is clear in *Novum organum* when Bacon presents his grounds for hope. He states: "we should have every hope that nature's recesses still conceal many secrets of excellent use which are quite unrelated to and unparalleled by anything already discovered" (*NO*, *OFB*, XI, 167-169). On the role of hope in Bacon's programme, see Le Doeuff, "Hope in Science," in *Francis Bacon's Legacy of Texts: 'The Art of Discovery Grows with Discovery'*, ed. William A. Sessions, (New York: AMS Press, 1990), 9-24, on 16. On Bacon's "Grounds for Hope" in *Novum organum*, see Rees, *OFB*, XI, lxi-lxvii.

terminate in a condition of ignorance. From that point of “innocence,” Baconian inquiry begins the process of uniting the mind and things.

I will begin with the unity of nature, and then discuss consent and its dependence on radiative matter. From there I argue that the human mind and the organs of the senses are incorporated in this radiative network and this is why Bacon accepts the adequacy of the senses and the power of the mind to interpret under the right conditions and with proper guidance and helps. Although Baconian inquiry begins from the bewildering multiplicity of things, it ends in the discovery of an underlying unity – “forms of the first class” (a minimal set of elements).¹²⁴

At the level of phenomenal reality, the unity of nature is sustained in a complex network of radiative matter: the human composite of mind and body is immersed in this radiative network.¹²⁵ In Bacon’s terms,

The body of nature is elegantly and truly represented as covered with hair; in allusion to the rays of things [*propter rerum radios*]. For rays are as the hairs or bristles of nature, nor is there anything which is not more or less radiant [*atque omnia fere vel magis vel minus radiosae sunt*]. This is seen most evidently in the faculty of sight, and no less in all magnetic virtue, and every effect which takes place at a distance. For whatever produces an effect at a distance may be truly said to emit rays [*Quidquid enim operatur ad distans, id etiam radios emittere recte dici potest*].¹²⁶

Throughout nature, emanative matter radiates its motions linking bodies in a malleable network of powers. The organs of the senses are bombarded by a bewildering display of nature’s fecundity. Though matter’s emanations are unlimited qualitatively, its active elemental powers are restricted quantitatively: with the

¹²⁴ Bacon, *DAS, SEH*, IV, 361, cf. I, 568.

¹²⁵ This illustrates how Bacon’s cosmology is underpinned by his cosmogony. On Bacon’s cosmology see Rees “Francis Bacon’s Semi-Paracelsian Cosmology,” *Ambix* 22 (1975), 81-101; idem., “Francis Bacon’s Semi-Paracelsian Cosmology and the *Great Instauration*,” *Ambix* 22 (1975), 161-173. The radiative and emanative cosmos is explicated from enfolded matter. As we saw in Chapter 2, the schematisms of matter emanate simple motions. Bacon’s concept of emanative power ontologically guarantees the unity of nature which (as I discuss below) guarantees that the senses are minimally reliable.

¹²⁶ Bacon, *DAS, SEH*, IV, 322, cf. I, 525.

corollary that its forms comprise a limited set. This minimal set of elements, acting in accordance with necessary laws, by combination gives rise to the whole variety of things. As Bacon puts it, "*Forms of the First Class ... (like the letters of the alphabet) are not many and yet make up and sustain the essences and forms of all substances.*"¹²⁷ Thus the forms underlying phenomenal reality retain the primordial unity, and this is the main reason why the mind possesses the ability to interpret nature. For Bacon, all activity in nature (including sensation, cognition, and the passions) retains an imprint of matter's primary unity.¹²⁸

¹²⁷ Bacon, *DAS, SEH*, IV, 361, cf. I, 568 (italics in original).

¹²⁸ Rees states that "whether human memory and imagination are functions of the spirit, are moot points. The evidence is contradictory, though on balance Bacon does appear to assign some of the higher faculties in man to the activity of the vital spirit," "Francis Bacon's Biological Ideas," 302. I argue that Bacon attributed all faculties to the vital spirit. Bacon states: "The faculties of the soul are well known; understanding [*Intellectus*], reason [*Ratio*], imagination [*Phantasia*], memory, appetite, will; in short all with which the logical and ethical sciences deal. But in the doctrine concerning the soul the origins of these faculties ought to be handled, *and that physically*, as they are innate and inherent in the soul" (*DAS, SEH*, IV, 398-399, cf. I, 607, my emphasis). According to Ellis, Bacon follows Telesius, ascribing sensation and imagination to the anima sensibilis and "leaving the higher faculties, and especially the moral sense as the portion of the anima rationalis" (*SEH*, I, 606). However, the passage does not support Ellis' interpretation. Bacon says that all the faculties of the soul "with which the logical and ethical sciences deal ... ought to be handled, and that physically, as they are innate and inherent in the soul." As they are to be handled physically, "soul" here must refer to the material anima sensibilis and not the immaterial anima rationalis. Ellis even notes that "Donius, to whom Bacon refers a little further on, in effect rejects the anima rationalis altogether; admitting, in apparently insincere deference to received opinions, that it may exist; but holding that, if it does so, it is incognisable by human reason" (*SEH*, I, 606). Bacon's interpretation of the fable of Pan shows that he follows Donius (the following passage is omitted from *DSV*): "Pan delights in the nymphs, that is in the spirits; for the spirits of living creatures are the delight of the world. And with reason is he styled their leader, for each of them follows its own nature as a guide, round which after their own fashion they leap and frisk in endless variety and constant motion. And therefore one of the moderns has ingeniously referred all the powers of the soul to motion [*Itaque acute quidem ex recentioribus facultates animæ omnes ad Motum reduxit*], and remarked on the conceit and precipitancy of the ancients, who in too eagerly fixing their eyes and thoughts on the memory, imagination, and reason, have neglected the Thinking Faculty [*Vis Cogitativam*], which holds the first place. For he who remembers or recollects, thinks; he who imagines, thinks; he who reasons, thinks; and in a word the spirit of man, whether prompted by sense or left to itself, whether in the functions of the intellect, or of the will and affections, dances to the tune of the thoughts; and this is the frisking of the Nymphs" (*DAS, SEH*, IV, 324-325; I, 528). According to Bacon, memory, imagination and reason (as well as the will and affections) are motions of spirit. The *Vis Cogitativa* derives from plenipotentiary matter. Ellis notes that the modern referred to in the above passage "is A. Donius. See his *De Naturâ Hominis*, 1581, the title of the twenty-first chapter of the second book which is *Omnes Operationes Spiritus esse Motum et Sensum*," adding that "as might be supposed, Donius is altogether a materialist" (*SEH*, I, 528). According to Olivieri, "Bacon's choice of the three faculties of memory, imagination, and reason as classificatory principles points in the direction of Galen and the Galenic-Nemesian tradition of the three faculties of the rational soul and the three ventricles of the brain," "Galen and Francis Bacon," 73. He says, "This tradition, although controversial, was still quite alive

The importance of the unity of nature in Bacon's programme cannot be overstated.¹²⁹ Katherine Park points out that even though Bacon rejected "the fanciful sympathies and antipathies of the magical and alchemical writers," this does not preclude his conception of a unity of nature.¹³⁰ Park concentrates on the analogy of the mind as an "enchanted glass," and on the more general and literary use of analogy to demonstrate Bacon's acceptance of a positive role for the imagination. In contrast to Park's depiction of Bacon's use of analogy, I argue that there are natural-philosophical reasons for reading Bacon's description of the mind as mirror in much more literal terms. Bacon appropriates the traditional image of the mind as a mirror or reflector that when suitably disposed will capture the radiative virtues of things. Thus, in glossing Ecclesiastes' praise of the divine wisdom as manifest in creation, Bacon comments that Solomon there "Declar[es] not obscurely, that God hath framed the minde of man as a mirrour, or glasse, capable of the Image of the vniuersall world, and ioyfull to receiue the impression thereof, as the Eye ioyeth to receiue light."¹³¹ Moreover, Bacon states that this act of praise should not be limited to contemplative worship, pointing out that the passage confirms how man is "rayseed also to finde out and discerne the ordinances and decrees which throughout

in Bacon's times and provided Bacon with an essential physiological basis from which to study man, in his highest powers of knowledge, from an experimental point of view" (*ibid.*).

¹²⁹ On the centrally important concept of unity in Bacon's programme, see Robert Forbes McRae, "The Unity of the Sciences: Bacon, Descartes, Leibniz," *Journal of the History of Ideas* 18 (1957), 27-48. The section on Bacon is expanded in McRae's *The Problem of the Unity of the Science: Bacon to Kant* (Toronto: University of Toronto Press, 1961), 24-45. The truly insightful work of McRae has been ignored in Bacon scholarship: there is no mention in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996); and oddly in Julie Robin Solomon and Catherine Gimelli Martin's recent collection of essays on the topic of Bacon's concept of the unity of the sciences, McRae's name does not appear either in the general index or in the individual articles, *Francis Bacon and the Refiguring of Early Modern Thought* (Aldershot: Ashgate, 2005). I will return to McRae's work in Chapter 6.

¹³⁰ Katherine Park, Lorraine J. Daston, and Peter L. Galison, "Bacon, Galileo, and Descartes on Imagination and Analogy," *Isis* 75 (1984), 287-326, on 294.

¹³¹ Bacon, *AL, OFB*, IV, 6.

all those Changes are infallibly obserued.”¹³² The authority for this Solomonic endorsement is given, says Bacon, by the scriptural text itself: “*God hath made all thinges beautifull or decent in the true returne of their seasons. Also hee hath placed the world in Mans heart, yet cannot Man finde out the worke which God worketh from the beginning to the end.*”¹³³ There is no doctrinal prohibition on discovering “*the worke which God worketh*” and there are no divine limitations on man’s legitimate inquiries.¹³⁴ However, even though the mind is naturally disposed to reflect the nature of things, this potential remains unrealised. The obstacle is a self-imposed darkness through the bondage of the understanding to illusory notions:

For the mind of man (dimmed and clouded [*obducta et obfuscata*] as it is by the smooth covering of the body), far from being a smooth, clear, and equal glass (wherein the beams of things reflect according to their true incidence [*quod rerum radios sincere excipiat et reflectat*]), is rather like an enchanted glass [*speculi incantati*], full of superstition and imposture.”¹³⁵

The unity of nature gives rise to instances of conformity whereby things that resemble each other share deeper affinities. Moreover, conformity occurs between bodies animate and inanimate, and this is clearly seen in cases where the organs of the senses and the bodies which produce “reflections upon the sense” have

¹³² Bacon, *AL, OFB*, IV, 6.

¹³³ Bacon, *AL, OFB*, IV, 6. Cf. Eccles. 3: 11.

¹³⁴ This is clear in *Valerius terminus* where Bacon states: “To conclude then, let no man presume to check the liberality of God’s gifts, who, as was said, *hath set the world in man’s heart*. So as whatsoever is not God but parcel of the world, he hath fitted it to the comprehension of man’s mind, if man will open and dilate the powers of his understanding as he may” (*VT, SEH*, III, 221). Benjamin Milner comments that in *Novum organum* (1620) Bacon declares that “Natural philosophy does not borrow its authority or receive its limits from theology: it is self-authenticating,” “Francis Bacon: The Theological Foundations of *Valerius Terminus*,” *Journal of the History of Ideas* 58 (1997), 245-264, on 264. According to Milner, Bacon sets aside *Valerius terminus* (1603), “abandon[ing] his theological foundation for natural philosophy ... since natural philosophy, as such, possesses a standing worthy of divinity,” 264. In my view, the passage cited above shows that Bacon did not change his mind; it is clear in *Valerius terminus* that there are no divine limitations on man’s inquiries into nature.

¹³⁵ Bacon, *DAS, SEH*, IV, 431, cf. I, 643.

comparable structures.¹³⁶ Conformity of structure rests on similarity of forms and schematisms – the source of consent among bodies. For Bacon, “consent lies in nothing other than the mutual symmetry of forms and schematisms.”¹³⁷ Moreover, consent between similar schematisms is the basis for human sensation. According to Bacon, there is no difference in the consent between the organs of the senses and their respective qualities, and the consent among other bodies. Thus Bacon’s ontology entails that there is no distinction between the material of the human composite and any other composite body except in terms of the complexity of their respective schematisms. Sensation is limited only by limitations on the number and structure of the sense organs: were they enhanced or more intricately structured there would be a corresponding increase in the range of perceptions.¹³⁸ The following passage contains a detailed summary of Bacon’s thinking on conformity of structure, and on the consent of the senses with external schematisms:

The following are instances of correspondence [*Instantiæ Conformes*]: the mirror and the eye, and likewise, the structure of the ear, and places with an echo. And from this correspondence [*Ex quâ Conformitate*], besides the observation of resemblance [*Similitudinis*] itself which is useful in many ways, it requires little extra effort to infer and fashion this axiom, i.e. that the organs of the senses and bodies which give rise to reflections upon the sense are of like nature. This moreover prompts the intellect to rise effortlessly to a certain more exalted and noble axiom – namely that there is no difference between the consents and sympathies of bodies furnished with sense and of inanimate things without sense, save that in the former animal spirit is added to a body so disposed, but in the latter the spirit is absent. Thus there may be as many senses in animate bodies as there are consents in inanimate, so long as there are perforations [*perforationes*] in the animate body to allow for animal spirit to disperse itself into a member properly set up, as into a suitable organ. And again, there may no doubt be as many motions in an inanimate body, where animal spirit is absent, as there are senses in animal ones; though it must be that there are many more motions in inanimate bodies than senses in animate, because of the small number of sense organs. Now we see a very good example of this in pains. For while

¹³⁶ Bacon, *NO, OFB*, XI, 291.

¹³⁷ Bacon, *NO, OFB*, XI, 437.

¹³⁸ Rees points out that “Bacon seems to have believed that the shape of an organ (ventricular “geometry”) modified the action of the spirits within it,” “Matter Theory: A Unifying Factor in Bacon’s Natural Philosophy,” 123, n. 27.

there are many kinds of pain in animals and many different manifestations of each of them (e.g. the pain of burning is one thing, bitter cold another, stabbing another, pressing another, racking another, and so on), it is absolutely certain that, as far as motion goes, all these exist in inanimate bodies, as in wood or stone when burnt, squeezed by ice, or stabbed, cut, bent, beaten, and so on, save that here they do not impinge on sense because the animal spirit is absent.¹³⁹

It is through the action of consent between the organs of the senses and *res* (matter's emanative powers) that the mind receives phenomenal qualities which are the basis for all human knowledge. Thus the metaphor of the mind as mirror carries much more philosophical (and materialist) import than is generally acknowledged. As if to anticipate future treatments of this notion solely in metaphorical terms, Bacon asks rhetorically:

Are not the Organs of the senses of one kinde with the Organs of Reflexion, the Eye with a glasse, the Eare with a Caue or Straight determined and bounded? Neither are these onely similitudes, as men of narrowe obseruation may conceyue them to bee; but the same footestepes of Nature, treading or printing vppon seuerall subiects or Matters.¹⁴⁰

The complexity of the human composite determines its capacity to consent with matter's infinite variety. Bacon's deployment of the macrocosm-microcosm trope explains how the human composite of mind-body is so constructed that it can mirror nature. He states:

It is most true that of all things in the universe man is the most composite [*maxime compositam esse et decompositam*], so that he was not without reason called by the ancients the little world. For though the Alchemists, when they maintain that there is to be found in man every mineral, every vegetable, &c., or something corresponding to them, take the word *microcosm* in a sense too gross and literal, and have so spoiled the elegance and distorted the meaning of it, yet that the body of man is of all existing things both the most mixed [*maxime mistum*] and the most organic, remains not the less a sober and solid truth. And this is indeed the reason it is capable of such wonderful powers and faculties; for the powers of simple bodies, though they be certain and rapid, yet being less refracted, broken up, and counteracted by mixture, they are few; but abundance and excellence of

¹³⁹ Bacon, *NO*, *OFB*, XI, 291.

¹⁴⁰ Bacon, *AL*, *OFB*, IV, 78. See also *DAS*, *SEH*, IV, 339, cf. I, 542-543.

power resides in mixture and composition [*virtutis autem copia et excellentia in mistura et compositione habitat*].¹⁴¹

Elsewhere Bacon describes the mind of man as *forma formarum* because it comprises all other forms.¹⁴² It is the mind's complexity that renders it capable of mirroring the world. Thus Bacon's use of the microcosm-macrocosm trope coheres perfectly with Ecclesiastes' proclamation that God "*hath placed the World in Mans heart.*" For Bacon, consent guarantees that phenomenal qualities (simple natures) provide the link to an originating form and schematism of matter. The task of inquiry is to chart a route from the phenomenal qualities of experience to the *fons emanationis* in matter.¹⁴³ Consent underpins the potential of the mind to interpret, and the guarantee of successful inquiry is directly related to the emanative power of nature's active virtues. Under the fundamental appetitive power of Cupid, consent is the naturally occurring linkage of schematisms or organisational structures. External schematisms of matter emanate motions that resonate on the senses and are reflected in internal schematisms. The rays linking the internal and the external schematisms are not ontologically distinct from any other form of consent.

However, the senses *are* limited, and the mind *does* distort reality. Matter's elemental structures account for both the strengths and weaknesses of the senses. But Bacon is clear on the distinction between his views and the sceptical attack on the unreliability of the senses:

But heere was their [skeptics] cheefe Errour: They charged the deceite vppon THE SENCES; which in my Iudgement (notwithstanding all their Cauillations) are verie sufficient to certifie and report truth (though not

¹⁴¹ Bacon, *DSV, SEH*, VI, 747, cf. 671.

¹⁴² Bacon, *DSV, SEH*, VI, 748, cf. 671. See also *DAS, SEH*, IV, 407, cf. I, 616; *AL, OFB*, IV, 107. Although this is an Aristotelian formulation, Bacon is speaking of his own forms which are "determined in matter" (Bacon, *NO, OFB*, XI, 443). See Aristotle, *De anima*, iii, 8. For Bacon, mind and body are material. See n. 128.

¹⁴³ In the opening aphorism of Book 2 of *Novum organum* Bacon lists *fons emanationis*, *natura naturans* and *vera differentia* as the terms which "comes closest to what [he] means" by form (*NO, OFB*, XI, 200-201).

alwayes immediately, yet by comparison; by helpe of instrument, and by producing, and vrging such things, as are too subtile for the sence, to some effect comprehensible, by the sence, and other like assistance. But they ought to haue charged the deceit *vpon the weaknes of the intellectual powers, & vpon the maner of collecting, & concluding vpon the reports of the senses*. This I speake, not to disable the minde of man, but to stirre it vp to seeke helpe; for no man, be he neuer so cunning or practised, can make a straight line or perfect circle by steadinesse of hand, which may bee easily done by helpe of a Ruler or Compass.¹⁴⁴

In contrast with the sceptical assault on knowledge, Bacon's matter theory explains how the senses are reliable. According to Bacon, "the consents of the senses with their objects ... are very obvious, have been well noted and keenly scrutinised."¹⁴⁵ Although limited, the senses are a reliable starting point for the inquiry into nature.

For Bacon, the unreliability of the senses is not merely a problem of corruption or distortion, but arises from a naturally determined state of limitation with regard to the infinite subtlety of matter's radiative powers.¹⁴⁶ In order for sensation to occur, matter's emanations have to register with the animal spirits and this requires suitable organs.¹⁴⁷ As Bacon explains, there must be "qualified perforations for the [animal] spirits to pass."¹⁴⁸ In the absence of these perforations,

¹⁴⁴ Bacon, *AL, OFB*, IV, 111 (italics in original).

¹⁴⁵ Bacon, *NO, OFB*, XI, 439.

¹⁴⁶ Bacon's concept of radiative matter is taken up again in Chapter 6 where I discuss the unity of the sciences. The whole issue of Bacon's notion of the "orb of virtue" and action-at-a-distance needs to be thoroughly investigated (*ANN, OFB*, XIII, 195). For William Gilbert's notion of the orb of virtue see *De mundo nostro sublunari philosophia nova*, Amsterdam, 1651 (Amsterdam: Menno Hertzberger, fac. repr. 1965), 47-48, 56-57, 61. Oddly, Marie Boas makes no mention of Bacon's appropriation of Gilbert's orb of virtue, "Bacon and Gilbert," *Journal of the History of Ideas*, 12 (1951), 466-467.

¹⁴⁷ Rees rightly says that, according to Bacon, "Animals are capable of sensation ... because the vital spirit, channeled throughout the body in the nerves and sinews, communicates with a ventricular concentration of spirit" in the brain, "Francis Bacon's Biological Ideas," 302. Penelope M. Gouk observes that "To Bacon himself ... his ideas about sound, hearing and perception were not caps of diverse philosophies assembled like a jigsaw puzzle. They formed part of a single, coherent natural philosophy," "Music in Francis Bacon's Natural Philosophy," in *Francis Bacon: Terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell'Ateneo, 1984), 139-154, on 144. She says that for Bacon, "The effects of musical sound on the listener ... arise from the similarity between the species of sound and the *spiritus*," 145. However, she fails to mention Bacon's doctrine of consent.

¹⁴⁸ Bacon, *SS, SEH*, II, 556.

the animal spirits cannot register matter's emanations.¹⁴⁹ The senses are limited to five because there are only five organs which have the necessary perforations "for the spirits to pass." Were there more than five suitable organs, there would (Bacon says) be a correlative expansion in the range of perception. As he puts it,

The organs of the senses qualify the motions of the spirits; and make so many several species of motions, and pleasures or displeasures thereupon, as there be diversities of organs. The instruments of sight, hearing, taste, and smell, are of several frame, and so are the parts for generation ... and if there were any other differing organs, and qualified perforations for the spirits to pass, there would be more than the five senses.¹⁵⁰

Hence the animal spirits are cut off from a multitude of motions which would be accessible if things were otherwise conformed. In Bacon's view, "The subtlety of nature far surpasses the subtlety of sense and intellect."¹⁵¹ The operation of spirit contained in tangible matter and the more subtle metaschematisms in gross bodies – the *sine qua non* of operative power – do not strike the senses. If knowledge of matter's hidden activities is a necessary condition for operative power, then without

¹⁴⁹ Bacon identifies two exceptions to this: "the affecting of the spirits immediately, and (as it were) without an organ, is of greatest pleasure; which is but in two things; sweet smells, and wine and the like sweet vapours" (SS, SEH, II, 556).

¹⁵⁰ Bacon, SS, SEH, II, 556. This leads Bacon to consider "whether some beasts and birds have not senses that we know not" (SS, SEH, II, 556). He notes that "the very scent of dogs is almost a sense by itself" (*ibid.*). In *Novum organum* he discusses "Summoning Instances" which lead down the non-sensible to the sensible" (my trans., NO, OFB, XI, 346). When "the object is incapable of making an impression on the sense," we must find ways of summoning the object to appear before the sense (*ibid.*). For example, if we are inquiring into the nature of "Heat or Cold or at any rate its degrees which the senses because of their weakness cannot make out," a calendar glass will make these perceptible (NO, OFB, XI, 355). He explains: "The air's sense, as far as hot and cold is concerned, is so subtle and exquisite that it far surpasses our faculty of touch, so much so that a sunbeam, or the heat of the breath or even more the heat of the hand placed on top of the glass, immediately and manifestly makes the water sink. Yet I think that the spirit of animals has a still more exquisite sense of heat and cold, save that the bodily mass blocks and blunts it" (NO, OFB, XI, 251). Hence "It is ... a subject of a very noble inquiry, to inquire of the more subtle perceptions; for it is another key to open nature, as well as the sense; and sometimes better" (SS, SEH, II, 602). Alternatively, "sometimes reduction [*Deductio*] does not take place in human sense but in that of some other animal whose sense in certain cases outdoes human capacities, as for instance in the dog when it comes to smell, or in the cat, the owl and suchlike creatures with night vision when it comes to the hidden light that lingers when the air is not illuminated by an outside source" (NO, OFB, XI, 357-359).

¹⁵¹ Bacon, NO, OFB, XI, 67. Bacon repeats this on many occasions – for example, in *Valerius terminus* he writes, "the subtilty of words, arguments, notions, yea of the senses themselves, is but rude and gross in comparison of the subtilty of things" (VT, SEH, III, 242). On the key notion of "subtlety" in Bacon's philosophy see Rees, "Atomism and 'Subtlety' in Francis Bacon's Philosophy," *Annals of Science* 37 (1980), 549-571.

this knowledge we are “as stupid as any star-struck imbecile.”¹⁵² The infinite subtlety of nature allied to the knowledge that our senses are the only connecting thread to nature’s hidden powers, entails that Bacon’s major concern is to overcome the limitations of the senses. Bacon’s account of the Idols of the Tribe highlights the limitations of the senses:

But by far the greatest hindrance and distortion of the human intellect stems from the dullness, inadequacy and unreliability of the senses, so that things which strike the senses outweigh those which, even if they are more important, do not strike them immediately. Reflection therefore almost stops where sight does, and so things invisible attract little or no attention.¹⁵³

Bacon’s position here is no mere empiricist theory of perception, but confirms his view that from cosmogonical beginnings the great schematism – the outcome of the balancing of all categories of nature – includes perceptual and subjective psychological categories. Within this cosmogonical framework, Bacon accepts that the qualities reported directly by sense (Hot, Cold, White, Black etc.) can be taken as reliable so long as the key aspect of a provision of helps is fulfilled.¹⁵⁴ Bacon’s simple natures retain the names of commonplace qualities (Hot, Cold etc.) because the task of metaphysics is to define the name after refining the notion.¹⁵⁵ Corrupt notions cannot be purified through redefinition, and any further purported clarification of terms only compounds the confusion. Bacon’s cure for the confusion generated by traditional names is to institute a science of definitions, materially generated from the signs and markers uncovered through inquiry. Because the organs of the senses (albeit unreliably) present phenomenal qualities, Bacon

¹⁵² Bacon, *HDR, OFB*, XIII, 71.

¹⁵³ Bacon, *NO, OFB*, XI, 87.

¹⁵⁴ See Bacon, *NO, OFB*, XI, 69.

¹⁵⁵ As Bacon explains in a letter to Father Redemptus Baranzano (1622), “It is the flux of matter and the inconstancy of the physical body which requires Induction; that thereby it may be fixed, as it were, and allow the formation of notions well-defined,” *LL*, XIV, 377.

postulates that terms describing qualities can be used to label matter's fundamental powers. This explains why the schematisms of matter and "forms of the first class" underlying simple natures (phenomenal qualities) share the same names. The perception of qualities such as hot and cold indicates consent between the organs of the sense and the originating forms and schematisms of matter. Current names for individual bodies and their qualities denote a confused mingling of elemental motions. Nonetheless Bacon utilises these names as the analytical threads to pursue whatever it is in matter that gives rise to a particular phenomenal quality (or simple nature). The experimental programme of exclusion resolves component qualities active in the latent schematisms of concrete bodies until a single source can be traced – the *fons emanationis* or form.¹⁵⁶

Consent guarantees that phenomenal qualities provide links to an originating simple nature in matter but inquiry relies on judgement, the work of the mind. The natural bond between our inner schematisms (the organs of the senses) and external schematisms in nature is so important for Bacon that he characterises the consent of the senses with their corresponding simple natures as a template applicable to all forms of consent. According to Bacon, "the consents of the senses with their objects ... may also shed considerable light on other consents which lie hidden."¹⁵⁷ The limitations of the senses refers only to their unreliability in terms of nature's subtlety; the imagination overrides this impediment and supplies fantastic explanations to overcome the mind's inability to directly access nature's hidden

¹⁵⁶ The human composite is linked to *res* through sensation – the links are the rays whose source of emanation (*fons emanationis*) is matter. For a possible source for Bacon's notion of radiative matter see Stephen Clucas, "Corpuscular Matter Theory in the Northumberland Circle," in *Late Medieval and Early Modern Corpuscular Matter Theories*, ed. Christoph Lüthy, John E. Murdoch and William R. Newman (Leiden: Brill, 2001), 181-207. Silvia Manzo also associates Bacon with the Northumberland Circle, "Francis Bacon and Atomism: A Reappraisal," in *Late Medieval and Early Modern Corpuscular Matter Theories*, 209-244.

¹⁵⁷ Bacon, *NO, OFB*, XI, 439.

virtues. Hence Bacon states, “And this is the very thing which I am preparing and labouring at with all my might, – to make the mind of man by help of art a match for the nature of things.”¹⁵⁸ The task of inquiry is to stop the mind acting directly on the unreliable input of the senses.

According to Bacon, the unreliable data supplied by the senses undergoes further distortion in the mind’s efforts to compensate for its inability to directly engage with the subtlety of nature. Bacon refers to this as the “grand deception of the senses.” In *Novum organum* he states:

For the deceptions of the senses should be held over to the specific investigations concerning sense and the sensible, save for that grand deception of the senses that sets up distinctions between things according to the measure of man and not according to the measure of the universe [*exceptâ illâ magnâ Fallaciâ Sensuum, nimirum quòd constituent lineas rerum ex analogiâ Hominis, & non ex analogiâ Vniuersi*] – a weakness which can only be put right by reason and universal philosophy.¹⁵⁹

The senses are to be acknowledged as mediator between things and the mind, but restored to their legitimate function: the imagination is to be constrained so that the mind truly judges their input. If the mind accepts unreliable information, any subsequent judgement amplifies ignorance. Bacon clearly states his position on this traditional distinction and the error is classified under the Idols of the Tribe: “For people falsely claim that human sense is the measure of things, whereas in fact all perceptions of sense and mind are built to the scale of man and not universe [*ex analogiâ hominis, non ex analogiâ Vniuersi*].”¹⁶⁰ The blame lies with the mind which “is to the rays of things like an uneven mirror [*instar speculi inæqualis ad radios rerum*] which mingles its own nature with the nature of things and distorts and stains

¹⁵⁸ Bacon, *DAS, SEH*, IV, 412, cf. I, 622.

¹⁵⁹ Bacon, *NO, OFB*, XI, 359.

¹⁶⁰ Bacon, *NO, OFB*, XI, 79-81.

it.”¹⁶¹ What Bacon seeks is a legitimate expansion of sensory range whilst simultaneously contracting the current judgemental freedom of the mind to interpret.

To achieve a reduction of the senses to their proper function and the control of the mind’s anticipations, Bacon demands a “disentangling” of the composite structures delivered to the mind via the organs of the senses.¹⁶² The latter are incapable of providing the distinct and separate causes of things. What the inquirer ultimately seeks to discover is the terminus in matter of that single cause or form which generates a given phenomenal effect (simple nature). The senses register concrete bodies as conglomerations of qualities; perception deals with composites but the elements of these composites (their originating forms) are simple. The task of inquiry is to chart the route from the phenomenal qualities of experience (simple natures) to the originating forms and schematisms of matter. Although the organs of the senses are the termini of a consenting material network, sensory data transmitted through this network requires informed interpretation. In Bacon’s terms, the oracular pronouncements of the senses are “wrapped in obscurity.”¹⁶³ Experiment supplies helps for the senses: “the minute differences of things ... are either laid bare to sense or forced into the light by evidence which can be submitted to sense.”¹⁶⁴ This is evident in the famous remark that “the sense judges only the experiment while the experiment judges nature and the thing itself [*re ipsâ*].”¹⁶⁵ The inquiry offers a way to overcome the limitations of the senses which are ministered to by what Bacon

¹⁶¹ Bacon, *NO, OFB*, XI, 81.

¹⁶² Bacon, *NO, OFB*, XI, 213.

¹⁶³ Bacon, *RPh, BF*, 106, cf. *SEH*, III, 560.

¹⁶⁴ Bacon, *RPh, BF*, 130, cf. *SEH*, III, 583.

¹⁶⁵ Bacon, *NO, OFB*, XI, 87.

calls “instances” and “apt and appropriate experiments.”¹⁶⁶ But this will not overcome the “grand deception of the senses”: inquiry must bridge the gulf between *res* and *mens*. Bacon states: “I present myself as high priest of the sense (from which all natural knowledge should, unless we prefer madness, be derived), and learned interpreter of its oracles; so that whereas others merely claim to watch over and cherish the sense, I do so in fact.”¹⁶⁷

In order to interpret the oracles of the senses, one requires a “key to Interpretation” (*clavis Interpretationis*).¹⁶⁸ Without this key, men will remain “wrapped in eternal night.”¹⁶⁹ The key is “true and legitimate *Induction*” which works to segregate composites through exclusion and comparison.¹⁷⁰ For Bacon, induction is a process of disentangling concrete bodies into their simple components. We will see in Chapter 5 that the analysis or disentangling of complex bodies is the work of metaphysics. As Bacon puts it, “the evidence drawn from things is like a mask cloaking reality and needs careful sifting.”¹⁷¹ Under normal circumstances, human perception recognises the species of things and labels them consistently. The mind rests satisfied that its cognitions carve or delineate nature and therefore reflect nature’s true divisions. Baconian science is based on access to more fundamental components and the composite must be analysed into its constituent parts: inquiry

¹⁶⁶ Bacon, *NO, OFB*, XI, 87. Farrington notes that “The word ‘Instance’ needs a definition. It is more than a mere phenomenon of nature. It is an observed fact that has entered into and formed part of a logical structure,” *BF*, 99, n. 2. Pérez-Ramos has a detailed footnote on the term, *Francis Bacon’s Idea of Science and the Maker’s Knowledge Tradition* (Oxford: Clarendon Press, 1988), 246, n. 8. Pérez-Ramos ties the notion to a forensic context, and hence to Bacon’s notion of a “Tribunal of the Intellect.”

¹⁶⁷ Bacon, *DO, OFB*, XI, 35.

¹⁶⁸ Bacon, *NO, OFB*, XI, 217. See also *CV, BF*, 101, cf. *SEH*, III, 620.

¹⁶⁹ Bacon, *RPh, BF*, 106, cf. *SEH*, III, 560.

¹⁷⁰ Bacon, *NO, OFB*, XI, 215-217 (italics in original).

¹⁷¹ Bacon, *TPM, BF*, 66, cf. *SEH*, III, 533.

seeks individual qualities and ultimately an elemental alphabet of powers. In

Bacon's terms:

He who has not mixed, confused and reduced to a mass the whole distinction of things which is manifest in species popularly established, or even in the names bestowed, will not see the unity of nature, nor the legitimate lines of things, <and> he will not be able to interpret.¹⁷²

Through experimentally excluding all that is extraneous to the simple nature, or all that fails to produce operative success, an ascent in theoretical knowledge is guaranteed. Beginning with the disentangling of sensory phenomena, there is a step-by-step narrowing of the domain of investigation and a homing in on the target of inquiry (*res*). Bacon's account of inquiry as a retracing of the path from the phenomena of simple nature to its source in matter (i.e. from what is better known to man to what is better known to nature) is determined by his doctrine of consent. We can now appreciate why Bacon's metaphysical assumptions establish that an analysis or sifting of nature's complexities will lead to elemental qualities.

Bacon does not claim to have exact cartographic knowledge of the terrain of inquiry, and says he "merely bear[s] the part of a guide."¹⁷³ His vision of "what nature may be made to do" and his implicit belief that, as he puts it, "the art of discovery grows with discovery" determines his self-correcting strategies.¹⁷⁴ Tactically speaking, this is diametrically opposed to the traditional procedures of both deductive and inductive logic. It is much more akin to the Socratic mode of dialectical questioning where argument through exclusion and negatives is paramount. Baconian inquiry is based on the decisive assumption that there is

¹⁷² My trans., Bacon, *DIN, SEH*, III, 785.

¹⁷³ Bacon, *NO, OFB*, XI, 57.

¹⁷⁴ My trans., Bacon, *NO, OFB*, XI, 197.

something to find irrespective of an absence of finalised and clear-cut directions.¹⁷⁵ Just as the concept of unknowing typical of the *via negativa* determines the contours of the spiritual journey in spite of a substantive lack of description, so Bacon's strategies direct to a goal that is known to exist via an uncharted route. In both cases what is absolutely known is that there *is* a goal. This explains the primary place given to negativity in his way of inquiry: proceeding through eliminations and exclusions redirects inquiry in accordance with the signs given by the cosmogonical architecture of a dark and unknowable matter.¹⁷⁶

Bacon's foundational strategies for overcoming the vices of learning are often ignored by commentators in favour of a more specific concentration on logical details. Alternatively, I have highlighted the more programmatic reforms of the senses and the mind. These reforms can justifiably be termed Bacon's philosophy of humility. Any attempt to bolster existing logic or techniques of demonstration without an understanding of how matter and the senses conspire in the production of knowledge will cause further deviations from the correct route. In Bacon's terms, "to put the matter simply ... in as much as a lame man on the road will outstrip an athlete who is off it, the case is altered."¹⁷⁷ Without experimentation there can be no

¹⁷⁵ In Plato's *Meno*, Meno proposes a paradox that relates to Baconian inquiry. The paradox states that there is no point in inquiring for what we do not know, since we would not recognise it if it were found; if we already recognise it, then there is no point in inquiring. See Plato, *Meno*, 80d-e in *Five Dialogues: Euthyphro, Apology, Crito, Meno, Phaedo*, trans., G. M. A. Grube (Indianapolis: Hackett Publishing Co., 2002). Malherbe inadvertently summarises the paradox with respect to Bacon. "How," Malherbe asks, "is it possible to invent truth and produce works methodically, and not by chance, since either we do not know what is to be found, and therefore we do not know where to search ... or we do know what is to be found and therefore there is nothing to search for?" "Bacon's Method of Science," 76. The paradox of inquiry is resolved by Bacon because the goal is certain notwithstanding that the route is only established through inquiry itself. This is, more or less, Socrates' response to Meno's paradox.

¹⁷⁶ In the following section I argue that the darkness of matter motivates Bacon to formulate his method around a central core comprising the concepts of negativity and exclusion.

¹⁷⁷ Bacon, *RPh*, *BF*, 118, cf. *SEH*, III, 572.

corrective as the route is only marked out by operation and effects. The humiliating reduction of the mind is the price for entry into the kingdom of knowledge:

in inquisition of nature they have ever left the oracles of God's works, and adored the deceiving and deformed imagery which the unequal mirrors of their own minds have represented unto them. Nay it is a point fit and necessary in the front and beginning of this work without hesitation or reservation to be professed, that it is no less true in this human kingdom of knowledge than in God's kingdom of heaven, that no man shall enter into it *except he become first as a little child.*¹⁷⁸

Entry into the kingdom of knowledge – and its corollary, viz., access to nature's unlimited bounty – requires purgation.¹⁷⁹ Bacon's comparisons of natural inquiry with the conditions necessary for spiritual regeneration indicates the level of reform required in reducing the mind to a state of primitive ignorance. As Bacon puts it, he “yearn[s] for some secret of initiation which, like the coming of April or of Spring, might avail to thaw and loosen ... fixed and frozen minds.”¹⁸⁰ In the following section I argue that Bacon appropriated a whole range of spiritual analogies in the form of apophatic theology and its attendant spiritual askesis, known generally as the *via negativa*. The dispositional proclivity to error and the tendency to premature theorising is so endemic in human nature that Baconian inquiry exacts a severe disciplining of the mind's freedom. In terms of methodical inquiry into nature, the apophatic approach is perfectly integrated with Bacon's ontological and epistemological assumptions.

¹⁷⁸ Bacon, *VT*, *SEH*, III, 224 (italics in original). See also, *ANN*, *OFB*, XIII, 173. Rees translates *Abecedarium nouum naturæ* as *A New Abecedarium of Nature* (in contrast to the *SEH* translation “an alphabet of nature”). He argues that the term *abecedarium* refers to “an alphabet book, child's primer, or absey book,” *OFB*, XIII, 305. As he puts it, “to restore human authority over nature we must ... be humble, become like children and work hard on our ABCs (abecedaria),” *OFB*, XIII, xl.

¹⁷⁹ Book 1 and Book 2 of *Novum organum* are entitled “Aphorisms concerning the Interpretation of Nature, and the Kingdom of Man.” (*NO*, *OFB*, XI, 65).

¹⁸⁰ Bacon, *RPh*, *BF*, 128, cf. *SEH*, III, 580-581.

B. Ignorance and the *via negativa*

In Chapter 2, I presented Bacon's concept of matter. Although beyond comprehension in essence, matter is the unique source of the current world which manifests a single facet of nature's multifaceted potential. Nature free results from a limitation of matter's absolute power (*natura naturans*). Inquiry into nature must begin with "what nature does" (nature free) before it can move to "what nature ... may be made to do" (the science of magic).¹⁸¹ Baconian ontology and epistemology depend on binding and exclusion, and so produce what can reasonably be called an apophatic approach to science.¹⁸² The apophatic approach fulfils two functions: first, it combats the anticipations of the mind and is therefore purgative in itself; second, in terms of methodical inquiry into nature, the apophatic approach with its emphasis on the *via negativa* vigilantly scrutinises crude affirmations. The incomprehensible nature of dark and unknowable matter determines many of the strategies of legitimate inquiry. Many of Bacon's more positive procedural devices emerge out of his prioritisation of the role of ignorance and exclusion. In analysing the components of Baconian inquiry, the concept of negativity cannot be overstated and Bacon's position on its pre-eminence is unqualified:

The human intellect ... suffer[s] from the peculiar and permanent error of being moved and excited more by affirmatives than negatives, when it ought to pay heed in a proper and systematic way to both equally; indeed, in the true setting up of every axiom, the power of the negative instance is actually greater.¹⁸³

¹⁸¹ *NO, SEH, IV, 127, cf. OFB, XI, 214.*

¹⁸² The term "apophatic" refers to knowledge of God obtained by way of negation. The terms "negative theology," "*via negativa*" and "apophatic theology" are interchangeable.

¹⁸³ Bacon, *NO, OFB, XI, 85*. According to Bacon, the mind's restlessness explains its pursuit of affirmatives – there is a "straining for what is further off" (*NO, OFB, XI, 85*). This is also the explanation for the mind's pursuing "final causes" (see *NO, OFB, XI, 85-86*).

Bacon constantly refers to the actions of purging and purifying, making it difficult to ignore his interminable borrowings from the language of spirituality and the asceticism of his disciplinary programme for the mind.¹⁸⁴

Although matter in itself is beyond conceptual parameters, its powers are manifest through their effects and in this way the senses and the understanding acquire a passing familiarity with nature's potency. But the mind's overconfidence in its ability to grasp the hidden powers underlying nature's phenomenal manifestations is the source of error. In this condition it misinterprets not only what matter is, but what it does and what it can be made to do. Bacon's project endorses a transition from current ignorance to a state of unknowing, in the positive sense of "learned ignorance."¹⁸⁵ For Bacon, our ignorance of what nature can do is corrigible precisely because matter's cosmogonical story involves a move from darkness and chaos to light and system: *natura naturata* (matter organised) is the only route back to "the innards of operation" (*natura naturans*).¹⁸⁶ The process of inquiry is a return journey into the darkness of matter:

Now this *Cupid* [primary matter] is truly an egg hatched by Night, for all knowledge of him (all that may be had) proceeds by exclusions and negatives. But proof made by exclusion is a kind of ignorance, and as it

¹⁸⁴ On Bacon's use of religious language, see John C. Briggs' brilliant study, *Francis Bacon and the Rhetoric of Nature* (Cambridge, Mass.: Harvard University Press, 1989). There he argues that "Bacon calls on the authority of Solomon, Moses, Paul, and Democritus to conceive a new persuasion, a way of understanding nature and mankind in terms of a code to be broken and exploited through self-abnegation and an assiduously analytic inquiry undertaken for the sake of charity," vii. However, in a later paper Briggs expresses doubts about the sincerity of Bacon's "quasi-religious readings," – see "Bacon's Science and Religion," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 172-199, on 185. For example, he asks, "Does this highest Baconian endeavour – the prolongation of life – arise from and perhaps extend the reach of religion and charity, or is it more simply a useful, perhaps debased, secular adaptation of religious concerns and doctrines of salvation?" 194. Briggs rightly argues that many studies fail to "do justice to the complexity of Bacon's debt to, and use of, religion. They do not adequately account for the tension between Bacon's solemnity, which moderns tend to underestimate, and the nearly grotesque, perhaps deeply subversive pretension of the New Atlantis's appropriation of religion for the sake of the new sciences," 196. To date, Briggs is the only commentator to do justice to this tension.

¹⁸⁵ See Jasper Hopkins, *Nicholas of Cusa on Learned Ignorance: A Translation and an Appraisal of De docta ignorantia* (Minneapolis: The Arthur J. Banning Press, 1985).

¹⁸⁶ Bacon, *NO, OFB*, XI, 181.

were *Night*, with regard to what is included in it [...]But the parable further suggests that there is some end and limit to these exclusions ... for Night does not incubate forever. Certainly it belongs to God alone, that, when His nature is inquired of by the sense, exclusions shall not end in affirmatives. But here the case is otherwise, that is, that after due exclusions and negatives something is affirmed and established, and an egg hatched, as it were, after an appropriate period of incubation; and not only is it that the egg is hatched by Night but also that the person of *Cupid* is hatched from the egg, that is, not only some notion of this matter drawn and extracted out of ignorance, but also a distinct and definite notion.¹⁸⁷

As we saw in Chapter 2, the Cupid fable contains “*the doctrine concerning the principles of things and the origins of the world.*”¹⁸⁸ The principles of things are the hidden powers of matter (*natura naturans*) and the phrase “origins of the world” signifies the processes that culminate in this particular world (*natura naturata*). In Bacon’s ontology, other worlds are possible but there is only one ultimate principle, figured by Cupid who depicts matter’s appetitive power and holds the keys to the union and dissolution of bodies. Cupid’s unitive power is also the fount of human operative power, but appropriating “the power of the keys, which binds and loosens” depends upon discovering the real lines of union and division in nature.¹⁸⁹ This involves an investigation into things that are (in all of their dynamic processes) beyond the reach of the human senses. The inaccessibility of matter (*res*), allied to the fact that the human mind (*mens*) is full of phantasmal smog, idols and illusions explains the scale of the task of regenerating the mind.¹⁹⁰ In order for the union of

¹⁸⁷ Bacon, *DPAO, OFB, VI*, 201-205.

¹⁸⁸ Bacon, *DPAO, OFB, VI*, 197 (italics in original). This has already been alluded to in Chapter 2 where I introduced the cosmogony/cosmology division. A failure to heed this distinction has misled much of the commentary on Baconian matter. This distinction has to be kept in mind if we are to understand Bacon’s optimism that “there be remaining so great an abundance of works most fruitful and utterly unknown” (my trans., *DIN, SEH, III*, 787).

¹⁸⁹ Bacon, *HDR, OFB, XIII*, 129. See Matt. 16: 19, 18: 18.

¹⁹⁰ As Bacon puts it, “the island of truth is lapped by a mighty ocean in which many intellects will still be wrecked by the gales of illusion [*idolorum*]” (*TPM, BF*, 69, cf. *SEH, III*, 536). On the various meanings of the term *idola* see Michèle Le Doeuff, “Hope in Science,” in *Francis Bacon’s Legacy of Texts: ‘The Art of Discovery Grows with Discovery,’* ed. William Sessions (New York: AMS Press, 1990), 9-24. Le Doeuff concentrates on the religious and cultic meanings of the term *idola*, but points out that even its epistemological meaning as “fallacies” has theological resonances. She says that on three occasions Bacon contrasts the “*humanae mentis Idola*” with the “*divinae mentis ideae*,” 14-15.

res and *mens* to be consummated, the understanding must be delivered from its corrupt notions and “drag[ged] back to [its] primitive ignorance.”¹⁹¹ From that purified state of ignorance, the mind is gradually reintroduced to nature beginning with the natural histories (*natura naturata*), which provide materials for the mind’s commerce with nature. According to Bacon, there is a symbiotic relationship between erasing the old and writing in the new:

If I should ask you to grapple immediately with the bewildering complexities of experimental science before your mind has been purged of its idols, beyond a peradventure you would promptly desert your leader. Nor, even if you wished to do so, could you rid yourself of idols by simply taking my advice without familiarising yourself with nature. On waxen tablets you cannot write anything new until you rub out the old. With the mind it is not so; there you cannot rub out the old till you have written in the new.¹⁹²

The process of erasing to a state of learned ignorance is traditionally associated with the *via negativa*. We have already seen that Bacon rejects the sceptical terminus, but does not reject the aim of sceptical thinking, viz., the reduction to an acknowledged ignorance. I argue that there is much to be gained from examining how the *via negativa* contributes both destructively (as a strategy in Bacon’s *pars destruens*) and constructively (as the core of his strategy in Book 2 of *Novum organum*) to the regeneration and continual governance of the intellect.

As discussed, Bacon’s optimism is all the more noteworthy given that matter’s schematisms are no less mysterious than its essential power. Our senses are too gross for nature’s subtlety and the mind is shrouded in delusion and fantasy. Despite these obstacles, Bacon maintains the existence of a path that leads “to the

The idols (in a theological sense) are those things which have ousted “things in themselves” in favour of false gods that are nothing but illusions generated by the mind. See Bacon, *PID*, *SEH*, III, 549; *NO*, *OFB*, XI, 73, 187.

¹⁹¹ Bacon, *DGI*, *OFB*, VI, 111.

¹⁹² Bacon, *TPM*, *BF*, 72, cf. *SEH*, III, 539. This is why Book 1 and Book 2 of *Novum organum* must work in tandem. See also *RPh*, *BF*, 103, 132, cf. *SEH*, III, 558, 584.

fountains of things”¹⁹³ This optimism is sustained notwithstanding that the precise contours of the route are unknown. My explanation for this *prima facie* incongruous optimism is based on Bacon’s promotion of the *via negativa*. In Chapter 2, I drew attention to Bacon’s view that because matter *per se* is beyond any positive designation, it can only be referred to by way of negatives. Hence Bacon praises Democritus’ rejection of all similarities between sensory qualities and the qualities of atoms. However, in its uncontracted primordial condition, matter holds all possible explications. The contraction of matter’s power and the subsequent production of a cosmology commit Bacon to further emphasising limitation and exclusion: matter limits its power in its self-contracting and organising mode, and in the process other possibilities are perforce excluded. Correspondingly, the mind limits its anticipations and its ultimate freedom with a view to endless operative possibilities. Thus the reasons for Baconian optimism are understood when we grasp Bacon’s conception of the power of negativity and limitation: they operate at all levels of matter’s activities and so provide the methodological analogue to his cosmogonical architecture. Baconian inquiry and the pursuit of infinite operative possibility are the consequences of matter’s primordial contraction but the clue to its delineations can only be found in its manifestations. Unfortunately (as discussed), this reliance on phenomenal qualities further contributes to the mind’s delusions. The method of exclusion is, in Bacon’s terms, a way of putting right “the corrupt complexion of that very faculty [the intellect], which simply cannot avoid being tainted and stained, and then perverted and twisted by the daily invasion of ordinary experience.”¹⁹⁴ This essential connection between matter’s obscurity and the exclusionary procedures of the method is never alluded to in Baconian commentary,

¹⁹³ My trans., Bacon, *PA, OFB*, XIII, 260.

¹⁹⁴ Bacon, *NO, OFB*, XI, 307.

and thus a major feature of the way of inquiry has been overlooked. It is not surprising – given Bacon’s radical alignment of ontology and inquiry – that he refuses to argue over philosophical detail: all former systems are wrongly conceived as they rest on two fatal errors.¹⁹⁵ First, they have not taken matter as the hidden fount of all things. Second, they have wrongly assumed that the senses and the naked mind can aspire to knowledge of things better known to nature (*notior naturæ*). In contrast, Bacon’s operative dialectical programme requires that mind and matter are in constant interplay: this synergism of mind and matter is the essence of Baconian inquiry.¹⁹⁶

In its current state of confusion and fascination with nonsense, the mind will mistake signs for things themselves and so “anticipate” by leaping to false explanations. In that case it has already left the path of inquiry. The continual regeneration of the mind (delivered in Book 1 of *Novum organum*) is only possible through constant guidance and “directions” on how to navigate “the dark and difficult tracts of nature” (outlined in Book 2 of *Novum organum*).¹⁹⁷ These are the twin supporting pillars of Bacon’s *Instauratio*. Under the Baconian regime, legitimate anticipations are permitted so long as there remains experimental contact with things themselves. The union of the mind and things is, I argue, conceived by Bacon through the appropriation of the language and concepts traditionally ascribed to the union between the soul and the divine in *via negativa* theology. The conditions underpinning both are a purification and cleansing of existing knowledge

¹⁹⁵ Malherbe points out that it is “not only for simplifying and tactical reasons that Bacon refuses any *disputatio* with earlier philosophies and that he prefers to conduct a *redargutio* rather than a *confutatio*. All philosophies reactivate the same natural tendency; all rest on the arbitrary act of a will which scorns the search for truth; and all offer, as a warranty, their demonstrative form, the order of which does not vary,” “Bacon’s Critique of Logic,” 73.

¹⁹⁶ It is worth noting that the division into negative and positive procedures is purely heuristic: in procedural terms they do not stand in isolation from each other. If the negative is the constant companion of the Baconian investigator there is also the positive generation of axioms.

¹⁹⁷ Bacon, *NO*, *OFB*, XI, 51; *DO*, *OFB*, XI, 29.

with a consequent reduction to ignorance. In this way the mind is rendered capable of mirroring things as they are: the method removes impediments that obscure nature's true delineations. Before expanding on this claim, and to further support my insistence on the importance of the *via negativa* in Baconian inquiry, I will provide a brief outline of traditional negative theology.

According to Denys Turner, the term "apophatic" (and its antonym "cataphatic") are derived from the Latin traditions of Neoplatonic mysticism most fully developed in the writings that have come down to us under the authorship of Pseudo-Dionysius the Areopagite.¹⁹⁸ Apophaticism refers to a way of theologising grounded in an acceptance of human ignorance with respect to the being and/or attributes of God. In the words of Aquinas:

The most perfect [state] to which we can attain in this life in our knowledge of God is that he transcends all that can be conceived by us, and that the naming of God through remotion [*per remotionem*] is most proper ... The primary mode of naming of God is through the negation of all things, since he is beyond all, and whatever is signified by any name whatsoever is less than that which God is.¹⁹⁹

This approach (with its prioritisation of human ignorance) receives incisive treatment in Nicholas of Cusa, where apophatic procedures culminate in what is now famously translated as "learned ignorance" (*docta ignorantia*).²⁰⁰ As Turner points out, this is not a "pre-critical" stance which has the possibility of an eventual knowing but is more a condition of "unknowing."²⁰¹ The author of *The Cloud of Unknowing*, for example, deploys the term "unknowing" (an invented transitive

¹⁹⁸ See Denys Turner, *The Darkness of God: Negativity in Christian Mysticism* (Cambridge: Cambridge University Press, 1995), 20.

¹⁹⁹ Aquinas, *Super Librum Dionysii De divinis nominibus*, cited in *A Companion to Philosophy in the Middle Ages*, ed. Jorge J. E. Gracia and Timothy B. Noone (Oxford: Blackwell, 2003), 648.

²⁰⁰ See Jasper Hopkins, *Nicholas of Cusa on Learned Ignorance: A Translation and an Appraisal of De docta ignorantia* (Minneapolis: The Arthur J. Banning Press, 1985).

²⁰¹ Denys Turner, *The Darkness of God: Negativity in Christian Mysticism* (Cambridge: Cambridge University Press, 1995), 19.

verb-form) to describe the alteration in human cognition from presumed knowledge to a state of absolute ignorance via the purgative removal of all knowing.²⁰²

Bacon's procedures for the mind's purgation and purification involve reducing or levelling its presumed abilities by systematically confronting it with its own ignorance. We saw that Bacon drew attention to the striking parallels between his own approach to knowledge and the way of *Acatalepsia* favoured by the sceptics. In a recent study Michael McCanles attempts to construct historical connections between Bacon's empiricist epistemology, late medieval Ockhamist nominalist semantics, and the negative theology of traditional Christian mystical spirituality.²⁰³ As a general strategy, Bacon deploys this confluence of philosophical and theological devices in response to dogmatic and sceptical claims that he considers unfounded.²⁰⁴ For example, Baconian epistemology demands that the investigation of matter's properties requires stringent discipline (askesis) governing theorising.²⁰⁵ Moreover, that Bacon consciously drew on the *via negativa* is clear

²⁰² It is this conceptual and terminological background which, some argue, feeds into late medieval nominalism with its emphasis on parsimony and extreme forms of empiricism and fideism associated with Ockham and his followers. As it concerns Bacon, see Michael McCanles "The New Science and the *Via Negativa*: A Mystical Source for Baconian Empiricism," in *Francis Bacon and the Refiguring of Early Modern Thought*, ed. Julie Robin Solomon and Catherine Gimelli Martin (Aldershot: Ashgate, 2005), 45-68; *idem.*, "From Derrida to Bacon and Beyond," in *Francis Bacon's Legacy of Texts: 'The Art of Discovery Grows with Discovery'* (New York: AMS Press, 1990), 25-46.

²⁰³ See McCanles, "The New Science and the *Via Negativa*," 45-47. According to McCanles, Bacon inherited the vocabulary and approaches of late medieval nominalism, which had itself been constructed on the mystical theology of Pseudo-Dionysian spirituality and applied to wider philosophical and theological issues.

²⁰⁴ There are innumerable instances throughout the Baconian corpus where Bacon integrates spiritual and inquisitorial or methodical concepts. See Briggs, *Francis Bacon and the Rhetoric of Nature* for an interpretation that links Baconian themes to Solomonian, Platonic and Pauline wisdom. As discussed, Briggs presents Bacon's work as a regenerative spiritual programme involving paradoxical interconnections between the exploitation of nature and self-abnegation. See n. 184.

²⁰⁵ McCanles focuses on epistemological and semantic issues and has little to say about the operative aspect of Baconian inquiry. Bacon is presented as someone concerned solely with disciplining the mind's "concept- and language-making powers," "The New Science and the *Via Negativa*," 53. Baconian control of the formation of notions and definitions cannot be divorced from Baconian ontology and cosmogony and certainly makes no sense in the absence of a discussion of experimentation. McCanles is correct that Bacon imposed limitations and constraints on the mind's epistemological excesses, but that in itself is only part of the intention of Baconian constraint.

from its explicit use in *De principiis atque originibus*.²⁰⁶ In brief, there are convincing textual and internal conceptual grounds for acknowledging Bacon's utilisation of the tradition of negativity, scepticism and learned ignorance.

We have seen that Bacon regards the human mind as insane; its madness expresses itself in its presumptive knowledge and inveterate pride. This highlighting of intellectual pride and the need for a corrective discipline of humiliation are central features of the *via negativa*. Hence, I began this discussion by echoing Bacon's own starting point, namely, that the mind must accept the move from knowing to unknowing. Without the recognition of current ignorance and insanity, Bacon proclaimed, no method can possibly offer correction because all methods will prolong the pathology of the mind (since they are themselves products of the unregenerated understanding). Madness is a consequence of the mind's strivings to overcome its confrontation with the darkness of matter by the construction of imaginative fantasies posing as philosophy. Bacon therefore regards these methods to console the mind as mere palliatives. Ultimately, the mind's confusion and corruption rests on its refusal to face up to the incomprehensibility of matter. Bacon's legitimate inquiry has the purgative power to cure both ignorance and its consequence – madness. In contrast to the palliatives of existing methods, Bacon's method demands a severe curtailment and expurgation of all existing knowledge. This askesis (or discipline) is extraordinarily harsh and Bacon was fully aware of its severity, seen in his advancing a surreptitious strategy of inveigling his programme into the human mind:

²⁰⁶ There is no textual evidence for a direct connection to an Ockhamist tradition. There may in fact be more immediate sources for Bacon's material here. Bruno, for example, identifies the darkness of matter and negativity. Moreover Bruno's debt to Cusa is well known. We have already seen (in Chapter 2) Bacon's use of Cusa's concept of *complicatio-explicato*, which was directly taken from Cusa by Bruno and probably appropriated by Bacon. On Bruno's frequent references to Cusa, see Paul Henry Michel, *The Cosmology of Giordano Bruno*, trans. R. E. W. Maddison (London: Methuen, 1973), 45.

Borgia said of the *French* expedition into *Italy*, that they came chalk in hand to mark up their lodgings and not sword in hand to break their way in. In the same way I plan to ease my doctrines into souls suitably qualified and capable of understanding them. For when we are at odds about the principles and notions themselves, and even about the forms of demonstrations, attacking opposing arguments is of no use at all.²⁰⁷

However, Bacon's purported gentle and non-antagonistic strategy should not obscure the sheer severity of Baconian discipline where the mind "is driven ... by harsh laws and extreme discipline."²⁰⁸ The reduction to ignorance and the promotion of the negative instance provide a healing purification. Without the practical implementation of Bacon's therapeutic programme, there is no Baconian project: the mind will relapse into its habitual insanity – sustained through anticipation and reckless theorising – a process made invisible by the fact that, as Bacon puts it, all are mad in the same way.

The interpretation of Baconian inquiry in terms of the *via negativa* can be further illustrated. By substituting knowledge of material causes for divine proximity, and operative success in producing novel effects for spiritual progress, the parallels are striking. Bacon's union of the knower (*mens*) and the known (*res*) closely parallels the mystical union of the purified soul and the divine vision. Both promise real effects and the only true criterion for success is to be found in operative power to produce effects: the one in the soul of the mystic, the other in the works

²⁰⁷ Bacon, *NO, OFB*, XI, 77. In a letter to Thomas Bodley after he had sent him *Cogitata et visa* (see below) Bacon writes: "You are, I bear you witness, slothful, and you help me nothing ... I can say no more to you, but *non canimus surdis, respondent omnia sylvæ*. If you be not of the lodgings chalked up (whereof I speak in the preface) I am but to pass by your door" (*LL*, X, 366). In *CV* Bacon says, "he could not forget that inveterate prejudices, like the delusions of the insane [*tanquam phreneticorum deliramenta*], must be artfully circumvented rather than exacerbated by violent opposition. Accordingly, to avoid fanning rather than quenching the flames of contention ... he recognised the desirability of a certain measure of prudent conformity. To this end he proposed a work on the interpretation of nature and on nature itself, designed to eradicate errors with the least possible offence and thus to effect a peaceable entry into the apprehensions of men" (*CV, BF*, 100, cf. *SEH*, III, 619). See also *TPM, BF*, 62, cf. *SEH*, III, 529; *NO, OFB*, XI, 149; *DAS, SEH*, IV, 371, cf. I, 578.

²⁰⁸ Bacon, *NO, OFB*, XI, 85. This is one of the few places where Bacon is completely candid about the effects of the method on the intellect. His tables of discovery bind and restrain the understanding in order to prevent it anticipating similarities among divers things.

derived from the science of magic.²⁰⁹ There is therefore ample crossover between the purging and purifying of the soul for the vision of divine things and the purging of the mind for its encounter with matter (*res*). In expository terms there are revealing analogues at work here that are not to be explained as a coincidence of terminology and a mere similarity of strategies. Knowledge (either of Baconian *res* or of the divine things) must be of what is and not of what is imagined. Both ways begin with a necessary levelling process to produce a salutary ignorance; they both demand purification and purgation as propaedeutics for entry into their respective mysteries. Bacon concludes *Temporis partus masculus*, “Take heart, my son, and give yourself to me so that I may restore you to yourself.”²¹⁰

In contrast to commentators such as Michael McCanles and John Briggs who see purgation as having conceptual or moral goals *per se*, I argue that Bacon’s strategic deployment of the *via negativa* serves material transformative ends.²¹¹ The

²⁰⁹ There are further confluences between the divine and the material. Bacon applies the terms “*Actus purus*” and “*natura naturans*,” terms normally reserved for God, to matter: both God and matter are deemed the inaccessible cause without cause (*causa causarum*). The isomorphism between matter and God seems complete in view of Bacon’s explicit elevation of matter in *De principiis atque originibus*. See Bacon, *NO, OFB*, XI, 88, 200. Charles T. Harrison writes that “Bacon’s basic metaphysical sympathies were with materialism. Expediency made him perform lip-service to religion, and one can hardly doubt after reading his essay “Of Atheism” that he held to some kind of belief in God. Yet nowhere in his writings does he attempt an examination of God’s nature or assign God a rôle in the universe,” “Bacon, Hobbes, Boyle, and the Ancient Atomists,” *Harvard Studies and Notes in Philology and Literature* 15 (1933), 191-218, on 193.

²¹⁰ Bacon, *TPM, BF*, 72, cf. *SEH*, III, 539.

²¹¹ The investigation into nature’s secrets – the pursuit of high knowledge – was seen by many as antagonistic to traditional theological and moral demands. Bacon’s defence of the probity of investigating nature forms part of the design of *VT* and *AL*. For this reason, I have reservations about a literal interpretation of Bacon’s “moral” reform. For example, McCanles makes much of the mystical “moral perfection of the knower” as a necessary condition for “knowledge aimed at,” “The New Science and the *Via Negativa*,” 51. As mentioned, Briggs locates Bacon’s programme in a lineage indebted to Solomonian, Pauline and Timaeic traditions which emphasise the need for purgation, humility and moral purity, *Francis Bacon and the Rhetoric of Nature* (see n. 184). Box detects contradictions between Bacon’s moralising in *AL* and his more Machiavellian tone in other places, “Bacon’s Moral Philosophy,” 260-282. Perhaps Bacon’s aims should be considered before paradoxes and contradictions are taken as symptomatic of his incoherence. On the cultural contradictions generated by the pursuit of “high” things see Carlo Ginzburg, “High and Low: The Theme of Forbidden Knowledge in the Sixteenth and Seventeenth Centuries,” *Past and Present* 73 (1976), 28-41. For a discussion of Bacon’s strategy for dealing with the difficulties caused for his Instauration by the dubious status of curiosity see Peter Harrison, “Curiosity, Forbidden Knowledge,

exclusionary approach is necessitated by Bacon's conception of matter and its contraction into the current world (nature free). Bacon's emphasis on the darkness of matter motivates the contours of his inquiry because of his foundational assumption that a path can be charted into matter's elemental activities. His *via negativa* removes the "shifts of ignorance" obscuring man's vision of what "nature can be made to do."²¹² To help the mind confront its own ignorance, Bacon tactically exploits the language and concepts of the *via negativa*. He deliberately appropriates theological terminology when speaking of matter; he time and again appropriates moral or doctrinal language in promoting his method and his vision of reform; even the traditional dichotomy of *potentia absoluta* and *potentia ordinata* maps precisely onto his cosmogonical and cosmological vision. His strategies for dealing with the mind are the same as those for dealing with matter. The binding of the mind enhances understanding and increases knowledge; likewise experimentation generates operative power through constraining matter. Thus the constraining of matter and mind coincide in Baconian inquiry. In Chapters 4 and 5 we will see that the construction of tables and the experimental testing of axioms contribute to the binding and restraining of the mind by clearing away extraneous details:

As the army of particulars is so vast and so scattered and dispersed that it dissipates and confounds the intellect, we should have no good hopes for the latter's cursory sorties and ineffectual flights, unless the particulars relating to the subject under investigation be marshalled and drilled by appropriate tables of discovery, well drawn up and ready, so to speak, for action, and unless the mind buckle down to the organised assistance made ready by these tables.²¹³

and the Reformation of Natural Philosophy in Early Modern England" *Isis* 92 (2001), 265-290. Harrison argues that "Bacon's proposals for the instauration of knowledge were an integral part of a process by which curiosity underwent a remarkable transformation from vice to virtue over the course of the seventeenth century," 265.

²¹² Bacon, *SS, SEH*, II, 614.

²¹³ Bacon, *NO, OFB*, XI, 159-161.

In *De principiis atque originibus* Bacon utilises the *via negativa* to rid the mind of false preconceptions about the nature of matter. But although Bacon's apophatic approach depicts matter as dark and incomprehensible, he offers an ontology of infinite possibility. Paradoxically, access to nature's infinite bounty requires a programme of self-abnegation. Hence the mind's reduction to ignorance is a substantive part of the Baconian method. Book 1 of *Novum organum* is an exercise in purification which does not have ethical or spiritual ends but epistemological and operative ones. The less the mind intervenes and imposes its ill-disposition the better:

I am emphatically of the opinion that men's wits require not the addition of feathers and wings, but of leaden weights. Men are very far from realising how strict and disciplined a thing is research into truth and nature, and how little it leaves to the judgement of men.²¹⁴

Human nature in its present cognitive state evinces an extreme self-aggrandisement. In its unregenerated state the mind is subject to the tyranny of the imagination, to principles wrongly established, to the short-term interests of the passions, and to an institutional authority reluctant to relinquish its power. These conflicting interests are reflected in the knowledge and methods used by the intellect to guarantee truth. Instead of undergoing the demands of the *via negativa*, the mind expands its imaginary dominion over things, whereas real dominion demands a subjection of the mind to things. Certainty in knowledge depends on operative success in shifting matter from what it presently does to what it can be made to do. Baconian inquiry lacks cogency unless there is the recognition that it maps perfectly onto Bacon's conception of matter.

²¹⁴ Bacon, *RPh*, *BF*, 119, cf. *SEH*, III, 573. See also *NO*, *OFB*, XI, 163.

III. Conclusion

This chapter has drawn attention to important correspondences between Bacon's concept of nature free/nature bound and his notion of the mind free/bound. The theme of freedom versus constraint offers salutary insight into Baconian inquiry. Bacon's remedy for the madness of the unfettered mind parallels the experimental act of binding matter's free and unfettered power. Binding facilitates the union of *res* and *mens*. By means of constraints, Bacon proposed to break the spell of the double labyrinth of mind and matter. Bacon's various ontological assumptions underpin his hopes for operative success. Baconian matter entails that the mind and things are implicated in the material unity of all things. The Baconian method, I argue, is a consequence of Bacon's cosmogony – not a shift in the nature of logical argumentation.

We have seen the importance of negativity as an inquisitional aid to the intellect in uniting the mind with things. Negativity is related to Bacon's philosophy of humility, illustrated by his incorporation into natural inquiry of the language and concepts of the *via negativa*. Bacon's discipline of constant correction was designed to strip the mind of extraneous and obstructive materials in order to render it capable of mirroring reality. These overarching strategies sustain a material union between the mind and things by way of a cybernetic epistemology. Negative instances (in the form of experimental feedback) offer a governing and self-correcting guidance ensuring certainty in reaching the target. Although it is impossible to know the contours of inquiry in advance, Bacon's concept of radiative matter guarantees a route from human perception to the origins or causes of phenomenal qualities. This is achieved by pursuing the resolution of complex phenomenal qualities of sensation

into their respective components. In this way, Baconian inquiry ultimately arrives at a limited number of elemental causal powers.

Having outlined Bacon's programme to unite the mind with things, the following chapter will focus on the practical implementation of his programme. The union of *res* and *mens* is hindered by the overwhelming complexity and bewildering fecundity of matter. Experimentation – a hitherto neglected aspect of Baconian inquiry – is the clue to nature's intricate labyrinth. Moreover, it sustains the union of *res* and *mens*.

Chapter 4

The Clue of Experiment

“For the several employments and offices of our fellows; we have twelve that sail into foreign countries, under the names of other nations, (for our own we conceal;) who bring us the books, and abstracts, and patterns of *experiments* of all other parts. These we call Merchants of Light.

“We have three that collect the *experiments* which are in all books. These we call Depredators.

“We have three that collect the *experiments* of all mechanical arts; and also of liberal sciences; and also of practices which are not brought into arts. These we call Mystery-men.

“We have three that try new *experiments*, such as themselves think good. These we call Pioners or Miners.

“We have three that draw the *experiments* of the former four into titles and tables, to give the better light for the drawing of observations and axioms out of them. These we call Compilers.

“We have three that bend themselves, looking into the *experiments* of their fellows, and cast about how to draw out of them things of use and practice for man’s life, and knowledge, as well for works as for plain demonstration of causes, means of natural divinations, and the easy and clear discovery of the virtues and parts of bodies. These we call Dowry-men or Benefactors.

“Then after divers meetings and consults of our whole number, to consider of the former labours and collections, we have three that take care, out of them, to direct new *experiments*, of a higher light, more penetrating into nature than the former. These we call Lamps.

“We have three others that do execute the *experiments* so directed, and report them. These we call Inoculators.

“Lastly, we have three that raise the former discoveries by *experiments* into greater observations, axioms, and aphorisms. These we call Interpreters of Nature.¹

In the preceding chapter, I outlined Bacon’s way of inquiry in terms of his programme to unite the mind with things. In this chapter, I focus on the details of how this union is implemented and maintained. This involves a detailed discussion of Bacon’s concept of experiment. Although Bacon has a reputation as “the first philosopher of experimental science,” there is surprisingly no thorough exposition of

¹ Bacon, *NA, SEH*, III, 164-165 (my emphasis).

the Baconian concept of experiment.² This chapter therefore provides such an exposition, adhering strictly to Bacon's precise meanings, and allowing him wherever possible to speak in his own terms.

I argue further that experiment is the clue that guides the interpreter through nature's labyrinth.³ It forms the core of Baconian inquiry. Each phase of inquiry prioritises experiment. Bacon's generic distinction between *experimenta fructifera* and *experimenta lucifera* is commonly treated in the literature: the former give rise to artefacts for immediate utility or pleasure, while the latter are "of no use in themselves but ... only contribute to the discovery of causes."⁴ What is not recognised is that, at different levels of inquiry, the terms *experimenta fructifera* and *experimenta lucifera* have quite specific meanings. This oversight stems from a tendency to conflate three distinct types of mechanics, which have very different functions in the Baconian programme.⁵ First, there is the mechanics of the artisan, whose techniques and operations have mostly been discovered by chance. Second,

² Ian Hacking, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science* (Cambridge: Cambridge University Press, 1983), 246. According to Peter Pesic, Bacon "envisioned the emergent character of experimentation," "Wrestling with Proteus: Francis Bacon and the 'Torture' of Nature," *Isis* 90 (1999), 81-94 on 81.

³ Bacon refers to the *filum experientæ* in the fable of "Dædalus, or the Mechanic" (*DSV, SEH, VI, 660*, cf. 735). Spedding's translation – "the clue of experiment" – is justified given that the phrase occurs in the context of a discussion of mechanics. Bacon states: "*Pulcherrima autem allegoria est de labyrintho, qua natura generalis Mechanicæ adumbratur. Omnia enim mechanica, quæ magis sunt ingeniosa et accurata, instar labyrinthi censerit possint; propter subtilitatem et variam implicationem, et obviam similitudinem, quæ vix ullo iudicio, sed tantum experientæ filo, regi et discriminari possunt. Nec minus apte adjicitur, quod idem ille qui labyrinthi errores invenit, etiam fili commoditatem monstravit. Sunt enim artes mechanicæ veluti usus ambigui, atque faciunt et ad nocumentum et ad remedium, et fere virtus earum seipsam solvit et retexit*" (*DSV, SEH, VI, 660*). Elsewhere Bacon remarks, "mere experience ... is called accident if it happens by itself, but experiment if it is deliberately sought out" (*NO, OFB, XI, 131*).

⁴ Bacon, *NO, OFB, XI, 157-159*. On *experimenta fructifera* and *experimenta lucifera* see Rees, *OFB, XI, lvii, lxiii, 530, 565*.

⁵ Baconian mechanics is not to be confused with the emergent discipline of the geometrical study of motion outlined in W. R. Laird, "The Scope of Renaissance Mechanics," *Osiris* 2 (1986), 43-68. For further evidence of Bacon's departures see George Ovitt, Jr. "The Status of the Mechanical Arts in Medieval Classifications of Learning," *Viator* 14 (1983), 89-105. For a brief discussion of the historiographical issues see J. A. Bennett, "The Mechanics' Philosophy and the Mechanical Philosophy," *History of Science* 24 (1986), 1-28, esp. 9.

there is a form of mechanics which proceeds “by extending or transferring or putting together former inventions.”⁶ Bacon terms this *experientia literata*. The third variety, Bacon defines as the operative counterpart to his science of physics: physics extracts axioms from experiments, and the science of mechanics extracts new experiments from axioms. The first is utterly without art or method, the second possesses nascent ordering, but the third forms the core of Baconian inquiry – it integrates physics and mechanics by a constant feedback process, a form of inquiry which I have labelled “cybernetic.”⁷ At the level of natural history and *experientia literata*, *experimenta fructifera* are artisanal works, while *experimenta lucifera* are procedures which help to illuminate causes. At the higher level of physics, *experimenta lucifera* are “experiments of a higher light, more penetrating into nature,” while in mechanics, *experimenta lucifera* test axioms (hypotheses).⁸ The prioritisation of *experimenta lucifera* plays a determinate role in maintaining the union of the mind with things. At all levels of inquiry, *experimenta lucifera* feed back into the experimental history so that “the art of discovering will grow as the number of things discovered grows.”⁹

⁶ Bacon, *DAS, SEH*, IV, 366, cf. I, 572.

⁷ On the meaning of the term “cybernetic,” see Chapter 3.

⁸ Bacon, *NA, SEH*, III, 185.

⁹ Bacon, *NO, OFB*, XI, 197.

I. Natural and experimental history

Baconian inquiry begins with the collection of “A Natural and Experimental History of a Kind Fit to Serve as a Plan for the Basis and Foundations of the True Philosophy.”¹⁰ The success of the Baconian method depends upon the quality of the natural and experimental history. Bacon refers to this as the “Mother history” because its purpose is “to illuminate the discovery of causes and nourish philosophy with its mother’s milk.”¹¹ We saw in Chapter 2 that Bacon’s natural philosophy presents us with a threefold division of nature. Nature, according to Bacon, “is either free and unfolds itself in its ordinary course [*& cursu suo ordinario se explicat*]; or it is torn from its course by the crookedness and arrogance of matter and by the violence of impediments; or it is restrained and moulded by art and human agency.”¹² This division is reflected in the mother history: it must accordingly deal with “the *liberty* of nature, or its *errors* or its *bonds*.”¹³ Hence Bacon divides the mother history into “*History of Generations, of Pretergenerations and of Arts*, the last of which,” he says, “I have also got used to calling *Mechanical and Experimental*.”¹⁴ According to Bacon, inclusion of the mechanical arts in the project of natural history is essential:

The *raison d’etre* of a natural history drawn up for its own sake is one thing, but one compiled systematically to inform the intellect for the building up of philosophy is quite another. And these two kinds of history

¹⁰ Bacon, *PAH, OFB*, XI, 451.

¹¹ Bacon, *PAH, OFB*, XI, 453; *DO, OFB*, XI, 39.

¹² Bacon, *PAH, OFB*, XI, 455.

¹³ Bacon, *PAH, OFB*, XI, 455.

¹⁴ Bacon, *PAH, OFB*, XI, 455. On Bacon’s innovations in natural history see Paula Findlen, “Francis Bacon and the Reform of Natural History in the Seventeenth Century,” in *History and the Disciplines: The Reclassification of Knowledge in Early Modern Europe*, ed. Donald R. Kelley (Rochester: University of Rochester Press, 1997), 239-260.

differ in many respects but above all in this: that the first takes in the variety of natural species but not the experiments of the mechanical arts.¹⁵

An entry in *Commentarius solutus* (Bacon's notebook) also shows his preoccupation with mechanical history:

To procure an History mechanicke to be compiled wth care and diligence (and to professe it that is of the experim^{ts} and observations of all Mechanicall Arts. The places or thinges to be inqyred are; first the materialls, and their quantities and proportions; Next the Instrum^{ts} and Engins requisite; then the use and adoperation of every Instrum^t; then the woork it self and all the processe thereof wth the tymes and seasons of doing every part thereof. Then the Errors w^{ch} may be comytted, and agayn those things w^{ch} conduce to make the woork in more perfection. Then all observacions, Axiomes, directions. Lastly all things collaterall incid^t or intervenient.¹⁶

An explanation of why the mechanical arts contribute so powerfully to the inquiry into nature forms the main theme of this section. Bacon's appraisal of the mechanical arts, then it is apparent, has little to do with the elevation of the role of the artisan. The role of mechanics is principally derived from the manner in which it brings matter's hidden powers to the surface.

The demand that a natural history should contribute to the growth of philosophy by mirroring nature's "threefold condition" allows us to see that the mechanical arts are correlated with nature bound.¹⁷ We saw in Chapter 2 that, for Bacon, the ordinary course of nature manifests a single aspect of nature's multifaceted possibility: "the universe with its several species according to their ordinary frame and structure, is merely the face of matter unconstrained and at liberty [*non constrictæ aut devinctæ*]."¹⁸ Matter's powers are not used up, hence

If any skilful Servant of Nature shall bring force to bear on matter, and shall vex it and drive it to extremities as if with the purpose of reducing it to nothing, then will matter (since annihilation or true destruction is not possible except by the omnipotence of God) finding itself in these straits,

¹⁵ Bacon, *NO, OFB*, XI, 157.

¹⁶ Bacon, *LL*, XI, 65-66.

¹⁷ Bacon, *DGI, OFB*, VI, 99.

¹⁸ Bacon, *DSV, SEH*, VI, 726, cf. 652.

turn and transform itself into strange shapes, passing from one change to another till it has gone the whole circle and finished the period; when, if the force be continued, it returns at last to itself.¹⁹

It is a fundamental principle of Bacon's conception that matter will make further use of its hidden powers when vexed or bound. Bacon maintains that nature limits its operations so that its manifestations arrange themselves in customary or habitual modes of action, leaving other pathways unused. Whereas the primordial powers randomly combine, the manipulation of motions in the mechanical arts is through an agent's intention. Even the most basic artisanal operation actualises hidden facets of nature. Artisans, Bacon thinks, are already engaged in the project of disclosing matter's potential. In the actions of the smith or the potter, nature "is restrained, moulded, completely transformed and as it were made new by art."²⁰

Mechanics is utterly reliant on the hidden powers or motions of matter. Its operations spur on or tie up motions, from which follows "conversion and transformation of matter itself."²¹ Bacon illustrates this idea in *Sylva sylvarum* under the heading "Experiments ... touching motion of bodies upon their pressure."²² There he makes it clear that mechanical arts are based on the utilisation of matter's hidden motions. He describes the experiment of pressing a solid body so as to cause "an inward tumult in the parts."²³ Under this constraint, the parts seek to free themselves from the compression and this, according to Bacon, "is the cause of all violent motion."²⁴ Although this motion of compression is "of all motions the most

¹⁹ Bacon, *DSV*, *SEH*, VI, 726, cf. 652.

²⁰ Bacon, *DGI*, *OFB*, VI, 101.

²¹ Bacon, *CDNR*, *SEH*, V, 425, cf. III, 21. In simple everyday mechanical operations such as dyeing or glazing, the apparent simplicity of operation obscures the import of the natural-philosophical causes – the hidden processes of motions are no less significant because the operation is routine and familiar.

²² Bacon, *SS*, *SEH*, II, 342.

²³ Bacon, *SS*, *SEH*, II, 342.

²⁴ Bacon, *SS*, *SEH*, II, 342.

common, and the chief root of all mechanical operations," it has, he says, "never been observed nor inquired."²⁵ In his account, "This motion worketh in round at first, by way of proof and search which way to deliver itself; and then worketh in progress, where it findeth the deliverance easiest."²⁶ This calls to mind Proteus' manoeuvrings: he "in order to get free, would turn himself into all manner of strange shapes."²⁷ For Bacon, this experiment demonstrates that bodies will not endure compression passively, and that motions seek the easiest route to recovery. Mechanics is the site where the production of artificial things has availed itself of the powers inherent in matter. When subjected to compression, propulsion etc., bodies seek escape and display hidden motions more accessibly "than when in enjoyment of [their] natural liberty."²⁸ The mechanical arts display matter's transformative powers, but their role in the mother history is to aid the discovery of the causes of transmutation – the moving principles "*whereby [per quæ] ... things occur.*"²⁹

In order to grasp why a manifestation of nature's hidden facets is so important for a mother history intended for the building up of natural philosophy, we need to examine Bacon's concept of the ascent of knowledge and its dependency on the derivation of axioms of increasing generality. The purpose of Bacon's ascending scale of axioms is to arrive at knowledge of primary axioms or forms – the laws

²⁵ Bacon, *SS, SEH*, II, 342.

²⁶ Bacon, *SS, SEH*, II, 342. Because of their habitual tendencies, motions seek to return to their former pathways (for example, when a spring is stretched). Bacon intends to compile a chart of history "On the powers of habit and novelty in motion" (*De viribus Consuetudinis et Novitatis in Motu*) (My trans., *ILM, SEH*, III, 635).

²⁷ Bacon, *DSV, SEH*, VI, 725, cf. 651.

²⁸ Bacon, *CV, BF*, 99, cf. *SEH*, III, 617-618.

²⁹ Bacon, *NO, OFB*, XI, 105 (italics in original).

which unify *natura naturata*.³⁰ According to Bacon, “the speculation was excellent in Parmenides and Plato ... ‘that all things by a certain scale ascend to unity.’”³¹

Baconian inquiry proceeds

by collecting and uniting the axioms of sciences into more general ones, and such as may comprehend all individual cases. For knowledges are as pyramids, whereof history and experience are the basis. And so of Natural Philosophy the basis is Natural History; the stage next the basis is Physic; the stage next the vertical point is Metaphysic. As for the cone and vertical point (“the work which God worketh from the beginning to the end,” namely, the summary law of nature) it may fairly be doubted whether man’s inquiry can attain to it.³²

These “three ... true stages of knowledge” mirror the unfoldings of matter giving rise to nature’s phenomenal fecundity.³³ In his representation of nature as rising to a point like a pyramid, Bacon provides the following description:

Individuals, which lie at the base of nature, are infinite in number; these are collected into Species, which are themselves manifold; the Species rise again into Genera; which also by continual gradations are contracted [*contrahuntur*] into more universal generalities, so that at last nature seems to end as it were in unity.³⁴

This unity of nature is a reflection of the primary impulse or desire of *materia prima* to cohere. Through a process of unfolding, this unity is retained in the multiplicity of individual things. This is why Bacon can chart the return journey from multiplicity to a termination in forms: individuals are never truly separated from that unity, and (at the cosmogonical level) the germinal elements of everything that can possibly be are already contained in enfolded matter. The move from the one to the many, characterised by the pyramidal figure, involves a successive constraint on the

³⁰ Forms are “laws of pure act” because they are independent of instantiation in specific bodies (*NO*, *OFB*, XI, 119-121). The summary law of nature – the source of all forms – is absolutely unspecified and therefore the ground of all possibility. Bacon identifies forms with possibility precisely because they cut across species. The experiments of the mechanical arts are instrumental in displaying the unity of nature insofar as they contribute to the mother history for the building up of natural philosophy.

³¹ Bacon, *DAS, SEH*, IV, 362, cf. I, 567.

³² Bacon, *DAS, SEH*, IV, 361-362, cf. I, 567.

³³ Bacon, *DAS, SEH*, IV, 362, cf. I, 567.

³⁴ Bacon, *DAS, SEH*, IV, 321, cf. I, 525.

absolute power of *materia prima* in so far as it is a unity. This move, although a contraction in terms of potency, entails a concomitant outward expansion of generative and organisational power: in this way unity gives rise to multiplicity. Commentators have overlooked that the purpose of Bacon's method is to make the pyramid of knowledge (*mens*) a perfect reflection of the pyramid of nature (*res*) (see figures 4.1 and 4.2). The inquiry inverts the primordial emanation from unity to multiplicity. Bacon is in no doubt that

The true philosophy ... echoes most faithfully the voice of the world itself, and is written as it were from the world's own dictation; being indeed nothing else than the image and reflexion [*simulacrum et reflexio*] of it, which it only repeats and echoes, but adds nothing of its own."³⁵

Thus whilst the multiplicity of nature (*natura naturata*) displays a bewildering fecundity, Bacon is able to identify the underlying simple forms with *natura naturans* (the supreme potency of matter).

³⁵ Bacon, *DSV, SEH*, VI, 714, cf. 640.

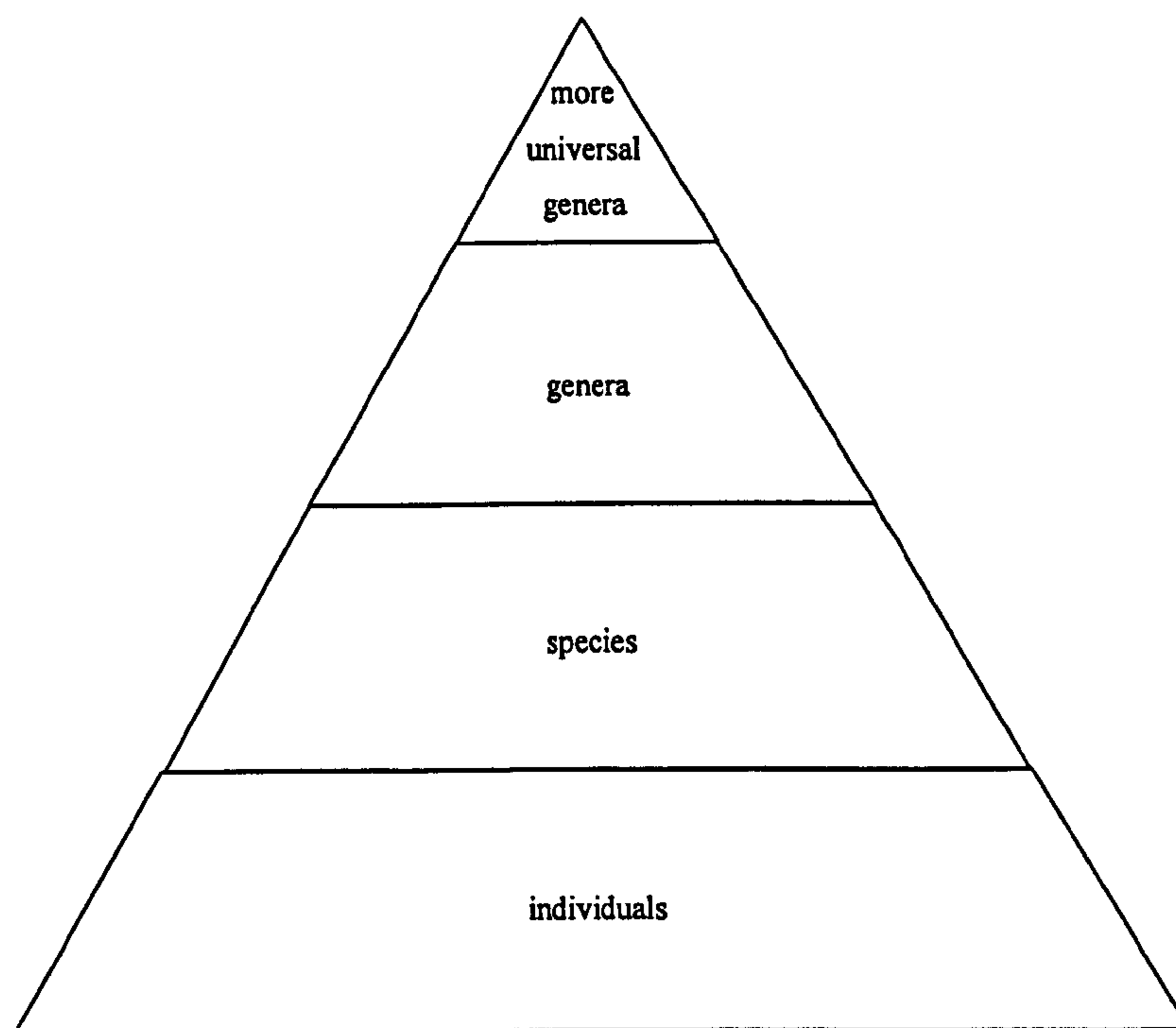


Fig. 4.1. The pyramid of knowledge

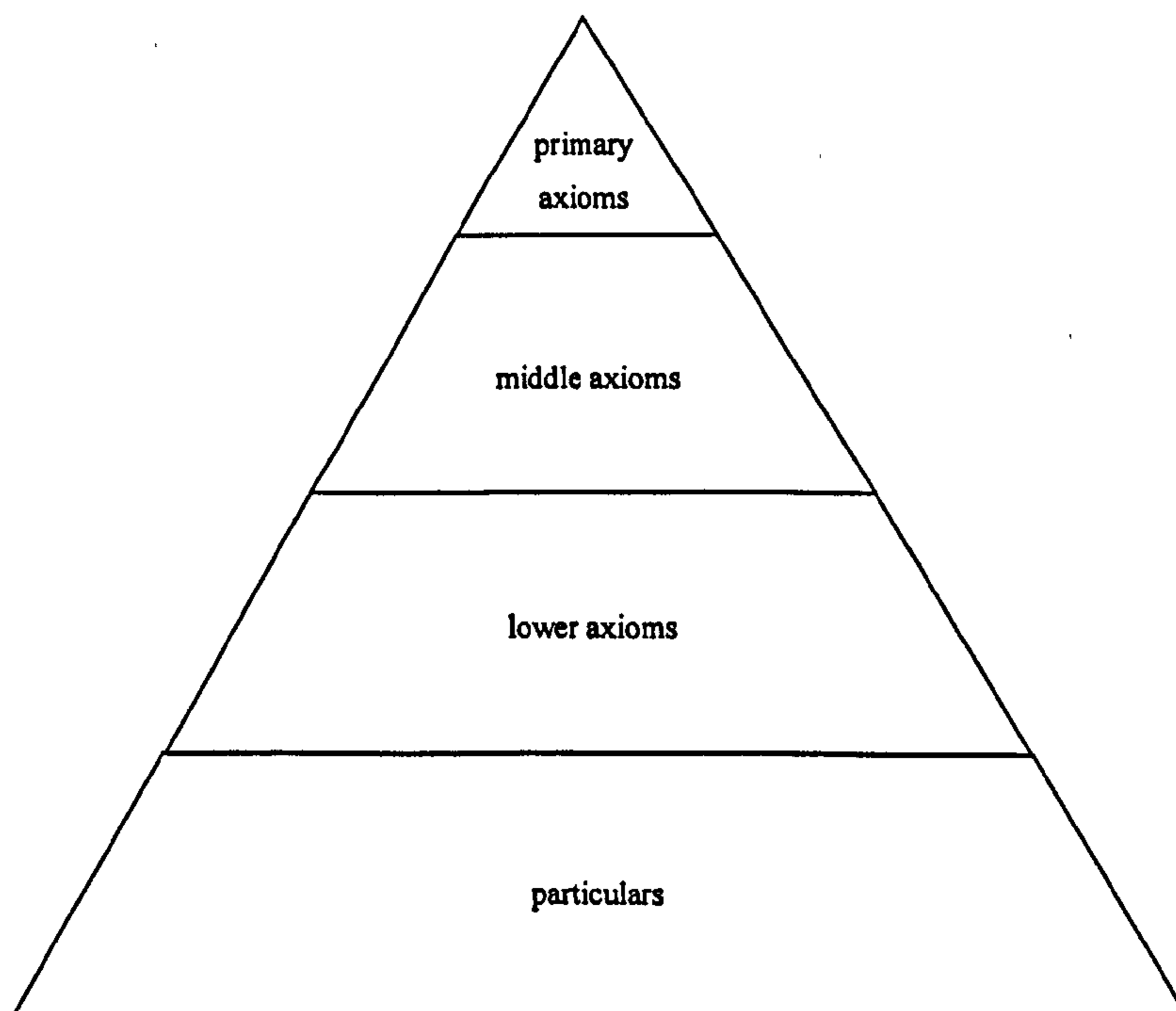


Fig. 4.2. The pyramid of nature

It is well known that Bacon's natural history supplies "the stuff and variety [*supellex atque sylva*] of the true and legitimate induction."³⁶ But it is not well understood that the ascending scale of axioms is intended to unify *natura naturata* in an ever closer approximation to primary axioms (forms). The further the ascent from the multiplicity of natural history (*natura naturata*), the more the axioms expand their scope proportionately. As we move from unity towards the base level of natural history, the scope of the axiom is diminished proportionately. This summarises the relationship between bare particular and form. The mind must not rest content at any intermediate level but use its interaction with things to expand the sphere of activity of its axioms. Hence Bacon says:

In the history which I expect to find and am intent on we must see above all that it has a wide range and is made to the measure of the universe. For the world is not to be tailored to the slenderness of the intellect (which is what has been done hitherto) but the intellect should be stretched and opened up [*sed expandendus Intellectus, & laxandus*] to take in the image of the world as we really find it. For this habit of *taking in just a few things* and *making assertions on the basis of them* has ruined everything.³⁷

In Bacon's severe castigation of traditional learning, he derides "the axioms in current use."³⁸ They have, he asserts, been produced "from a handful of slender experiences" based on the casual investigation of "particulars which crop up often."³⁹ These particulars are then forced to fit the understanding so that experience is narrowed to the demands of prevailing theories. Axioms generated in this way have no footing in the reality of things themselves. As he puts it, men "have simply given up Natural History in the sense of a perambulation of the world. Instead they have based themselves in everything on the agitation of their own wit, content to circle round and round for ever amid the darkest idols of the mind under the high-

³⁶ My trans., Bacon, *DGI, OFB*, VI, 104.

³⁷ Bacon, *PAH, OFB*, XI, 459 (italics in original).

³⁸ Bacon, *NO, OFB*, XI, 73.

³⁹ Bacon, *NO, OFB*, XI, 73.

sounding name of contemplation.”⁴⁰ On that basis, of convenience and accommodation, where things are “pretty much made and tailored to fit” the mind’s preconceived categories, Bacon concludes, “it is no wonder if they [axioms] do not lead to new particulars.”⁴¹

In order for axioms to be fruitful, they must have an increasingly wide applicability; they must be drawn from a wide range of particulars inclusive of all the main divisions of nature. This entails a concomitant expansion of the mind from its customary observations. In its expanded purview, the mind is able to produce axioms made to the measure of the universe and not to the measure of man. The history of generations is merely a record of a single facet of nature’s possible faces. The experiments of the mechanical arts, however, increase this record of *natura naturata*. By forcing matter to exhibit actions that it would not otherwise have done, they have unveiled alternative facets. Thus Baconian inquiry is a search for axioms with a wide applicability – axioms that will unify particulars drawn from nature free, nature erring and nature bound (the mechanical arts). As he says,

Once ... the History has been finished of all those things I have mentioned – of *Generations*, *Pretergenerations* and of *Arts* and *Experiments* – it seems to me that we will lack nothing we need to equip the sense for informing the intellect. Then no longer shall we, like people bewitched, tread out our narrow round; instead we shall bestride the walls of the world.⁴²

The mother history supplies the human mind with “the basic material [*primæ materiæ*] of the sciences.”⁴³ Because the mother history equips the sense, Bacon conceives of it as a “ministration to sense.”⁴⁴

⁴⁰ Bacon, *CV, BF*, 82, cf. *SEH*, III, 600-601.

⁴¹ Bacon, *NO, OFB*, XI, 73.

⁴² Bacon, *PAH, OFB*, XI, 461-463.

⁴³ Bacon, *DGI, OFB*, VI, 97.

⁴⁴ Bacon, *NO, OFB*, XI, 215. The mind cannot generate effects but only recognise and respond to them. As it depends on the senses for its stock of effects, the more the senses are assisted in expanding their range of experience, the more the mind is equipped for the ascent to axioms. The

Having outlined how all material effects – whether “natural,” “deviant” or “artificial” – are equally manifestations of matter’s potency, we are now in a position to understand why the inclusion of the mechanical arts in the mother history is essential. However, although matter is the common cause, Bacon prioritises the history of arts over and above the history of generations and pretergenerations and this is a highly revealing move in Baconian inquiry. “The use of History Mechanical is,” he says, “of all others, the most radical and fundamental towards natural philosophy.”⁴⁵ Bacon offers further reasons for the inclusion of the mechanical arts in the project of natural history. Not only do the mechanical arts shake out nature’s hidden folds, but they also display “the passages and variations of nature.”⁴⁶ The more traditional histories are on a par with a descriptive, “pastoral” philosophy.⁴⁷ They “reflect on nature by fits and starts, and after bodies have finished off what they are doing” when what is most needful is an engagement with bodies “while they are still operating.”⁴⁸ This form of active inquiry, in contrast to passive observances, is facilitated by the mechanical arts.

Bacon prioritises the history of mechanical arts because he recognises them as modes of operation which “betray” matter’s hidden powers or motions:

For just as in affairs of state we see a man’s mettle and the secret sense of his soul and affections better when he is under pressure than at other times,

main obstacle to inquiry is the current fascination of the mind with the limited experiences delivered to it by the senses. As Bacon puts it, the corrupt intellect “simply cannot avoid being tainted and stained, and then perverted and twisted by the daily invasion of ordinary experience” (*NO, OFB, XI, 307*).

⁴⁵ Bacon, *DAS, SEH, IV, 297*, cf. I, 500.

⁴⁶ Bacon, *AL, OFB, IV, 65*. The concept of “display” here differs from the way in which a geometrical modelling of mechanical forces displays a model of interactions among bodies. Bacon seeks a literal display, not a model and his axioms are intended to lead the mind to operatively access motions, not to represent them schematically.

⁴⁷ Bacon, *DPAO, OFB, VI, 251*. See also *AL, OFB, IV, 93*.

⁴⁸ Bacon, *NO, OFB, XI, 359*.

so nature's secrets betray themselves [*produnt se*] more through the vexations of art than they do in their usual course.⁴⁹

The history of mechanical arts “strips the mask and veil from natural things which generally lie concealed or hidden beneath a variety of shapes and outward appearances.”⁵⁰ The analogy between the vexing of Proteus and the mechanical manipulation of matter is overtly stated when Bacon draws attention to a fundamental property of matter, viz., that under duress it will exhibit its internal appetites and potencies: “the vexations of art are indeed like the chains and manacles of *Proteus* which betray the ultimate strivings and exertions of matter [*quæ vltimos Materiæ Nixus & Conatus produnt*].”⁵¹ Bacon’s notion of nature betraying itself underpins his interest in the above experiment touching the strivings of bodies under pressure. In *Sylva sylvarum* he points out that this motion whereby bodies strive to deliver themselves from compression “is visible” in liquids: “for all liquors stricken make round circles, and withal dash; but in solids (which break not) it is so subtile, as it is invisible; but nevertheless bewrayeth itself by many effects.”⁵² Bacon is convinced that “the same nature, which seems to be hidden and secret [*latens & occulta*] in some things, is manifest and almost palpable in others.”⁵³ Because matter

⁴⁹ Bacon, *NO, OFB*, XI, 157. Ursula Klein points out that Boerhaave, “Like Bacon and Boyle before him, ascribes to experiments the role of displaying the latent peculiar powers of bodies that cannot be observed directly by our senses. Chemical art ‘discovers and lays before our eyes the very instruments whereby that powerful agent [nature] produces her effects, and thus leads us in her most secret ways, and often wisely directs them to our own uses,’” “Experimental History and Herman Boerhaave’s Chemistry of Plants,” *Studies in History and Philosophy of Biological and Biomedical Sciences* 34 (2003), 548.

⁵⁰ Bacon, *PAH, OFB*, XI, 463.

⁵¹ Bacon, *PAH, OFB*, XI, 463.

⁵² Bacon, *SS, SEH*, II, 342.

⁵³ Bacon, *NO, OFB*, XI, 143. Bacon’s favourite example is the water bubble: “Water-bubbles seem to shut themselves up in little hemispherical membranes; the force by which they do this strikes us as something mysterious and ingenious. The force which holds wood or stone together we take for granted, and give them the name solid,” *CV, BF*, 91, cf. *SEH*, III, 609.

will make further use of its hidden powers when vexed or bound, the mechanical arts (Bacon thinks) reveal “secret motions of things.”⁵⁴

We saw in Chapter 3 that Bacon’s method is a product of “prolonged examination both of the state of nature and the state of the human mind.”⁵⁵ Considered from the point of view of the human mind, the mechanical arts are “trustworthy interpreters of causes.”⁵⁶ Man’s intervention in nature in the mechanical arts increases his understanding of nature’s processes.⁵⁷ As Bacon puts it, “Can it be said that anyone had just happened to explain the nature of lightning or a rainbow as clearly before the principles of each had been demonstrated by artillery or the artificial simulacra of rainbows on a wall?”⁵⁸ In the mechanical arts the mind is focused on how things come about; the structure of artificial things is simpler and their history can be witnessed as they come into being.⁵⁹ According to Bacon,

Nature of its own accord, free and shifting, disperses the intellect and confuses it with its variety, but in mechanical operations the judgement is concentrated, and we see nature’s modes and processes [*& naturæ modi & processus cernuntur*], not just its effects.⁶⁰

⁵⁴ Bacon, *NA, SEH*, III, 156.

⁵⁵ Bacon, *TPM, BF*, 62, cf. *SEH*, III, 528.

⁵⁶ Bacon, *PhU, OFB*, VI, 9.

⁵⁷ Farrington rightly points out that, for Bacon, “The secret workings of nature do not reveal themselves to one who simply contemplates the natural flow of events. It is when man interferes with nature, vexes nature, tries to make her do what he wants, not what she wants, that he begins to understand how she works and may hope to learn how to control her,” *Francis Bacon: Philosopher of Industrial Science* (London: Macmillan, 1951), 109. But Farrington fails to uncover the deeper intentions of this Baconian principle. According to Bacon, vexing nature will not of itself bring about the understanding required to control nature. Bacon’s artful control of nature depends upon the discovery of forms – the laws unifying nature’s behaviour.

⁵⁸ Bacon, *PhU, OFB*, VI, 9.

⁵⁹ Bacon’s concept of witnessing should not be confused with Steve Shapin’s and Simon Schaffer’s account of virtual witnessing, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N.J.: Princeton University Press, 1985), *passim*. Indeed, Boyle’s discussion of the Baconian distinction between *experimenta lucifera* and *experimenta fructifera* cited below indicates that Boyle had notions of experimentation other than the paradigmatic social witnessing expounded in Shapin’s and Schaffer’s account.

⁶⁰ Bacon, *PhU, OFB*, VI, 5.

When speaking of the mechanical arts in *Commentarius solutus*, Bacon takes it for granted that we can observe the “woork it self and all the processe thereof wth the tymes and seasons of doing every part thereof.” In *Novum organum* he writes, “if anyone wanted to explore and study the industry and skill of any artisan, he would want not only to see just the raw materials of the art and then the finished product but rather to be there while the artisan was doing his job and carrying his work forward.”⁶¹ In the mechanical arts, the manner “of making and working” artefacts “is generally plain to see, whereas in ... nature it is often much less obvious.”⁶² The crucial point is that in mechanical contrivances, “nature’s modes and processes” are made visible: we see “things in motion” (*Res in Motu*).⁶³ Bacon explains that “among the arts we should prefer those which display, change and prepare [*exhibent, alterant, & præparant*] natural bodies and material things, for instance agriculture, cookery, chemistry, dyeing, the manufacture of glass, enamel, sugar, gunpowder, pyrotechnics, paper, and the like.”⁶⁴ In their delineation of how phenomenal things have come about, artificial things are assigned “the leading roles in shedding light on nature.”⁶⁵

Most importantly (as it throws light on matter’s hidden powers), Bacon’s mechanical history focuses not only on the products of the arts (*experimenta fructifera*) but also on what he calls *experimenta lucifera*: on what, in *Commentarius solutus*, he describes as “things collaterall incid^t or intervenient.” Kenneth Cardwell refers to Bacon’s promise that “when the natural history and its ‘auxiliary and light-

⁶¹ Bacon, *NO, OFB*, XI, 359.

⁶² Bacon, *NO, OFB*, XI, 301.

⁶³ Bacon, *PAH, OFB*, XI, 463.

⁶⁴ Bacon, *PAH, OFB*, XI, 463. Bacon’s interests here have led commentators such as Farrington and Rossi to draw biographical links between the famous French potter Bernard Palissy and Bacon. On the possible connections see Rossi, *Francis Bacon*, 8; Farrington, *BF*, 33; *idem.*, *Francis Bacon*, 13-15.

⁶⁵ Bacon, *PhU, OFB*, VI, 9.

giving experiments' are in hand, 'the inquisition of nature and of all sciences will be the work of a few years.'"⁶⁶ To illustrate the importance that Bacon attributes to *experimenta lucifera*, consider his discussion of redness as it applies to alteration during mechanical operation:

In the whole mass of this *History of the Arts*, we must observe one thing especially and remember it all the time, namely that we must adopt not just Experiments of Arts which lead directly to the purpose of the art in question but also those that crop up in the process. For instance, the fact that mud-coloured lobsters and crabs turn red when cooked means nothing to the diner, but this very instance is still very useful for inquiring into the nature of redness, since the same thing happens to baked bricks.⁶⁷

The history of mechanical arts, in Bacon's terms, "will give a more true and real illumination concerning the investigation of causes of things and axioms of arts, than has hitherto shone upon mankind ..."⁶⁸ Crucially, the experiments of the mechanical arts are "not to be judged by their intrinsic worth but by how they can ... fertilize the field of philosophy."⁶⁹ Bacon has in mind that "streams of experiments of the mechanical arts should flood on every side into the sea of philosophy."⁷⁰ We will see in the next section that *experientia literata* extends the experimental history, supplying philosophy with further *experimenta lucifera*.

⁶⁶ See Kenneth Cardwell, "Francis Bacon, Inquisitor," in *Francis Bacon's Legacy of Texts*, ed. William Sessions (New York: AMS Press, 1990), 269-289, on 271. Cardwell's paper offers an excellent account of the connections between the juridical notion of inquisition and Bacon's use of it in the investigation of nature. Among the many insightful points made by Cardwell, he draws attention to the emphasis Bacon places on "the testimonies of experience" and "heaped up *evidentia*," in contrast to a juridical display of rhetorical "argument," 280. In the questioning of nature, there is no argument because, as Cardwell says, Bacon's inquisitorial strategies are based in experience, natural histories, and the testimony of nature itself – all of which obviate the need for adversarial argument. These inquisitorial procedures are also recursive: any answer received from nature can be immediately fed back into the inquisitorial process as the response of a perfectly trustworthy witness.

⁶⁷ Bacon, *PAH, OFB*, XI, 463.

⁶⁸ Bacon, *DAS, SEH*, IV, 297-298, cf. I, 500.

⁶⁹ Bacon, *PAH, OFB*, XI, 465.

⁷⁰ Bacon, *PAH, OFB*, XI, 465.

II. *Experientia literata*

In *De augmentis* Bacon identifies three modes of discovery: chance, the raising of axioms by means of *Novum organum*, and *experientia literata*. As he puts it,

All inventions of works which are known to men have either come by chance and so been handed down from one to another, or they have been purposely sought for [*aut de industria quæsita*]. But those which have been found by intentional experiment have been either worked out by the light of causes and axioms [the New Organon], or detected by extending or transferring or putting together former inventions [*experientia literata*].⁷¹

This section will examine the role of *experientia literata* (literate experience) in Baconian inquiry.

According to Bacon, “almost all mechanical arts have sprung from small beginnings presented by nature or chance.”⁷² The same is true of the alchemists’ findings: “if, in the course of their devious wanderings through the jungle of experience, they now and then lighted on something useful, this was by good luck rather than good guidance.”⁷³ Bacon compares the alchemists’ case to the fable of the old man who bequeathed to his sons gold buried in a vineyard, pretending not to know the exact spot – the sons dig the vineyard and, although they fail to find the gold, the vintage is made more plentiful by their digging. In the same way, “the Sons of Chemistry, searching for gold which may or may not be there, have by their bustle and stir been of no small profit and service to mankind. But their discoveries take their rise and bear their fruit on no higher intellectual plane than those of the

⁷¹ Bacon, *DAS, SEH*, IV, 366, cf. I, 572.

⁷² Bacon, *DAS, SEH*, IV, 416, cf. I, 627.

⁷³ Bacon, *TPM, BF*, 67, cf. *SEH*, III, 534.

Mechanical Arts. They depend on mere experience.”⁷⁴ In Bacon’s view the mechanic, “caring nothing for investigating the truth, does not give his mind or reach out his hand to anything apart from what helps him in his work.”⁷⁵ Hence he characterises the mechanical arts as “merely empirical and operative.”⁷⁶ For the most part, the alchemists are no better; “they, being faithful disciples of the furnace, ... never got beyond their art.”⁷⁷ However, among the alchemists Bacon identifies “a valuable group,” not utterly devoted to their theoretical systems, who try, by noticing the varying contexts to which a more “subtle application of mechanics” can extend, to enlarge “the range of discoveries.”⁷⁸ In Bacon’s eyes, “such a one was Roger Bacon.”⁷⁹ Bacon’s concept of *experientia literata* facilitates this “subtle application of mechanics” exemplified by Roger Bacon.⁸⁰

Experientia literata refers to the mother history drawn into “titles and tables.”⁸¹ The tables bring “all the experiments of all the arts ... collected and arranged [*collecta & digesta*] ... within one man’s knowledge and judgment.”⁸² By offering craftsmen a storehouse of previously scattered materials, *experientia literata* dissolves the boundaries of proprietorial and professional interests. According to Bacon,

⁷⁴ Bacon *CV, BF*, 87, cf. *SEH*, III, 605. The term “experience” as used here refers to the limited experience obtained in the practice of a single craft where habitual routines are encouraged. Bacon’s aim is to break such habits through the cross-fertilisation of the arts.

⁷⁵ Bacon, *NO, OFB*, XI, 157.

⁷⁶ Bacon, *DAS, SEH*, IV, 365, cf. I, 572.

⁷⁷ Bacon, *TPM, BF*, 67, cf. *SEH*, III, 534.

⁷⁸ Bacon, *TPM, BF*, 67, cf. *SEH*, III, 534.

⁷⁹ Bacon, *TPM, BF*, 67, cf. *SEH*, III, 534.

⁸⁰ On Roger Bacon see William R. Newman, “The Philosopher’s Egg: Theory and Practice in the Alchemy of Roger Bacon,” *Micrologus: Nature, Sciences and Medieval Societies* 3 (1995), 75-101.

⁸¹ Bacon, *NA, SEH*, III, 164.

⁸² Bacon, *NO, OFB*, XI, 161.

If men could only bring themselves not to fix their thoughts too intently on the consideration of the subject before them, rejecting everything else as irrelevant [*parerga*] ... they would never be so dull as they are wont to be, but by a free passage and transference of their thoughts they would find many things at a distance which near at hand are concealed [*sed transferendo cogitationes suas et discurrendo, plurima invenirent in longinquo quæ prope latent*].⁸³

This is the force of *experientia literata*; it facilitates the drawing of connections, similarities, analogies and differences that transcend the seclusion and isolation of the various arts. As Lisa Jardine puts it, "*experientia literata* is the material of the natural history organised in such a way as to suggest to a perceptive mind the possibilities for enlarging [experimental] knowledge by applying techniques successful in one field in similar fields, or by applying experiments successful on one type of material to similar materials."⁸⁴ *Experientia literata* puts the mechanic's natural sagacity to better informative and indicative use by incorporating the mechanical history within tables and thereby overcoming his narrow concentration on operations and techniques peculiar to his specific art.

Bacon identifies eight ways of extending the mechanical history: "The method of experimenting proceeds principally either by the Variation, or the Production, or the Translation, or the Inversion, or the Compulsion, or the Application, or the Conjunction, or finally the Chances [*Sortes*], of experiment."⁸⁵

⁸³ Bacon, *HV, SEH*, V, 194-195, cf. II, 73. *Parerga* is a term meaning "incidentals" – it is used to describe deeds that were not one of the twelve great labours of Hercules but were incidental to the actual labour (such as finishing Antaeus).

⁸⁴ Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge University Press, 1974), 144.

⁸⁵ Bacon, *DAS, SEH*, IV, 413, cf. I, 624. For a detailed account of Bacon's methods of experimenting see Jardine, *Francis Bacon*, 143-149; William Eamon, *Science and the Secrets of Nature* (Princeton, N.J.: Princeton University Press, 1994), 285-291; James Stephens, *Francis Bacon and the Style of Science* (Chicago: The University of Chicago Press, 1975), 92-96; F. H. Anderson, *The Philosophy of Francis Bacon* (Chicago: The University of Chicago Press, 1948), 284-288.

Although Bacon here includes chance among the methods of experimenting, chance and *experientia literata* should not be conflated.⁸⁶ As Bacon explains,

A man may proceed on his path in three ways: he may grope his way for himself in the dark; he may be led by the hand of another, without himself seeing anything; or lastly, he may get a light, and so direct his steps; in like manner when a man tries all kinds of experiments without order or method [*serie aut methodo*], this is but groping in the dark; but when he uses some direction and order in experimenting, it is as if he were led by the hand; and this is what I mean by Learned Experience. For the light itself, which was the third way, is to be sought from the Interpretation of Nature, or the New Organon.⁸⁷

Chance as a form of experimenting “is merely irrational and as it were mad, when you have a mind to try something, not because reason or some experiment leads you to it, but simply because such a thing has never been attempted before.”⁸⁸ Bacon retains a role for chance because “the *magnalia* of nature generally lie out of the common roads and beaten paths, so that the very absurdity of the thing may sometimes prove of service.”⁸⁹ However, *experientia literata* – “the transference and application of processes already known” – will not bring to light *magnalia naturæ*.

As Bacon says,

no one contemplating the siege-engines and catapults of the ancients would ever, even if he spent a lifetime straining every nerve, have stumbled on the invention of weapons worked by gunpowder ... Hence all the discoveries which we regard as more noble have (if you think about it) been brought to light not by minute elaborations and extensions of the arts [*experientia literata*], but entirely by chance.⁹⁰

Bacon’s praise of printing, gunpowder, and the compass is well known.⁹¹ According to Benjamin Farrington, “To the sixteenth century these three discoveries – printing, gunpowder, and the compass – were the symbols of what mechanical inventions

⁸⁶ Bacon lists chance among the methods of experimenting because he has earlier divided the Art of Indication into two parts (notwithstanding that “a man may proceed ... in three ways”) (*DAS, SEH, IV, 413, cf. I, 622*).

⁸⁷ Bacon, *DAS, SEH, IV, 413, cf. I, 623*.

⁸⁸ Bacon, *DAS, SEH, IV, 420, cf. I, 632*.

⁸⁹ Bacon, *DAS, SEH, IV, 420, cf. I, 632*.

⁹⁰ Bacon, *NO, OFB, XI, 303*.

⁹¹ See Bacon, *NO, OFB, XI, 195*.

could effect ...”⁹² Yet for Bacon, only printing can be deemed a mechanical invention; gunpowder and the compass (which “rest on the hidden properties of things”) are due to chance.⁹³ As he says, “Printing involved nothing more than the combination of things already known, things that lay on the surface, as one might say.”⁹⁴ For Bacon, printing “gives ground for hope that a vast number of inventions depend, not on the ferreting out of mysterious operations, but on the transference and application of processes already known [*experientia literata*].”⁹⁵ However, no great matter can be hoped from that. In Bacon’s terms, “the rule is that what discoveries lie on the surface exert but little force. The roots of things, where strength resides, are buried deep.”⁹⁶ Hence it is essential to distinguish between chance and *experientia literata* as modes of discovery. If we fail to do so, we cannot explain why *Novum organum* is required at all. Chance, he says, “scatters her blessings on mankind only after tedious and tortuous wanderings.”⁹⁷ No man, for example, would “have ventured to imitate thunder and lightning, if it had not been suggested by the pot lid of the monkish chemist suddenly flying up with great force

⁹² See also Rossi: “These [mechanical arts], he [Bacon] says, unlike theoretical sciences, will not be set up as idols of perfection, for they are continually thriving, growing, advancing, and alive to the needs of humanity; we have already seen this happen in the case of printing, artillery, and navigation. These achievements were made possible because many minds collaborated to one end: in the mechanical arts there can be no dictators but only ‘senates’ of free and equal workers,” *Francis Bacon*, 9. Rossi’s comments here show the care that must be taken when reading Bacon. Rossi’s mistake is that he has not paid sufficient attention to the divisions and phases of Baconian inquiry as clearly delineated by Bacon. The distinctions are important because the whole system of inquiry depends on them for its coherence. Pérez-Ramos makes the same error, *Francis Bacon’s Idea of Science and the Maker’s Knowledge Tradition* (Oxford: Clarendon Press, 1988), 80.

⁹³ Bacon, *CV, BF*, 97, cf. *SEH*, III, 615.

⁹⁴ *ibid.*

⁹⁵ *ibid.*

⁹⁶ Bacon, *CV, BF*, 93, cf. *SEH*, III, 612. Bacon’s point is all the more significant because the *topos* of the “three great discoveries” is repeatedly cited as Bacon’s evidence for what can be achieved through focusing on experiment and observation.

⁹⁷ Bacon, *CV, BF*, 73, cf. *SEH*, III, 591.

and a loud report.”⁹⁸ According to Bacon, “nothing anticipates or gets ahead of chance (whose custom is to work only over long ages) except the discovery of forms.”⁹⁹ We will see in Chapter 5 that Bacon’s science of magic “applies the knowledge of hidden forms” so that the *magnalia* of nature “can be speedily, suddenly and simultaneously anticipated and made manifest.”¹⁰⁰

Not only have commentators conflated chance and *experientia literata*, but also *experientia literata* and physics. I deal with the relationship between Bacon’s doctrines of physics and mechanics in Part III. Here I am concerned only to define and delimit *experientia literata*. Bacon states:

Indication either proceeds from one experiment to another; or else from experiments to axioms; which axioms themselves suggest new experiments. The one of these I will term Learned Experience [*Experientiam Literatam*], the other Interpretation of Nature, or the New Organon.¹⁰¹

Bacon is absolutely clear in his demarcation of *experientia literata* and *Novum organum*. *Experientia literata* “proceeds from one experiment to another.” It does not “extend so far as to the invention of any axiom. For all transition from experiments to axioms, or from axioms to experiments, belong to that other part, relating to the New Organon.”¹⁰² Yet William Eamon argues that “Bacon characterized learned experience as an inductive methodology.”¹⁰³ According to Eamon,

Bacon’s learned experience ... was essentially an attempt to define a rigorous methodology for conjecturing from the seen to the unseen aspects of nature, and from causes to effects ... He wanted to reduce cunning to a

⁹⁸ Bacon, *DAS, SEH*, IV, 416, cf. I, 627.

⁹⁹ Bacon, *NO, OFB*, XI, 303.

¹⁰⁰ Bacon, *DAS, SEH*, IV, 367, cf. I, 573; *NO, OFB*, XI, 169.

¹⁰¹ Bacon, *DAS, SEH*, IV, 413, cf. I, 622-623.

¹⁰² Bacon, *DAS, SEH*, IV, 413, cf. I, 624.

¹⁰³ Eamon, *Science and the Secrets of Nature*, 287.

rule, and to provide an orderly and systematic way of proceeding from particulars to axioms.¹⁰⁴

This cannot possibly be the case given that Bacon says *experientia literata* does not “extend so far as to the invention of any axiom.” Lisa Jardine comes closer to the mark when she states that “*experientia literata* ... is merely a stage on the way to forms.”¹⁰⁵ However, she too conflates *experientia literata* and physics. For example, she states:

All the techniques described by Bacon for discovering order and regularity in nature prior to application of the perfected inductive method fall within the investigations of physics ... They are techniques for collating, transferring and extending knowledge of cause and effect derived from unsystematic observation, rather than from knowledge of the essential nature of bodies.¹⁰⁶

In fact, all the techniques described by Bacon for discovering order and regularity in nature prior to application of the inductive method fall *outside* the investigations of physics. Jardine misrepresents the role of physics, whose essential function lies precisely in the application of the inductive method and is dedicated to the raising of axioms. She fails to recognise that physics forms part of the *scala intellectus* – the raising of axioms. As such, physics properly belongs to *mens*, and *experientia literata* belongs to the senses, or to *res*: the former is the provenance of *Novum organum* but the latter is not.¹⁰⁷ Consequently, the techniques to which Jardine refers

¹⁰⁴ Eamon, *Science and the Secrets of Nature*, 290.

¹⁰⁵ Jardine, *Francis Bacon*, 147.

¹⁰⁶ Jardine, *Francis Bacon*, 141.

¹⁰⁷ This is a common misconception. *Novum organum* is unfinished; we only have two of nine intended books. Book 3 (“*Rectification of Induction*”) was to have dealt with latent process and latent schematism. On the unfinished condition of *Novum organum* see Rees, *OFB*, XI, xcii-xcvii. Rees states that, “As for Rectification of Induction, the only clue to the content of this topic may be Bacon’s remark that insufficiencies of the senses ‘need rectifications.’ That apart, I find nothing to tell us what this third further section of *Novum organum* was designed to do.” Rees notes “merely that at the end of the work when Bacon refers back to the list of topics still to be covered, he slips in several extra items not mentioned before: after Rectification of Induction he means to proceed ‘to things concrete, and both *Latent Processes*, and *Latent Schematisms*, and to the rest set forth in due order in *Aphorism 21*,” *OFB*, XI, xciii. However, *Valerius terminus* offers further evidence to support Rees’ view. There (after describing “whiteness fixed and inherent”) Bacon speaks of the need for “a reduction back to certainty or verity; for it is not all position or contexture of unequal bodies that will

belong to *experientia literata*. Perhaps the confusion arises from treating Bacon's notion of *experimentum* as if it were easily transferable to our modern conception.¹⁰⁸ However, Bacon uses the term to refer to the fortuitous discoveries of the mechanical arts, *experientia literata*, and the systematic discoveries of physics and mechanics. Experiment cannot be used as a determining criterion of the character of the operation unless we are clear about its rationale (or lack thereof). In the *New Atlantis*, all thirty-six fellows of Solomon's House concern themselves with experiments, yet Bacon distinguishes nine phases of inquiry.¹⁰⁹

A further misunderstanding stems from Bacon's request that experience should "at last becom[e] literate."¹¹⁰ According to Farrington, *experientia literata* is a learned presentation of materials. For Farrington, Agricola's *De re metallica* is "the perfect example of what Francis Bacon later called *experientia literata*, or dumb practice which has been to school and learned to express itself in writing."¹¹¹ However, Bacon describes Agricola's work as an example of "that mechanic which is connected with physical causes."¹¹² Because Agricola's treatise is concerned with causes, it falls "outside the limits of learned experience."¹¹³ In Bacon's classification of the sciences, *De re metallica* belongs to the science of mechanics. This confusion arises because commentators have failed to grasp what Bacon signifies by the use of the term *litteratum*. The term here refers to the recording of observations and

produce colour; for *aqua fortis*, oil of *vitriol*, &c. more manifestly, and many other substances more obscurely, do consist of very unequal parts, which yet are transparent and clear" (*VT, SEH, III, 237-238*). Thus Rectification of Induction depends upon the investigation of latent process and schematism.

¹⁰⁸ On the important distinctions between *experimentum* and *experientia* see Charles B. Schmitt, "Experience and Experiment: A Comparison of Zabarella's View with Galileo's in *De Motu*," *Studies in the Renaissance* 16 (1969), 80-138.

¹⁰⁹ See epigraph, Bacon, *NA, SEH, III, 164-165*.

¹¹⁰ Bacon, *NO, OFB, XI, 159*.

¹¹¹ Farrington, *BF, 33*.

¹¹² Bacon, *DAS, SEH, IV, 366, cf. I, 572*.

¹¹³ Bacon, *DAS, SEH, IV, 419, cf. I, 631*.

experiments in writing. Experience becomes literate in the sense that data formerly held in the memory is put in writing.¹¹⁴

Having defined Bacon's concept of *experientia literata* (and distinguished it from the doctrines of physics and mechanics which belong to *Novum organum*), the remainder of this section will examine the role of *experientia literata* in Baconian inquiry. I argue that *experientia literata* contributes to Baconian inquiry in two ways: (1) it supplies *experimenta lucifera* which feed back into the mother history; (2) it functions as a ministration to memory. *Experientia literata* also has a third benefit – it generates useful inventions (*experimenta fructifera*) – but this is incidental to Bacon's programme.

The crucial role of *experientia literata* in supplying *experimenta lucifera* has been overlooked.¹¹⁵ Bacon continually urges that “experiments of Light are even more to be sought after than experiments of Fruit.”¹¹⁶ Hence “no one should be disheartened or confounded if the experiments which he tries do not answer his expectation. For though a successful experiment be more agreeable, yet an unsuccessful one is oftentimes no less instructive.”¹¹⁷ In *Some Considerations Touching the Usefulness of Experimentall Naturall Philosophy*, Robert Boyle expresses concern that Bacon's prioritisation of *experimenta lucifera* may lead men to overlook so-called *experimenta fructifera* which – although not executed for the

¹¹⁴ In *PAH* Bacon says the mother history should be “set down briefly and concisely ... For no one collecting and storing materials for shipbuilding or the like bothers (as shops do) about arranging them nicely and displaying them attractively; rather this sole concern is that they are serviceable and good, and take up as little space as possible in the warehouse. And this is just what should be done here” (*PAH, OFB, XI, 457*). This is a far cry from Agricola's *De re metallica*.

¹¹⁵ Although Jardine notes that “*Experientia literata* shares close links with the prerogative instances,” she does not mention *experimenta lucifera* in her discussion of *experientia literata*. See Lisa Jardine, *Francis Bacon*, 147; *idem.*, “*Experientia Literata* or *Novum Organum*? The Dilemma of Bacon's Scientific Method,” in *Francis Bacon's Legacy of Texts: 'The Art of Discovery Grows with Discovery,'* ed. William Sessions (New York: AMS Press, 1990), 47-67.

¹¹⁶ Bacon, *DAS, SEH, IV, 421, cf. I, 633*.

¹¹⁷ Bacon, *DAS, SEH, IV, 421, cf. I, 632-633*.

purpose of furthering knowledge – may nonetheless be of service to natural philosophy. He points out that

Though that famous Distinction, introduc'd by the Lord *Verulam*, whereby Experiments are sorted into *Luciferous* and *Fructiferous*, may be (if rightly understood) of commendable Use; yet it would much mislead those that should so understand it, as if Fructiferous Experiments did so meerly advantage our interests, as not to promote our Knowledg; or the Experiments called Luciferous, did so barely enrich our Understandings, as to be no other waies useful. For though some Experiments may be fitly enough call'd Luciferous, and others Fructiferous, because the more obvious and immediate Effect of the One is to discover to us Physiological Truths, and of the other to enable us to perform something of Use to the Possessour; yet certainly there are few Fructiferous Experiments, which may not readily become Luciferous to the attentive Considerer of them. For by being able to produce unusual Effects, they either hint to us the Causes of them, or at least acquaint us with some of the Properties or Qualities of the things concurring to the production of such Effects. And on the other side those Experiments, whose more obvious use is to detect to us the Nature or Causes of things, may be, though lesse directly, and in somewhat a remoter way, exceedingly Fructiferous.¹¹⁸

It is worth citing this passage in full because it highlights the complexity of Bacon's concept of experiment. Bacon of course knew that so-called fructiferous experiments could "promote our Knowledg." This is why the mechanical arts must be included in the mother history. However, Bacon (unlike Boyle) did think luciferous experiments were, for the most part, in "no other waies useful." According to Bacon, what was needed was "a class of experiments ... which no one who was not pressing forward on a certain and direct road to the discovery of causes would have thought to investigate."¹¹⁹ Experiments which "in themselves ... have no great use, and are quite obviously not sought out for their own sake but stand in the same relation to things and works as the letters of the alphabet do to speech and words."¹²⁰ Bacon's problem was to find a way of directing men's attention towards *experimenta*

¹¹⁸ Robert Boyle, *The Works of Robert Boyle*, ed. M. Hunter and E. B. Davis, vol. 6 (London: Pickering & Chatto, 1999), 433-434. As I pointed out above (n. 59), Boyle's comments here seem at odds with Shapin's and Schaffer's account which emphasises virtual witnessing. Boyle does not appear here to use experiment as a way of establishing a consensually agreed "fact," but as something that leads the mind to the hidden properties of things – exactly what an experiment of light should do.

¹¹⁹ Bacon, *DO, OFB*, XI, 41.

¹²⁰ Bacon, *DO, OFB*, XI, 41.

lucifera. His distinction between luciferous and fructiferous experiments is a product of his insight into the nature of men. As he says,

The Interpretation of Nature, rightly conducted, ought in the first steps of the ascent, until a certain stage of Generals be reached, to be kept clear of all application to Works. And this has in fact been the error of all those who have heretofore ventured themselves at all upon the waves of experience – that being either too weak of purpose or too eager for display, they have all at the outset sought prematurely for works, as proofs and pledges of their progress, and upon that rock have been wrecked and cast away.¹²¹

We will see in Part III that *experimenta fructifera* play no role in the Interpretation of Nature (the ascent to axioms); at the level of *experientia literata*, they are incidental to Baconian inquiry.

Bacon does not rule out experiments of fruit – they have obvious economic benefits. The financial demands of the method are significant; the construction of the mother history “is a thing of exceedingly great mass and could not be accomplished without enormous effort and investment, for it requires an army of workers.”¹²² In the *New Atlantis*, half the fellows of Solomon’s House contribute to the collection of the mother history.¹²³ Hence Bacon states:

If ... a man is fitter and handier for the mechanical arts, and is good at hunting out works solely as a consequence of being conversant with experiments, I allow and leave to him the job of culling from my history and tables the many things that lie as by the wayside, and of applying them to works, and as it were acquiring interest for a time, until the capital can be had. But I, striving for greater prizes, renounce all precipitate and premature

¹²¹ Bacon, *LL*, X, 86.

¹²² Bacon, *PAH*, *OFB*, XI, 451. In 1620 Bacon writes to James I asking for help with the collection of the natural history. He says he “hope[s] further, that your Majesty will be aiding to me, in setting men on work for the collecting of a natural and experimental history; which is *basis totius negotii* ... that even in your times many noble inventions may be discovered for man’s use. For who can tell, now this Mine of Truth is once opened, how the veins go, and what lieth higher and what lieth lower?” (*LL*, XIV, 130).

¹²³ According to Bacon, “the materials for the intellect are so widely spread out that they ought to be sought out and gathered in (as if by agents and merchants) from all sides” (*PAH*, *OFB*, XI, 451). On the role of merchants of light in the *New Atlantis* see Charles C. Whitney, “Merchants of Light: Science As Colonization in the *New Atlantis*,” in *Francis Bacon’s Legacy of Texts: ‘The Art of Discovery Grows with Discovery,’* ed. William Sessions (New York: AMS Press, 1990) 255-267.

delays in this matter as if (as I generally say) they were Atalanta's apples.¹²⁴

Interestingly, the *Physiological Remains* include "experiments for profit."¹²⁵ For example, Bacon concludes his experiments "about weight in air and water" by noting, "It is a profitable experiment which sheweth the weights of several bodies in comparison with water. It is of use in lading of ships and other bottoms, and may help to show what burden in the several kinds they will bear."¹²⁶ As one might expect, Bacon himself never turns a blind eye to experiments for profit.¹²⁷ His notion that men should "keep their eyes continually turned to the nature of things on one side, and to the uses of man on the other" shows that *experimenta fructifera* are never ruled out.¹²⁸ As he explains,

The best chance of bringing down as from heaven a shower of inventions at once useful and new, is to bring within the knowledge of one man, or of a few who may sharpen one another by conference, the experiments of a number of mechanical arts; that by this translation (as I call it) of experiments the arts may mutually cherish and as it were kindle one another by mixture of rays. For though the rational method of inquiry by the Organon promises far greater things in the end, yet this sagacity proceeding by Learned experience will in the meantime present mankind with a number of inventions which lie near at hand, and scatter them like the donatives that used to be thrown among the people.¹²⁹

In the *New Atlantis* dowry-men or benefactors "bend themselves, looking into the experiments of their fellows, and cast about how to draw out of them things of use and practice for man's life and knowledge, as well for works as for plain demonstration of causes, means of natural divinations, and the easy and clear

¹²⁴ Bacon, *NO, OFB*, XI, 177. On the fable of "Atalanta, or Profit" see Bacon, *DSV, SEH*, VI, 743-744, cf. 667-668.

¹²⁵ Bacon, *Physiological Remains, SEH*, III, 821-822.

¹²⁶ Bacon, *Physiological Remains, SEH*, III, 821.

¹²⁷ Lisa Jardine and Alan Stewart show that "throughout his entire life he [Bacon] was to be dogged by financial difficulties and the ever-present necessity of expending his energies on extricating himself from them," *Hostage to Fortune: The Troubled Life of Francis Bacon* (London: Gollancz, 1998), 48.

¹²⁸ Bacon, *DAS, SEH*, IV, 419-420, cf. I, 631.

¹²⁹ Bacon, *DAS, SEH*, IV, 417, cf. I, 628-629.

discovery of the virtues and parts of bodies.”¹³⁰ Hence the Bensalamites reap the fruits of *experientia literata*.¹³¹ However, no great matter can be hoped from that. The mechanic, Bacon says, “is apt to think himself as among the great inventors, if he has had the good luck to give a finer finish or enhanced elegance to some old invention, to combine in one what was previously separate, to make a fruitful application to practice of something already known, or to reproduce a familiar model on a bigger or smaller scale.”¹³² However, for Bacon, the “extension of a thing already invented [*experientia literata*] ... does not merit the name of a new invention.”¹³³ The following passage highlights the lowly status of the works (*experimenta fructifera*) generated from *experientia literata*:

He [Bacon] felt driven to condone the strange practice of the Egyptians. Like other ancient peoples they deified their inventors; and if they set up images even of brute beasts in their temples, well, they had the excuse that the irrational animals have discovered almost as many of nature’s operations as men have done. Men indeed have failed to use their prerogative of reason to this end.¹³⁴

¹³⁰ Bacon, *NA, SEH*, III, 165.

¹³¹ More work needs to be done on Bacon’s notion of charity. Kennington rightly argues that “upon closer scrutiny it becomes clear that it is not Christian charity that persuades Bacon to endorse mastery of nature. Bacon’s version of charity is much too wordly to be considered peculiarly biblical or Christian. As possible fruits of scientific mastery it features the extremes of pleasure, great engines of warfare, and indeed the pursuit of immortality of the body in this life. Baconian charity is thoroughly humanistic,” *On Modern Origins*, 5. Timothy Paterson points out that purely selfish motives lead the Benefactors of Solomon’s House “to act as if they were in fact the humane and charitable scientist-saints of Baconian legend,” “The Secular Control of Scientific Power in the Political Philosophy of Francis Bacon,” *Polity* 21 (1989), 457-480. For an alternative reading see Brian Vickers, “Bacon’s So-called ‘Utilitarianism’: Sources and Influences,” in *Francis Bacon: terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell’Ateneo, 1984), 281-313; Masao Watanabe, “Francis Bacon: Philanthropy and the Instauration of Learning,” *Annals of Science* 49 (1992), 163-173.

¹³² Bacon, *CV, BF*, 74, cf. *SEH*, III, 592.

¹³³ My trans., Bacon, *DIN, SEH*, III, 788. He criticises those who “descend to the level of calling every petty addition or improvement to the practice of the crafts a new invention” (*CV, BF*, 74, cf. III, 593).

¹³⁴ Bacon, *CV, BF*, 90, cf. *SEH*, III, 608.

Experientia literata does not use the “prerogative of reason.” It is “rather a sagacity and a kind of hunting by scent, than a science.”¹³⁵ Those who participate in this activity are no more inventors than are the irrational animals. True inventions (the *magnalia* of nature) belong to the science of magic.

Bacon’s distinction between *experimenta fructifera* and *experimenta lucifera* allows him to promote the status of the latter. According to Bacon, mechanics are of all men, those most troubled by envy.¹³⁶ By promoting the status of *experimenta lucifera*, Bacon hopes to appeal to their vanity. As Laurence Lampert rightly argues, “Bensalamite society [in the *New Atlantis*] is calculated to feed the envious natures of the Daedaluses [mechanics].”¹³⁷ Bacon repeatedly states, “I do not chase like a child after golden apples [*experimenta fructifera*], but stake everything on a victory for art in its race against nature; nor do I rush off to mow the moss or green corn but wait for the ripened crop.”¹³⁸ According to Bacon, “If gunpowder had been discovered, not by good luck but by good guidance, it would not have stood alone but been accompanied by a host of noble inventions of a kindred sort.”¹³⁹ Whereas “chance discovereth new inventions by one and one,” forms will discover them “by knots and clusters.”¹⁴⁰ There is, he says, “not one of the sciences or arts which follows the true and legitimate course constantly forth till it reach its end; but it perpetually happens that arts stop in their undertakings half way, and forsake the

¹³⁵ Bacon, *DAS, SEH*, IV, 421, cf. I, 633. Artisans have not attained the purification of mind required to interpret nature. They cannot therefore arrive at knowledge of forms. This poses difficulties for Pérez-Ramos’ claim that, for Bacon, “to know, in brief, means to make,” *Francis Bacon’s Idea of Science*, 292.

¹³⁶ See Bacon, *DSV, SEH*, VI, 734-735, cf. 659.

¹³⁷ Laurence Lampert, *Nietzsche and Modern Times: A Study of Bacon, Descartes, and Nietzsche* (New Haven: Yale University Press, 1993), 36. See also Timothy Paterson, “The Secular Control of Scientific Power in the Political Philosophy of Francis Bacon,” *Polity* 21 (1989), 457-480, esp. 472.

¹³⁸ Bacon, *NO, OFB*, XI, 177.

¹³⁹ Bacon, *TPM, BF*, 71, cf. *SEH*, III, 538.

¹⁴⁰ Bacon, *VT, SEH*, III, 247.

course, and turn aside ... after profit and commodity.”¹⁴¹ Bacon’s message is clear: philosophy “fails from no cause more than from curious and premature meddling and impatience.”¹⁴² He laments:

We need more meticulous care and handpicked trials, not to mention funding and the utmost patience besides. For it has ruined everything in the experimental field that right from the beginning men have continually aimed at Experiments of Fruit not ones of Light, and have devoted their energies entirely to producing some splendid work, not to revealing nature’s oracles, which is the work of works [*opus operum*] and encompasses in itself all power.¹⁴³

As Bacon interprets the fable of Orpheus, Orpheus (Bacon’s figure for universal philosophy) lost Eurydice because “in the impatience of love and anxiety” he looked back before he reached the light.¹⁴⁴ The Interpreter must refrain from the temptation of works until he reaches the light of forms. Only knowledge of forms will shake out the *magnalia* of nature – secrets “such as to elude and mock the imagination and thought of men.”¹⁴⁵ The Interpretation of Nature (the means to discover forms) requires *experimenta lucifera*. Therefore those who devote themselves to seeking out *experimenta lucifera* will “be liberally recompensed in the end.”¹⁴⁶ Thus Bacon has arranged the hierarchy of experimental practices perfectly in accordance with human character. Bacon’s message is clear: great inventors (greedy Daedaluses) should aspire to *experimenta lucifera*.

¹⁴¹ Bacon, *DSV, SEH*, VI, 744, cf. 668.

¹⁴² Bacon, *DSV, SEH*, VI, 722, cf. 648.

¹⁴³ Bacon, *PhU, OFB*, VI, 5.

¹⁴⁴ Bacon, *DSV, SEH*, VI, 720, cf. 647.

¹⁴⁵ Bacon, *CV, BF*, 96, cf. *SEH*, III, 615. The phrase “elude and mock” refers to the inability of the imagination to grasp the possibilities presented by Baconian inquiry, which promises unprecedented *nova*. I discuss this further in Chapter 5.

¹⁴⁶ Bacon, *VT, SEH*, III, 247.

In addition to extending the experimental history, *experientia literata* functions as a “ministration to memory.”¹⁴⁷ In *Novum organum* Bacon explains that

Natural and Experimental History is so various and scattered that it may bewilder and distract the intellect unless it be set down and presented in suitable order. So we must fashion *Tables*, and Structured Sets of Instances [*Coordinationes Instantiarum*], marshalled in such a way that the intellect can get to work on them.¹⁴⁸

Experientia literata presents the mother history in a suitable form for the intellect.

“The great help to the memory,” Bacon says, “is *writing*.”¹⁴⁹ Moreover, “this is particularly the case in inductive philosophy and the interpretation of nature; for a man might as well attempt to go through the calculations of an Ephemeris in his head without the aid of writing, as to master the interpretation of nature by the natural and naked force of thought and memory, without the help of tables duly arranged [*tabulas ordinatas*].”¹⁵⁰ The tables digest the mother history *before* the intellect gets to work on it. This is the force of a familiar aphorism:

Those who have dealt with the sciences have either been empirics or dogmatists. The empirics, in the manner of the ant, only store up and use things; the rationalists, in the manner of spiders, spin webs from their own entrails; but the bee takes the middle path: it collects its material from the flowers of field and garden, but its special gift is to convert and digest it. The true job of philosophy is not much different, for it depends not only or mainly on the powers of the mind, nor does it take the material gathered from natural history and mechanical experiments and store it unaltered in the memory [*in Memoriâ integram*] but lays it up in the intellect changed and elaborated [*sed in Intellectu mutatam & subactam reponit*].¹⁵¹

This aphorism is often misinterpreted.¹⁵² For example, Perez Zagorin states: “The business of philosophy, [Bacon] said, is to imitate the bee; and in the method of

¹⁴⁷ Bacon, *NO, OFB*, XI, 215.

¹⁴⁸ Bacon, *NO, OFB*, XI, 215.

¹⁴⁹ Bacon, *DAS*, IV, 435, cf. I, 647.

¹⁵⁰ Bacon, *DAS*, IV, 435, cf. I, 647.

¹⁵¹ Bacon, *NO, OFB*, XI, 153.

¹⁵² For an accurate interpretation see Rossi, “Ants, spiders, epistemologists,” in *Francis Bacon: terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell’Ateneo, 1984), 245-260, esp. 255. However, even Rossi does not elaborate on the significance of the digestion of

discovery he presented in his treatise he strove to do so by showing how the power of the mind could digest the evidence it derived from natural history and experiments and transform it into a knowledge of forms and the mastery of nature."¹⁵³ In fact, Bacon is making precisely the opposite point. The bee collects its material from "the flowers of field and garden" which signifies the natural and experimental history. The special function of philosophy is "to convert and digest" the material gathered from the mother history, but this does *not* depend "only or mainly on the powers of the mind." Rather, the mother history is "changed and elaborated" in tables *before* being worked on by the intellect. The mother history is not laid up in the memory whole (*integrum*).¹⁵⁴ The intellect, in Bacon's view, is not capable of digesting "a farrago and mass" of mother history; the tables therefore perform a "first digestion."¹⁵⁵ As Rawley puts it, experience "must be broken and grinded, and not whole, or as it groweth."¹⁵⁶ *Experientia literata* ministers to the memory in two ways. First, it functions as a "storehouse of things ... for the work of the Interpreter, which comes next."¹⁵⁷ Second, the arrangement of the mother history into topics and tables stops the intellect from being distracted by the dizzying array of things. Bacon refers to this as "a kind of cutting off of infinity of search."¹⁵⁸ As he puts it,

experience (see below). See also R. H. Bowers, "Bacon's Spider Simile," *Journal of the History of Ideas*, 17 (1956), 133-135.

¹⁵³ Perez Zagorin, *Francis Bacon* (Princeton, N.J.: Princeton University Press, 1998), 101.

¹⁵⁴ In *DAS* Bacon explains that "The sense, which is the door of the intellect, is affected by individuals only. The images of those individuals – that is, the impressions which they make on the sense – fix themselves in the memory, and pass into it in the first instance entire [*integræ*] as it were, just as they come" (*SEH*, IV, 292-293, cf. I, 494-495.). The tables alter the intellectual process by performing a first digestion so that the images do not pass into the intellect *integræ*. I discuss this further in Chapter 5.

¹⁵⁵ Bacon, *NO*, *OFB*, XI, 75, 155.

¹⁵⁶ Rawley, *SEH*, II, 336.

¹⁵⁷ Bacon, *PAH*, *OFB*, XI, 459.

¹⁵⁸ Bacon, *DAS*, *SEH*, IV, 436, cf. I, 648.

When a man desires to recall anything into his memory, if he have no prenotation or perception of that he seeks, he seeks and strives and beats about hither and thither as if in infinite space. But if he have some certain prenotation, this infinity is at once cut off, and the memory ranges in a narrower compass; like the hunting of a deer within an enclosure. And therefore order also manifestly assists the memory; for we have a prenotation that what we are seeking must be something which agrees with order.¹⁵⁹

Here we see the beginnings of directed inquiry, as opposed to casual observations.

Order circumscribes the range of questions so as to focus the inquisition. The inquirer must know two things: 1) that the answers, although not yet known, are possible; 2) that the questions are framed so as to elicit the sought for answers.¹⁶⁰

Nature of course has the answers to all possible questions, but the mind, as Bacon says, is unsuited for going to and fro “to the remote and heterogeneous instances” of the mother history. In order to prevent the intellect striving and beating about hither and thither, the observations and experiments of the mother history are “marshalled and drilled by appropriate tables.”¹⁶¹

In brief, Bacon conceives of the mother history as a dense forest (*Sylva sylvarum*). *Experientia literata* offers some “direction and order in experimenting.” Rather than groping in the dark, one is led by the hand.¹⁶² Moreover, the first digestion of the mother history into titles and tables is a ministrations to memory for the work of the Interpreter which follows.

¹⁵⁹ Bacon, *DAS, SEH*, IV, 436, cf. I, 648.

¹⁶⁰ In his *Critique*, Kant (commenting on Bacon) says: “Reason must not allow itself to be kept ... in nature’s leading strings,” but must devise experiments to “[constrain] nature to give answers of reason’s own determining,” preface to the Second Edition, *Critique of Pure Reason*, trans. Norman Kemp Smith (London: Macmillan & Co., 1956), 20.

¹⁶¹ Bacon, *NO, OFB*, XI, 161.

¹⁶² In his letter prefaced to Bacon’s *Sylva sylvarum*, William Rawley says that the attentive reader will find that the particulars “have a secret order” (*SEH*, II, 337). *Sylva sylvarum* is organised in such a way as to hint at axioms and causes so that “men’s minds ... would not think themselves utterly lost in a vast wood of experience” (*SEH*, II, 336-337).

III. Physics and mechanics

This section focuses on the “transition from experiments to axioms, or from axioms to experiments,” which belongs to *Novum organum*.¹⁶³ The transition from experiments to axioms is the domain of physics and metaphysics; the transition from axioms to experiments is the domain of mechanics and magic. Chapter 5 will examine Bacon’s doctrine of forms (metaphysics) and his operative science of magic. Here I will focus on the role of physics and mechanics in the ascension to primary axioms (forms).

Baconian knowledge ascends through a series of axioms of expanding generality. According to Bacon, “all true and fruitful [*solida et fructuosa*] Natural Philosophy has a double scale or ladder [*duplicem scalam*], ascendant and descendent.”¹⁶⁴ Bacon states time and again that his “route is not laid on the flat but goes up and down – ascending first to axioms, and then descending to works.”¹⁶⁵ We saw in Part II that *experientia literata* extracts “works from works, or experiments from experiments.”¹⁶⁶ In contrast, the Interpretation of Nature extracts “from works and experiments causes and axioms, and in turn from causes and axioms new works and experiments.”¹⁶⁷ The Interpretation of Nature begins with works and experiments, viz., the mother history and the ever-increasing *experimenta lucifera* supplied by *experientia literata*. Physics (we will see below) supplies “new

¹⁶³ Bacon, *DAS, SEH*, IV, 413, cf. I, 624.

¹⁶⁴ Bacon, *DAS, SEH*, IV, 343, cf. I, 547.

¹⁶⁵ Bacon, *NO, OFB*, XI, 161.

¹⁶⁶ Bacon, *NO, OFB*, XI, 175.

¹⁶⁷ Bacon, *NO, OFB*, XI, 175.

experiments of a higher light, more penetrating into nature.”¹⁶⁸ On the basis of this “powerful underpinning of experiments of light,” the Interpreter ascends to axioms.¹⁶⁹ This is the *scala intellectus*.¹⁷⁰ However, every ascent of the mind to an axiom must be followed by a descent via experimentation to things, thereby guaranteeing the continual union of the mind and things. It is only through a retention of this union that the inquiry is guaranteed to terminate in the science of magic. The role of Bacon’s science of mechanics – by its continual descent from axioms to experiments – is to sustain that union. Oddly, the crucial role of mechanics has been entirely overlooked in the secondary literature.¹⁷¹

In *Novum organum* Bacon explains that physics proceeds by way of “concrete bodies as we find them in nature in her ordinary course.”¹⁷² We saw in Chapter 2 that, for Bacon, this world is no more than a subset of possibilities. However, nature as it presents itself is the Interpreter’s only point of departure: inquiry must begin with *natura naturata* in order to discover the manner in which possibilities have been actualised (*natura naturans*). Natural history and physics focus on the ordinary course of nature in all its phenomenal fecundity, in which the human mind is immersed. But there is a great difference between the engagement with nature at the level of natural history and the engagement with nature at the level of physics, viz., physics deals with things that do not strike the senses. As Bacon puts it, “up to now we cool our heels in the antechambers of nature and are not

¹⁶⁸ Bacon, *NA*, *SEH*, III, 165.

¹⁶⁹ Bacon, *HIDA*, *OFB*, XIII, 229.

¹⁷⁰ Bacon, *DO*, *OFB*, XI, 26.

¹⁷¹ For example, Jardine refers to “mere *mechanic* – practical activity for its own ends, or to implement the findings of physics,” *Francis Bacon*, 147.

¹⁷² Bacon, *NO*, *OFB*, XI, 207. In *DAS* (but not *AL* or *NO*), Bacon divides the doctrine of physics into concrete physics and abstract physics. See Rees, Table 1, *OFB*, XIII, xxxviii. I deal with abstract physics and metaphysics in Chapter 5.

granted access to her sanctuary.”¹⁷³ Because of the limitations of the senses, an intermediary or interpreter is required if nature’s oracles (its manifest effects) are to be fully understood in terms of matter’s hidden motions. According to Bacon, “the sense is by nature a weak and wandering thing ... but all truer interpretation of nature is accomplished by means of instances, and apt and appropriate experiments, where the sense judges only the experiment while the experiment judges nature and the thing itself.”¹⁷⁴ Physics investigates what Bacon calls “latent schematism” and “latent process.”¹⁷⁵ Because these things are hidden, they must be accessed via experiments of light.¹⁷⁶

Latent process refers to the “unbroken process” of motions “which for the most part evades the sense.”¹⁷⁷ Bacon stresses, “we do not mean certain visible degrees, marks or stages of a process in bodies.”¹⁷⁸ As we saw in Chapter 2, the scholastics (in Bacon’s view) deal only with observable changes (generation, corruption etc.) and regard these as expressions of motion. Cataloguing the

¹⁷³ Bacon, *NO, OFB*, XI, 211.

¹⁷⁴ Bacon, *NO, OFB*, XI, 87. In *DO* Bacon states: “I set little store by the immediate and peculiar perception of the sense, but carry the matter to the point where the sense judges only the experiment whereas the experiment judges the thing. Hence I believe that I present myself as high priest of the sense (from which all natural knowledge should, unless we prefer madness, be derived), and learned interpreter of its oracles; so that whereas others merely claim to watch over and cherish the sense, I do so in fact” (*DO, OFB*, XI, 35). The term “interpreter of nature” is used by Pico della Mirandola who states: “I was not satisfied by the many assertions made by many men concerning the outstandingness of human nature: that man is ... the interpreter of nature ...,” *On the Dignity of Man*, trans. Charles Glenn Wallis, Paul J. W. Miller and Douglas Carmichael (Indianapolis: The Bobbs-Merrill Company, 1965), 3.

¹⁷⁵ Bacon, *NO, OFB*, XI, 201.

¹⁷⁶ Bacon discusses helps for the senses in *Novum organum* under the heading “*Instances of the Lamp*.” There are five classes of prerogative instance that support the senses: “the first ones strengthen, enlarge and correct the immediate actions of the sense; the second reduce [*deducunt*] the imperceptible to the perceptible; the third show up the continued processes or successive stages of those events and motions which generally go unnoticed except when they finish or reach the end of a cycle [latent process]; the fourth provide substitutes for the sense when it fails altogether; the fifth attract the attention and notice of the sense, and at the same time limit the subtlety of things” (Bacon, *NO, OFB*, 343). On prerogative instances see Chapter 5.

¹⁷⁷ Bacon, *NO, OFB*, XI, 209.

¹⁷⁸ Bacon, *NO, OFB*, XI, 209.

observable properties, the end points of change, is merely a description of nature's effects. In contrast, the investigation of latent process examines "the ways and means of ... mutations and transformations" of things.¹⁷⁹ For example, one investigates

from what beginnings, by what means and by what process [*ex quibus initijs, & quo modo, & quo processu*] gold or any other metal or stone is generated, starting with its first menstrua or rudiments, all the way up to the finished mineral; or, in the same way, by what means plants are generated, starting with the first concretions of juices in the earth, or with seed, and ending up with the mature plant, after the whole run of motions [*successione Motûs*] and the various protracted travails of nature; or likewise of the orderly unfolding [*explicatâ*] of the generation of animals, from conception to birth; and likewise for other bodies.¹⁸⁰

The investigation of latent process is not only directed "towards generations of bodies, but also towards other motions and works of nature [*opificia Naturæ*]."¹⁸¹

Whereas latent process investigates bodies in motion, latent schematism investigates a body's internal consistency when it is *quiescens* – when the simple motions are locked in a state of dynamic tension.¹⁸² For example, Bacon says

in every body we must investigate how much of it is spirit and how much tangible matter; and whether the spirit itself is plentiful and swelling or scanty and starved; whether thinner or thicker; more airy or fiery; active or idle; robust or insubstantial; advancing or retreating; cut off or continuous; agreeing or disagreeing with external and ambient bodies, etc. And likewise the tangible essence (which has no fewer differences than the spirit) – together with its hairs and fibres and all kinds of textures; as well as the distribution of spirit through the mass of the body, with its pores, passages, veins and cellules, and the rudiments or tentative beginnings of an organic body – comes under this same investigation.¹⁸³

Bacon acknowledges that "human effort has not been entirely in abeyance" in this respect, "for tending towards this very thing is the separation of bodies by

¹⁷⁹ Bacon, *CDNR, SEH*, V, 424, cf. III, 19.

¹⁸⁰ Bacon, *NO, OFB*, XI, 207.

¹⁸¹ Bacon, *NO, OFB*, XI, 207. For example, Bacon says "the investigation takes place in the case of the whole run and continued actions of nourishing, from the first taking in of food to complete assimilation" (*NO, OFB*, XI, 207-209).

¹⁸² Bacon, *NO, OFB*, XI, 200.

¹⁸³ Bacon, *NO, OFB*, XI, 213. On Bacon's concept of *spiritus* see Chapter 5.

distillation and other modes of dissolution to make plain the dissimilarity of a compound body by causing like parts to move to like.”¹⁸⁴ However, this too often produces fallacious results “because many natures ascribed and imputed to separation, as if they were things pre-existing in the compound, are in fact newly implanted and superinduced by fire and heat, and by other modes of opening up.”¹⁸⁵ Hence distillations and other modes of dissolution are limited in what they can achieve: they mistakenly present the investigator not with a separation of the constituents of latent schematisms but with newly derived latent schematisms – not with analytic constituents but with new syntheses.¹⁸⁶ Regardless of potential errors, for Bacon the investigation of latent process and latent schematism is valuable insofar as it supplies *experimenta lucifera* which feed back into the mother history. However, he regards these studies “as night work on account of our small but constantly shining lamp.”¹⁸⁷ Only the discovery of the primary axioms (forms) will cast “a true and undimmed light” on nature’s hidden recesses.¹⁸⁸

¹⁸⁴ Bacon, *NO, OFB*, XI, 211.

¹⁸⁵ Bacon, *NO, OFB*, XI, 211. Heat as a mode of operation is problematic because “the subtler schematisms of things are ruined and brought to confusion” (*NO, OFB*, XI, 431). William Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (Chicago: The University of Chicago, 2004) quotes a passage from *Sylva sylvarum* which, he says, demonstrates Bacon’s debt to alchemical procedures: “And therefore it is well said by an obscure writer of the sect of the chemists, that there is no such way to effect the strange transmutations of bodies, as to endeavour and urge by all means the reducing of them to nothing” (*SS, SEH*, II, 383-384). On this basis Newman argues that “It would not be an exaggeration to say that the art of chymistry was for Bacon the model upon which he built his concept of experiment pushing nature to the limit so that it would reveal its deepest secrets,” *Promethean Ambitions*, 265. While Bacon’s debt to alchemical procedures is manifest, his concept of experiment extends far beyond the chemical laboratory. It would be more accurate to say that Bacon commends the alchemical procedure of driving matter “to extremities” because of his prior commitment to the doctrine of the indestructibility of matter (see Bacon, *DSV, SEH*, VI, 726, cf. 652).

¹⁸⁶ On the wide range of views expressed in the chemical literature of the sixteenth and seventeenth centuries concerning the validity of fire analysis, see Allen G. Debus, “Fire Analysis and the Elements in the Sixteenth and Seventeenth Centuries,” *Annals of Science* 23 (1967), 127-147.

¹⁸⁷ Bacon, *NO, OFB*, XI, 361.

¹⁸⁸ Bacon, *NO, OFB*, XI, 213.

The significance of Bacon's claim that full knowledge of latent schematism depends upon discovery of forms has been missed. For example, Jardine argues that

Despite the fact that the superior study of the metaphysics of forms is supposed to give man complete control over nature, knowledge of latent process and latent configuration is an essential part of the application of forms in order to transform bodies. This is a fundamental weakness in Bacon's programme for the growth of human power over nature, and one which remains completely unresolved. Because Bacon fails to work out the relation between latent process and configuration, with their spirits, expansions and contractions, and the metaphysics of forms with its vocabulary of fundamental properties, the gap between operative and contemplative knowledge remains as broad in his scheme of knowledge as in any of the more conventional theories which he criticises.¹⁸⁹

But according to Bacon, knowledge of forms gives man complete control over nature precisely because it gives him complete knowledge of latent process and latent schematism. In fact, Bacon is very clear about the relation between latent process and schematism and the metaphysical doctrine of forms. The investigation of latent process and schematism supplies powerful experiments of light which feed back into the mother history. The discovery of forms (as well as lower and middle axioms in physics) hinges upon these luciferous experiments. Because commentators have failed to grasp the role of *experimenta lucifera* in physics, they have failed to find any connection between physics and metaphysics. For example, Kennington (like Jardine) argues that "physics and metaphysics are disjunctive of one another."¹⁹⁰ He criticises Mary Hesse who rightly argues that "the real distinction between physics and metaphysics for Bacon is the distinction between the lower and higher axioms of the inductive ladder."¹⁹¹ According to Kennington,

¹⁸⁹ Jardine, *Francis Bacon*, 143.

¹⁹⁰ Richard Kennington, *On Modern Origins: Essays in Early Modern Philosophy*, ed. Pamela Kraus and Frank Hunt (New York: Lexington Books, 2004), 12.

¹⁹¹ Mary Hesse, "Francis Bacon's Philosophy of Science," in *Essential Articles for the Study of Francis Bacon* ed. Brian Vickers (Connecticut: Archon Books, 1968), 118. However, Hesse fails to appreciate the significance of the physics-metaphysics distinction.

latent process and schematism “lack any essential connection with laws.”¹⁹² Common sense dictates that this simply cannot be the case; a ladder of axioms – a *scala intellectus* as Bacon calls Part IV of his *Instauratio* – cannot be disjunctive.¹⁹³

As Bacon says,

We should hope for better things from the sciences only when we ascend the proper ladder by successive, uninterrupted or unbroken steps [*per Scalam veram, & per gradus continuos, & non intermissos, aut hiulcos*], from particulars to lower axioms, then to middle ones, each higher than the last until eventually we come to the most general.¹⁹⁴

A true ladder of the intellect has no interrupted or disconnected steps. Bacon explains that the primary axioms (forms) are limited by the intermediate axioms of physics.¹⁹⁵ As Fowler puts it, “the axiomata media are particular cases” of laws.¹⁹⁶ This directly contradicts Kennington’s claim that “latent process and latent configuration are not less general versions of the laws studied by metaphysics.”¹⁹⁷ We will see in Chapter 5 that Bacon considers the rules of physics to be limitations of the laws unifying *natura naturata*.

The investigation itself of latent process and latent schematism only gives us more knowledge of latent process and latent schematism. None of this is axiomatic: it is merely providing physical information about the ordinary course of nature. Axioms belong to *mens* not *res*; they are not simply given by physics as if they were a constituent among things, rather they must be educed on the basis of what physics has investigated. *Experimenta lucifera* (supplied by physics) further illuminate

¹⁹² Kennington, *On Modern Origins*, 41.

¹⁹³ However, there are good reasons why a number of commentators argue that physics and metaphysics are disjunctive. I address these in Chapter 5.

¹⁹⁴ Bacon, *NO, OFB*, XI, 161.

¹⁹⁵ See Bacon, *NO, OFB*, XI, 160: “At media sunt Axiomata illa vera, & solida, & viua, in quibus humanæ res, & fortunæ, sitæ sunt; & supra hæc quoque, tandem ipsa illa generalissima; talia scilicet, quæ non abstracta sint, sed per hæc media verè limitantur.”

¹⁹⁶ Thomas Fowler, *Bacon’s Novum Organum* (Oxford: Clarendon Press, 1889), 308.

¹⁹⁷ Kennington, *On Modern Origins*, 41.

causes so that the Interpreter can ascend to axioms. For example, “by careful noting of the first beginnings and rudiments or attempts of life [*tentamentorum vitæ*] in animalcules born of putrefaction,” Bacon extracts “the great axiom of vivification.”¹⁹⁸ Namely, “there must be heat to dilate the spirit of the body; an active spirit to be dilated; matter viscous or tenacious to hold in the spirit; and that matter to be put forth and figured.”¹⁹⁹ We saw in Chapter 3 that “the understanding is endowed by nature with an evil impulse to jump from particulars to the highest axioms.”²⁰⁰ “This impulse,” Bacon says, “must be held in check; but generalisations lying close to the facts may first be made, then generalisations of a middle sort, and progress thus achieved up the successive rungs of a genuine ladder of the intellect.”²⁰¹ In *Novum organum* Bacon speaks of the need to supply the understanding “with leaden weights to curb all jumping and flying up.”²⁰² In practice, these weights take the form of further luciferous experiments.

According to Bacon, every ascent of the mind to an axiom must be followed by a descent via experimentation to things, thereby guaranteeing the continual union of the mind and things. It is precisely for this purpose that mechanics seeks out *experimenta lucifera*. By introducing the concept of *experimenta lucifera*, Bacon effectively redefines the science of mechanics. Its goal is no longer works (*experimenta fructifera*). It must now concern itself solely with experimental testing

¹⁹⁸ Bacon, *NO, OFB*, XI, 351; *SS, SEH*, II, 559.

¹⁹⁹ Bacon, *SS, SEH*, II, 559.

²⁰⁰ Bacon, *CV, BF*, 99, cf. *SEH*, III, 618.

²⁰¹ Bacon, *CV, BF*, 99, cf. *SEH*, III, 618. Rees points out that Bacon failed to hold his own understanding in check. According to Rees, “in the *Novum Organum*, Bacon is living dangerously, trying to advertise elements of his world system without compromising the principles of his method,” “Francis Bacon’s Semi-Paracelsian Cosmology and the *Great Instauration*,” *Ambix* 1975, 167. However, Bacon makes no secret of the fact that he is flouting his own methodological rules. Rather, he says he does not “in any way wish to be obliged ... to hang on to everything” he propounds (*PA, OFB*, XIII, 263).

²⁰² Bacon, *NO, OFB*, XI, 163.

for the purpose of establishing axioms. This continual movement between the mind and things is the core of Bacon's criterion of truth. Its essential feature is that it incorporates error and negativity as the cybernetic means of control over inquiry. The inquisition into nature is completely dependent on this feedback epistemology where questions are designed to elicit answers that determine further questions and where the feedback loop can eliminate error. This is why Bacon thinks his proposed procedures lead to certainty.²⁰³

Bacon's originality rests on his notion that he knows the true goal of philosophy. This, thinks Bacon, is the difference between him and all who have gone before. "The end and scope of knowledge," he says, "hath been generally mistaken."²⁰⁴ According to Bacon, those who have sought knowledge have "propounded to themselves a wrong mark, namely satisfaction (which men call truth) and not operation."²⁰⁵ He points out that "in the inquiring of causes and reasons it is much easier to find out such causes as will satisfy the mind of man and quiet objections, than such causes as will direct him and give him light to new

²⁰³ The grounds for Bacon's doctrine of certain truth have been ignored in attempts to reduce the so-called method to the formal procedures of eliminative induction or some form of hypothetico-deduction. Defending the latter, Peter Urbach objects to this central Baconian assumption, viz., that certainty is guaranteed, *Francis Bacon's Philosophy of Science: An Account and a Reappraisal* (La Salle: Open Court, 1987). Urbach tries to elevate what he calls Bacon's *provisional* fallibility to a fixed methodology of fallibility per se. However, Bacon's understanding of fallibility is pragmatic and provisional, and (as shown above) is principally a procedure of error-correction. In Chapter 3, I detailed Bacon's doctrine of error and his account of the genetic source of the mind's declination. Experiment realigns the mind through the signs and marks provided by *nova*. Error is sustained in demonstrative systems because of the lack of direction or guidance through nature's tortuous labyrinth. Bacon makes no attempt to substitute novel formalisms for existing ones, given that operative direction requires a feedback strategy which cannot be predetermined but is responsive to specific contexts. This, for Bacon, is precisely what is absent in traditional systems of dialectic. Thus commentators should be cautious in translating Baconian inquiry into more familiar but ill-fitting formalised or methodical moulds.

²⁰⁴ Bacon, *VT, SEH*, III, 231.

²⁰⁵ Bacon, *VT, SEH*, III, 232. Bacon repeatedly returns to the image of Scylla, "a fair woman upwards in the parts of show, but when you come to the parts of use and generation, Barking Monsters." Like the scholastic philosophy, she "hath the curse of barrenness, and is courtesan-like, for pleasure, and not for fruit" (*VT, SEH*, III, 232-233). As discussed, the mind's acquiescence in theoretical satisfaction is a consequence of nature's dazzling and bewildering power.

experiences and inventions.”²⁰⁶ As Bacon sees it, men “have put themselves in way without foresight or consideration of their journey’s end.”²⁰⁷ In his terms, “a man may wander in the way, by rounding up and down. But if men have failed in their very direction and address that error will never by good fortune correct itself.”²⁰⁸

Bacon corrects this error by defining the true goal of philosophy:

It is not the pleasure of curiosity, nor the quiet of resolution, nor the raising of the spirit, nor victory of wit, nor faculty of speech, nor lucre of profession, nor ambition of honour or fame, nor inablement for business, that are the true ends of knowledge ... to speak plainly and clearly, it is a discovery of all operations and possibilities of operations from immortality (if it were possible) to the meanest mechanical practice.²⁰⁹

The true end of knowledge is “discovery of particulars not revealed before for the better endowment and help of man’s life.”²¹⁰ This notion relates to Bacon’s doctrine of the unexploited potentiality of matter. For Bacon, the goal is the actualisation of *nova* – the shaking out of nature’s hidden folds. *Nova* provide the Baconian inquirer with a determinable direction, and function as his criterion of truth. As he explains,

In nature practical results are not only the means to improve well-being but the guarantee of truth [*veritatis pignora*]. The rule of religion, that a man should show his faith by his works, holds good in natural philosophy too. Science also must be known by works. It is by the witness of works, rather than by logic or even observation, that truth is revealed and established.

²⁰⁶ Bacon, *VT, SEH*, III, 232. For Bacon, this is the meaning of the fable of Sphinx: “Sphinx proposes to men a variety of hard questions and riddles which she received from the Muses. In these, while they remain with the Muses, there is probably no cruelty; for so long as the object of meditation and inquiry is merely to know, the understanding is not oppressed or straitened by it, but is free to wander and expatiate [*intellectus non premitur, nec in arcto ponitur, sed vagatur et expatiatur*], and finds in the very uncertainty of conclusion and variety of choice a certain pleasure and delight; but when they pass from the Muses to the Sphinx, that is from contemplation to practice, whereby there is necessity for present action, choice, and decision, then they begin to be painful and cruel; and unless they be solved and disposed of, they strangely torment and worry the mind, pulling it first this way and then that, and fairly tearing it to pieces” (*DSV, SEH*, VI, 756, cf. 679).

²⁰⁷ Bacon, *VT, SEH*, III, 232.

²⁰⁸ Bacon, *VT, SEH*, III, 231-232.

²⁰⁹ Bacon, *VT, SEH*, III, 222.

²¹⁰ Bacon, *VT, SEH*, III, 233.

Whence it follows that the improvement of man's mind and the improvement of his lot are one and the same thing.²¹¹

This is the meaning of the well known claim that "*ipsissimæ Res sunt ... Veritas & Vtilitas.*"²¹² Rossi points out that this phrase has been wrongly translated and offers an accurate rendering: "the very things themselves are ... both truth and utility."²¹³ But even Rossi fails to grasp that Bacon is here expressing his criterion of truth. According to Rossi, the import of this phrase is that only adoption of the method guarantees the coincidence of truth and utility.²¹⁴ However, Rossi has inverted the meaning of this phrase. Bacon is not saying that the method guarantees the coincidence of truth and utility, but that the coincidence of truth and utility (his criterion of truth) guarantees the success of the method. This is clear when we return the phrase to its original context in *Novum organum*. Bacon states:

Itaque ipsissimæ Res sunt (in hoc genere) Veritas & Vtilitas: atque Opera ipsa pluris facienda sunt, quatenus sunt veritatis pignora, quam propter vitæ commoda.²¹⁵

And the things themselves are (in this case) truth and utility: and works themselves give much more as pledges of truth, than as comforts of life (my trans.).

That is, truth and utility correspondently reside in *res*; they are not made by *mens*, but are discovered. Bacon is once again prioritising *experimenta lucifera* above *experimenta fructifera*. At the level of mechanics, *experimenta lucifera* (new particulars) function as pledges of truth.

The Interpreter ascends to an axiom; if the axiom is true it will specify new particulars – it will extend to the discovery of *nova*. An axiom (for Bacon) is a way

²¹¹ Bacon, *CV, BF*, 93, cf. *SEH*, I, 612.

²¹² Bacon, *NO, OFB*, XI, 186.

²¹³ Rossi, "Bacon's Idea of Science," in *The Cambridge Companion to Bacon*, ed. Markku Peltonen (Cambridge: Cambridge University Press, 1996), 37; *idem.*, *Philosophy, Technology and the Arts in the Early Modern Era* (New York: Harper and Row, 1970), 157-160.

²¹⁴ Rossi, *Philosophy, Technology and the Arts*, 161.

²¹⁵ Bacon, *NO, OFB*, XI, 186.

of expressing nature's fecundity in philosophical doctrine. Because nature "acts according to law," its modes of operation can be expressed in doctrine.²¹⁶ An axiom is a rule or law unifying nature's behaviour. The greater the generality of the rule, the more effects it explains. The effects are an explication (*explicatio*) of the rule, that is, a description of nature's unfolding. This is clear in *Historia vitæ et mortis* where each of the *canones mobiles* ("provisional rules") is followed by an *explicatio* which details the various effects which flow from the rule (and whence the rule is derived).²¹⁷ At the level of physics we are dealing with "the particular and special habits of nature," which can be expressed as rules.²¹⁸ The rules of physics are lower or middle axioms. Lower axioms hardly differ from bare experience; they therefore have little operative value. Middle axioms, however, are "fuller and more extensive" – hence they will specify new particulars.²¹⁹ As Bacon explains,

In setting up axioms with this form of induction, we must check and see whether the axiom so set up be appropriate and made only to the measure of the particulars whence it is derived, or whether it is fuller and more extensive. Now if it is fuller and more extensive, we must see whether that amplitude and latitude be confirmed, as if by a kind of guarantee [*quasi fide-iussione quâdam*], by the specification of new particulars, lest we either cling only to things known already, or perhaps with slacker grasp catch hold of shadows and abstract forms, and not of things solid and bound in matter.²²⁰

Because a Baconian axiom is an expression of *natura naturans*, it will not only explain "the particulars whence it is derived," but also specify new particulars. In other words, a Baconian axiom unifies actual and potential works. The science of mechanics tests whether an axiom does in fact discover new particulars. Bacon

²¹⁶ Bacon, *NO, OFB*, XI, 203.

²¹⁷ Bacon, *HVM, SEH*, V, 320-335, cf. II, 212-226.

²¹⁸ Bacon, *NO, OFB*, XI, 209.

²¹⁹ Bacon says "A valid axiom, in his view, should not be narrowly cut to the measure of the facts from which it is drawn. It should have a more ample scope, permitting the inclusion of new facts under it by which its final limits would be fixed" (*CV, BF*, 99-100, cf. *SEH*, III, 618). In other words, a valid axiom will fulfil his criterion of truth.

²²⁰ Bacon, *NO, OFB*, XI, 163-165.

conceives of these new particulars as pledges of truth – confirmations which give encouragements and direction, helping to set up provisional axioms.²²¹ However, the discovery of new particulars does not mean that an axiom is certainly true – it merely indicates that we are possibly on the right path. Although we ought to pay heed to affirmatives, “in the true setting up of every axiom, the power of the negative instance is actually greater.”²²²

Bacon has an asymmetrical criterion of truth which incorporates negativity in an error-correcting procedure. He states:

The discovery of new works and active directions not known before, is the only trial to be accepted of; and yet not that neither, in case where one particular giveth light to another; but where particulars induce an axiom or observation, which axiom found out discovereth and designeth new particulars. That the nature of this trial is not only upon the point, whether the knowledge be profitable or no, but even upon the point whether the knowledge be true or no; not because you may always conclude that the Axiom which discovereth new instances is true, but contrariwise you may safely conclude that if it discover not any new instance it is in vain and untrue.²²³

According to Bacon, the failure to produce a novel particular is a sign that the inquiry has been diverted from its goal. Whenever there is successful production of *nova*, although this is no guarantee that the axiom is true, it signifies that the direction should be maintained. We can now see the force of the negative instance; when used in a cybernetic epistemology, the negative instance excludes useless pursuits and redirects the inquiry back onto a fruitful course. Bacon has devised a way of making sure axiomatic generalisation stays in contact with reality. The feedback from the experimental testing in mechanics is the guarantee that the investigation is still pursuing its target in nature. Baconian inquiry involves – at

²²¹ An axiom indicates, that is, it offers direction to potential new particulars. On Bacon's concept of axiom, see G. W. Kitchin, *Novum organum: sive indicia vera de interpretatione naturæ* (Oxford: Oxford University Press, 1855), 341-344.

²²² Bacon, *NO, OFB*, XI, 85. On Bacon's use of the negative instance, see William Sessions, “Francis Bacon and the Negative Instance,” *Renaissance Papers* (1970), 1-9.

²²³ Bacon, *VT, SEH*, III, 242.

every step of the axiomatic ladder – descent to works to ensure that the mind is still in contact with things. The science of mechanics extracts experiments from axioms. These experiments feed back into the inquiry in a continual play of error correction that produces a cybernetic epistemology.²²⁴ Inquiry fails when men “sever and withdraw [*divellere et abstrahere*] their thoughts too soon and too far from experience and particulars.”²²⁵ Bacon’s dialectical zigzagging between generalisations and feedback (experimental testing) stops men severing their thoughts from particulars. In this way, the intellect is kept on a tight leash and does not “exceed due degrees of certainty.”²²⁶ Bacon frequently states that a closer alliance of the experimental and rational faculties is required. In Baconian inquiry this alliance takes the form of the repeated ascent to axioms (in physics) and descent to experiments (in mechanics).

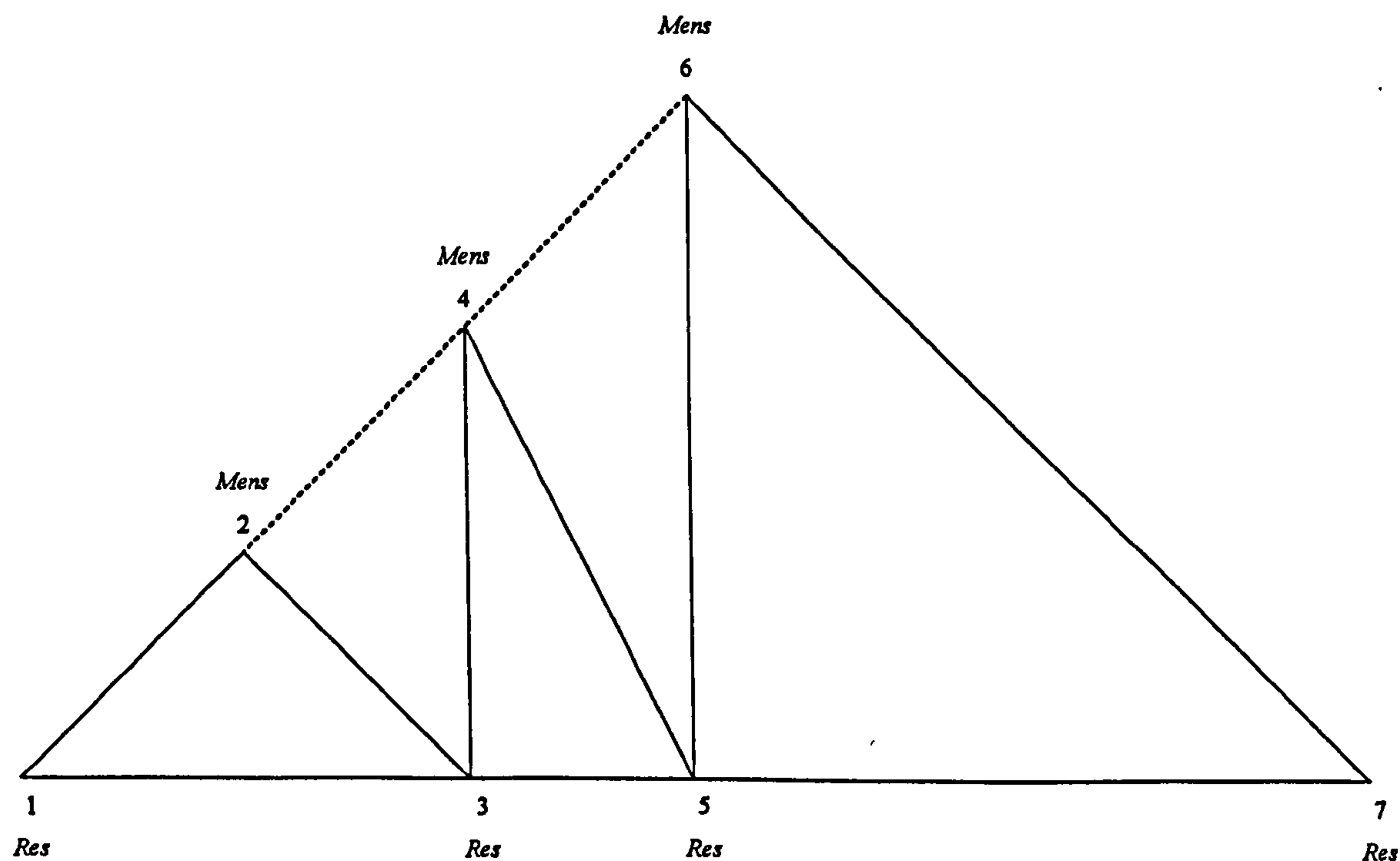
This relationship is illustrated in figure 4.3. On the basis of a powerful underpinning of *experimenta lucifera* (the mother history supplemented by the experiments of *experientia literata* and physics), the mind ascends to an axiom. This axiom specifies new particulars. Mechanics subjects the axiom to experimental testing. If these experiments discover new particulars (*pignora veritatis*), the mind can safely ascend to a higher axiom. If these experiments do not discover new particulars, the axiom is void and the process begins again. In this manner, “Physic

²²⁴ While axioms are undergoing refinement, they belong to Part V of Bacon’s *Instauratio magna*. As Bacon explains to Father Fulgentio, “In the fifth place will follow the book which I have entitled the ‘Precursors of the Second Philosophy,’ which will contain my discoveries concerning new axioms, suggested by the experiments themselves [*ab experimentis ipsis excitata*]” (LL, XIV, 1625, 533, cf. 532). As axioms are refined by *experimenta lucifera* (pledges of their truth), their “degree of certainty” increases until they are at last admitted to Part VI – “*Philosophia Secunda, siue Scientia Actiua*” (NO, OFB, XI, 53; DO, OFB, XI, 26).

²²⁵ Bacon, DAS, SEH, IV, 361, cf. I, 566.

²²⁶ Bacon, NO, OFB, XI, 261.

advances farther and farther every day and develops new axioms."²²⁷ This process of ascending to axioms and descending to experiments continues until the mind reaches the most general axioms (forms). We will see in Chapter 5 that the descent from forms to works constitutes Bacon's science of magic.



1. *experimenta lucifera*
2. lower axiom
3. new particulars (*experimenta lucifera*)
4. middle axiom
5. new particulars (*experimenta lucifera*)
6. primary axiom / form
7. magical effects (*experimenta fructifera*)

Fig. 4.3. The double ladder

²²⁷ Bacon, *DAS, SEH*, IV, 371, cf. I, 578.

IV. Conclusion

I would like to conclude with Bacon's vivid description of his way of inquiry in *Scala intellectus* (the preface to Part IV of his *Instauratio*). He describes how the journey begins in "the woods of nature, both obscured and darkened by an infinite variety of experiments as though by foliage and entangled by subtlety of observations as though by undergrowth and brambles."²²⁸ This is the mother history. Bacon's notion of *experientia literata* allows us to "penetrate and pass by the woods of nature."²²⁹ "And now," he says, "we have come to matters perhaps more open but yet more arduous, from the woodlands, that is to say, to the base of the mountains."²³⁰ At this point, the ascent to axioms (the Interpretation of Nature) begins. According to Bacon,

He who endures with true and unflagging patience to suspend judgement and gradually to ascend and surmount the ridges of things, as though of mountains, first one and then another and then again another, he will reach betimes the summits and peaks of nature where there is both a serene stopping place and a most lovely view out over things, and a descent by a gentle slope leading to all practical things.²³¹

As described in figure 4.3, the Interpreter repeatedly ascends to axioms and descends to experiments. But each ascent reaches higher, to a more general axiom, until the Interpreter finally reaches forms ("the summits and peaks of nature"). From there the science of magic descends "by a gentle slope" to the *magnalia* of nature.

²²⁸ My trans., Bacon, *SI, SEH*, II, 688-689.

²²⁹ My trans., Bacon, *SI, SEH*, II, 689.

²³⁰ My trans., Bacon, *SI, SEH*, II, 689.

²³¹ My trans., Bacon, *SI, SEH*, II, 689.

This chapter has described how Baconian inquiry “leads from history to universals by a certain and constant path.”²³² I have argued (contra Jardine et al.) that Bacon does not “adopt two conflicting strategies for dealing with the single problem of scepticism concerning access to knowledge of natural phenomena,” viz., “the machinery of the *new organon*” and “the techniques of *experientia literata*.”²³³ Rather, he adopts a single strategy, viz., experiment. Experiment is the clue that guides the interpreter through nature’s labyrinth. Baconian inquiry with its emphasis on experiment keeps men’s minds close to things.

In this chapter Baconian experiment has emerged as analytically far more complex than existing commentary gives us to understand. We see rather a meticulously graduated scheme of experiment, incorporating three distinct phases: natural history, *experientia literata* and physics/mechanics. At the level of physics and mechanics, experiment devolves around ascent to, or descent from, appropriately posed axiomatisation. We shall see in the following chapter that the ascent (and descent) continues in abstract physics and metaphysics. No particular Baconian experiment may be understood without first grasping its schematic placement, nor without realising its relational position in an elaborately phased process. No general notion of Baconian experiment may be fully grasped without realising its fundamental intent, which is to provide the operative union of *res* and *mens*.

²³² My trans., Bacon, *SI, SEH*, II, 689.

²³³ Jardine, “*Experientia literata* or *Novum Organum*?” 60-61.

Chapter 5

Metaphysics and Magic

Metaphysic ... enfranchises the power of men to the greatest liberty, and leads it to the widest and most extensive field of operation. For Physic carries men in narrow and restrained ways, imitating the ordinary flexuous courses of nature [*per angustos et impeditos calles humanam operam dirigit, naturæ ordinariæ flexuosos tramites imitata*]; ... But whosoever knows any Form, knows also the utmost possibility of superinducing that nature upon every variety of matter [*in omnigenam materiam*], and so is less restrained and tied in operation ... which kind of knowledge Solomon likewise, though in a more divine sense, elegantly describes, “Thy steps shall not be straitened, and when thou runnest thou shalt not stumble;” meaning thereby that the ways of wisdom are not much liable either to straitness or obstructions.¹

In Chapter 2 I argued that Bacon’s vision was nothing less than a harnessing of nature’s appetitive power in order to create *nova opera* (new works) by discovering new ways of binding nature, restricting its inherent power, and thereby causing it to transform itself into new schematisms. Matter is self-organised into conglomerations of motions through the fashioning power of forms. For Bacon, the science of magic is nothing other than a goading and restraining of these sums of motions. The artful manipulation of bodies is achieved through the superinduction of new natures. This chapter explains Bacon’s concept of forms and their role in the systematic constraint of matter to produce *magnalia* of nature. Forms are limitations (constraints) on matter’s primordial power and responsible for the production of the current system of nature. Knowledge of forms enables the Baconian Magus to reconfigure the bonds underpinning the present order of nature, thereby (re)creating a new nature –

¹ Bacon, *DAS, SEH*, IV, 362-363, cf. I, 568; Cicero, *Tusc. Quæst.*, IV, 26; *Prov.*, IV, 12.

an “alternative universe ... of things.”² Commentary on Baconian forms is bewildering and reflects Bacon’s dense and almost impenetrable account. The core principle of his account suggests a dynamic relationship between freedom and constraint both in ontological and operative terms. To derive the knowledge of forms, the operator is obliged to discover the original constraining processes that gave rise to the unfolding of nature free. Nature free is a limitation of matter’s potency, but knowledge of forms leads to freedom of operation.

It should be noted at the outset that a Baconian form is neither a recipe nor an arrangement of material minimal parts. These are common and misleading perceptions. A Baconian form refers to the bond or law which limits or constrains matter’s extraordinary power, thereby generating what Bacon calls “simple natures.”³ The summary law of nature is the apex of a hierarchy of forms corresponding to nature’s unfolding (the explication of the summary law). The first unfolding gives rise to the “*Forms of the First Class*” which we experience as simple natures (dense, rare, hot, cold, etc.).⁴ Further unfoldings give rise to the whole variety of simple natures (colour, volatility, etc.). These simple natures are dynamic nodes of motions whose emanations register on the organs of the senses. Hence inquiry into forms begins with phenomenal appearances (simple natures), searching for the causes of qualities. In the pursuit of operative power, “the work and aim of human knowledge” is to discover how these simple natures originate (the forms of simple natures).⁵ “The work and aim of human power,” says Bacon, is to

² Bacon, *PAH, OFB*, XI, 455.

³ On simple natures, see Chapter 3.

⁴ Bacon, *DAS, SEH*, IV, 361, cf. I, 568 (italics in original).

⁵ Bacon, *NO, OFB*, XI, 201.

recapitulate the cosmogonical processes through the superinduction of new natures.⁶ Magic is nature “bound and constrained” into fashioning novel conglomerations of simple natures (and forms).⁷ Exegesis of Bacon’s doctrine of forms is notoriously difficult. This chapter will focus on the early aphorisms of Book 2 of *Novum organum*. I offer a reinterpretation of these aphorisms in the light of preceding discussions.

⁶ Bacon, *NO*, *OFB*, XI, 201.

⁷ My trans., Bacon, *DSV*, *SEH*, VI, 652.

I. Mechanics: restricted operation

The analysis of Baconian forms necessitates an examination of the restricted nature of physics and its corresponding operative rules in mechanics. According to Bacon, “The precept [*Præceptum*] or axiom concerning the transformation of bodies is of two kinds.”⁸ There are mechanical precepts (rules of operation) deduced from the axioms of physics and there are magical precepts deduced from the axioms of metaphysics. We have already encountered the physical axiom which “turns on the discovery of *latent process*,” and proceeds by way “of concrete bodies as we find them in nature in her ordinary course.”⁹ The axioms of physics “have to do with natures concrete or bound together and embodied in a structure; and bear on the particular and special habits of nature.”¹⁰ According to Bacon,

By the knowledge of Phisicall causes, there cannot faile to followe, many indications and designations of new particulers, if men in their speculation will keepe one eye vpon vse & practise. But these are but Coastings along the shoare, *Premendo littus iniquum*, For it seemeth to me, there can hardly bee discovered any radicall or fundamentall alterations, and innouations in Nature, either by the fortune & essayes of experiments, or by the light and direction of Phisical causes.¹¹

In Chapter 4, I explained how the axioms of physics give rise to new particulars. But, says Bacon, these will be “new discoveries in materials to some

⁸ My trans., Bacon, *NO, OFB*, 205. Bacon consistently uses the term *præceptum* to signify a rule of operation. For Bacon, precepts must be deduced from axioms. Hence he identifies *præceptum* and *deductio* (*NO, OFB*, XI, 204). I discuss Bacon’s notion of deduction below.

⁹ Bacon, *NO, OFB*, XI, 207 (italics in original).

¹⁰ Bacon, *NO, OFB*, XI, 209.

¹¹ Bacon, *AL, OFB*, IV, 89. As Kiernan notes, the reference (“*Premendo littus iniquum*”) is Horace, *Odes*, II, x, 3 (see *OFB*, IV, 284). The passage states: “Licinius, to live wisely shun The deep sea; on the other hand, Straining to dodge the storm don’t run Too close in to the jagged land” (trans. Wright). In the final stanza of this Ode, Licinius is advised to act courageously and not run for the coast. This calls to mind the image of the ship sailing beyond the Pillars of Hercules.

degree alike and made ready.”¹² That is, they will not be “radicall or fundamentall alterations.” This is because “Physical causes,” according to Bacon, “give light and direction to new inventions in similar matter.”¹³ The axioms of physics are tied to concrete bodies, therefore the mechanic is likewise “tied in operation, either to the basis of the matter or to the condition of the efficient.”¹⁴ In other words, although it may be possible to perform an operation on a wide variety of bodies and in a wide variety of ways, the narrow scope of the axiom will “restrict or tie” the mechanic “to certain means and certain specific modes of operating.”¹⁵ Because an axiom of physics relates to the material and efficient cause (latent schematism and process) in concrete bodies, the corresponding rule of operation will be confined to “materials to some degree alike and made ready.”¹⁶

Consequently, if the mechanic is “not ... able conveniently to get hold of or lay hands on the means in question,” he will not be able to perform the operation.¹⁷ As Bacon explains, “if there be other means and modes (besides the one recommended) for producing a particular nature, there will perhaps be some among them which lie within the operator’s power but from which he is shut out by the narrow scope of the precept, so that he does not derive any advantage.”¹⁸ In other words, he may “have power and not attempt.”¹⁹ Baconian operation is invariably aimed at widening the scope or latitude of axioms and their corresponding precepts.

¹² Bacon, *NO, OFB*, XI, 203.

¹³ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

¹⁴ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

¹⁵ Bacon, *NO, OFB*, XI, 205.

¹⁶ Bacon, *NO, OFB*, XI, 203.

¹⁷ Bacon, *NO, OFB*, XI, 205.

¹⁸ Bacon, *NO, OFB*, XI, 205.

¹⁹ Bacon, *VT, SEH*, III, 236.

The following example from *Sylva sylvarum* illustrates the narrow scope of physical axioms and the limitations of the corresponding rules of transformation.

Bacon describes how one would make gold on the basis of physical axioms.²⁰ He begins by listing his physical “axioms of maturation”:

The first is, that there be used a temperate heat; for they are ever temperate heats that digest and mature: wherein we mean temperate according to the nature of the subject; for that may be temperate to fruits and liquors, which will not work at all upon metals. The second is, that the spirit of the metal be quickened, and the tangible parts opened: for without those two operations, the spirit of the metal wrought upon will not be able to digest the parts. The third is, that the spirits do spread themselves even, and move not subsultorily; for that will make the parts close and pliant. And this requireth a heat that doth not rise and fall, but continue as equal as may be. The fourth is, that no part of the spirit be emitted, but detained: for if there be emission of spirit, the body of the metal will be hard and churlish. And this will be performed, partly by the temper of the fire, and partly by the closeness of the vessel. The fifth is, that there be choice made of the likeliest and best prepared metal for the version: for that will facilitate the work. The sixth is, that you give time enough for the work; not to prolong hopes (as the alchemists do), but indeed to give nature a convenient space to work in.²¹

Bacon then proceeds to “derive a direction of trial” out of these physical axioms and his knowledge of the latent schematisms of metals.²² He states:

Let there be a small furnace made, of a temperate heat; let the heat be such as may keep the metal perpetually molten, and not more; for that above all importeth to the work. For the material, take silver, which is the metal that in nature symbolizeth most with gold; put in also with the silver, a tenth part of quicksilver, and a twelfth part of nitre, by weight; both these to quicken and open the body of the metal; and so let the work be continued by the space of six months at the least. I wish also, that there be at some times an injection of some oiled substance; such as they use in the recovering of gold, which by vexing with separations hath been made churlish; and this is to lay the parts more close and smooth, which is the main work. For gold (as we see) is the closest (and therefore the heaviest) of metals; and is likewise the most flexible and tensible. Note, that to think to make gold of quicksilver, because it is the heaviest, is a thing not to be

²⁰ I use the term “physical axioms” to refer to the axioms of physics (cf. metaphysical axioms). However, all Baconian axioms are physical in the sense of pertaining to nature.

²¹ Bacon, *SS, SEH*, II, 449–450. On Bacon’s concept of *spiritus*, see below.

²² Bacon, *SS, SEH*, II, 450. We saw in Chapter 4 that Bacon says “no one can endow a given body with a new nature or successfully and appropriately convert it into a new body unless he has acquired a good understanding of the body to be altered or transformed. If not he will run headlong into means that are futile or at least difficult and misguided, and not suited to the nature of the body he is working on” (*NO, OFB*, XI, 211). Bacon terms this “the investigation and discovery of the latent schematism in bodies” (*ibid.*).

hoped; for quicksilver will not endure the manage of the fire. Next to silver, I think copper were fittest to be the material.²³

This trial demonstrates the problem with physical axioms. When it comes to making gold, the mechanic is confined to specific ways and means of operating. Although it may be possible to transmute a wide range of bodies into gold, and although there may be many possible modes of operating, these are beyond the reach of the mechanic. He is confined to using a material similar to gold, namely, silver. He cannot use quicksilver because it will not endure the fire. He may possibly be able to use copper but this is as far as his choice of material extends. Likewise, his mode of operation is confined to imitating the latent process whereby gold is naturally produced.²⁴ Consequently, mechanics (which derives its precepts from physical axioms) “extends and enlarges operation beyond the ones usually found in nature to certain operations which are closer to hand or not very far off.”²⁵ As Bacon puts it, “Physic carries men in narrow and restrained ways, imitating the ordinary flexuous courses of Nature.”²⁶ Mechanical operations have relatively slight powers to alter embodied structures; they merely imitate the productions of nature free.

This brings us to the status of *imitationes naturæ* in Bacon’s programme. This issue needs resolution before the Baconian doctrine of forms can be fully explicated. Following Pérez-Ramos, William Newman argues that producing such imitations as the artificial rainbow and artificial gold “is the foundation of Bacon’s famous maker’s knowledge, for it is the identity of the natural and the artificial product that allows man to certify his knowledge of the former’s causes by creating

²³ Bacon, *SS, SEH*, II, 450.

²⁴ We saw in Chapter 4 that physics investigates “by what means and by what process gold ... is generated, starting with its first menstura and rudiments, all the way up to the finished mineral” (*NO, OFB*, XI, 207). It seeks to know “under what climates, in what earth, and to what depth individual metals are generated” (*NO, OFB*, XI, 437).

²⁵ Bacon, *NO, OFB*, XI, 209.

²⁶ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

the latter.”²⁷ Similarly, Peter Zetterberg argues that Bacon’s goal was the production of imitations of nature. According to Zetterberg, “Rossi is incorrect in asserting that Bacon rejected ‘the doctrine of art as *imitatio naturae*’ itself.”²⁸ On Zetterberg’s reading of Bacon, “science in its theory and art in its work should reflect or echo or imitate nature.”²⁹ But for Bacon, imitations mark a stage in inquiry, viz., the discovery of latent process and schematism. In contrast, Baconian magic brings forth the *magnalia* of nature. In the *New Atlantis* we are told that these “excellent works ... since you have not seen ... it were too long to make descriptions of them; and besides, in the right understanding of those descriptions you might easily err.”³⁰ These unseen works are the *magnalia*, secrets “such as to elude and mock the imagination and thought of men.”³¹ True *nova* cannot be described because they are “things that have never been done before,” things which “human thought can barely grasp.”³² We saw in Chapter 2 (figure 2.3, p. 80) that the inventions of physics/mechanics (*imitationes naturæ*) generally fall into the light grey area of overlap. However, it is the unshaded part of the diagram which Bacon is interested in – the *majority* of artificial bodies which cannot “exist *except* by human intervention” (my emphasis).³³ Without man’s intervention, these bodies will never come into being. As I discuss below, only knowledge of metaphysical axioms (forms) will shake out nature’s hidden folds.

²⁷ Newman, *Promethean Ambitions*, 261.

²⁸ Zetterberg, “Echoes of Nature in Salomon’s House,” *Journal of the History of Ideas* 43 (1982), 179-193, on 180.

²⁹ According to Zetterberg, “Salomon’s House ... is an artificial world carefully fashioned and crafted in imitation of the natural world,” “Echoes of Nature in Salomon’s House,” 187. Although Solomon’s House does produce imitations, these are described as “the preparations and instruments we have for our works” – they are not the works themselves (Bacon, *NA*, *SEH*, III, 156).

³⁰ Bacon, *NA*, *SEH*, III, 166.

³¹ Bacon, *CV*, *BF*, 96, cf. *SEH*, III, 615.

³² Bacon, *NO*, *OFB*, XI, 207.

³³ Bacon, *ANN*, *OFB*, XIII, 219.

II. Abstract physics

We have seen that Baconian inquiry unifies knowledge. As Bacon puts it,

Knowledges [*Scientiæ*] are as pyramids, whereof history and experience are the bases. And so of Natural Philosophy the basis is Natural History; the stage next the basis is Physic; the stage next the vertical point is Metaphysic ... these three are the true stages [*contabulationes*] of knowledge.³⁴

Each phase of inquiry is more abstracted from particulars. In order to facilitate the transition from physic to metaphysics, Bacon has an intermediary doctrine which he calls abstract physics (see figure 5.1). He explains:

But Physic diffused, which touches on the variety and particularity of things, I will again divide into two parts: Physic concerning things Concrete, and Physic concerning things Abstract; or Physic concerning Creatures, and Physic concerning Natures. The one (to make use of logical terms) inquires concerning substances, with every variety of their accidents, through every variety of substances. For example, if the inquiry be about a lion, or an oak, these support many different accidents; if contrariwise, if be about heat or gravity, these are found in many different substances. But as all Physic lies in a middle term between Natural History and Metaphysic, the former part [*Physica de Concretis*] (if you observe rightly) comes nearer to Natural History, the latter [*Physica de Abstractis*] to Metaphysic.³⁵

In Chapter 4, we saw that concrete physics takes the operator a stage beyond natural history. As Bacon says, “Natural History investigates and relates the fact, whereas Physic likewise examines the causes.”³⁶ Concrete physics investigates latent process and schematism (material and efficient causes) in concrete bodies and on the basis of these discoveries – which feed back into the mother history – proceeds to axioms. Concrete physics is therefore “subject to the same division as Natural History; being conversant either with the heavens or meteors, or the globe of earth and sea, or the greater colleges, which they call the elements, or the lesser colleges or species [Nature Free], as also with pretergenerations [Nature Erring] and mechanics [Nature

³⁴ Bacon, *DAS, SEH*, IV, 361-362, cf. I, 567.

³⁵ Bacon, *DAS, SEH*, IV, 347, cf. I, 551.

³⁶ Bacon, *DAS, SEH*, IV, 347, cf. I, 551.

Bound].”³⁷ In other words, its axioms are derived from the material of the mother history. They pertain to “concrete bodies as we find them in nature in her ordinary course.”³⁸

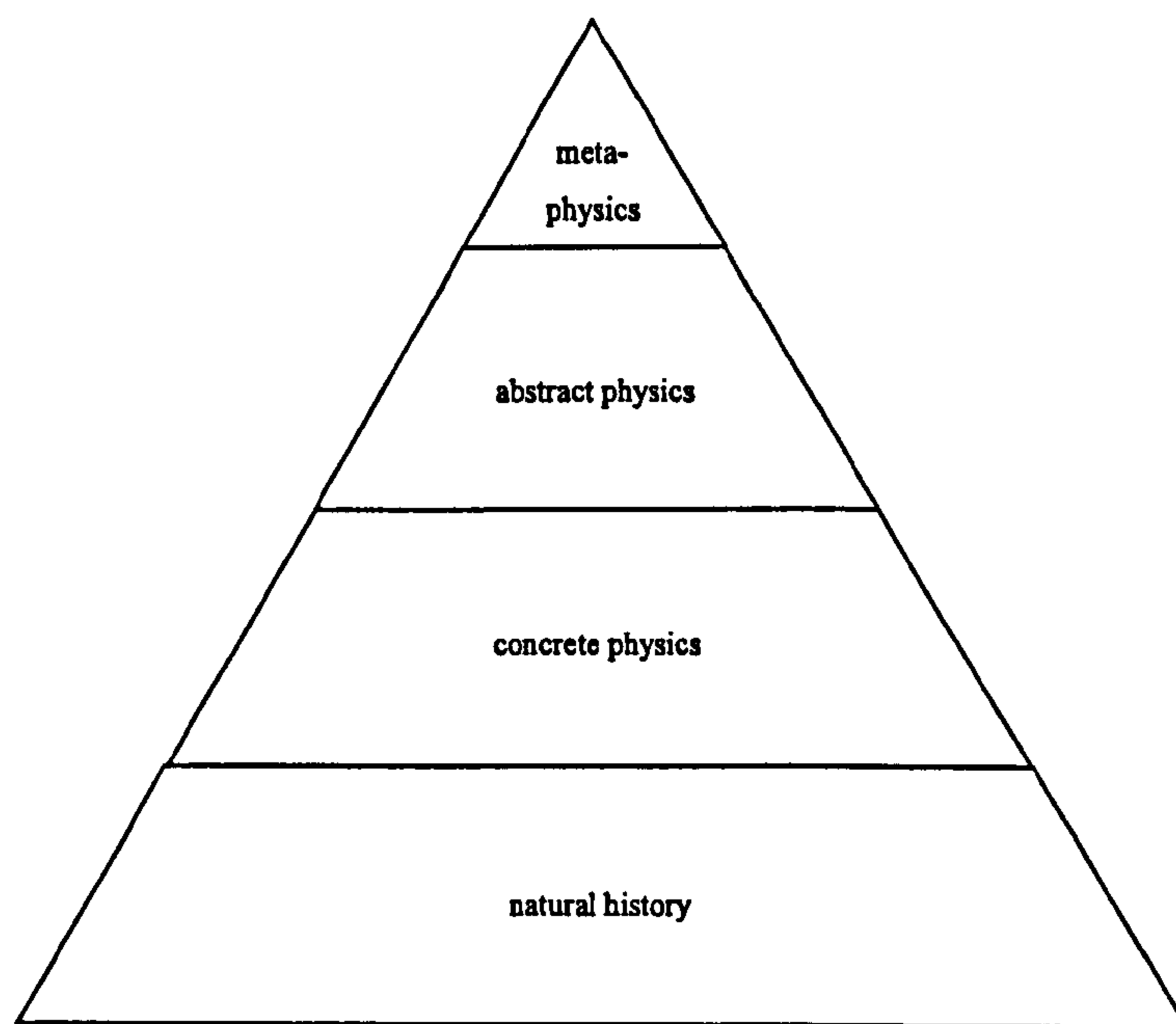


Fig. 5.1. The pyramid of sciences

³⁷ Bacon, *DAS, SEH*, IV, 347, cf. I, 551.

³⁸ Bacon, *NO, OFB*, XI, 207.

In contrast, abstract physics looks on bodies as conjunctions of simple natures while still remaining at the level of embodied structures. It does not extend to metaphysics: it examines bodies from the perspective of substratum. In *De augmentis* Bacon explains that “the true Physic of Abstracts” considers the following schematisms of matter, in so far as they are expressed in concreated bodies:

Dense, Rare; Heavy, Light; Hot, Cold; Tangible, Pneumatic; Volatile, Fixed; Determinate, Fluid; Moist, Dry; Fat, Crude; Hard, Soft; Fragile, Tensile; Porous, Close; Spirituous, Jejune; Simple, Compound; Absolute, Imperfectly Mixed [*imperfecte Mistum*]; Fibrous and Venous, Simple of Structure, or Equal; Similar, Dissimilar; Specific, Non-Specific; Organic, Inorganic; Animate, Inanimate.³⁹

These simple natures are further abstracted and re-addressed in Metaphysics, “which considers chiefly the simple forms of things.”⁴⁰ For example, many bodies are dense but they all have different schematisms. However, the form of density is common to all dense bodies. Whereas “Physic handles that which is most inherent in matter and therefore transitory,” Metaphysic deals with that “which is more abstracted and fixed.”⁴¹ We will see in Part III that abstract physics considers simple natures from the point of view of substratum, whereas metaphysics considers simple natures from the point of view of potency. This distinction is crucial if we are to understand the nature of a Baconian form and its connection with the final stage of operative power.

While concrete physics mirrors the divisions of the mother history, abstract physics and metaphysics require a reordered history mirroring the change in perspective from concretes to simples. This reordered history deals with “the *Cardinal Virtues* in nature,” which Bacon says “clearly constitute the primordia of nature and, indeed, the primary passions and desires of matter, viz. *Dense, Rare,*

³⁹ Bacon, *DAS, SEH*, IV, 356, cf. I, 560.

⁴⁰ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

⁴¹ Bacon, *DAS, SEH*, IV, 346, cf. I, 550.

Hot, Cold, Consistent, Fluid, Heavy, Light, and quite a few others besides.”⁴² He conceives of this as natural history with its face turned towards philosophy.⁴³ According to Bacon, “it is not properly history but a middle term, so to speak, between history and philosophy.”⁴⁴ Bacon’s *Historia densi & rari* is an example of such a history. Abstract physics mirrors the divisions of the history of cardinal virtues.⁴⁵ This reordering of natural history signifies a crucial stage in Baconian inquiry. As Malherbe rightly says,

He [Bacon] entertains an evolutive concept of method: order changes according to the degree of abstraction. A first order can collect the data and it will be empirical, immediately drawn from things, as they appear. Such a history is still mainly narrative. But ... the mind can set down a second order, which will be no longer the order of sensible things, but the order of qualities (what Bacon calls natures); and after some labor, this order of concrete natures will be changed into the order of abstract natures, an order much more informative about the causes producing phenomena.⁴⁶

Having taken the inquiry as far as concrete physics can go, the mother history is reordered and the process begins again. This illustrates the cybernetic (or evolutionary) nature of Baconian method. The transition from concrete physics to abstract physics is the transition from a first order of concrete bodies to a second order of simple or abstracted natures (see Appendix 2 where Bacon conceives of this in terms of what he calls a movement from an exterior to an interior vein). The reordering of the mother history takes the operator a step closer to knowledge of the true “divisions and veins of nature.”⁴⁷ As Bacon puts it,

He who has not mixed, confused and reduced to a mass the whole distinction of things which is manifest in species popularly established, or

⁴² Bacon, *DO*, *OFB*, XI, 39; *PAH*, *OFB*, XI, 473.

⁴³ See Bacon, *PhU*, *OFB*, VI, 15.

⁴⁴ Bacon, *DGI*, *OFB*, VI, 109-111. Rees points out, “this study was to be (at least at the start) one of Bacon’s special and exclusive responsibilities,” *OFB*, XI, lxx. See Bacon, *PAH*, *OFB*, XI, 473.

⁴⁵ According to Rees, Bacon’s *Abecedarium nouum naturæ* “maps out the territory of what the *De augmentis* calls abstract physics,” *OFB*, XIII, xxxviii.

⁴⁶ Malherbe, “Bacon’s method of science,” in *The Cambridge Companion to Bacon*, 75-98, on 85-86.

⁴⁷ Bacon, *NO*, *OFB*, XI, 257.

even in the names bestowed, will not see the unity of nature, nor the legitimate lines of things, <and> he will not be able to interpret.⁴⁸

The history of cardinal virtues moves away from species. The mind has now ascended a step closer to perceiving “the unity of nature,” and moves towards its union with things (*res*).

Abstract physics continues to ascend through a series of axioms of expanding generality. This process is described in *Valerius terminus* where Bacon gives an example of an inquiry into the simple nature “whiteness.”⁴⁹ This example helpfully documents Bacon’s notion of increasing freedom through the removal or exclusion of restraints. He states:

Let the effect to be produced be *Whiteness*; let the first direction be that if air and water be intermingled or broken in small portions together whiteness will ensue, as in snow, in the breaking of waves of the sea and rivers, and the like. This direction is certain, but very particular and restrained, being tied to air and water.⁵⁰

At the outset, the rules of abstract physics are tied to specific concrete bodies. Bacon continues:

Let the second direction be, that if air be mingled as before with any transparent body, such nevertheless as is uncoloured and more grossly transparent than air itself, that then &c. as glass or crystal, being beaten to fine powder, by the interposition of the air becometh white; the white of an egg being clear of itself, receiving air by agitation becometh white, receiving air by concoction becometh white; here you are freed from water, and advanced to a clear body, and still tied to air.⁵¹

The third direction “exclude[s] or remove[s] the restraint of an uncoloured body.”⁵² “The fourth direction exclude[s] the restraint of a body more grossly transparent than air.”⁵³ These four directions are still tied to air. The fifth direction states that “if any bodies, both transparent but in an unequal degree, be mingled as before,

⁴⁸ My trans., Bacon, *DIN, SEH*, III, 785.

⁴⁹ Bacon, *VT, SEH*, III, 236-239.

⁵⁰ Bacon, *VT, SEH*, III, 236.

⁵¹ Bacon, *VT, SEH*, III, 236.

⁵² Bacon, *VT, SEH*, III, 236.

⁵³ Bacon, *VT, SEH*, III, 236.

whiteness will follow.”⁵⁴ According to Bacon, “Now are you freed from air, but still you are tied to transparent bodies.”⁵⁵

Crucially, Bacon identifies the process of exclusion with the removal of restraints on the operator. Moreover, in terms of matter’s hidden virtues, it can now be seen how Bacon’s way of exclusion (the *via negativa*), his cosmogony, and the twin goals of knowledge and power are related. Matter’s cosmogonical story depicts the move from darkness and chaos to light and system. The operator begins from the terminus of matter’s unfolding (*natura naturata*) and retraces the only possible route back to “the innards of operation” (*natura naturans*).⁵⁶ The contraction of matter’s power is effectively a primordial “operation.” The subsequent production of a cosmology commits Bacon, in ontological terms, to a conception of human operation as a repetition of the primordial limitations and exclusions. Primordial matter limits its extraordinary power in producing the ordinary course of nature. In its self-contracting and organising mode other possibilities are perforce excluded. What the operator seeks is the knowledge of the limiting or constraining forces which gave rise to this particular world, as the means to (re)create other worlds. The move from *natura naturata* to *natura naturans* is perfectly represented in the pyramid of sciences (see figure 5.1).

Bacon posits cosmogonical bonds resulting from matter’s shaking out its folds. These bonds constitute dynamic nodes of motions (forms of the first class) which “by combining and transplanting” gave rise to the branching termini of the variety of things in nature.⁵⁷ The discovery of the form of a simple nature entails a rejection or exclusion of all other restraints that are not brought to bear in the

⁵⁴ Bacon, *VT, SEH*, III, 236.

⁵⁵ Bacon, *VT, SEH*, III, 236.

⁵⁶ Bacon, *NO, OFB*, XI, 181.

⁵⁷ Bacon, *DAS, SEH*, IV, 360, cf. I, 565.

production of the given form. In operation each exclusion throws light on the constraining forces that produced the form – in the above case, the form of whiteness. Every exclusion takes the inquirer a step closer to discovering the form. Bacon conceives of the “Formula of Interpretation” as “The Light of Nature” and the “truth of things” or forms as “Nature Illuminated.”⁵⁸ Although matter’s origins are shrouded in darkness, the *via negativa* with its exclusionary processes throws light on nature’s cosmogonical beginnings. Moreover, every exclusion/removal of a non-contributory restraint entails an increase in operative power because the operator is less tied and restricted in his operations.

The significance of the operational force of the *via negativa* has enormous consequences for Baconian magic and has not been adequately addressed. Exclusions are proportionally tied to increasing latitude and freedom of operation. The slogan “knowledge is power” has obscured this crucial component of the Baconian method: it is nothing less than Bacon’s identification of the way of truth (the *via negativa*) with the way of power. In *Aphorismi et consilia* Bacon states:

The way and perfection of truth and power is the same ... so that the forms of things may be discovered: from whose acquaintance follows true contemplation and free operation.⁵⁹

The ascension through the intellectual scale (by means of increasing levels of abstraction) furthers knowledge of matter’s cosmogonical beginnings and our perception of the unity of nature. Operation approximates more and more to matter’s absolute potency (*natura naturans*). The more we abstract from concrete bodies (by excluding restraints), the less restricted is our the power to (re)create. Although commentators like Rossi and Malherbe have noted that Bacon’s forms fulfill the criteria of freedom and certainty (the rule of truth and the rule of prudence), the

⁵⁸ Bacon, *TPM, BF*, 61, cf. III, 528. See also *AC, SEH*, III, 793; Appendix 2.

⁵⁹ My trans., Bacon, *AC, SEH*, III, 794.

operational significance of this connection has been overlooked.⁶⁰ Ellis astutely notes that this process “is the exact counterpart of the *Exclusiva* of the *Novum Organum*.”⁶¹ But in *Valerius terminus* Bacon refrains from ascending further up the scale. He explains that this

would open that which in this work [*Valerius terminus*] I determine to reserve; for to pass through the whole history and observation of colours and objects visible were too long a digression; and our purpose is now to give an example of a free direction, thereby to distinguish and describe it; and not to set down a form of interpretation how to recover and attain it.⁶²

Further ascension on the ladder of the intellect requires the key of interpretation (*Novum organum*). I shall examine Bacon’s use of the *via negativa* in *Novum organum* (and its connection to the freeing of a direction) in Part III.

⁶⁰ In *Valerius terminus* Bacon states: “Neither do I contend but that this motion which I call the freeing of a direction, in the received philosophies (as far as a swimming anticipation could take hold) might be perceived and discerned; being not much other matter than that which they did not only aim at in the two rules of *Axioms* before remembered [the rule of truth and the rule of prudence], but more nearly also in that which they term the form or formal cause, or that which they call the true difference; both which nevertheless it seemeth they propound rather as impossibilities and wishes than as things within the compass of human comprehension” (Bacon, *VT, SEH*, III, 239).

⁶¹ Ellis, *SEH*, I, 42.

⁶² Bacon, *VT, SEH*, III, 237.

III. Metaphysics: the doctrine of forms

Having traversed the various stages of Baconian inquiry, we arrive at Baconian metaphysics, which Bacon characterises as the knowledge of forms. This is the highest attainable degree of abstraction from concrete structures. The terms *metaphysica*, *physica* and *forma* are heavily weighted with Aristotelian and Platonic connotations, and refusal to part with these associations is a contributory factor in the problems surrounding exegesis on Baconian forms. As Kennington points out, “These familiar terms [physics and metaphysics] have to be scrubbed clean of their classical meanings and encoded with their new, Baconian ones.”⁶³ Bacon is quite candid regarding his appropriation and subversion of traditional terminology. In *De augmentis* he states, “I desire men to observe that I use the word *metaphysic* in a different sense from that which is commonly received.”⁶⁴ He explains that although his “conceptions and notions are novel and differ from the ancient,” he intends “to retain with scrupulous care the ancient terms ... hoping well that ... the clear explanation which [he] give[s] of everything will prevent the words ... from being misunderstood.”⁶⁵ For Bacon, metaphysics “is itself a part of Physic, or of the doctrine concerning nature.”⁶⁶ Specifically, “the investigation of forms, eternal and immutable as they are ... constitutes *Metaphysics*.”⁶⁷ As mechanics is the practical part of physics, so magic is the practical part of metaphysics. Because metaphysics

⁶³ Kennington, *On Modern Origins*, 40.

⁶⁴ Bacon, *DAS, SEH*, IV, 344, cf. I, 548.

⁶⁵ Bacon, *DAS, SEH*, IV, 344, cf. I, 548.

⁶⁶ Bacon, *DAS, SEH*, IV, 404, cf. I, 613. In a letter to Father Redemptus Baranzano, Bacon refers to metaphysics as “true Physics.” He states: “Be not troubled about the Metaphysics. When true Physics have been discovered, there will be no Metaphysics. Beyond the true Physics is divinity only” (*LL*, XIV, 375, 377).

⁶⁷ Bacon, *NO, OFB*, XI, 215.

is a high physics, Bacon (in the marginalia of *Advancement of Learning*) refers to natural magic as “*Physica Operatiua Maior*” (the Major Operative Physics).⁶⁸

The principal distinction outlined in this chapter rests on the difference between minor operative physics (mechanics) and major operative physics (magic). For Bacon, what distinguishes magic from mechanics is its “greater dominion over nature.”⁶⁹ Whereas “Phisicke carrieth men in narrow and restrained waies, subiect to many accidents of impediments, imitating the ordinarie flexuous courses of Nature,” Metaphysic “doth enfranchise the power of Man vnto the greatest libertie, and possibilitie of workes and effects.”⁷⁰ The Baconian Magus (unlike the mechanic) is empowered “to identify and bring about things of the kind which neither the vicissitudes of nature, nor hard experimenting, nor pure accident could ever have actualised, or human thought dreamed of.”⁷¹ Bacon believed knowledge of forms would “enfranchise the power of Man vnto the greatest libertie, and possibilitie of workes and effects.”⁷² I argue that the key to understanding the relation between Bacon’s doctrine of forms and his science of magic is his identification of a “free direction” with form. But although this general principle seems relatively transparent, the details are notoriously opaque.

Thomas Fowler comments that “What Bacon precisely means by this word ‘Form,’ is one of the first questions which must occur to ever reader of the *Novum organum*, and it is probably one of the last difficulties which will be cleared from his path.”⁷³ I concur with Fowler here and I argue that much of the confusion

⁶⁸ Bacon, *AL, OFB*, IV, 89.

⁶⁹ My trans., Bacon, *NO, OFB*, XI, 214.

⁷⁰ Bacon, *AL, OFB*, IV, 85.

⁷¹ Bacon, *NO, OFB*, XI, 203.

⁷² Bacon, *AL, OFB*, IV, 85.

⁷³ Thomas Fowler, *Bacon’s Novum Organum*, 54.

surrounding Baconian forms stems from a lack of understanding of Bacon's cosmogony and a failure to consider carefully the purpose of Baconian inquiry (viz., the union of *res* and *mens*). To many commentators, Bacon's doctrine of forms appears "radically incoherent."⁷⁴ In its simplest expression, a Baconian form identifies "a [simple] nature that is unseparable from the [simple] nature you inquire upon."⁷⁵ That is, a form describes a *relation* between two simple natures. For example, when investigating the simple nature heat, the aim is to find another simple nature which cannot (under any circumstances) be divorced from heat. As Bacon puts it:

The form of any nature is such that if it be in place the given nature invariably follows. Thus it is constantly present when that nature is present, and universally asserts it, and inheres in the whole of it. The same form is such that if it departs, the given nature infallibly disappears. Thus it is always absent when the nature is absent, and always withholds it, and inheres it not at all.⁷⁶

The question then arises: How can *forma* – defined here by Bacon as a partnership between two simple natures – refer also (as Bacon claims) to *fons emationis*, *natura naturans*, true difference, law of pure act and free direction (to name but a few)? As Brian Copenhaver puts it,

Obviously, the Baconian form is not the Peripatetic abstraction, but its exact contours are obscure – a generative force, a defining essence, a taxonomic distinction, a natural law, a material quality, an alchemical additive, any of these will answer to Bacon's description.⁷⁷

Thus *prima facie*, Bacon's doctrine of forms appears incoherent and impenetrable.

According to J. R. Milton,

⁷⁴ Milton, "Laws of Nature," in *The Cambridge history of Seventeenth-Century Philosophy*, ed. Daniel Garber and Michael Ayers, vol. 1 (Cambridge: Cambridge University Press, 1998), 686.

⁷⁵ Bacon, *VT, SEH*, III, 240.

⁷⁶ Bacon, *NO, OFB*, XI, 205.

⁷⁷ Copenhaver, "Astrology and Magic," in *The Cambridge History of Renaissance Philosophy*, ed. C. B. Schmitt and Quentin Skinner (Cambridge: Cambridge University Press, 1988), 264-300, on 299-300. Similarly, Michael Hattaway, says that Bacon's "notion of scientific law is a development of Aristotle's formal cause, with, however, a strange mixture of ultimately theological notions derived from alchemical and cabbalistic sources," "Bacon and 'Knowledge Broken,'" 188-189.

Despite much effort, no one has ever succeeded in subsuming everything that Bacon said about laws and forms into a single coherent account, and one may reasonably suspect that the enterprise is impossible. Instead historians should try to understand why it is that his theory is so radically incoherent. One explanation is that Bacon's natural philosophy is a system in transition.⁷⁸

Likewise, Virgil Whitaker criticises Ellis for "assuming that Bacon had an elaborate and consistent philosophic doctrine of 'forms.'" ⁷⁹ Whitaker "propose[s] to argue for a much simpler explanation by assuming that Bacon used somewhat uncritically a variety of ideas current in his age and failed to achieve a philosophically coherent system."⁸⁰ This is at odds with everything I have argued in this thesis and makes nonsense of Bacon's programmatic vision. The confusion results because commentators treat the concept of form independently of a consideration of the full range of Bacon's natural philosophical principles. In the following section, I shall attempt to subsume Bacon's various comments regarding laws and forms into a single coherent account. In the process, I shall relate Bacon's doctrine of forms to his cosmogony, the union of *res* and *mens*, the *via negativa* and his science of magic. I follow Ellis's suggestion that, "As Bacon uses the word [*forma*] in his own sense, we must endeavour to interpret the passages in which it occurs by means of what he has himself said of it."⁸¹ Thus I will interpret key passages of *Novum organum* in the light of other aspects of Bacon's natural philosophical programme.

⁷⁸ Milton, "Laws of Nature," in *The Cambridge history of Seventeenth-Century Philosophy*, ed. Daniel Garber and Michael Ayers, vol. 1 (Cambridge: Cambridge University Press, 1998), 686.

⁷⁹ Whitaker, "Bacon's Doctrine of Forms: A Study of Seventeenth Century Eclecticism," *Huntington Library Quarterly* 33 (1970), 209-216, on 209.

⁸⁰ Whitaker, "Bacon's Doctrine of Forms," 209-210. According to Whitaker, "this assumption is itself consistent with Bacon's own repeated enunciations of his distrust of building systems and with his choice of the aphorism as the basic principle structure in the *Novum Organum* to avoid any appearance of erecting the vast philosophic systems characteristic of some of his predecessors and contemporaries," 210. Writing several years before Rees, Whitaker says Bacon's "distrust of building a whole cosmology on very inadequate foundations was certainly commendable," 210.

⁸¹ Ellis, *SEH*, I, 28.

A. The potency-substratum distinction (II)

To begin the analysis of Baconian forms, I draw attention to how the transition from physical to metaphysical axioms (forms) indicates a crucial change in perspective. We saw in Chapter 4 that, although Bacon holds that we must ascend the *scala intellectus* “by successive, uninterrupted or unbroken steps,” many commentators argue that physics and metaphysics are disjunctive.⁸² For example, Jardine argues that Bacon’s failure to work out the relation between physics and metaphysics is “a fundamental weakness in Bacon’s programme for the growth of human power over nature, and one which remains completely unresolved.”⁸³ In contrast, I argue that the problem of the relation between physics and metaphysics is resolved when we consider Bacon’s dual perspective on matter, viz., the potency-substratum distinction. Physics considers matter from the perspective of substratum, whereas metaphysics considers matter from the perspective of potency. Thus, physics and metaphysics are not disjunctive; an understanding of their interdependence requires attending to the change in perspective. Ellis unwittingly (and somewhat confusedly) picks up on the potency-substratum distinction:

Such phenomena as the rising of cream, the subsidence of the lees of wine, the clinging of gold leaf round the finger, &c., were to be explained in the first instance by the instincts and appetites of portions of matter, and afterwards to receive a deeper and more fundamental explanation when these instincts and appetites were themselves shown to result from the site, form, and configuration of the ultimate particles of which all bodies are composed.⁸⁴

⁸² Bacon, *NO, OFB*, XI, 161.

⁸³ Jardine, *Francis Bacon*, 143.

⁸⁴ Ellis, *SEH*, I, 55.

But according to Bacon, and contra Ellis, physics investigates phenomena in terms of configuration of particles (substratum).⁸⁵ To gain the requisite increase in abstraction, the same phenomena are then investigated in metaphysics in terms of the fundamental appetites and motions of bodies (potency). It is the latter perspective that offers the deeper and more fundamental explanation. In *Novum organum* Bacon discusses this change in perspective in terms of two kinds of axioms of transformation. The axioms of physics, as already explained, proceed by way “of concrete bodies as we find them in nature in her ordinary course.”⁸⁶ In contrast,

Metaphysics

looks on [*intuetur*] a body as an array or conjugation [*turmam siue coniugationem*] of simple natures; for instance, in gold these things come together: that which is yellow; that which is heavy up to such and such a weight; that which can be beaten or drawn out to such and such an extent; that which cannot become volatile, or lose mass by fire; that which can flow to such and such a degree; that which can be separated or dissolved by this or that means; and so on for the rest of the natures which come together [*concurrunt*] in gold. Thus an axiom of this sort brings the matter down to the forms of simple natures [*rem deducit ex Formis Naturam simplicium*].⁸⁷

Bacon’s notion that we can look on bodies as conjunctions of simple natures is pivotal. Causes (forms) are abstractions, not structures. For Bacon, *forma* refers to matter’s unfolding powers, not to concrete configurations. Bacon habitually alludes to “the error in propounding chiefly the search of causes in productions of things concrete, which are infinite and transitory, and not of abstract natures, which are few and permanent.”⁸⁸ These natures, says Bacon, “are as the alphabet or simple letters, whereof the variety of things consisteth; or as the colours mingled in the painter’s

⁸⁵ As I argued in Chapter 2, Bacon does not think we can arrive at knowledge of “the ultimate particles” (the atom).

⁸⁶ Bacon, *NO, OFB*, XI, 207.

⁸⁷ Bacon, *NO, OFB*, XI, 205-207.

⁸⁸ Bacon, *VT, SEH*, III, 243.

shell, wherewith he is able to make infinite variety of faces or shapes.”⁸⁹ By viewing bodies as conjugations of simple natures, we move a step away from *natura naturata* towards *natura naturans*. As Bacon explains, “I, engaging purely and unceasingly with things, do not abstract my intellect further from them than to allow (as with sight) their images and rays to come into focus [*Intellectum longiùs à Rebus non abstrahimus, quàm vt rerum imagines, & radij (vt in sensu fit) coire possint*].”⁹⁰ Through the various stages of inquiry in which the intellect compares and contrasts bodies, simple natures are abstracted sufficiently to allow the “rays to come into focus.” This leads ultimately to a perception of the unity of nature (“the summits and peaks of nature”).⁹¹ Through abstraction, the operator takes a step back from nature in its phenomenal appearances to perceive the commonalities underlying its fecundity.

We saw in Chapter 2 that the unity of nature is a reflection of the primary impulse or desire of *materia prima* to cohere. This is why Bacon can chart the return journey to a terminus in forms: individuals are never truly separated from that unity. The move from the one to the many, characterised by the pyramidal figure, results from a successive unfolding and fashioning of the absolute power of *materia prima*. The constraint of nature’s absolute potency entails a concomitant outward expansion of generative power. The purpose of Bacon’s method is to discover the means of restraint in order to reconfigure simple natures in novel conglomerations. Metaphysics investigates the cardinal powers that gave rise to the current order of nature (nature free). In other words, metaphysics considers nature from a cosmogonical perspective. It searches out the primordial constraints on nature’s

⁸⁹ Bacon, *VT, SEH*, III, 243.

⁹⁰ Bacon, *IM, OFB*, XI, 21.

⁹¹ My trans., Bacon, *SI, SEH*, II, 689.

potency that gave rise to this world. Hence, Bacon's forms describe limitations on matter's potency that resulted in the generation of simple natures (heat, light, death etc.). In inquisitional terms, the operator moves from bondage to phenomenal things, through an increasing freedom of action, by means of abstracting and disentangling composites, until he reaches the form. Thus Baconian inquiry inverts the primordial emanation from unity to multiplicity. The following section elaborates on the relationship between form and cosmogony.

B. Form and cosmogony

We saw in Chapter 2 that in Bacon's cosmogony, all motions and virtues stem from the atom by means of a process of unfolding. Nature emerges from a point in a pyramidal expansion that ends in multiplicity and variation. The reverse of this in inquisitional terms is to begin with natural history, ascend through a hierarchy of axioms, terminating in the *lex summaria*.⁹² My main claim here is that "form," in its Baconian sense, refers to the constraints or limitations whereby matter's absolute power is unfolded and organised into simple natures. As Bruno says, "potency is not the same as act, since act is not absolute but limited."⁹³ This is precisely the Baconian position: Bacon's forms are laws of pure act. This becomes clearer if we re-examine Bacon's investigation of the form of heat in *Novum organum*. In treating what he calls "*The First Vintage concerning the Form of Heat*," Bacon concludes that "Each and every *Instance* indicates that the nature of which heat is a limitation is motion."⁹⁴ He then proceeds to describe the "true *Differences* which limit motion

⁹² Bacon, *DSV, SEH*, VI, 655.

⁹³ Bruno, *Cause, Principle and Unity*, ed. and trans. Richard J. Blackwell and Robert de Lucca (Cambridge: Cambridge University Press), 66.

⁹⁴ Bacon, *NO, OFB*, XI, 263 (italics in original).

and establish [*constituunt*] it as the form of heat.”⁹⁵ It is this differential in potency (typically ignored in Baconian commentary) that constitutes the form of heat.⁹⁶

Bacon states:

Now from this *First Vintage*, the form or true definition of heat (i.e. of heat relative to the universe and not just relative to the sense) is, put briefly, this: that *Heat is an expansive motion, but restrained and struggling [cohibitus, & nitens] by way of the lesser parts*. But the expansion is modified [*Modificatur*], so that in expanding all round, it nevertheless tends to rise upwards. The struggle [*Nixus*] by way of the parts is also modified [*Modificatur*], so that it is not altogether sluggish but driven on and with some vigour to it.⁹⁷

Thus the form of heat refers to motion (nature’s potency) limited or restrained in specific ways. This contraction produces an expansion of generative power which brings forth the simple nature heat. In the case of heat, spirit expands but is restrained by the tangible parts so that a struggle (*Nixus*) ensues.⁹⁸ Bacon’s notion of form as a limitation of act explains the following passage:

From what I have said concerning motion (namely that it is like a genus to heat’s species), I do not mean that heat begets motion or that motion begets heat (though in some cases these things are true) but that the very heat itself or *Quid ipsum* of heat is motion and nothing else; but this conclusion is limited by *Differences* which I shall give.⁹⁹

⁹⁵ Bacon, *NO, OFB*, XI, 265.

⁹⁶ Rees refers to commentators’ “tunnel vision” when it comes to aspects of *Novum organum*. This applies even to Bacon’s infamous form of heat. Commentators have seized on Bacon’s statement that the “*Quid ipsum* of heat is motion” but paid very little attention to his claim that “this conclusion is limited by *Differences*” (*NO, OFB*, XI, 263).

⁹⁷ Bacon, *NO, OFB*, XI, 271 (italics in original).

⁹⁸ It is not generally recognised that when Bacon refers to “an expansive motion,” he is referring to a dilation of spirit. There is a struggle between spirit and tangible matter (“the lesser parts”). The reasons for this oversight are clear. Consider Mary Horton’s claim that, “In stating that the essence of heat is motion, he [Bacon] anticipates Rumford and Davy’s refutation of the caloric theory of heat, and their conclusions that heat is a form of motion, by about 175 years. In addition, if we consider the ‘true difference’ and make the assumption that particles that were not the minutest but of tolerable dimensions might be an intuitive description of molecules, it could be suggested that in embryo form Bacon’s Theory of Heat anticipates the Kinetic Theory of Matter,” “In Defence of Francis Bacon: A Criticism of the Critics of the Inductive Method,” *Studies in the History and Philosophy of Science* 4 (1973), 241-278, on 255. Michael Hattaway is correct when he says “Bacon’s notion of form is virtually inseparable from the notion of spirit,” “Bacon and ‘Knowledge Broken,’” 190. We will see below that Bacon designates *spiritus* the source of “that rich and fruitful supply of active power” (*DSV, SEH*, VI, 759, cf. 681). Baconian magic works by constraining *spiritus*. However, Bacon does not, as Hattaway claims, blur “the distinctions between, cause, form, and spirit,” *ibid.*

⁹⁹ Bacon, *NO, OFB*, XI, 263 (italics in original).

Bacon's form must not be confused with the efficient cause – that which produces heat in a particular concrete body. Efficient and material causes are specific to embodied structure, but the form is fixed, independent of all embodiment, and present universally in bodies where motion is restrained in the specific and requisite manner. That is, the form heat is the simple nature *per se*, and is invariably connected with the presence of another simple nature.

To further illustrate Bacon's dense account, it is helpful to consider his retention of the language of genus and species, which strikes many commentators as odd. For example, Malherbe comments that "Remarkably, Bacon borrows from Aristotle the species/genus structure."¹⁰⁰ To the best of my knowledge, no commentator appreciates the function that Bacon's subversion of this doctrine performs.¹⁰¹ As Kennington points out, "From the start Bacon ... challenged Aristotle on a fundamental issue: how is a natural being to be understood? The difference is from the start a difference of standpoint: Bacon seeks to understand a being in terms of how it initially came to be, in order that its production can be reproduced by man."¹⁰² Ellis also seems to grasp this point when he says, "Natural philosophy considered from [Bacon's] point of view, is therefore only an answer to the question, How does Nature work in the production of phenomena? When, to take

¹⁰⁰ Malherbe, "Bacon's Method of Science," in *The Cambridge Companion to Bacon*, 95.

¹⁰¹ In a recent paper Angus Fletcher argues that "Bacon's apparently awkward inclusion of the term 'genus' is ... not a reference to Aristotle; rather, it is a manifestation of a Ramist approach to definition that views complex substances in terms of the addition of a specific form to a more abstract genus," "Francis Bacon's Forms and the Logic of Ramist Conversion," *Journal of the History of Philosophy* 43 (2005), 157-169, on 164-165. Fletcher's account is confused because his interpretation of Bacon's genus is based on the latter's investigation of whiteness in *Valerius terminus*. Fletcher fails to realise that *Valerius* is concerned with abstract physics, whereas *Novum organum* is concerned with metaphysics. The two accounts are not therefore interchangeable. Bacon's notion of "convertible" natures is not "Ramist in origin" but relates to his notion of enfolded matter, 161.

¹⁰² Kennington, *On Modern Origins*, 9. For an alternative reading see Robert E. Larsen, "The Aristotelianism of Francis Bacon's *Novum Organum*," *Journal of the History of Ideas* 23 (1962), 435-450. According to Larsen, the Aristotelian conception of form "is the basis of Bacon's view of 'form,'" 443.

a trivial example, she superinduces yellowness on the green leaf, or silently and gradually transforms ice into crystal, we ask how are these changes brought about?"¹⁰³ The retention of the terms is best explained by the *complicatio-explicatio* concept. For Bacon, genus refers to matter *complicatio*, and species to matter *explicatio*. In the case of heat, the genus (motion) is *complicatio* whereas the species (heat) is *explicatio*. Conversely, species by "continual gradations are contracted [*contrahuntur*] into more universal generalities," i.e. genera.¹⁰⁴ Thus a species is produced through an *explicatio* of a genus. Contraction (*complicatio*) increases power and expansion (*explicatio*) increases organisation. We can now make sense of the following passage:

A true form is such that it draws up the given nature [the species] from some source of being [the genus] which inheres in many other things, and is (as they have it) better known to nature than the form itself [*vt Naturam datam ex fonte aliquo Essentiæ deducat, quæ inest pluribus, & notior est Naturæ (vt loquuntur) quàm ipsa Forma*]. Thus for a true and perfect axiom for knowing, the prescription [*pronuntiatum*] and precept is this: *that there be discovered another nature which is convertible with the given nature, but which is nevertheless a limitation of one better known to nature like a true genus.*¹⁰⁵

Because the genus is *complicatio*, it potentially inheres in many other things, and is not necessarily in specific things. This means that matter can unfold in many different ways, and what applies to heat applies to all forms. When Bacon says that the genus is better known to nature than the form itself, he means that the genus is a more primordial in nature – it is a "radical and formative" nature.¹⁰⁶ In the case of the form of heat, motion is the genus because it is more original than heat: it is freer and less restricted and so closer to the extraordinary power of *natura naturans*. The genus is the source (*fons*) from which the species is drawn up (*deducere*). As Rom

¹⁰³ Ellis, *SEH*, I, 59.

¹⁰⁴ Bacon, *DAS*, *SEH*, IV, 321, cf. I, 525.

¹⁰⁵ Bacon, *NO*, *OFB*, XI, 205 (italics in original).

¹⁰⁶ Bacon, *VT*, *SEH*, III, 241.

Harré points out, *deducere* would “in this period, have been understood in the physical sense of ‘leads out’ or ‘produces’ rather than the logical sense of ‘implies’ or ‘entails.’”¹⁰⁷ The limitation/constraint of the genus draws up the simple nature: it is this constraint or limiting force (*vis*) active in matter’s unfolding into organisation which is the Baconian form. The two inseparable natures are convertible because, as Bacon says in *De principiis atque originibus*, “the nature of a principle is that things should resolve themselves into it as readily as they should be produced out of it [*ut res in illud solvantur, quam ut res ex illo gignantur*].”¹⁰⁸ However, the form is always a limitation of a more primordial nature better known to nature (*notior Naturæ*). We will see below that this has operative consequences.

We are now in a position to resolve a problem that has plagued Baconian commentary. Many commentators argue that Bacon’s notion of form has two irreconcilable meanings, viz., essence and cause. Fowler argues that Bacon’s account of form in *Novum organum* can be “ranged under two classes, according as the word ‘Form’ may be replaced by words like essence, differentia, definition, &c. or by words like law, cause, &c.”¹⁰⁹ However, Fowler notes that “there is one passage (i, 75) in which the two meanings are brought together.”¹¹⁰ Fowler attempts (unsuccessfully) “to reconcile or bring into any connexion these two apparently divergent meanings.”¹¹¹ Similarly, Ellis comments, “It will be observed that the two modes in which Bacon speaks of the Form, namely as *ipsissima res* and as a law,

¹⁰⁷ Rom Harré, “A Note on Ms. Horton’s Defence of Bacon,” *Studies in the History and Philosophy of Science* 5 (1974), 305-306, on 306.

¹⁰⁸ Bacon, *DPAO, OFB*, VI, 223.

¹⁰⁹ Fowler, *Bacon’s Novum Organum*, 57.

¹¹⁰ Fowler, *Bacon’s Novum Organum*, 57, n. 38.

¹¹¹ Fowler, *Bacon’s Novum Organum*, 58.

differ only, though they cannot be reconciled, as two aspects of the same object.”¹¹² The confusion over the apparent irreconcilability of these terms arises because Bacon describes his forms as laws of pure act: “When I speak of forms, I mean nothing other than those laws and determinations of pure act which regulate and constitute [*ordinant & constituunt*] any simple nature, like heat, lumen, weight, in every kind of matter [*in omnimodâ materiâ*] and susceptible subject.”¹¹³ We saw in Chapter 2 how Bacon identifies matter’s appetitive power with the summary law of nature. This law, he states, is nothing other than the original force (*vis*) impressed on the atom “that fashions all things out of matter [*quæ ex materia omnia ... effingit*].”¹¹⁴ The above confusion can be resolved if we recognise that in its self-organisation matter is conceived as originally “fashioned” by a primary law. In that case all subsequent forms are “clauses” of this “summary” law. In regarding forms as laws it follows that just as the summary law is a force (*vis*), so the unfolded hierarchy of forms are also “forces,” fashioning and constraining matter (*explicatio*) to limit its absolute power (*complicatio*). This is why nature behaves in accordance with laws and why forms are fixed and universal. Moreover, forms describe an active process, not a static configuration. Hence they are the source of operative power. As Bacon puts it,

For although nothing really exists in nature besides individual bodies, carrying out pure, individual acts according to law [*ex lege*], yet in the sphere of doctrine, this very law, and the investigation, discovery and explanation [*explicatio*] of it, is the very foundation of knowing as it is of operating. It is this *law* then, and its *clauses*, that I understand by the name of forms.¹¹⁵

¹¹² Ellis, *SEH*, I, 31.

¹¹³ Bacon, *NO, OFB*, XI, 255.

¹¹⁴ Bacon, *DSV, SEH*, VI, 729, cf. 655.

¹¹⁵ Bacon, *NO, OFB*, XI, 203. Cf. Bruno: “the potency is always limited to a single act, because it never has more than one, specific and particular being,” *Cause, Principle and Unity*, ed. and trans. Richard J. Blackwell and Robert de Lucca (Cambridge: Cambridge University Press), 66.

Nature's acts are explications of the summary law of nature (matter's appetitive power). Through forms matter is constrained and channelled into a network of simple natures. Hence, Bacon's concept of a law of nature is intimately related to his concept of an appetitive matter. The derivation of all things from a single source (the atom) implicates them in this law. The *lex summaria* is the unity underlying the *fabrica* of nature. Matter unfolds itself according to the *lex summaria* and the resulting chain of causes is ultimately explicable in terms of this same law. For Bacon, forms are explications of the *lex summaria*. Hence he states, "forms are fictions of the human soul, except when you want to call those laws governing the act forms."¹¹⁶ When we consider nature from the point of view of causes, the motion of the atom is *causa causarum*; when we consider nature from the point of view of its *modus operandi* (*natura naturans*), the unfolding from a single source corresponds to the fixed chains of causation determined by the summary law of nature.¹¹⁷ And from that perspective forms are laws. This is clear when Bacon states:

The fabric of nature contains in her own lap and bosom every event whatever ... and develops them in due season by a fixed law [*fabrica ipsa naturæ suo sinu et gremio omnem eventum ... complectatur, et suo tempore certa lege prodat*].¹¹⁸

Considered from a cosmogonical perspective, there is a fixed relationship between genus and species, a contraction or limitation of nature's potency with a concomitant increase in generative power. This generative act is an explication of the *lex summaria*. The form is the law governing the act, the limitation or constraint of matter's potency which we experience as a given simple nature. This is what law does – it limits action. As Bacon says, "*lex and ligantia come both a ligando*."¹¹⁹ In

¹¹⁶ Bacon, *NO*, *OFB*, XI, 89.

¹¹⁷ Bacon, *DPAO*, *OFB*, VI, 198; *NO*, *OFB*, XI, 200.

¹¹⁸ Bacon, *DAS*, *SEH*, IV, 321, cf. I, 524.

¹¹⁹ Bacon, *LL*, X, 330.

operative terms, as we saw in Chapter 4, each of Bacon's *canones mobiles* ("provisional rules") is followed by an *explicatio* which details the various effects which flow from the rule. An axiom is a rule or law unifying nature's behaviour. The greater the generality of the rule, the more effects it explains. The effects are an explication (*explicatio*) of the rule, that is, a description of nature's unfolding.¹²⁰ Having now shown how nature's unfolding from a single source can be expressed in terms of laws of act, we can reconcile Bacon's notion of form as law and essence. Forms are explications of nature's "fundamental and everlasting laws" expressed in terms of the relation between genus and species.¹²¹

Because forms are unifying laws, they reveal the commonalities underlying nature's infinite variety. According to Bacon, "he who knows forms grasps the unity beneath the surface of materials which are very unlike."¹²² Bacon expands on this idea in the following passage:

But if any man thinks that our forms too smack of abstraction in that they mix and conjoin things unrelated [*heterogenea*] – for the heat of the heavens and of fire seem not to be alike; neither do the fixed red of a rose and so on, and the apparent red of a rainbow or rays from an opal or diamond; nor again do death from drowning, burning, the sword, apoplexy, or atrophy; yet these things agree in the nature of heat, redness and death respectively – such a man must learn that custom, the unanalysed appearances of things, and mere opinion enslave his intellect. For it is absolutely certain that these things, however unlike and foreign to each other, come together [*coire*] in the form or law which governs [*ordinat*] heat, redness, or death; and that human power can never throw off the shackles of nature in its ordinary course, and stretch out and lift itself to new efficientes and new modes of operation [*nec emancipari posse potentiam humanam, & liberari à Naturæ cursu communi, & expandi & exaltari ad Efficientia noua, & Modos operandi novos*], unless it does so by unmasking and discovering forms of this kind.¹²³

¹²⁰ In *Historia sympathiæ et antipathiæ rerum*, Bacon speaks of "unravelling [*enucleando*] the law of nature, and interpreting the relations of things" (*SEH, HAS, V, 204*).

¹²¹ Bacon, *NO, OFB, XI, 215*.

¹²² Bacon, *NO, OFB, XI, 203*.

¹²³ Bacon, *NO, OFB, XI, 257*.

Because forms unify nature, they promise a huge expansion in operative power and emancipation from nature's ordinary course. Confusion regarding the unifying power of forms can be traced as far back as Mill. Mill misunderstood entirely Bacon's position that every phenomenal appearance must be traced to a fixed cause or form. Unsurprisingly, later commentators have concurred with Mill. For example, Fowler states:

The whole of the enquiry into Form, and, consequently, the Method of Exclusions, proceeds on the assumption that every phenomenon has only one cause, that is to say, is due to only one set of conditions. Of the 'simple natures' there is some one, and one only, which, if it could be found, is the 'Form' of the 'natura data' ... But the same event, as is so often and so justly insisted on by Mr. Mill, whenever he has occasion to speak of what he terms 'Plurality of Causes,' may be due to one set of conditions at one time and to a different set of conditions at another ... Hence, though it is invariably true that the same cause is always followed by the same effect, the converse proposition that the same effect is always due to the same cause would frequently be misleading.¹²⁴

However, Mill confused latent process (the plurality of causes giving rise to the *natura data* in a particular concrete body) and form (the unique cause of the *natura data* in all bodies). He conflates efficient cause (*vehiculum formæ*) and form.¹²⁵ The former belongs to physics, but the latter belongs to metaphysics. Mill's error arises from an ignorance of Bacon's cosmogony underlying the doctrine of forms. Unless we are clear that form refers to a restriction of nature's potency, which in the process of unfolding produces the *natura data*, we cannot understand how Bacon could be "absolutely certain that things ... unlike and foreign to each other, come together in the form." Without the concept of *complicatio-explicatio* supporting his doctrine of forms, Bacon's foundational metaphysical assumption of the unity of nature and the

¹²⁴ Fowler, *Bacon's Novum Organum*, 62. See Mill's *Logic*, V, ch. 3, 7.

¹²⁵ Bacon warns against this very error in *Novum organum*: "I warn you some danger lurks in these [migratory] instances, i.e. they can restrict the form too much to the efficient, and take over the intellect or rather, from contemplating the efficient, narrow it to a false opinion of the form. However, I always maintain that the efficient is nothing other than the vehicle or carrier of the form [*vehiculum, siue deferens Formæ*]. But carrying out the *Exclusive* process properly is an effective cure for this ill" (*NO, OFB, XI, 275-277*).

necessary presence of the unique form is incoherent. For example, speaking of the form of light in *De augmentis* Bacon writes:

Men ought to have sunk their speculations for awhile, and inquired what that is which is common to all lucid bodies; in other words, into the Form of Light. For what an immense difference of body there is (if they be considered according to their dignity) between the sun and rotten wood, or even the putrefied scales of fish? ... What connexion with fire and lighted matter have glowworms and fireflies, and the Indian fly, which lights up a whole room; or the eyes of some animals in the dark; or sugar while it is being scraped or broken; or the sweat of a horse, hard-ridden on a hot night; and the like? ... Men have not from particular instances elicited the Common Forms of natures; which I have laid down as the proper subject of Metaphysic.¹²⁶

The form is the commonality underlying nature's phenomenal variety. Forms unify the most disparate phenomena. As Bacon puts it in *De interpretatione naturæ sententiæ xii*, "things, although they seem most unlike, nevertheless conceal a genuine likeness known to the interpreter."¹²⁷ This genuine likeness concealed beneath nature's bewildering variety is the form. In *Historia vitæ et mortis* Bacon says "it is convenient to know the character and form of old age; which will be done best by making a careful collection of all the differences in the state and functions of the body between youth and old age, that by them you may see what it is that branches out [*frondescent*] into so many effects."¹²⁸ Bacon's use of the verb *frondescere* (to become leafy, to put forth leaves, to shoot out) vividly captures the relationship between his cosmogony and his doctrine of forms. He is trying to discover what it is that branches out or unfolds into so many effects; this unifying factor is the form. Moreover, the notion of branching and channelling into a profusion of seams and lines in matter captures the idea that a form is a fashioning and constricting force. This also leads to a demolition of the idea of fixed kinds of things. The only commentator seriously to address this aspect of Bacon's doctrine of

¹²⁶ Bacon, *DAS, SEH*, IV, 403-404, cf. I, 612-613. Cf. *SS, SEH*, II, 456-457.

¹²⁷ My trans., Bacon, *DIN, SEH*, III, 788.

¹²⁸ Bacon, *HVM, SEH*, V, 222, cf. II, 110.

forms is Kennington and I am indebted to his insightful account. In particular, Kennington highlights the following important point:

The concepts of physics are kind-related, or intrinsic to kinds; the concepts of metaphysics cut across the kinds. Thus there are no laws of nature that are laws peculiar to one kind; there are no laws, for example, that are peculiar to the human species. Conversely, the concepts peculiar to physics, latent process and latent structure or configuration, do not cut across species, but are inherent in species.¹²⁹

We will see below that it is this property of laws to cut across kinds that promises the expansion in operative power and the emancipation from nature's ordinary course. Without acknowledging the concept of unity, a form will consistently be taken as signifying the efficient cause in concrete bodies. However the goal of Baconian magic is to return to the point prior to embodiment in concrete structures, to access the forms responsible for imposing organisation and cohesiveness.

C. Form and the union of *res* and *mens*

We saw in Chapter 4 that the purpose of Bacon's method is to make the pyramid of knowledge (*mens*) a perfect reflection of the pyramid of nature (*res*) (see figures 4.1 and 4.2, p. 160). For Bacon,

The true philosophy ... echoes most faithfully the voice of the world itself, and is written as it were from the world's own dictation; being indeed nothing else than the image and reflexion [*simulacrum et reflexio*] of it, which it only repeats and echoes, but adds nothing of its own."¹³⁰

I have also noted that Baconian inquiry inverts the primordial emanation from unity to multiplicity. Thus whilst the multiplicity of nature (*natura naturata*) displays a bewildering fecundity, Baconian operative power relies on a limited set of underlying simple forms identified with *natura naturans* (the supreme potency of matter). Baconian inquiry proposes to unite *mens* and *res*: to lead the mind "to the

¹²⁹ Kennington, *On Modern Origins*, 40.

¹³⁰ Bacon, *DSV, SEH*, VI, 714, cf. 640.

things themselves [*ad res ipsas*].”¹³¹ Although Baconian forms are abstracted from bodies, Bacon says “I never withdraw or abstract from the things themselves [*à rebus ipsis*].”¹³² This shows clearly that the term *res* does not refer to phenomenal things but to the hidden virtues and powers of matter. For Bacon, the form is attained as a consequence of the perfect union of *res* and *mens*. In *Novum organum* he says “the form or true definition [*Definitio vera*] of heat” is “heat relative to the universe and not just relative to sense [*eius, qui est in ordine ad Vniuersum, non relatiuus tantummodò ad Sensum*]”¹³³ Baconian science “emerge[s] not just from the nature of the mind but from the very nature of things [*vt non solùm ex Naturâ Mentis, sed ex Natura Rerum quoque*].”¹³⁴ Hence Bacon’s forms are, in so far as they contribute to operative power, determined by the union of the mind and things. Yet many commentators treat Bacon’s forms as material entities existing in matter. For example, Stephen Gaukroger states:

Although there is some variation in the way in which Bacon characterises Forms, the Form of something seems to be, above all, its basic material structure, the way in which its constituent material parts are disposed. This is, of course, a traditional atomist concept.¹³⁵

Similarly, Anthony Quinton writes that forms are “the hidden states of the fine structure of things by reference to which their straightforwardly observable properties can be explained.”¹³⁶ Form is “a latent structural property of the particles of which matter ... is composed ... an arrangement or configuration of matter, not a

¹³¹ Bacon, *IM, OFB*, XI, 21.

¹³² Bacon, *NO, OFB*, XI, 255-257.

¹³³ Bacon, *NO, OFB*, XI, 271.

¹³⁴ Bacon, *NO, OFB*, XI, 443.

¹³⁵ Stephen Gaukroger, *Francis Bacon and the Transformation of Early-Modern Philosophy* (Cambridge: Cambridge University Press, 2001), 140.

¹³⁶ Anthony Quinton quoted in Vickers, “Francis Bacon and the Progress of Knowledge,” *Journal of the History of Ideas* 53 (1992), 495-518, on 504.

thing in its own right.”¹³⁷ We have already seen that Bacon quite clearly distinguishes between latent schematism (material cause) and form. The idea that form is identical to latent structure is contradictory. Structure is specific to concrete bodies whereas form is universal. The former considers bodies from the point of view of substratum, the latter from the point of view of potency. Quinton’s statement reveals that it is the relationship between simple nature and form which leads him to the conclusion that form must refer to “the fine structure of things.” However, as we saw in Chapter 3, Bacon explains our perception of simple natures in terms of radiative matter. The form is the *fons emanationis* giving rise to a simple nature. Our perception of the simple nature is a product of consent between the organs of the senses and the forms and schematisms of matter.

In Chapter 2, I explained how ordinary macroscopic bodies are nodes of complicated motions which have attained relative stability. Apparent rest occurs when nodes of simple motions are locked in a state of dynamic tension. The schematisms of matter are products of these dynamic tensions. *Schematismus* is a descriptive term for matter which can keep its form because the simple motions are locked in a state of dynamic tension. We have already examined (in abstract physics) the schematisms of matter which are the material causes of simple natures. From the point of view of potency (i.e. metaphysics), schematisms are locked nodes of simple motions. The schematisms of matter emanate simple motions. Bacon’s forms describe the stable nodes of simple motions – islands of stability – which consent with the organs of the senses, giving rise to a particular simple nature. When discussing the form of heat, Bacon says

As far as sense goes, heat is a respective thing, and relative to man, not to the universe [*Calidum ad sensum, res Respectiua est, & in ordine ad*

¹³⁷ *ibid.*

Hominem, non ad Vniuersum]; and it is rightly set down that heat is just its effect on the animal spirits. The effect is moreover intrinsically variable, since the same body can (according to the sense's condition) induce the perception of heat or of cold.¹³⁸

The inquiry into Baconian forms goes beyond what is relative to the sense, in order to discover what it is in nature which gives rise to the simple nature. What is it that impinges on the animal spirits? This is *res* (the thing itself) and should not be confused with the simple nature. Bacon states:

The form of the thing is the very thing itself, and the thing does not differ from the form in any other way than appearance from existence, external from internal, or that relative to man from that relative to the universe [*Cùm enim Forma rei sit ipsisima Res; neque differat Res à Formâ, alitèr quàm differunt Apparens & Existens, aut Exterius & Interius, aut in ordine ad Hominem & in Ordine ad Vniuersum*].¹³⁹

On the face of it, this aphorism seems incongruous because Bacon describes the form as “*in ordine ad Hominem*,” whereas elsewhere he describes it as “*in ordine ad Vniuersum, non relatiuus tantummodò ad Sensum*” (“relative to the universe and not just relative to the sense”).¹⁴⁰ However, this aphorism cannot be divorced from its context and is crucially important as it highlights the relationship between form and *res*. *Res* is in (radiative) matter and it impinges on our senses. In other words, *res* is “existence,” “external,” “relative to the universe.” Yet the form is “the very thing itself” and should therefore share the attributes of *res*. Considered from the standpoint of man, the form is “appearance,” “internal,” “relative to man,” but not in the same way as the simple nature is merely relative to the sense. This is clear if we bear in mind that the purpose of Bacon’s method is to make the pyramid of knowledge (*mens*) a perfect reflection of the pyramid of nature (*res*).¹⁴¹ As Bacon

¹³⁸ Bacon, *NO, OFB*, XI, 263.

¹³⁹ Bacon, *NO, OFB*, XI, 237.

¹⁴⁰ Bacon, *NO, OFB*, XI, 270.

¹⁴¹ Those who argue that Bacon is here merely presenting the primary/secondary quality distinction are overlooking the goal of inquiry. There is no operative counterpart in the traditional distinction. See, for example, Maxwell Primack, “Francis Bacon’s Philosophy of Nature” (unpubl. Ph.D. diss.,

puts it, “the truth of being, and the truth of knowing are one, differing no more than the direct beame, and the beame reflected.”¹⁴² Because the purpose of inquiry is to unite *res* and *mens*, Bacon can state (without contradicting himself) that the form “is the very thing itself” and “does not differ from the form in any other way than appearance to existence.” The form is the reflection of the thing itself in the levelled mirror of a mind, no longer mingling its own nature with the nature of things. The true form is a true reflection of things. Rossi picks up on this when he says that “the central theme of Bacon’s philosophy ... [is] an “*expurgatio intellectus*” which is to transform the human mind – compared to an “enchanted mirror” – into a clear mirror capable of reflecting the structures of natural reality.”¹⁴³

D. Form and the *via negativa*

We have already seen that Bacon utilises the *via negativa* in abstract physics as the means to climb the *scala intellectus*. This exclusionary method continues right up to the discovery of the form in metaphysics. In *Novum organum* Bacon famously considers “the investigation of the form of heat by way of example.”¹⁴⁴ The term “example” needs emphasising and it should be noted that Bacon does not claim to have discovered the form of heat. On the contrary, he states quite clearly that no forms “have yet been discovered”¹⁴⁵ Aphorisms 11-20 of Book 2 describe the process whereby one draws up tables of discovery in order to identify the form. The investigator

Johns Hopkins University, 1962); Jardine, *Francis Bacon: Discovery and the Art of Discourse*, 112-113.

¹⁴² Bacon, *AL, OFB*, IV, 26.

¹⁴³ Rossi, *Philosophy, Technology, and the Arts in the Early Modern Era*, 159.

¹⁴⁴ Bacon, *NO, OFB*, XI, 217.

¹⁴⁵ Bacon, *NO, OFB*, XI, 303.

must find, on *Submission* of every last one of the instances, a nature which is such that it is always present or absent when the given nature is, and increases or diminishes with it, and is ... a limitation of a more general nature [*Naturæ magis communis*].¹⁴⁶

According to Kennington, “Bacon posits a one-to-one correspondence between a form ... and a nature. The double condition ... can now be stated: if the form ... is present, the nature is present, and if the form is absent, the nature is absent.”¹⁴⁷ This statement is typical in Baconian commentary but is not precise enough for our purposes. More correctly, Bacon posits a one-to-one correspondence between one simple nature and another more general (i.e. primordial) simple nature. Returning to a cosmogonical perspective, this relation exists between genus and species, between a contraction or limitation of nature’s potency and a concomitant increase in generative power – in other words, an unfolding in accordance with the laws of nature. When the more primordial simple nature is limited, we experience this as the superinduction of a new nature. Thus Bacon’s form refers to the relation between either two simple natures, or between genus and species. It describes how the genus (a more primordial simple nature) is limited in order to give rise to the species (the given nature).

Hence, the final stage of inquiry seeks to discover a “constant [*fidum*] and indissoluble” partnership between two simple natures.¹⁴⁸ The investigator proceeds by way of rejection or exclusion. The “*Exclusive* process” filters out all the natures which erroneously appear to be in partnership with the simple nature under investigation but are in fact merely “proprieties, effects, circumstances, concurrences, or what else you shall like to call them, and not radical and formative

¹⁴⁶ Bacon, *NO, OFB*, XI, 253 (italics in original).

¹⁴⁷ Kennington, *On Modern Origins*, 36.

¹⁴⁸ Bacon, *NO, OFB*, XI, 321.

natures towards the nature supposed.”¹⁴⁹ Bacon conceives of this as a “thorough solution and separation of Nature, not in fact by fire, but with the mind.”¹⁵⁰ He explains, “once we have performed *Rejection* and *Exclusion* in the right ways, the residue left, after all volatile opinions have been driven off as fumes, will be a form affirmative, solid, and both true and well defined.”¹⁵¹ In *Aphorismi et consilia* he summarises this process:

The discovery of forms, which proceeds through the exclusion or rejection of natures, is simple and unique. For all natures, which either are absent when the given nature is present, or present when the given nature is absent, are not of the form; and after rejection or negation has been completed, the form and affirmation remains. For example, if we inquire into the form of heat, and we find hot water is not bright, reject light: if we find tenuous air is not hot, reject tenuity.¹⁵²

This is the simple principle at the heart of Baconian metaphysics – a process of rejection or exclusion which finally terminates in an affirmation (the form). We reject or exclude all simple natures which are not of the form (i.e. all simple natures which “either are absent when the given nature is present, or present when the given nature is absent”). The exclusionary process is complete when we are left with a single “[simple] nature that is unseparable from the [simple] nature you inquire upon.” For example, we might think (as Telesio did) that heat and brightness form an indissoluble partnership. However, the exclusionary process will reject or exclude light because of the negative instance “hot water is not bright.” As Bacon puts it, “every *contradictory instance* wrecks a conjecture regarding a form”¹⁵³ At every phase of inquiry, Bacon’s criterion of truth incorporates error and negativity. Every time we establish what the form is not, we are a step closer to discovering what the

¹⁴⁹ Bacon, *VT, SEH*, III, 241.

¹⁵⁰ Bacon, *NO, OFB*, XI, 255.

¹⁵¹ Bacon, *NO, OFB*, XI, 255.

¹⁵² My trans., *AC, SEH*, III, 794.

¹⁵³ Bacon, *NO, OFB*, XI, 257 (italics in original).

form is. As we saw in Chapter 3, “if the mind tries to proceed by affirmative instances from the start (which it always does when left to itself) the result will be phantasms.”¹⁵⁴ Hence Bacon states that men “are allowed only to proceed by *Negatives* at first, and then to finish up with *Affirmatives* after making every sort of exclusion [*post omnimodam exclusionem*].”¹⁵⁵ But, as Bacon says, “all this is soon said but it is only to be achieved by long and involved processes.”¹⁵⁶ In practice this requires the drawing up of “the three tables of *first Submission*” set out in *Novum organum*.¹⁵⁷

This aspect of the Baconian method has received a great deal of attention in the secondary literature and I cannot do better than quote Malherbe’s account. However, it must be emphasised that metaphysics (like physics) requires *experimenta lucifera*. Bacon is quite clear that the key of interpretation will work only if the tables comprise the right kinds of instances. Hence he devotes most of Book 2 of *Novum organum* to a discussion of “the prerogatives of instances” (derived from the highest kind of *experimenta lucifera*). According to Bacon, “*these Instances* singled out and endowed with *Special Powers* are like the soul amongst the ordinary instances submitted; and ... a few of them can stand in for many of the others, so when we construct *Tables* they should be investigated with complete attention and written up.”¹⁵⁸ (For a breakdown of the Prerogative Instances see

¹⁵⁴ Bacon, *NO, OFB*, XI, 253.

¹⁵⁵ Bacon, *NO, OFB*, XI, 253 (italics in original).

¹⁵⁶ Bacon, *NO, OFB*, XI, 255.

¹⁵⁷ Bacon, *NO, OFB*, XI, 261 (italics in original).

¹⁵⁸ Bacon, *NO, OFB*, XI, 445 (italics in original). Unfortunately, limitations of space preclude a full discussion of the prerogatives of instances. Rees points out that commentators have completely overlooked Bacon’s treatment of “Instances with Special Powers,” which accounts for “70 per cent of Book II,” Rees, *OFB*, XI, lxxvii. For a summary of the purpose of each class of ISP (Rees’s abbreviation) in inquiry, see Appendix 3. In *De interpretatione naturæ sententiæ xii* Bacon instructs the interpreter to “watch for the pre-eminences of instances which have the most efficacy for abridging the work” (my trans., *DIN, SEH*, III, 787). In a letter to Father Redemptus Baranzano,

Appendix 3). The experiments of physics and mechanics feed back into the mother history, prerogative instances are “sought out and as it were tracked down,” the charts are reordered and the final stage of inquiry (metaphysics) begins.¹⁵⁹ Whereas physics is the “inferior” machine of the intellect, metaphysics is the “superior.”¹⁶⁰ The superior machine proceeds by means of “the three tables of *first Submission*.” Malherbe correctly summarises this process as follows:

There are three tables: the first one, which still pertains to natural history, exhibits the quality or given nature (for instance, heat, whiteness) that is studied in the common experience of things: the given nature appears as the quality of various substances which will be as dissimilar as possible to enlarge the range of the inquiry. This is the table of presence where the ontological status of substances is still empirical. In order to move from this to the table of absence, it is necessary to break with the Aristotelian notion that a quality is an accident of the substance or something which belongs to its essence. By an abstraction, a quality is correlated with another quality, which is always present or absent when the first quality is present or absent ... As for the third table, the table of comparison, it confirms the results of the previous ones, varying the degrees of presence and absence in the two natures henceforth related, the given nature and the invented nature (the form).¹⁶¹

However, Malherbe fails to appreciate the significance of Bacon’s identification of the process of exclusion with the removal of restraints on the operator. The changing recursive responses of the operator seems absent in most accounts. As we saw above, Bacon identifies “the way of truth” (the *via negativa*) with “the way of power.” Every time we establish what the form is not, we are freed from an operational restraint. There is a correlative increase in operative power. As Bacon puts it,

The utterance of words in the contemplative or operative matter does not differ. For when you say this, “Light is not of the form of heat”; it is the

Bacon says “the Prerogatives of Instances ... will diminish the multitude of them [Instances] very much,” *LL*, XIV, 375-377.

¹⁵⁹ Bacon, *PAH*, *OFB*, XI, 465.

¹⁶⁰ Bacon, *ILM*(*CS*), *SEH*, III, 625. See Appendix 2. Cf. *NO*, *OFB*, XI, 201, Aphorism 1.

¹⁶¹ Malherbe, “Bacon’s Method of Science,” *The Cambridge Companion to Bacon*, 75-98, on 88.

same as if you say, “In producing heat it is not necessary that you also produce light.”¹⁶²

Because “light is not of the form of heat,” the operator is not tied to light bodies when he wants to produce heat, that is, he can superinduce heat on dark bodies. As Bacon expresses this thought in *Novum organum*: “when (for example) in investigating the form of heat I say *reject tenuity, or tenuity is not the form of heat*, that is like saying that *man can superinduce heat on a dense body* or, conversely, that *man can remove or keep heat from a tenuous body*.”¹⁶³ Hence knowledge and operative freedom go hand in hand. This brings us to Bacon’s operative counterpart to the form of heat. The significance of the following passage for Bacon’s science of magic has been entirely overlooked. Bacon states:

But when the operative part is taken into consideration, the same applies. For the specification [*designatio*] is this: *If in any natural body you are able to spark off a motion of self-dilation or expansion, and to repress [reprimere] the motion and turn it back on itself in such a way that the dilation does not go forward smoothly but is now given its head and now forced to retreat, then without doubt you will generate heat: regardless of whether that body be elementary (as they have it) or impressed by the heavenly bodies, luminous or opaque, tenuous or dense, expanding locally or keeping to its original dimensions, tending to dissolution or staying in its original state, animal, vegetable or mineral, water, oil, or air, or any other substance whatever that is susceptible to the motion just mentioned.*¹⁶⁴

The first half of the passage states that if the operator can “spark off a motion of self-dilation or expansion” (in spirit) and repress/constrain the motion in the way described, he will certainly generate heat. But commentators seem unable to get beyond the first half of the passage. This is unfortunate because the second half of the passage explains why it is that Bacon’s doctrine of forms promises extraordinary operative freedom. The form tells the operator that he can superinduce heat on “*any ... substance whatever* that is susceptible to the motion ... mentioned” (my emphasis). In other words, “Each and every one of the [rejected] natures ... has

¹⁶² My trans., Bacon, *AC, SEH*, III, 794.

¹⁶³ Bacon, *NO, OFB*, XI, 257 (italics in original).

¹⁶⁴ Bacon, *NO, OFB*, XI, 271-273 (italics in original).

nothing to do with the form of heat. And man is free of the lot of them in his operations on heat."¹⁶⁵ Unlike mechanics where the operator is restricted to superinducing natures on very few bodies, metaphysics lays before the operator the widest possible range of ways and means of operating. The widest possible latitude of operation is identified with Baconian magic.

¹⁶⁵ Bacon, *NO, OFB, XI*, 261.

IV. Magic: free operation

Thus far, I have laid down Bacon's route from the limitations of physical axioms (which give rise to *imitationes naturæ*) to metaphysical axioms (forms) which are most abstracted from particulars. In *Novum organum*, Bacon expresses concerns over the abstraction of forms. He says that, "because of the vicious and inveterate custom of meddling with abstractions, it is safer to raise and organise the sciences on foundations which align themselves with the active department so that this may set its imprint and bounds upon the speculative department."¹⁶⁶ Thus, "we should consider, for the purpose of generating or superinducing any nature on a given body, what precept, direction or procedure someone would most wish for; and put that in the most simple and least recondite terms."¹⁶⁷ To continue this account of Baconian forms, it is therefore necessary to deal in depth with aphorism 5 of Book 2 of *Novum organum*. Bacon states:

For example, if someone wanted to superinduce on silver the yellowish colour of gold, or (in compliance with the laws of matter) an increase in weight, or transparency on some stone lacking it, or tenacity on glass, or vegetation on something lacking it, we must (I say) consider what precept or procedure [*præceptum, aut deductionem*] he would most like to have. Now in the first place, someone will doubtless want to be shown something of a kind that will not let him down in operation or deceive him in the experiment. Secondly, he will want to have something laid down for him which will not restrict him or tie him to certain means and certain specific modes of operating. For perhaps he may lack or not be able conveniently to get hold of or lay hands on the means in question. But if there be other means or modes (besides the one recommended) for producing [*progignendæ*] a particular nature, there will perhaps be some among them which lie within the operator's power but from which he is shut out by the narrow scope of the precept, so that he does not derive any advantage [*à quibus nihilominus per angustias præcepti excludetur, nec fructum capiet*]. Thirdly, he will want to be shown something which is not as difficult as that

¹⁶⁶ Bacon, *NO, OFB*, XI, 203.

¹⁶⁷ *ibid.*

very operation he is investigating, but something that is handier for practice [*sed propiùs accedat ad praxin*].¹⁶⁸

On this basis, he concludes:

Thus in the matter of a true and perfect precept for operating [*præcepto vero & perfecto operandi*], this would be the prescription [*pronuntiatum*]: *that it be certain, unrestricted, and arranged or lined up for action* [*vt sit certum, liberum, & disponens, siue in ordine ad actionem*]. And this very prescription [*pronuntiatum*] goes for the discovery of a true form. For the form of any nature is such that if it be in place the given nature invariably follows. Thus it is constantly present when that nature is present, and universally asserts it, and inheres in the whole of it. The same form is such that if it departs, the given nature infallibly disappears. Thus it is always absent when that nature is absent, and always withholds it, and inheres in it not at all. Lastly, a true form is such that it draws up the given nature from some course of being which inheres in many other things, and is (as they have it) better known to nature than the form itself [*Postremò, Forma vera talis est, vt Naturam datam ex fonte aliquo Essentiæ deducat, quæ inest pluribus, & notior est Naturæ (vt loquuntur) quàm ipsa Forma*]. Thus for a true and perfect axiom for knowing, the prescription and precept [*pronuntiatum & præceptum*] is this: *that there be discovered another nature which is convertible with the given nature, but which is nevertheless a limitation of one better known to nature like a true genus* [*vt inueniatur Natura alia, quæ sit cum Naturâ datâ conuertibilis, & tamen sit limitatio Naturæ notioris, instar generis veri*]. And these two prescriptions [*pronuntiata*], the active and contemplative, are the same thing; for what is most useful in operating, is most true in knowing [*& quod in operando utilissimum, id in sciendo verissimum*].¹⁶⁹

The relationship between these two passages provides an insight into how form and operation cohere. It is clear that Bacon's practical criteria map onto his criteria for a true form: both are certain, free, and "*in ordine ad actionem*." Because the form is certain (the given nature is always present when the genus is limited in the way described), the operator who deduces a precept from the form will not be let down in operation.¹⁷⁰ Because the form is free, the operator is not restricted "to certain means and certain specific modes of operating."

Returning to the relation between magic and Bacon's notion of a free direction, I draw attention to *De augmentis* where Bacon identifies "two respects" in

¹⁶⁸ Bacon, *NO, OFB*, XI, 205.

¹⁶⁹ *ibid.*

¹⁷⁰ As discussed above (n. 8), Bacon consistently uses the term *præceptum* to signify a rule of operation. A precept is a deduction from a primary axiom (form).

which metaphysic is “most excellent.”¹⁷¹ The first relates to freedom of operation. According to Bacon, “this way of operating (which looks at simple natures though only in a concrete body) proceeds from the things in nature which are constant, eternal, and catholic, and opens up paths to human power so broad that (as things stand now) human thought can barely grasp or imagine them.”¹⁷² This notion of “broad paths” is central to Bacon’s conception of magic. In *Novum organum*, Bacon terms the practical part of metaphysics, “magic” “on account of the broad paths it opens up and its greater sway over nature.”¹⁷³ In *De augmentis* he says that Solomon (“though in a more divine sense”) elegantly describes metaphysical knowledge when he says, “Thy steps shall not be straitened, and when thou runnest thou shalt not stumble” meaning thereby that the ways of wisdom are not much liable to straitness or obstructions [*angustiis nec obicibus*].¹⁷⁴ According to Bacon,

Metaphysic ... enfranchises the power of men to the greatest liberty, and leads it to the widest and most extensive field of operation [*quod potestatem humanam emancipet maxime et liberet, eamque in amplissimum and apertissimum operandi campum educat*]. For Physic carries men in narrow and restrained ways, imitating the ordinary flexuous courses of nature [*per angustos et impeditos calles humanam operam dirigit, naturæ ordinariæ flexuosos tramites imitata*]; but the ways of the wise are everywhere broad [*sed latae undique sunt sapientibus viæ*]; to wisdom (which was anciently defined to be the knowledge of things divine and human) there is every abundance and variety of means.¹⁷⁵

Bacon continues, “whosoever knows any Form, knows also the utmost possibility of superinducing that nature upon every variety of matter [*qui Formam aliquam novit, novit etiam ultimam possibilitatem superinducendi naturam illam in omnigenam materiam*].”¹⁷⁶ This is a key statement and it explains why Bacon designates his

¹⁷¹ Bacon, *DAS, SEH*, IV, 361, cf. I, 567.

¹⁷² Bacon, *NO, OFB*, XI, 207.

¹⁷³ Bacon, *NO, OFB*, XI, 215.

¹⁷⁴ Bacon, *DAS, SEH*, IV, 363, cf. I, 568; *Prov.*, IV, 12.

¹⁷⁵ Bacon, *DAS, SEH*, IV, 362, cf. I, 568; Cicero, *Tusc. Quæst.*, IV, 26.

¹⁷⁶ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

operative science “magic.” Because forms (or primary axioms) unify nature, they have the widest operative scope. They specify the cause of a simple nature in “*omnigena materia*.” Consequently, the operator comprehends all ways and means of operation. In this way, Bacon’s forms remove “a limitation rather potential than actual, which is when the effect is possible, but the time or place yieldeth not the matter or basis whereupon man should work.”¹⁷⁷ If the operator is not able “to get hold of or lay hands on” certain means, he is no longer “shut out by the narrow scope of the precept, so that he does not derive any advantage.” Because he has “abundance and variety of means,” he can find a means or mode of operation which lies within his power. Again, regarding Bacon’s third practical criterion, viz., that the operator “will want to be shown something which is not as difficult as that very operation he is investigating, but something that is handier for practice,” Bacon’s notion of form fulfils this criterion. Because the form “comprehendeth all the means and ways possible,” the operator can discover how to superinduce the given nature on the widest variety of bodies in the widest variety of ways – from the least difficult to the most difficult.¹⁷⁸ As Bacon says, “the ways of wisdom are not much liable to straitness or obstructions.” In brief, the Baconian form is not tied “either to the basis of the matter or the condition of the efficient.”¹⁷⁹ Consequently, the operator is not tied to “certain means and certain specific modes of operating.”

Bacon’s account here is contrary to the dominant interpretation of a Baconian form in the secondary literature. The vast majority of commentators assert

¹⁷⁷ Bacon, *VT, SEH*, III, 223.

¹⁷⁸ Bacon, *VT, SEH*, III, 223. He does this by deducing middle axioms (rules of operation) from the form (see below).

¹⁷⁹ Bacon, *DAS, SEH*, IV, 362, cf. I, 568.

that, according to Bacon, a form is a recipe.¹⁸⁰ For example, Antonio Pérez-Ramos says that “what Bacon has called ‘Form’ is all at once a statement purporting to unveil the quiddity or essence of a phenomenon by redescribing it in a lawlike manner and a recipe for the successful operation or reinstantiation of it on the basis of the pragmatic effectiveness of that law.”¹⁸¹ According to Pérez-Ramos, “if the knower/*agent* manipulates the relevant variables using the Form as a recipe or ‘direction for action,’” the desired effect can be achieved.¹⁸² Therefore, “to know how means to be able to rearrange Nature’s parts so that the sought-for ‘effect’ could be achieved at will in accordance with natural regularities ... To know, in brief, means to make.”¹⁸³ And yet, as we have seen, the whole point of Bacon’s doctrine of forms is to move away from recipes (a notion that certainly fits the rules of physics) towards the fundamental laws of metaphysics. The claim that a form is a recipe is easily refuted. A recipe, to use William Eamon’s definition, “prescribes specific ingredients and an ordered sequence of events to be followed in preparing them, often specified in exact quantities and measured lengths of time.”¹⁸⁴ In other words, a recipe prescribes specific ways and means of operation – ways and means that are tied to both “the basis of the matter” and “the condition of the efficient.” A recipe is therefore the antithesis of the Baconian form. Bacon only uses the term “recipe” on two occasions – both in *Valerius terminus*. The context makes it

¹⁸⁰ See Peter Dear, “What Is the History of Science the History Of? Early Modern Roots of the Ideology of Modern Science,” *Isis* 96 (2005), 390-406, on 396; Jardine, *Francis Bacon: Discovery and the Art of Discourse*, 111; Pérez Ramos, “Bacon’s Forms and the Maker’s Knowledge Tradition,” in *The Cambridge Companion to Bacon*, 99-120, on 109-110; *idem.*, *Francis Bacon’s Idea of Science*, 131; Rees, *OFB*, XI, lxxi; Mary Hesse, “Francis Bacon’s Philosophy of Science,” in *Essential Articles for the Study of Francis Bacon*, 125.

¹⁸¹ Pérez Ramos, “Bacon’s Forms and the Maker’s Knowledge Tradition,” 109.

¹⁸² Pérez Ramos, *Francis Bacon’s Idea of Science*, 131.

¹⁸³ Pérez Ramos, *Francis Bacon’s Idea of Science*, 292.

¹⁸⁴ William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton, N.J.: Princeton University Press, 1994), 132.

perfectly clear that he is not talking about forms; recipes are new works framed upon middle axioms. Bacon is perfectly aware that forms *per se* do not give sufficient direction for works. As he puts it,

For we see that too remote generalities (unless they be deduced) give little information, and do but offer knowledge to the scorn of practical men; being of no more avail for practice, than an Ortelius's universal map is to direct the way between London and York.¹⁸⁵

And yet commentators have persisted in criticising Bacon for coming up with “nothing but a vague and useless formula.”¹⁸⁶ As W. M. Dickie puts it,

To us it appears very doubtful if a knowledge of forms has the practical value which Bacon claims for it. Can I produce whiteness more readily if I know the form of whiteness than if I know only certain efficient causes of whiteness? Assuredly not. The form of whiteness is the principle of corpuscular structure upon which whiteness depends, and to say, “Produce whiteness by producing the form of whiteness,” is practically the same as saying, “Produce whiteness by producing it.”¹⁸⁷

Commentators – in their rush to assume that Bacon's doctrine of forms is merely inconsistent and incoherent – have misinterpreted him on this fundamental point. Nowhere in the Baconian corpus does Bacon identify *forma* with recipe.

The key to solving the alleged gap between forms and operative magic is Bacon's use of the term *deducere* in the Ortelius passage cited above. Natural magic, Bacon states quite clearly, is “*the Deduction of Forms to Works*.”¹⁸⁸ In Chapter 4 we

¹⁸⁵ Bacon, *DAS, SEH*, IV, 453-454, cf. I, 668.

¹⁸⁶ Whewell, 1831, quoted in Pérez Ramos, “Bacon's Forms and the Maker's Knowledge Tradition,” 115.

¹⁸⁷ W. M. Dickie, “‘Form’ and ‘Simple Nature’ in Bacon's Philosophy,” *Monist* 33 (1923), 428-437, on 434. Likewise Fowler states: “Bacon seems to have thought that, if we could once discover the ‘form,’ we could superinduce the corresponding ‘nature’ on any given body, but this consequence by no means necessarily follows. Suppose we knew the exact ‘form’ of the ‘natures’ which are predicable of and constitute gold, could we superinduce these on silver, or could we eliminate the ‘natures’ which characterise silver and substitute those which characterise gold?” Bacon's *Novum Organum*, 343. Jardine goes so far as to try to “tentatively reconstruct” a recipe for hot milk on the basis of Bacon's preliminary investigations of the forms of heat and whiteness, *Francis Bacon: Discovery and the Art of Discourse*, 118.

¹⁸⁸ Bacon, *DAS, SEH*, V, 121, cf. I, 838 (italics in original).

saw that Baconian magic descends “by a gentle slope” (deduction) to all practical things.¹⁸⁹ And in Chapter 1, I stated Bacon’s definition of magic as:

The science which applies the knowledge of hidden forms to the production of wonderful operations; and by uniting (as they say) actives with passives, displays the wonderful works of nature [*Nos vero eam illo in sensu intelligimus, ut sit scientia quæ cognitionem Formarum Abditarum ad opera admiranda deducat; atque, quod dici solet, activa cum passivis conjungendo magnalia naturæ manifestet*].¹⁹⁰

Magic “leads down [*deducat*] cognition of hidden forms to works to be admired.”¹⁹¹

In Aphorism 21 of Book 2 of *Novum organum* Bacon states that Book 7 of that work will deal with “Bringing things down to Practice or what is relative to man [*de Deductione ad Praxin, siue de eo quod est in Ordine ad Hominem*].”¹⁹²

Unfortunately, this book was never written. However, it is clear that Bacon thought knowledge of forms of itself was insufficient for works. In the case of transmutation of gold discussed at the beginning of this chapter, Bacon derives a trial out of physical axioms. This is followed in *Sylva sylvarum* by an “Experiment solitary touching the nature of gold.”¹⁹³ This experiment is intended to illustrate the difference between physical and metaphysical axioms:

Gold hath these natures; greatness of weight, closeness of parts, fixation, pliantness or softness, immunity from rust, colour or tincture of yellow. Therefore the sure way (though most about) to make gold, is to know the causes of he several natures before rehearsed, *and the axioms concerning*

¹⁸⁹ My trans., Bacon, *SI, SEH*, II, 689.

¹⁹⁰ Bacon, *DAS, SEH*, IV, 366-367, cf. I, 573. The phrase “*Nos vero*” indicates Bacon’s emphasis on the necessary condition for magical power, viz., the discovery of forms. The phrase “uniting actives with passives” is typically used to describe operative power in natural magic. Della Porta speaks of “the mutual and fit application of one thing to another,” *Natural Magick, Thomas Young and Samuel Speed: London, 1658*, facsim. repr. (New York: Basic Books, 1957), 2. Bacon knows precisely how to structure his project in these terms, especially given the success of the natural magic literature.

¹⁹¹ My trans., Bacon, *DAS, SEH*, I, 838.

¹⁹² Bacon, *NO, OFB*, XI, 273. Rees notes that “This part of the *Novum organum* would ... have been central to Bacon’s ideas on the means of converting knowledge into power, and on the role of instrumentation in that process” (Rees, *OFB*, XI, xciv).

¹⁹³ Bacon, *SS, SEH*, II, 450.

the same. For if a man can make a metal that hath all these properties, let men dispute whether it be gold or no.¹⁹⁴

It is clear that knowledge of forms is not sufficient to make gold. This is even clearer in *Advancement of learning* where Bacon states:

For it is a thing more probable, that he that knoweth well the Natures of *Waight, of Colour, of Pliant, and fragile* in respect of the hammer, of *volatile and fixed* in respect of the fire, and the rest, may superinduce vpon some Mettall the Nature, and forme of Gold by such *Mechanique* as longeth to the production of the Naturs afore rehearsed, then that some graynes of the Medecine projected, should in a fewe Moments of time turne a Sea of Quick-siluer or other Materiall into Gold.¹⁹⁵

Likewise in *Novum organum*, Bacon says “he who knows the forms *and means of superinducing* yellow, weight, ductility, fixity, fluidity, dissolution and the rest in their proper degrees and amounts, will see to it that these can be conjoined in a particular body to bring about its transformation into gold.”¹⁹⁶ We have already seen that knowledge of latent schematism and latent process (material and efficient cause) is the domain of physics. Bacon’s prioritisation of mechanics throughout the method (see Chapter 4) means that inquiry is always “*in ordine ad actionem*.”¹⁹⁷ However,

¹⁹⁴ Bacon, *SS, SEH*, II, 450 (my emphasis).

¹⁹⁵ Bacon, *AL, OFB*, IV, 89 (italics in original & my emphasis).

¹⁹⁶ Bacon, *NO, OFB*, XI, 207 (my emphasis).

¹⁹⁷ It should be noted that, according to Bacon, the “investigation of nature turns out best when physics is given definition by mathematics” (*NO, OFB*, XI, 213). Bacon stipulates that when collecting the natural history “every thing to do with natural phenomena, be they bodies or virtues, should (as far as possible) be set down, counted, weighed, measured and defined. The same is true in Physics: we are after works not speculations, and, indeed, a good marriage of Physics and Mathematics begets practice” (*PAH, OFB*, XI, 465). In *De augmentis* Bacon designates mathematics “both in Physics and Metaphysics and Mechanics and Magic, as appendices and auxiliaries to them all” (*DAS, SEH*, IV, 370, cf. I, 576). These Appendices deal with “the *measurements of motions*; namely what is the effect of the *how much* or *dose* in nature; what of the distance, which is not unfitly called the orb of virtue or activity; what of rapidity or slowness; what of short or long delay; what of the force or dulness of the thing; what of the stimulus of surrounding things” (*DAS, SEH*, IV, 357, cf. I, 561). The measurements of motions are given detailed treatment in *Novum organum* where they form part of the prerogative instances (see Appendix 3). According to Bacon, “for the most part operation lets you down ... by inaccurate determination and measurement of the powers and actions of bodies ... and unless [the measures of motions] have been well and carefully weighed up, the sciences will perhaps be pretty as speculation, but fall flat in practice” (*NO, OFB*, XI, 367). Clearly – as Rees argues – mathematics plays a crucial role in Bacon’s programme. Without the union of physics and mathematics there can be no science of magic. As Bacon explains, “as Physic [the doctrine concerning nature] advances farther and farther every day and develops new axioms, it will require fresh assistance from Mathematic in many things” (*DAS, SEH*, IV, 371, cf. I, 578). In fact, one particular type of magical instance depends entirely upon measures of motions (see *NO, OFB*,

observation 999 of *Sylva sylvarum* states that “in the practical part of knowledge, much will be left to experience and probation, whereunto indication cannot so fully reach.”¹⁹⁸ Knowledge of forms brings knowledge of “the utmost possibility of superinducing that nature upon every variety of matter.” Bacon apparently thinks that middle axioms can be deduced from primary axioms (forms). This is because metaphysics “collect[s] and unite[s] the axioms of sciences into more general ones, and such as may comprehend all individual case.”¹⁹⁹ Conversely (Bacon thinks), middle axioms can be drawn out of or deduced from primary axioms (forms). But ultimately the sagacity of the mechanic will play a crucial role in transmutation.

This brings us to the second respect in which metaphysic is “most excellent.” According to Bacon, “it is the duty and virtue of all knowledge to abridge the circuits and long ways of experience (as much as truth will permit), and to remedy the ancient complaint that ‘life is short and art is long.’”²⁰⁰ Bacon repeatedly states that the work of interpretation “is to abridge experience and to make things as certainly found out by Axiom in short time, as by infinite experiences in ages.”²⁰¹ In *Novum organum* he writes:

We should have every hope that nature’s recesses still contain many secrets of excellent use which are quite unrelated to and unparalleled by anything already discovered, but stand well off the beaten track of fancy and are still undiscovered. These very things will also no doubt come to light some day after the lapse of long ages ... but by the route of which I now speak they can be speedily, suddenly and simultaneously anticipated and made manifest.²⁰²

XI, 443). On the role of mathematics in Bacon’s programme see Rees, “Quantitative Reasoning in Francis Bacon’s Natural Philosophy,” *Nouvelles de la république des lettres* (1985), 27-48; *idem.*, “Mathematics And Francis Bacon’s Natural Philosophy,” *Revue internationale de philosophie* 40 (1986), 399-426.

¹⁹⁸ Bacon, *SS*, *SEH*, II, 672.

¹⁹⁹ Bacon, *DAS*, *SEH*, IV, 361, cf. I, 567.

²⁰⁰ Bacon, *DAS*, *SEH*, IV, 361, cf. I, 567.

²⁰¹ Bacon, *VT*, *SEH*, III, 247.

²⁰² Bacon, *NO*, *OFB*, XI, 167-169.

According to Bacon, “nothing anticipates or gets ahead of chance (whose custom is to work only over long ages) except the discovery of forms.”²⁰³ Primary axioms (forms) indicate all possible inventions. With knowledge of forms comes power to effect “all things possible.”²⁰⁴ Hence in *Valerius terminus* Bacon describes his goal as “discovery of all operations and possibilities of operations.”²⁰⁵ We have seen that, according to Bacon, “the fabric of nature contains in her own lap and bosom every event whatever ... and developes them in due season by a fixed law.”²⁰⁶ Forms describe the explications of this law, thereby permitting man to produce them spontaneously rather than waiting for nature to “develope them in due season.” As Bacon explains elsewhere, the method “contain[s] within itself the potentiality of all particular inventions.”²⁰⁷ This is because matter contains within itself the potentiality of all particular inventions. This brings us back to the metaphysics/physics distinction. As Maxwell Primack points out,

Physics as conceived by Bacon is concerned with the ordinary course of nature, i.e., matter as it is organized. Metaphysics (as the study of the forms of simple natures) is concerned with the exceptionless laws of nature, the existence of which is suggested to Bacon by his conception of matter as distinct from the world order.²⁰⁸

In other words, metaphysics considers nature from a cosmogonical perspective. Primack rightly argues that “On the basis of the distinction that he makes between matter and the world, Bacon distinguishes two kinds of uniformities in nature: (1) uniformities that hold only for the most part, or which could conceivably have exceptions ... ; (2) uniformities that hold without exception and would hold for any

²⁰³ Bacon, *NO*, *OFB*, XI, 303.

²⁰⁴ Bacon, *NA*, *SEH*, III, 156.

²⁰⁵ Bacon, *VT*, *SEH*, III, 222.

²⁰⁶ Bacon, *DAS*, *SEH*, IV, 321, cf. I, 524.

²⁰⁷ Bacon, *CV*, *BF*, 92, cf. *SEH*, III, 611.

²⁰⁸ Maxwell Primack, “Outline of a Reinterpretation of Francis Bacon’s Philosophy,” *Journal of the History of Philosophy* 5 (1967), 123-132, on 127.

world composed of the same matter as ours.”²⁰⁹ As we have seen, the rules of physics are confined to concrete bodies – permitting only superficial deflections from nature’s ordinary course. In contrast, the exceptionless laws of metaphysics cut across all possible species. Hence man can spontaneously bring forth true *nova*. As Bacon explains, “Such works are called *Epistemides*, that is, daughters of knowledge, which do not come into actuality otherwise than through knowledge and pure interpretation.”²¹⁰ In the following section I examine how, according to Bacon, magic (which he terms “primary action”) could recapitulate the original cosmogonical binding of matter.²¹¹

²⁰⁹ Primack, “Outline of a Reinterpretation of Francis Bacon’s Philosophy,” 125.

²¹⁰ My trans., Bacon, *DIN, SEH*, III, 788.

²¹¹ Bacon, *NO, OFB*, XI, 207.

V. Re-creation *ex chao*

The proposed resolution of the Baconian doctrine of forms offered here is consistent with an explication of Baconian magic. Knowledge of forms (“laws of pure act”) is knowledge of the fashioning and governing of matter’s behaviour.²¹² The ubiquitous presence in the Baconian corpus of the concept of binding highlights the central role of Bacon’s cosmogony in his science of magic.²¹³ Baconian magic recapitulates (at the level of operation) the primordial binding of matter’s inordinate potency. For Bacon, there is no ontological distinction between imitations and *nova*. This distinction reflects the different scope of physical and metaphysical axioms. Freedom of operation (magic) depends on knowledge of forms. Physics operates without knowledge of forms, hence it is confined to imitating nature’s ordinary course. The hierarchy of Baconian forms is active at all levels of reality from the primordial down to the local levels of change observable in nature free. Because forms are universal active internal agents, they provide the Baconian Magus with the key to a recapitulation of matter’s cosmogonical unfoldings. Baconian magic is a re-creation: it replicates experimentally by a reduction of existing bodies to chaos (or putrefaction) in order to superinduce new natures. To understand how Baconian magic is a re-creation, it is necessary to consider Bacon’s use of the terms *compositio* and *mistio*.

²¹² Bacon, *NO*, *OFB*, XI, 119-121.

²¹³ It is noteworthy that Bacon (like Bruno) retains the notion of magic as the power to bind. Kirby Flower Smith writes, “Possession or obsession ... is a constraint, any form of metamorphosis ... is a constraint, *fascinatio* in all its numerous forms is a constraint. The ancients habitually associate the processes of magic with the ideas of binding, tying up, nailing down, and their opposites. A magic act is a κατάδεσμος, a κατάδεσις, a *defixio*, a *devinctio*; the removal of its effect is ἀνάλυσις, a *olutio*, and the corresponding verbs are, e.g., καταδέω, *defigo*, λύω, *solvo*,” in *Encyclopædia of Religion and Ethics* (Edinburgh: T. & T. Clark, 1915), 279.

Compositio refers to the operator's physical uniting of bodies and *mistio* to the outcome of union where a new form obtains: the former is the work of man and the latter is the work of nature. In describing the *compositio-mistio* distinction, Bacon notes its general use:

The difference is excellent which the best observers in nature do take between *compositio* and *mistio*, putting together and mingling: the one being but a conjunction of bodies in place, the other in quality and consent: the one the mother of sedition and alteration, the other of peace and continuance: the one rather a confusion than an union, the other properly an union. Therefore we see those bodies which they call *imperfecte mista* last not, but are speedily dissolved [...] So as the difference between *compositio* and *mistio* clearly set down is this; that *compositio* is the joining or putting together of bodies without a new form: and *mistio* is the joining or putting together of bodies under a new form. For the new form is *commune vinculum* [a common bond], and without that the old forms will be at strife and discord.²¹⁴

Bacon is clear that "for works man can do nothing except bring natural bodies together or put them asunder; nature does the rest from within."²¹⁵ By means of *compositio*, Bacon hopes to achieve the conflation of simple motions: the result is *mistio*. When *mistio* takes place, fusing motions in dynamic tension, a new form is superinduced. Hence *mistio* requires a *commune vinculum*, otherwise the body will dissolve. However, Bacon expressly maintains that a common bond will form only if the bodies brought together consent. As shown in Chapter 2, the term "consent" refers to the tendency of bodies to unite willingly. When this occurs the *compositio* of consenting bodies results in *mistio*. The operator has no direct power over *mistio*. Although he understands forms, he only provides favourable conditions by bringing together consenting bodies. It is matter alone that produces the new form. The following passage elaborates on this idea:

²¹⁴ Bacon, *A Brief Discourse Touching the Happy Union of the Kingdoms of England and Scotland*, LL, XI, 93-94. In Chapter 6, I return to Bacon's letter to James in relation to the Baconian unity of the sciences.

²¹⁵ Bacon, *NO, OFB*, XI, 65.

The natural philosophers say well, that *compositio* is *opus hominis*, and *mistio opus naturæ*. For it is the duty of man to make a fit application of bodies together, but the perfect fermentation and incorporation of them must be left to Time and Nature ... So we see, after the grift is put into the stock and bound, it must be left to Nature and Time to make that *continuum*, which was at first but *contiguum*.²¹⁶

Opus naturæ refers to matter as potency (*natura naturans*), that is, to the form.²¹⁷

The resulting body, from the point of view of substratum, is a schematism (or fabric) which keeps its form because it is subject to a common bond. In this case, the body is a genuine *mistio*. The converse of this is that novel schematisms will always be novel bodies bound by a common bond, and hence Baconian *nova* are *mistio*.²¹⁸ The operative governance of *mistio* is nothing less than a key to Cupid's secret primordial power over the elements. When found, this key will permit, at the level of individual bodies, a recapitulation of the original creation *ex chao*.²¹⁹

The successful production of *mistio* (or *nova*), rather than simple *compositio* is facilitated by an inquiry into motion:

We should investigate those appetites and inclinations of things by which all that variety of effects and changes which we see in the works of nature and art is made up and brought about [*conflatur et emergit*]. And we should try to enchain Nature, like Proteus; for the right discovery and distinction of the kinds of motions are the true bonds of Proteus. For according as motions, that is incentives and restraints, can be spurred on or tied up [*Nam prout motuum, id est, incitationum et cohibitionum, stimuli et nodi adhibentur*], so follows conversion and transformation of matter itself.²²⁰

The phrase “incentives and restraints” is an apt and succinct description of both the primary appetitive power of Cupid and of magical operation. Cupid holds the key

²¹⁶ Bacon, *A Brief Discourse Touching the Happy Union of the Kingdoms of England and Scotland*, LL, X, 98.

²¹⁷ Bacon, *NO, OFB*, XI, 201.

²¹⁸ Consequently, Bacon rejects some traditional formulations of the *compositio-mistio* relationship – for example, Galen's claim that man has no power over *mistio*. Instead he states emphatically that knowledge of consenting bodies will permit man to govern *mistio*. William Newman identifies the exact source of Bacon's criticism viz., Galen's *De temperamentis*, see *Promethean Ambitions*, 259.

²¹⁹ In *Historia densi & rari* Bacon speaks of this “power of the keys, which binds and loosens” (*HDR, OFB*, XIII, 129). See also Matt. 16: 19, 18: 18.

²²⁰ Bacon, *CDNR, SEH*, V, 425, cf. III, 20-21.

because he understands how to excite and goad, and how to restrain and hold back stabilised structures (schematisms). Likewise, magic provokes and restrains sums of simple motions. The simple motions are the locus of all power because change supervenes on motion. Discovery of the “true bonds of Proteus” (simple motions) is the key to nature’s metamorphic potential. Hence Bacon describes “the transformation or metamorphosis of bodies” as “a really noble and rare sum [of simple motions] ... a most powerful effect in nature and one by which human power is ... raised to the highest degree.”²²¹ Knowledge of forms is the key to matter’s appetitive power. The “laws of pure act” that fashion and govern matter’s behaviour are laws of motions.²²² This terminus of knowledge can be seen in the following passage:

For the principles, fountains, causes, and forms of motions, that is, the appetites and passions of every kind of matter, are the proper objects of philosophy; and therewithal the impressions or impulses of motions, the restraints and reluctations, the passages and obstructions, the alternations and mixtures, the circuits and series [*catenæ*]; in a word, the universal process of motions.²²³

Bacon’s science of magic is nothing less than a complete understanding and control of motions so that it becomes possible

by proper methods and a course of application suitable to nature [*ministerio naturæ convenienti*], to acquire the power of exciting, restraining, increasing, remitting, multiplying, and calming and stopping any motion whatever in a matter susceptible of it; and thereby to preserve, change, and transform bodies.²²⁴

This is the real import of the purported Baconian phrase “knowledge is power.”²²⁵

The simple motions and their hidden possibilities constitute the material basis of

²²¹ Bacon, *ANN, OFB*, XIII, 209.

²²² Bacon, *NO, OFB*, XI, 119-121.

²²³ Bacon, *CDNR, SEH*, V, 426, cf. III, 21-22.

²²⁴ Bacon, *CDNR, SEH*, V, 426, cf. III, 22.

²²⁵ In *Novum organum*, Bacon says, “Human knowledge and power come to the same thing, for ignorance of the cause puts the effect beyond reach” (*OFB*, XI, 65).

Bacon's programme: "it is most certain," he says, "that by how much the more simple motions are discovered, by so much will the power of man be increased."²²⁶

The binding power, required by the Baconian magician, belongs principally to the form of tenuous matter which Bacon calls "attached" (*devinctus*) spirit.²²⁷ Spirit, as the "rich and fruitful supply of active power," is the principle by which material transformation occurs.²²⁸ Human agents cannot access this capacity to bind directly: an operator can only arrange things so that spirit's transformative power is directed to particular ends. The operator harnesses spirit's binding power by constraining it. In *Historia densi et rari* Bacon describes a simple experiment to illustrate this principle. He instructs the operator to fill a strong iron cube up to the brim with pure water. He must then "put an iron lid on top no less strong than the sides of the container, and seal it up ... so that it is as tight as a drum and can withstand ... fire."²²⁹ The container should then be placed among the coals for some hours, but removed periodically and allowed to cool down. Bacon explains that he has

chosen the experiment of pure water for this reason: that water is the simplest of bodies, lacking colour, smell, taste, and other qualities. And therefore, if the spirit of the water ... were not given off but were provoked and attenuated by heat of this sort to turn itself on the grosser parts of the water and could so dispose and change them into a new schematism (namely, one less simple and more unequal) until it either took on some colour, smell, taste, a kind of oiliness, or some other remarkable alteration ... then no doubt an extraordinary thing would be accomplished.²³⁰

Spirit is provoked because matter is eternal, and therefore resists all attempts at its destruction. But no schematism is immune from dissolution and there are no bonds

²²⁶ Bacon, *CDNR, SEH*, V, 426, cf. III, 22.

²²⁷ Bacon, *HDR, OFB*, XIII, 61-63. On Bacon's concept of inanimate spirit see Rees, esp. *OFB*, VI, lix-lxv; D. P. Walker, "Francis Bacon and *Spiritus*," in *Science, Medicine, and Society in the Renaissance: Essays to Honour Walter Pagel*, ed. A. G. Debus (New York: Science History Publications, 1972), 121-130; idem., "Spirits in Francis Bacon," in *Francis Bacon: terminologia e fortuna nel XVII secolo*, ed. Marta Fattori (Rome: Edizioni dell'Ateneo, 1984), 315-327.

²²⁸ Bacon, *DSV, SEH*, VI, 759; cf. 681.

²²⁹ Bacon, *HDR, OFB*, XIII, 101.

²³⁰ Bacon, *HDR, OFB*, XIII, 103.

which do not tend to disruption. Without this absolutely foundational principle Baconian magic would be impossible. Bacon's claim in the above experiment is that we witness the binding or fashioning power of spirit. So long as it is present spirit exercises its organisational capacity. It is this administrative feature of spirituous matter which prevents putrefaction – a return to chaos at the local level. But when spirit is vexed this governing power is temporarily overruled and putrefaction follows.²³¹ For this reason, Bacon pays very close attention to the processes of dissolution, corruption and putrefaction. Counteracting the inherent tendency of bodies to dissolve, spirit acts as the principal source of restraint in composite things:

For as long as ... bodies are filled with a nimble spirit which, like the very lord of all, orders and controls their particular parts of whatever kind, so long the control stops homogeneous things coming together, but once that spirit evaporates or cold smothers it, then the parts, freed from the control, come together according to their natural inclination. And so it comes about that all bodies containing a sharp spirit ... last without separating out because of the permanent, durable control exercised by the dominant and mastering spirit.²³²

In striking governmental metaphors, Bacon outlines the almost bureaucratic function of spirituous matter.²³³ Without spirit's capacity for organisation and internal workmanship there would be no individual coherence. This is why dissolution and putrefaction are so important for Bacon: they exhibit spirit's countervailing generative power whose motions are the source of the common bond. Its governing and executive role is brought out in Bacon's reference to the motion of spirit as the

²³¹ In Century IV of *Sylva sylvarum* Bacon discusses putrefaction. He says "it is an inquiry of excellent use to inquire of the means of preventing or staying putrefaction; for therein consisteth the means of conservation of bodies: for bodies have two kinds of dissolutions; the one by consumption and desiccation, the other by putrefaction" (SS, SEH, II, 453). I suggest that the cube experiment induces putrefaction.

²³² My trans., Bacon, *NO, OFB*, XI, 394-396.

²³³ Bacon elaborates on this in *De sapientia veterum*. Proserpina (who signifies spirit) is "Mistress or Queen of Dis: for the spirit does in fact govern and manage everything in those regions, without the help of Pluto [Bacon's figure for tangible matter], who remains stupid and unconscious" (*DSV, SEH*, VI, 759, cf. 681).

“*Royal or Political Motion.*”²³⁴ It orders the parts of a body, he explains, “not according to their own desires but to the well-being of the governing part, such that the ruling part exercises a kind of *Government or Political Power* over the subject parts.”²³⁵ “This motion,” Bacon continues, “is eminently conspicuous in the spirits of animals, where, as long as it is in vigour, it tempers all the motions of the other parts.”²³⁶ For Bacon, magic is ultimately control of the controller, that is, control of spirit. Magical effects are brought about by constraining spirit: through either “simple imprisonment and violence” (as in the iron cube) or “administering [*per ministracionem*] some suitable aliment” so that “the spirit is detained willingly.”²³⁷ In the latter case, the Baconian operator uses “motions that are in [his] power” (i.e. the associating and disassociating of natural bodies) to “excite inward motions [of spirit] that are not in [his] power, by consent.”²³⁸ Because “man can do nothing except bring natural bodies together or put them asunder,” he must entice nature into doing “the rest from within.” For Bacon,

Strife and friendship in nature are the spurs of motions and the keys of works. Hence are derived the union and repulsion of bodies, the mixture [*mistio*] and separation of parts, the deep and intimate impressions of virtues, and that which is termed the junction of actives with passives; in a word, the *magnalia naturæ*.²³⁹

Elsewhere he calls “the individual and particular friendships and quarrels or sympathies and antipathies of bodies ... *motion of the minor congregation.*”²⁴⁰ The operator must use his knowledge of consents to excite motion of the minor

²³⁴ Bacon, *NO, OFB*, XI, 409.

²³⁵ Bacon, *NO, OFB*, XI, 409.

²³⁶ Bacon, *NO, SEH*, IV, 228, cf. *OFB*, XI, 408.

²³⁷ Bacon, *DSV, SEH*, VI, 760, cf. 681; *HVM, SEH*, V, 329, cf. II, 220. On magical effects brought about via consent see *NO, OFB*, XI, 443.

²³⁸ Bacon, *SS, SEH*, II, 367.

²³⁹ Bacon, *Historia sympathiæ et antipathiæ rerum, SEH*, V, 203, cf. II, 81.

²⁴⁰ Bacon, *ANN, OFB*, XII, 197.

congregation. We can now see why Bacon defines magic as “the science which applies the knowledge of hidden forms to the production of wonderful operations; and by uniting (as they say) actives with passives, displays the wonderful works of nature.”²⁴¹

Bacon identifies putrefaction (the dissolution of the old form) with “anarchy” because it results from the loss of spirit’s governing power.²⁴² For Bacon, “dissolution of the old form, i.e. that very coming together of like to like, precedes the putrefaction which paves the way for generation of the new. Now if nothing gets in the way of the process simple dissolution occurs; but if different obstacles are encountered putrefactions set in and these are the rudiments of new generation.”²⁴³ The cube experiment (Bacon anticipates) will display the “inception of putrefaction as in water corrupted, which has a kind of fatness or oil.”²⁴⁴ The point of putrefaction is chaos or “anarchy” but it is also the point at which a new form may be superinduced. The Baconian operator must therefore have detailed knowledge of the optimal point (the mid-point) at which dissolution is recoverable but the body is still fluid enough to fashion “marvellous metaschematisms.”²⁴⁵ Thus the precise relationship between putrefaction (dissolution or chaos) and creation is of central importance in Baconian operative science. As he puts it in *De sapientia veterum*:

²⁴¹ Bacon, *DAS, SEH*, IV, 366-367, cf. I, 573.

²⁴² Bacon, *Commentarius solutus, LL*, XI, 71.

²⁴³ Bacon, *NO, OFB*, XI, 397, cf. *ANN, OFB*, XIII, 205. This coming together of like parts to like parts is due to motion of the minor congregation. According to Bacon, this motion is brought into play “both with regard to adjacent and neighbouring bodies as well as within [bodies’] own parts” (*ANN, OFB*, XIII, 197). In *Novum organum* Bacon discusses “government of motion when one body meeting another checks, repels, releases or directs the other’s spontaneous motion” (*NO, OFB*, XI, 435). He says “this generally consists in the shapes and positions of vessels. For an upright beak in alembics helps vapours condense, whereas one pointing down in receiving vessels helps sugar get deposited. However, sometimes you need a coiled one, or one that is broad and narrow by turns, and so on” (*ibid.*). The vessels supply obstacles to motions.

²⁴⁴ Bacon, *SS, SEH*, II, 460.

²⁴⁵ Bacon, *HDR, OFB*, XIII, 103.

The full and legitimate time ... for completing and bringing forth the species out of matter already duly prepared and predisposed ... is the middle point between the first rudiments of them and their declination. And this we know from the sacred history to have been in fact at the very time of the creation.²⁴⁶

The reference to creation ought not to be taken lightly and directly impinges on the idea that magical power is a recreation *ex chao*. Bacon draws a comparison between the work of the six days in Genesis and the potential for human re-creation. In *Novum organum* he states, "Discoveries are ... like new Creations [*quasi novæ Creationes*] ... and imitations of God's handiwork."²⁴⁷ It is no coincidence that the natural-philosophical "Order or Society" in Bacon's *New Atlantis* "is sometimes called ... the College of the Six Days Works."²⁴⁸ What is even more significant, especially given Bacon's concept of a powerful and fecund matter as the unique *causa causarum*, is his use of Lucretius' phrase, "And RECREATED life," to illustrate this process.²⁴⁹ Bacon's notion of man as a second creator derives from his concept of a plenipotentary matter and his materialism should be recognised as a fundamental constituent of his natural philosophy notwithstanding the theological issues this raises.

²⁴⁶ Bacon, *DSV*, *SEH*, VI, 726, cf. 651. The importance of corruption and chaos cannot be overstated. As Bacon puts it, "The inducing and accelerating of putrefaction is a subject of a very universal inquiry: for corruption is a reciprocal to generation: and they two are as nature's two terms or boundaries [being and non-being]; and the guides to life and death" (*SS*, *SEH*, II, 451).

²⁴⁷ Bacon, *NO*, *OFB*, XI, 193.

²⁴⁸ Bacon, *NA*, *SEH*, III, 146.

²⁴⁹ Lucretius, *De rerum natura*, 6, 3 cited in Bacon, *NO*, *OFB*, XI, 193.

VI. Conclusion

Nature free (*natura naturata*) is only the lazy and habitual expression of *natura naturans* filtered through a hierarchy of constraints or bindings. Matter's underlying irrepressible fecundity will eventually find expression in all possible transformations of which it is capable, over the long course of ages as part of the vicissitude of things. Baconian magic is essentially the abridgement of time and Bacon illustrates its power when he says that "even in Divine miracles, accelerating of the time is next to the creating of matter."²⁵⁰ Forms are the key to this process and the term "recipe" is highly inappropriate. I have also rejected the view that Baconian magic is covered by the terms *imitationes* and "maker's knowledge." The science of magic, in Bacon's view, possesses the power to alter nature "radically and shake it to its depths."²⁵¹ To shift nature from its otiose condition, the Baconian operator recapitulates the original binding of matter. The relationship of Bacon's cosmogony to the experimental replication of chaos is not addressed in current Baconian commentary.²⁵²

According to Bacon, the primordial Chaos "is without form."²⁵³ His critique of Telesio (as we saw in Chapter 2) is aimed partly at his ignoring the importance of the Chaos, because without chaos there is no possibility of "changes in the Great

²⁵⁰ We have already seen the connection between miracles, the abridgement of time and magical operations. *Sylva sylvarum* Century IV is largely devoted to explaining how "divine miracles" can be imitated by the acceleration (or retardation) of time (*SS, SEH*, II, 442). Bacon remarks, "acceleration of time may be esteemed *inter magnalia naturae*" (*ibid.*). The *Sylva* is replete with discussions on ways and means to accelerate and retard physical processes: germination (Experiments 401-412 and 413-421 respectively); putrefaction (Experiments 329-340 and 341-351); birth (Experiment 353); stature (Experiment 354); maturation (Experiments 312-324).

²⁵¹ Bacon, *DGI, OFB*, VI, 103.

²⁵² For an alternative discussion of chaos, see Graham Rees, "Introduction," *OFB*, VI, xlix.

²⁵³ Bacon, *DPAO, OFB*, VI, 209.

Schematism.”²⁵⁴ A philosophy that ignores chaos is, says Bacon, “a frivolous product of the limitations of the human mind.”²⁵⁵ I have argued that without the reduction to chaos, Baconian magic cannot create *nova*. This underscores the scale of the Baconian project, viz., to establish a systematic new science whose function is the discovery of forms, and whose sole purpose is to re-organise matter’s occult powers.²⁵⁶ When in place, this science of magic will actualise benefits of unimaginable novelty and too numerous to comprehend.

To appreciate the extraordinary extent of the Baconian vision and to underline the distinction between physics and metaphysics, I shall contrast a passage from Cicero’s *De natura deorum* with a passage from Bacon. In Cicero’s dialogue, Balbus proclaims:

²⁵⁴ Bacon, *DPAO, OFB*, VI, 251.

²⁵⁵ Bacon, *DPAO, OFB*, VI, 251.

²⁵⁶ Baconian commentary is blind to Bacon’s vision of transformative power because it cannot locate a practical systematic account of transmutation and its causes. I suggest that *Sylva sylvarum* in presenting itself as “a high kind of natural magic” fulfils the required system (SS, *SEH*, II, 378). If one considers the list of *Magnalia Naturæ* appended to the *New Atlantis*, it is evident that all, or virtually all, the topics in this long list are covered, often at length, in the *Sylva*. The operational goal of Baconian science (defined at the opening aphorism of Book 2 of *Novum organum* as the superinduction of forms), which I have argued in this chapter is quintessentially a magical procedure, is handled in the *Sylva* under the terms “version,” “conversion,” “perfect concoction,” and “maturation” (a degree of concoction), and absolute conversions are distinguished into assimilation and transmutation (SS, *SEH*, II, 613-614). Thus the *Sylva* could certainly be considered as a kind of manual of Baconian magic. The preface to *Sylva sylvarum* also claims that there is a “secret order” and that “he that looketh attentively into [these particulars] shall find [it]” (SS, *SEH*, II, 337). Without a full investigation it is unwise to pre-empt any intricate patterning that might be discovered in Bacon’s movement from “experiment” to “experiment” throughout the course of the *Sylva*. My proposal for the overall order to the *Sylva* is one which suggests that posthumous publication was no accident. This is purely tentative and requires a great deal of exegetical attention, but I propose that the *Sylva* is Bacon’s contribution to the genre of hexameral commentary, though it takes the form of an anti-Genesis, or at least a counter-Genesis. It follows, in general terms, the sequence of the six days works, but handles the topics demystified and naturalised. As Rawley says, “for his lordship’s course is to make wonders plain, and not plain things wonders” (II, *SEH*, 336). Moreover, the motto on the engraved title is Genesis 1: 7, “*Et vidit Deus lucem quod esset bona.*” Furthermore, the prefatory phrase “an ill-digested heap of particulars” echoes the opening lines of Ovid’s *Metamorphoses* in its description of the original chaos as a “rude and undigested heap” (trans., F.J. Miller 1, 5-7). It also echoes Della Porta’s 20th chapter of *Natural Magick*, which he calls “Chaos” because it contains materials “heaped ... altogether confusedly,” and interestingly he begins with the same experiment on the separation of the waters that Bacon uses in his opening to *Sylva*. (Genesis opens with the spirit of God moving “on the face of the deep” and the separation of the waters). See Della Porta, *Natural Magick*, 395; Genesis 1: 2, 1: 6. I have already noted the correspondences between Genesis and features of the *New Atlantis*.

The entire command of the commodities produced on land is vested in mankind. We enjoy the fruits of the plains and of the mountains, the rivers and the lakes are ours, we sow corn, we plant trees, we fertilize the soil by irrigation, we confine the rivers and straighten or divert their courses. In fine, by means of our hands we essay to create as it were a second world [*quasi alteram naturam*] within the world of nature.²⁵⁷

On the face of it, there is a striking similarity between this passage and the following passage from Bacon:

Then at last as it were another nature [*veluti altera Natura*] will establish its manifoldnesses [*plerumquitates*] whose wanderings are to be as marvels.²⁵⁸

In both cases, there is the notion of altering the realm of nature (the current universe) so that it becomes “as it were another nature.” Whereas Cicero is describing man’s limited dominion (the equivalent of Baconian physics) over the current world, Bacon envisages the production of an “alternative ... universe of things” (the realm of Baconian metaphysics and its operative counterpart magic). In the fable of Atalanta, Bacon underlines the distinction between *imitationes* and *nova*. He glosses Atalanta’s distractedness as a waste of operative power in the pursuit of profit, whereas the investigation into forms would succeed in outstripping nature and, he says bluntly, “according to the agreement and condition of the contest put her [Nature] to death or destroy her.”²⁵⁹ Nature destroyed is nature shifted entirely from its ordinary course; the means of achieving this is the experimental evocation of the dormant powers of *natura naturans*. Inducing nature to deviate itself from its accustomed paths is summed up in the Baconian aphorism that “nature is not conquered save by obeying it.”²⁶⁰ Baconian magic is radically transformative “since many of the things we seek from the fountains of nature [*ex fontibus rerum*] fail to

²⁵⁷ Cicero, *De natura deorum* 2, 60 in *De natura deorum and Academica*, trans. H. Rackham, Loeb Classical Library (London: William Heinemann Ltd, 1933) 267-269.

²⁵⁸ My trans., Bacon, *DIN, SEH*, III, 787.

²⁵⁹ Bacon, *DSV, SEH*, VI, 744, cf. 668.

²⁶⁰ Bacon, *NO, OFB*, XI, 65.

flow in the usual channels.”²⁶¹ This is not a destruction of nature *per se*: destruction of matter and its irrepressible productive power is impossible. This is figured in the Proteus myth where the binding of Proteus is analogous to the primal constraints imposed on the absolute power of matter. In the iron cube, the power of heat causes “distillation in close” and provokes the “Proteus of matter” to “turn and change into many metamorphoses.”²⁶² Under constraint, matter transforms itself into multiple forms – a chaos of forms – because of the “impossibility of annihilation.”²⁶³ The recreation from chaos is possible at the experimental level because it recapitulates Chaos and the emanation of forms at the primordial level. In brief, the doctrine of forms is Bacon’s operational key to a science of magic which recapitulates the original cosmogonical binding of matter.

²⁶¹ Bacon, *NO, OFB*, XI, 165.

²⁶² Bacon, *SS, SEH*, II, 383.

²⁶³ Bacon, *SS, SEH*, II, 383-384. The cube experiment restates Bacon’s foundational doctrine of the “impossibility of annihilation”. In this experiment the effect of heat is to cause “a great work wrought in nature, and a notable entrance made into strange changes of bodies and productions” (*SS, SEH*, II, 383). He then repeats the concept of the abridgment of time when he says fire can do “in small time, [what] the sun and age do in long time” (*ibid.*).

Chapter 6

Conclusion

But indeed the chief business of the Persian magic (so much celebrated) was to note the correspondences between the architectures and fabrics of things natural and things civil. Neither are these only similitudes (as men of narrow observation may perhaps conceive them to be), but plainly the same footsteps of nature [*vestigia aut signacula*] treading or printing upon different subjects and matters.¹

Throughout this thesis I have argued against fragmenting Bacon's programme. In Chapter 1, I accounted for the neglect of Baconian magic on two grounds: the failure to engage with Bacon's substantive natural philosophy, and his characterisation as a transitional figure. As a corrective to ill-conceived historical categories and to refocus on Bacon's self-understanding, I suggested an historiographical shift prioritising textual exegesis over a contextual approach. I also suggested that instead of representing Bacon's system as eclectic it was more fitting to describe it as a synthesis. Regarding Bacon's efforts as a synthesis leads to a consideration of the unity of the sciences. Chapter 2 located the foundation of Bacon's synthesis in the cosmogonical unfolding of an appetitive and radiative matter. As *causa causarum*, matter's inherent powers of explication organise cosmological structures terminating in the ordinary course of nature. Bacon's goal is to discover what nature can be made to do. Chapter 3 dealt with neglected aspects of Baconian inquiry and the therapeutic reduction of the mind to ignorance and humility. I argued that Bacon exposed the mind's spellbound fascination with ersatz systems. In response to matter's inaccessible darkness and the fecundity of its phenomenal productions, the

¹ Bacon, *DAS, SEH*, IV, 339, cf. I, 542-543.

mind finds solace in fantastic explanations. Bacon undertakes a therapeutic regime of the mind and I argued that this was much more than a reflection of cultural dissatisfaction with Aristotelian syllogistic logic. The removal of impediments and the provision of assistance ensure that the human mind is capable of the requisite union with things. Nature itself, in its apparently random deviations from its habitual productions, discloses other possibilities. Systematic deviations from nature's habits are visible in the science of mechanics and the artificial products of human industry. In Chapter 4 I examined the complexities of Baconian experimentation and the role of mechanics in Bacon's inquiry. In Chapter 5 I analysed the relationship between forms and the systematic deviation from nature free (magic). I concluded that the doctrine of forms is the basis of unlimited possibility but must be explicated against the background of Bacon's cosmogony. Moreover, the doctrine of forms culminates in the union of *res* and *mens*, and guarantees the success of Baconian magic.

Bacon's expansive cosmogony seems all inclusive, thus raising the question of the extent of Bacon's unique material principle and the boundaries of his synthesis. Does the unity of matter impact on areas traditionally exempt from natural philosophical concerns? By way of conclusion, I shall explore the question of Bacon's conception of the unity of knowledge in terms of his materialism and his self-representations. Some of what follows are tentative proposals for future projects. But notwithstanding the tentative nature of this discussion, it supports the main claims of this thesis – namely, that Baconian reform was unique, all encompassing, a restoration of the science of magic and a promissory note for ultimate governing power based on a supreme knowledge. I shall concentrate on the moral and civic sciences, concluding with a brief look at Bacon and religion.

Baconian reform is not constrained by boundaries and there is no area of knowledge or operation which it leaves untouched. Though in the *Advancement of*

learning and *De augmentis* Bacon gives a classification of knowledge, it is in the context of an inventory and I suggest it is more heuristic than definitive:

And generally let this be a Rule, that all partitions of knowledges, be accepted rather for *lines & veines*, then for *sections and separations*: and that the continuance and entirenes of knowledge be preserued. For the contrary hereof hath made particular Sciences, to become barren, shallow, & erronious: while they haue not bin Nourished and Maintained from the common fountaine.²

The “entirenes” of knowledge suggests control in religious, moral and civic domains just as much as in the natural. It appears to extend Bacon’s materialism to inappropriate domains. For example, Bacon characterises the Socratic injunction “know thyself” as “a portion of Naturall Philosophy *in the continent of Nature*.”³ Robert McRae rightly argues that “the basis for Bacon’s conception of the unity of the sciences is a thorough-going philosophical materialism, for Nature consists of a wholly self-determinate matter.”⁴ McRae appears to echo Bacon’s claim when he maintains that Baconian inductive procedures are not limited to the science of nature, but are equally applicable to the science of the passions and appetites, such as anger, fear, shame, etc.⁵ The naturalisation of all knowledge intimates hidden coherences among its multiple branches. The unity of knowledge is linked to the

² Bacon, *AL, OFB*, IV, 93 (italics in original). Bacon’s classification of the sciences in *Advancement of learning* and *De augmentis* is well known. The system is traditionally presented in diagrammatic form based on a Ramistic dichotomising. This should not be taken as a literal transposition of Bacon’s discussion. Bacon criticises the Ramistic method of distributing “everything into two members” because it “produces empty abridgements” (*DAS, SEH*, IV, 448-449, cf. I, 663). Bacon’s conception of knowledge is not restricted by any pre-ordained method. This is why he distinguishes between the “*Magistral* and the *Initiative*”: the former distributes and disposes the known into distinct categories, the latter “intimates,” inquires and extends its domain by removing boundary lines (*DAS, SEH*, IV, 449, cf. I, 663). For the diagram see Kusakawa, “Bacon’s Classification of Knowledge,” in Peltonen, *The Cambridge Companion to Bacon*, 69.

³ Bacon, *AL, OFB*, IV, 93 (italics in original).

⁴ Robert McRae, *The Problem of the Unity of the Sciences: Bacon to Kant* (Toronto: University of Toronto Press, 1961), 31.

⁵ However, McRae argues for a Baconian “absolute separation of the divine from the natural,” *The Problem of the Unity of the Sciences*, 33. But accepting unquestioningly Bacon’s separation does not address the extent to which Bacon incorporates into natural philosophy functions traditionally belonging to the supernatural.

unity of matter. In that case, Baconian materialism has operative consequences for the governance of human action in political, moral and religious spheres.

In Chapter 2 we saw how composite bodies are sums of simple motions and how interaction among bodies is caused by fundamental appetites and aversions.⁶ In the multiple alterations and reconfigurations among things, matter retains its essential unitary nature. Material composites retain signs or marks of this unity and (as we saw in Chapter 3) correspondences and conformities exist even among the most diverse things. Hence a moral action, a passion, political control and physical processes have fundamental elemental structures in common. Bacon's goal of a reunification and synthesis of the sciences reflects this unity of matter. As Bacon puts it, the "true office" and primary function of wisdom resides in "displaying the unity of nature."⁷

Bacon's subversive synthesis of traditional knowledge is demonstrated by his reinterpretation of the traditional Aristotelian concept of *philosophia prima* as Persian magic.⁸ Persian magic, according to Bacon, was the science that registered "the correspondences between the architectures and fabrics of things natural and civil [*architecturas et fabricas rerum naturalium et civilium*]."⁹ Bacon maintains

⁶ The best discussion of the relationship between the senses, the passions and appetites is still Wallace, *Francis Bacon on the Nature of Man*, 40-54.

⁷ Bacon, *DAS, SEH*, IV, 339, cf. I, 543.

⁸ There is no adequate commentary on the relationship between Bacon's restoration of Persian magic and his concept of the unity of *all* sciences. There is some commentary on how his theory of matter supports that unity. See Robert McRae, *The Problem of the Unity of the Sciences: Bacon to Kant*; Laurence Berns, "Francis Bacon and the Conquest of Nature," *Interpretation: A Journal of Political Philosophy* 7 (1978), 1-26; Johann Mouton "'The Summary Law of Nature': Revisiting Bacon's Views on the Unity of the Sciences," in William Sessions, *Francis Bacon's Legacy of Texts*, 139-150; Julian Martin, *Francis Bacon, the State, and the Reform of Natural Philosophy* (Cambridge: Cambridge University Press, 1992), 141-143.

⁹ Bacon, *DAS, SEH*, IV, 339, cf. I, 542. Della Porta says of the Persians: "This doth *Plato* seem to signifie in his *Alciabiades*, where he saith, *That the Magick of Zoroastres, was nothing else, in his opinion, but the knowledge and study of Divine things, wherewith the Kings [sic] Sons of Persia, amongst other princely qualities, were endued; that by the example of the Common-wealth of the whole world, they also might learn to govern their own Common-wealth,*" *Natural Magick*, 2 (italics

that these “correspondences” are not “similitudes,” as “men of narrow observation may perhaps conceive them to be.”¹⁰ They are, he says, “plainly the same footsteps of nature treading or printing upon different subjects and matters.”¹¹ Because the laws of matter generate the primordial paradigm for the laws of government and the moral law, Bacon seeks a universal science with the capacity to register axioms of the broadest latitude. No one, he says, “has yet collected one; though it is a thing of excellent use for displaying the unity of nature; which is supposed to be the true office of Primitive Philosophy.”¹² Such axioms, says Bacon, would demonstrate a “great affinity and consent between the rules of nature, and the true rules of policy: the one being nothing else but an order in the government of the world, and the other an order in the government of an estate.”¹³ According to Bacon, “the Persian Magic, which was the secret literature of their kings, was an observation of the contemplations of nature and an application thereof to a sense politic; taking the fundamental laws of nature, with the branches and passages of them, as an original and first model, whence to take and describe a copy and imitation for government.”¹⁴ To fully grasp Bacon’s overarching proposals for the incorporation of the moral and civic sciences, it is necessary to be clear on how the unity of the sciences can be identified with Persian magic, or universal “*sapience*.”¹⁵ I suggest

in original). Porta cites Cicero’s *Divinations*: “amongst the Persians no man might be King, unless he had first learned the Art of Magick,” 2 (italics in original).

¹⁰ Bacon, *DAS, SEH*, IV, 339, cf. I, 543.

¹¹ *ibid.*

¹² *ibid.*

¹³ Bacon, *LL*, X, 90. See below for further discussion of Bacon’s *A brief discourse touching the happy union of the kingdoms of England and Scotland*.

¹⁴ Bacon, *LL*, X, 90. In *De augmentis* Bacon notes that “among the Persians magic was taken for a sublime wisdom, and the knowledge of the universal consents of things; and so the three kings who came from the east to worship Christ were called by the name of Magi” (*DAS, SEH*, IV, 366, cf. I, 573).

¹⁵ On the Renaissance understanding of *sapientia* see Cesare Vasoli, “The Renaissance Concept of Philosophy,” *The Cambridge History of Renaissance Philosophy*, 57-74, on 61.

that Baconian magic is the operative science whose theoretical base is constituted by such unificatory axioms, and that the latter is identical with what Bacon calls *philosophia prima*.”¹⁶ Thus if magic is a science of control through knowledge of forms, then knowledge of the forms of civil, moral and religious actions should lead to governance of human appetites, the soul, the state, the imagination, etc. Hence Bacon proposes to “compile history and tables of discovery concerning anger, fear, shame and so on, and also ones to do with examples of civil business, no less than to do with the mental motions of memory, composition and division, judgement, and the rest, just as much as ... of hot and cold, or light, or vegetation, or the like.”¹⁷

In spite of Bacon’s desired integration of knowledge, there is confusion surrounding the question of how his political and moral agenda are linked to the underlying principles of Baconian inquiry. This confusion arises from the fact that Bacon left no political or administrative guidelines that obviously reflect elements of his natural inquiry.¹⁸ Markku Peltonen, for example, suggests a complete lack of coherence between Bacon’s civil knowledge and his method. The following passage is quoted at length because it summarises several mistaken readings of Baconian themes that I wish to pursue here:

Despite his claims of the universality of his new induction and of his hope to unite theoretical (contemplative) and practical (operative) parts of [the] sciences, Bacon’s civil knowledge lacks the theoretical part. In natural philosophy the operative element was termed natural prudence or wisdom, but in civil knowledge Bacon called every single part “wisdom.” There was no theoretical part of civil philosophy, no “civil science” and consequently no “inquisition of causes” in civil knowledge. Even though Bacon

¹⁶ Bacon, *DAS, SEH*, IV, 345-346, cf. I, 549-550.

¹⁷ Bacon, *NO, OFB*, XI, 191.

¹⁸ This is seen in the way commentary on the *New Atlantis* invariably concentrates on the institutional and bureaucratic functions and not on the way its structures model politics as a science of nature. See Judah Bierman, “Science and Society in the *New Atlantis* and Other Renaissance Utopias,” *Publications of the Modern Language Association* 78 (1963), 492-500; Cf. Stephen A. McKnight, “The Wisdom of the Ancients and Francis Bacon’s *New Atlantis*,” in *Reading the Book of Nature: The Other Side of the Scientific Revolution*, ed. Allen G. Debus and Michael T. Walton (Kirksville, MO: Sixteenth Century Journal Publishers, 1998), 91-109.

emphasized that the theoretical and active parts of science were inseparable, it seems as if the idea of a theoretical part of civil philosophy did not even occur to him ... There is not a single clue as to what this theoretical part of civil knowledge would have looked like.¹⁹

Peltonen is incorrect both in his reading of the method and in his representation of Bacon's account of the unity of the sciences. Drawing attention to Bacon's comment that "in Ciuile matters there is a wisdom of discourse, and a wisdom of direction," Peltonen says this statement has been "withdrawn" in *De augmentis*, concluding that it reflects Bacon's failure to produce a theory of politics.²⁰ In contrast, I maintain that government is a natural philosophical concern and that Bacon's civic and moral wisdom rests on Baconian *sapience*, the knowledge contained in his *philosophia prima*. Peltonen's reading of Bacon illustrates the point that no understanding of Bacon's account of political or moral control is possible in the absence of an understanding of Baconian matter and of Bacon's way of inquiry. Moreover, without investigating the function of Persian magic, as a science that controls minds as well as bodies, there is little to be gained from, for instance, analysing the hierarchical structure of the *New Atlantis* as a model for a social and political scientific utopia.²¹ Thus the more significant point is that the laws of matter

¹⁹ Markku Peltonen, "Bacon's Political Philosophy," in *The Cambridge Companion to Bacon*, 283-310, on 294. There seems to be a lack of basic historiographical understanding of the distinction between what Bacon proposed and what he achieved. B. H. G. Wormald, in spite of citing the relevant passages on Bacon's proposals for a *prima philosophia*, says this "would not succeed under Bacon's guidance in establishing that all sciences are parts of natural science." Wormald attributes to Bacon the segregation of man's body from his mind and so has difficulties in reconciling how Bacon can talk of appetites in human nature and appetites in nature, *Francis Bacon: History, Politics and Science, 1561-1626* (Cambridge: Cambridge University Press, 1991), 30-31, 169-171.

²⁰ Bacon, *AL, OFB*, IV, 80.

²¹ Rawley's preface to the *New Atlantis* has been the focus of conflicting interpretations among commentators. According to Rawley, "His Lordship thought also in this present fable to have composed a frame of Laws, or of the best state or mould of a commonwealth; but foreseeing it would be a long work, his desire of collecting the Natural History diverted him, which he preferred many degrees before it" (*SEH*, III, 127). Historians of science have taken this dismissive attitude to *New Atlantis* at face value. For example, Gaukroger argues that "for Bacon, it is the sovereign who, in the image of Solomon, the philosopher-king, directs the work – and ... it is the sovereign, rather than those who perform this directed work, who is the natural philosopher par excellence," *Francis Bacon and the Transformation of Early-Modern Philosophy* (Cambridge: Cambridge University Press, 2001), 131. However, he dismisses the *New Atlantis*, stating that Bacon has "no real idea" on how to

and the laws of policy derive from the same source and hence optimum political and moral power resides in that source.²² The science of magic provides the principles of control and they must reflect the lines and interconnections of Baconian matter. Amidst infinite fragmentation, these lines retain the coherence of their source and this is reflected in the Baconian system of the sciences.

Bacon conceives of the unification of knowledge as a restorative venture, a return to an originary state of primordial wisdom. He presents an historical narrative of the fragmentation of the sciences that signals his programme for the restoration of Persian magic. In *Valerius terminus* he cites Cicero's complaint against Socrates' severing of philosophy and rhetoric.²³ This was tantamount to the divorce of "matter and words" and a rupture in "universal *Sapience*," a science of both matter and words:

"proceed in the organisation of natural philosophy at a national level," 131. Echoing the views of Peltonen, he states that "the lack of any practical or theoretical sense of how one might set up a large-scale communal investigation in natural philosophy is nowhere more evident than in his [Bacon's] scientific utopia, *New Atlantis*. We are given particulars of everything from the placing of windows in the streets to the dress of the Fathers of Solomon's House, right down to the colour of their underwear (white); but we are given no details of any of the mechanisms by which political and civil processes operate," 165. In contrast, political philosophers such as Lampert argue that "one ought to hesitate before taking one of Bacon's valets as the guide to his work; as Howard White said, 'One may not be perfectly understood by one's chaplain'" *Nietzsche and Modern Times*, 27; White, *Peace Among the Willows*, 15.

²² In many ways the older historiography is closer, in programmatic terms, to capturing the extent of Bacon's vision. Johann Mouton quotes Harold Fisch's remarks on Bacon's aim as one of a "limitless expansion of human power." Mouton also refers to Oskar Kraus's accusation that Bacon's life was dedicated to the "cult of power." Mouton is defending Bacon against "this line of attack" which he identifies with the neo-Marxist Frankfurt School and recent anti Enlightenment work in the history of science such as Brian Easlea's, *Witch-hunting, Magic and the New Philosophy: An Introduction to Debates of the Scientific Revolution 1450-1750* (Sussex: Harvester Press, 1980). See Mouton, "The Summary Law of Nature': Revisiting Bacon's Views on the Unity of the Sciences," in *Francis Bacon's Legacy of Texts*, 139-150, quoted remarks, 139. What is interesting about Mouton's defence of Bacon against the above charges, as it relates particularly to this thesis, is his distinction between a "therapeutic power" (bold in original) to restore man's prelapsarian perfection and a "manipulative or exploitative power," 140. Here I have attempted to show how on the basis of the union of *res* and *mens* there is no distinction. I will return to Mouton's paper below as he deals admirably with Bacon's matter theory and moral good.

²³ Bacon, *VT, SEH*, III, 228. Cicero's dictum that a single *sapientia* contained the "knowledge of all things human and divine" was commonly cited in renaissance discussions on the nature of philosophy. See Cesare Vasoli, "The Renaissance Concept of Philosophy," in *Cambridge History of Renaissance Philosophy*, 57-74, 61. For a general discussion on the union of philosophy and rhetoric and the Ciceronian move to recombine these sciences see J. E. Seigel, *Rhetoric and Philosophy in Renaissance Humanism* (Princeton: Princeton University Press, 1968).

before his [Cicero's] time the same professors of wisdom in Greece did pretend to teach an universal *Sapience* and knowledge both of matter and words, Socrates divorced them and withdrew philosophy and left rhetoric to itself, which by that destitution became but a barren and un noble science. And in particular sciences we see that if men fall to subdivide their labours, as to an oculist in physic, or to be perfect in some one title of the law, or the like, they may prove ready and subtile, but not deep or sufficient, no not in that subject which they do particularly attend, because of that consent which it hath with the rest.²⁴

The Socratic partitioning produces specialised sciences that are “subtile” but not “deep.” In this way (as we saw in Chapter 4 when discussing the role of *experientia literata*), the “consent” and mutual cross-fertilisation of the sciences is lost. Specialities have narrowed their focus so that they have “respect to but a few things.”²⁵ The analogy with nature is compelling; particulars display the subtlety of nature but not the deep underlying connections of things. Hence the central importance of a restoration of unified knowledge to disclose the depths of matter’s elemental unity. This can be seen in Bacon’s reference to the term “Circle Learning”:

And it is a matter of common discourse of the chain of sciences how they are linked together, insomuch as the Grecians, who had terms at will, have fitted it of a name of *Circle Learning*. Nevertheless I that hold it for a great impediment towards the advancement and further invention of knowledge, that particular arts and sciences have been disincorporated from general knowledge, do not understand one and the same thing which Cicero’s discourse and the note and conceit of the Grecians in their word *Circle Learning* do intend.²⁶

After “disincorporation” the sciences lost their usefulness to one another.²⁷ To restore a mutual illumination, the currently discrete sciences need to be *re-united* in

²⁴ Bacon, *VT, SEH*, III, 228.

²⁵ Bacon, *VT, SEH*, III, 231.

²⁶ Bacon, *VT, SEH*, III, 228. Bacon’s departure from the Greeks undoubtedly refers to his incorporation of the operative sciences among the contemplative and discursive. Based on a comparison between passages in *Cogitata et visa* (*CV, BF*, 86-87) and *Novum organum*, Lampert argues that Bacon consistently held the view that “a superior wisdom preceded the Greeks,” *Nietzsche and Modern Times*, 25, n. 5.

²⁷ It is interesting that Bacon here is not arguing for what we typically regard as “use” such as the use made of geometry in navigation, but use for “light and information” (*VT, SEH*, III, 229). In this way the concept of “use” incorporates sciences as widely separated as optics and law.

a “universal knowledge” supplying “full” and “true” axioms covering the widest possible range of instances.²⁸ Furthermore, in spite of the current institutional disintegration of knowledge, there exists a homologous relationship between the unity-in-multiplicity of matter and the unity of the sciences. Socrates sundered an already existing unity analogous to the way the primordial unity of matter emanates into the multiplicity of the phenomenal world. Knowledge and matter retain that primordial unity but it is obscured in diversity. Multiplicity is superficial and *philosophia prima* discovers, or uncovers, the hidden lines of connection. Bacon’s *philosophia prima* is therefore a summary science under which the major generic divisions of the sciences of “Man,” “God” and “Nature” are subsumed.²⁹

The historical narrative in the story of Socrates above illustrates how Bacon’s aim is a *restoration* of universal knowledge. Repeating the Ciceronian formula, Bacon comments that wisdom was “*formerly [olim] defined as the knowledge of things divine and human.*”³⁰ The priority of the universal science is analogous to the priority of a mother to her offspring, and to the manner in which the unity of matter is prior to its multiple emanations. Bacon’s restoration of *philosophia prima* is a recovery of a science that formerly displayed the analogies of nature. This knowledge expresses the common root of all things:

But since the divisions of knowledge are not like several lines that meet in one angle; but are rather like branches of a tree that meet in one stem [*in uno trunco*] (which stem grows for some distance entire and continuous, before it divide itself into arms and boughs); therefore it is necessary before we enter into the branches of the former division, to erect and constitute one universal science, to be as the mother of the rest, and to be regarded in the progress of knowledge as a portion of the main and common way, before we come where the ways part and divide themselves. This science I

²⁸ Bacon, *VT, SEH*, III, 230.

²⁹ Bacon, *DAS, SEH*, IV, 337, cf. I, 540. He states: “The object of philosophy is threefold – God, Nature, and Man.”

³⁰ Bacon, *DAS, SEH*, IV, 337, cf. I, 540 (my emphasis). He says, “To this [science] no other is opposed; for it differs from the rest rather in the limits within which it ranges than in the subject matter; treating only of the highest stages of things.”

distinguish by the name of *Philosophia Prima*, primitive or summary philosophy; or *Sapience*, which was formerly defined as the knowledge of things divine and human.³¹

Commentators overlook the importance of “recovery” mainly as a result of apparent ambiguities in Bacon’s classification of the sciences. The precise relationship between *philosophia prima*, metaphysics and natural philosophy presents exegetical difficulties. Jardine points out how “in scholastic classifications of knowledge *philosophia prima* is a synonym for metaphysics.”³² However, Bacon states:

I intend Primitive or Summary Philosophy [*Philosophia Prima*] and Metaphysic, which heretofore have been confounded as one, to be two distinct things. For the one [*Philosophia Prima*] I have made a parent or common ancestor to all knowledge; the other [Metaphysic], a branch or portion of Natural Philosophy.³³

Jardine remarks that Bacon believed in “some general principles which recur and stand out in so many separate sciences that they may be immediately judged to be universally true.”³⁴ This, she points out, “is a standard Aristotelian view.”³⁵ However, as Jardine notes, this position entails that the method is superfluous. She therefore concludes that “despite Bacon’s claims that the inductive method rests on experience alone, it appears that the investigator is to be armed with knowledge of *philosophia prima* at the outset.”³⁶ I suggest that Jardine is approaching the problem in reverse. *Philosophia prima*, in Bacon’s sense, does not refer to an *a priori* system. On the contrary, things themselves exhibit the possibility of this universal science,

³¹ Bacon, *DAS, SEH*, IV, 337, cf. I, 540.

³² Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge University Press, 1974), 104, n. 1. For a detailed account of the Renaissance and early modern discussions on “first philosophy” and on the debates over the remit of the science of metaphysics see Charles H. Lohr, “Metaphysics,” in *The Cambridge History of Renaissance Philosophy*, 537-638.

³³ Bacon, *DAS, SEH*, IV, 345-346, cf. I, 549.

³⁴ Jardine, *Francis Bacon: Discovery and the Art of Discourse*, 101.

³⁵ *ibid.*

³⁶ *ibid.*, 108. Quite apart from the discussion here, I have already discussed Bacon’s metaphysical assumptions. Bacon nowhere argues that experience *alone* could lead an investigator into matter’s hidden structures. However, his view of the relationship between the organs of the senses and matter’s radiative powers demonstrates that he is still philosophising according to the senses. Sense is always the arbiter of the true and the false.

that is to say, Bacon's *sapience* rests on ontological, not epistemological grounds.³⁷ Moreover, I maintain that for Bacon *philosophia prima* and natural philosophy are synonyms: the term "metaphysics" is now defined as a "branch or portion of natural philosophy."³⁸ Given his subversion of traditional categories, it is not surprising that Bacon is less than candid about his naturalising of the full range of human knowledge.³⁹ To reconcile the apparent confusion, we have to acknowledge that Bacon's "first philosophy" is *not* metaphysics in the Aristotelian sense. For Bacon, *philosophia prima* is a way of reintegrating and synthesising the sciences, under the direction of natural philosophy.

The confusion arises mainly, as McRae and Jardine point out, because Bacon designates both *philosophia prima* and natural philosophy as the "mother" science. In *De augmentis* he uses the same expressions to refer to *philosophia prima* as he elsewhere (particularly in *Novum organum*) uses to describe natural philosophy. McRae, however, comments correctly that the differences in Bacon's accounts contain "a basic consistency underlying the theory of *philosophia prima* and the forthright naturalism of the *Novum Organum*."⁴⁰ The inconsistency disappears when it is realised that Bacon's *philosophia prima* refers to a mode of thinking "in which

³⁷ Bacon's use of logical examples to illustrate *philosophia prima* has led to its identification with axiomatic principles in the sense of propositions that are intuitively true. See Wallace for an account of Bacon's concept of the intellect (*intellectus*) and its function in apprehending comparisons and distinctions in the natural history tables in order to "abstract," *Francis Bacon on the Nature of Man: The Faculties of Man's Soul*, 100-101. This is not "intuitionism" as McCanles argues, "From Derrida to Bacon and Beyond," in *Francis Bacon's Legacy of Texts*, 25-46.

³⁸ Bacon, *DAS, SEH*, IV, 346, cf. I, 549.

³⁹ A very close reading of the key passages in *De augmentis* is required here. McRae is correct on the relationship between *philosophia prima* and metaphysics, *The Unity of the Sciences*, 30. Moreover, caution should be exercised when dealing with Bacon's divisions of the sciences in *De augmentis*. Bacon is devious and ambiguous when dealing with terms and definitions. When we consider the ramifications of his claim for morality and religion, for example, Bacon's reasons for obfuscation and concealment are clear.

⁴⁰ McRae, *The Unity of the Sciences*, 30.

all knowledge is restricted to nature as its object.”⁴¹ As we saw in Chapters 4 and 5, natural philosophy is the only science whose function is the production of high level axioms. These axioms touch upon the universalities of things and from these primary axioms, the axioms of all other arts and sciences are connected to the mother science. Hence natural philosophy (the ascent from physics to metaphysics) is the “mother philosophy” that gives birth to and vitally sustains all other sciences. *Philosophia prima* is in that sense a “receptacle” for the high level axioms of natural philosophy.⁴²

Thus we return to my earlier question, how extensive is the science of natural philosophy? Bacon’s goal for the human sciences is to derive axioms of politics, ethics and theology that mirror the axioms of natural philosophy. *Philosophia prima* should expand the traditional boundaries of natural philosophical axioms so that they incorporate the science of human things. In the deduction of middle axioms (the provenance of particular sciences) from primary axioms, Bacon insists that the unity of nature must be kept in view, primarily to avoid repetitions and correct errors. This is what Bacon intends when he speaks of “latitude” of knowledge:

There still remain two limitations of propositions, besides that for making them convertible; the one regarding their extension, the other their production. Certainly sciences, if a man rightly observe it, have, besides profundity, two other dimensions, namely latitude and longitude. The profundity relates to their truth and reality; for it is they which give solidity. As to the other two, the latitude may be accounted and computed from one science to another [*philosophia prima*]; the longitude from the highest proposition to the lowest in the same science [physics and metaphysics]. The one contains the true bounds and limits of sciences, that the propositions thereof may be handled properly, not promiscuously, and repetition, excursion, and all confusion may be avoided; the other prescribes

⁴¹ *ibid.*

⁴² Bacon’s claim that *philosophia prima* is a “receptacle” diverts attention away from its powerful function. For an explanation of how it “should tend primitively and summarily to the advancement of the sciences,” see *DAS, SEH, IV, 339, cf. I, 543.*

how far and to what degree of particularity the propositions of a science should be deduced.⁴³

Philosophia prima, therefore, discovers how far the latitude of the axioms of natural philosophy extends. Moreover, to ensure that fragmentation does not reoccur, all axioms of the particular arts and sciences feed back into the mother philosophy. This guarantees a continual process of error correction and (I suggest) is Bacon's reason for appropriating the pre-Socratic term "Circle Learning." It is the business of natural philosophy to penetrate the hidden depths of matter. The restoration of "the great mother of the sciences" is intended to add depth to specific sciences that currently "skate over the surface and variety of things."⁴⁴ The reason why the sciences of ethics and politics are currently not conceived in natural terms is that their "roots" are not sunk deeply in matter.⁴⁵ In the same way that *experientia literata* functions to draw connections across low-level artisanal crafts, so the axioms of the different sciences should inform and throw light on each other. Bacon is emphatic that

These are no allusions but direct communities, the same delights of the mind being to be found not only in music, rhetoric, but in moral philosophy, policy, and other knowledges, and that obscure in the one, which is more apparent in the other, yea and that discovered in the one which is not found at all in the other, and so one science greatly aiding to the invention and augmentation of another. And therefore without this intercourse the axioms of sciences will fall out to be neither full nor true.⁴⁶

Philosophia prima, for Bacon, contains the augmented knowledge of the discrete sciences.

As the following passage demonstrates, natural philosophy is the directing science. Bacon uses the axioms of physics as a guide to correct the axioms of other sciences:

⁴³ Bacon, *DAS, SEH*, IV, 453, cf. I, 668.

⁴⁴ Bacon, *NO, OFB*, XI, 127.

⁴⁵ *ibid.*

⁴⁶ Bacon, *VT, SEH*, III, 230.

Things are preserved from destruction by bringing them back to their first principles," is a rule in Physics; the same holds good in Politics [*eadem valet in Politicis*] (as Macchiavelli rightly observed), for there is scarcely anything which preserves states from destruction more than the reformation and reduction of them to their ancient matters. "Putrefaction is more contagious before than after maturity," is a rule in Physics; the same is eminently true in Morals [*eadem insignis etiam in Moralibus*], for the men who are most wicked and profligate produce less corruption in the public manners than those who appear to have some soundness and virtue in them, and are only partly evil. "Whatever is preservative of a greater Form is more powerful in action," is a rule in Physics; for that connexion of things should not be severed, nor a vacuum (as they call it) admitted, tends to preserve the fabric of the universe; whereas the collection of heavy bodies towards the mass of the earth tends to preserve only the region of dense bodies; and therefore the first motion overcomes the last. The same holds in Politics [*Eadem tenet in Politicis*]; for whatsoever contributes to preserve the whole state in its own nature, has greater power than that which only benefits the particular members of that state. It holds likewise in Theology [*Similiter eadem locum habet in Theologia*]; for of the theological virtues, charity, which is the virtue most communicative of good, excels all the rest.⁴⁷

Each example begins with a rule in physics. Following the statement of this rule, Bacon's repeated use of the term *eadem* shows that he is in fact cross-mapping the axioms of physics onto the rules of politics and theology. Thus the axioms of politics and theology are, for Bacon, expressions of natural philosophical truths. As Bacon says to James, we must "reflect this light of Nature upon Matter of Estate."⁴⁸ The axioms of physics (or metaphysics) illuminate political and theological actions. The relationship between metaphysics and *philosophia prima* now becomes clear. Metaphysics supplies natural philosophical axioms and these axioms (along with axioms from all other sciences) are placed in the receptacle of *philosophia prima*. This permits the recursive correction of axioms from the particular sciences. Consequently there is no contradiction when Bacon refers in *Novum organum* to natural philosophy as the "great mother of the sciences." He states:

Let no one hope for great progress in the sciences (especially in the operative department) unless natural philosophy be extended to the particular sciences, and these in turn reduced [*reductæ*] to natural

⁴⁷ Bacon, *DAS, SEH*, IV, 338, cf. I, 541-542.

⁴⁸ Bacon, *LL*, X, 94.

philosophy. For hence it comes about that astronomy, optics, music, many of the mechanical arts, and medicine itself, and (which may surprise you) moral and political philosophy, and the science of logic have practically no depth but skate over the surface and variety of things; because once these are dispersed and set up as particular sciences, they are no longer nourished by natural philosophy; which could have given them new strength and growth at source and from a true knowledge of motions, rays, sounds, textures and schematisms of bodies, affections, and intellectual apprehensions. Since, therefore, the sciences have been cut off from their roots, it is no wonder that they do not grow.⁴⁹

The direct dependence of the political sciences on natural philosophy, and the potential benefits for political control based on knowledge of matter's virtues is clearly seen in Bacon's *A brief discourse touching the happy union of the kingdoms of England and Scotland* dedicated in private to James. This tract offers a further illustration of how Persian magic and a theory of matter cohere in Bacon's universal *sapience*.⁵⁰ The document is an extraordinary discussion of radiative matter and its astrological import; the concept of union and consent; and the distinctions between *compositio* and *mistio*. In advising James on the union of Scotland and England, Bacon applies flawlessly his materialist cosmogonical principles to policy. Although familiar, the opening comments are worth quoting in full:

I do not find it strange (excellent King) that when Heraclitus, he that was surnamed the obscure, had set forth a certain book which is not now extant, many men took it for a discourse of nature, and many others took it for a treatise of policy and matter of estate. For there is a great affinity and consent between the rules of nature, and the true rules of policy: the one being nothing else but an order in the government of the world, and the other an order in the government of an estate. And therefore the education and erudition of the kings of Persia was in a science which was termed by a name then of great reverence, but now degenerate and taken in ill part; for the Persian Magic, which was the secret literature of their kings, was an

⁴⁹ Bacon, *NO, OFB*, XI, 127. Designating Bacon's way of inquiry as a cybernetic epistemology seems highly apposite here since it specifies how natural philosophy flows into the particular sciences and they in turn flow back into natural philosophy. The sciences are nourished by natural philosophy (their roots) – natural philosophy supplies true knowledge of motions etc. The sciences then feed back their findings (*experimenta lucifera*) into natural philosophy so that it continues to grow.

⁵⁰ Julian Martin reads Bacon as associating the laws of nature with God's laws. According to Martin, this explains the "resemblance" between the world of government and the natural world. Although Martin cites the passages referring to Persian magic, he overlooks the all important physical examples given by Bacon and so avoids dealing with the foundational role of natural philosophy in the kinds of advice the Persian Magi gave their kings, *Francis Bacon, the State, and the Reform of Natural Philosophy*, 142.

observation of the contemplations of nature and an application thereof to a sense politic; taking the fundamental laws of nature, which the branches and passages of them, as an original and first model, whence to take and describe a copy and imitation for government.⁵¹

Whilst identifying his role with that of the Magi, Bacon proceeds (in a series of natural examples taken from astronomy, meteorology, astrology and mechanics) to illustrate how the principles of nature should underpin policy and the principles of government.⁵² He introduces the material notions of consent and union, and divides their moral and civic application into two categories: as they pertain respectively to individual good and to cooperative good. According to Bacon, even though in nature all things have “private and particular affection and appetite,” for the sake of “the more general and common” good “they forsake their own particularities ... and aspire to uphold the public [good].”⁵³ To focus the correspondence between the natural and the political, Bacon outlines “the grounds of nature touching the union and commixture of bodies.”⁵⁴ Bacon’s natural philosophical explanation is based on the principle that things conspire with their like, thereby enhancing their vigour – as he puts it, “*vis unita fortior*.”⁵⁵ For example, he describes in naturalised astrological

⁵¹ Bacon, *LL*, X, 90. In the prefatory remarks to Bacon’s *A brief discourse touching the happy union of the kingdoms of England and Scotland*, Spedding raises the issue of Bacon’s derivation of “his idea of the nature of the Persian Magic” and suggests “a remark in Plato,” *LL*, X, 89. Elsewhere he expands on this: “The first idea of the connexion between the Persian magic and the art of government was suggested by the circumstance mentioned in the *Alcibiades* of Plato – that the princes of Persia were by the same persons instructed in politics and magic” (*SEH*, I, 542-543, n. 4).

⁵² For an alternative discussion see Martin, *Francis Bacon, the State, and the Reform of Natural Philosophy*, 143-145.

⁵³ Bacon, *LL*, X, 91. Bacon says, “So we see the iron in small quantity will ascend and approach to the loadstone upon a particular sympathy: but if it be any quantity of moment, it leaveth his appetite of amity with the loadstone, and like a good patriot falleth to the earth, which is the place and region of massy bodies.”

⁵⁴ Bacon, *LL*, X, 92. This could be called a “doctrine of connaturals” and is a consequence of Bacon’s cosmology which describes the separation and bonding of similarities, the light from the heavy, the hot from the cold, etc. This is why at a certain stage in cosmological development different regions settle out into discrete and antagonistic zones. For a discussion of Bacon’s cosmology see Rees, *OFB*, VI, xlii-xlvi.

⁵⁵ Similar remarks are found in Bacon’s essay “On Friendship.” He says: “So that it is, in Truth of Operation upon a Mans Minde, of like virtue, as the *Alchymists* use to attribute to their Stone, for Man’s Bodie; That it worketh all contrary Effects, but still to the Good, and Benefit of Nature. But

terms how the radiative power of the stars gains strength in certain conjunctions, thus illustrating the “force of union.”⁵⁶ The manner of union can be voluntary or enforced and Bacon concentrates on the former. This leads to his central concern, viz., the distinction between *compositio* and *mistio*. I discussed this distinction in Chapter 5 where we saw that *compositio* is a union without a new form whereas *mistio* superinduces a form.

Because the forms of natural and political union come from the same source, Bacon concludes that the “light of Nature” reflects “upon Matter of Estate.”⁵⁷ In the one case (*compositio*), there is a sovereignty where “the ancient forms [are] still severed,” and in the other, where pains have been taken “to superinduce a new form agreeable and convenient to the entire estate,” there is *mistio*.⁵⁸ This satisfies the natural philosophical principle that the good of the greater overrides individual or particular good. Bacon has therefore illustrated that the union of states is as much an experimental production of *mistio* as the production of a new form in natural experimentation: in both cases a new form is superinduced. Therefore, Bacon argues, if the principles of nature are followed, the union of Scotland and England will entail *mistio* and not merely *compositio*. The new form will supply the *commune vinculum* – the common bond (charity or brotherhood) that binds it into a fixed entity.⁵⁹

yet, without praying in Aid of *Alchymists*, there is a manifest Image of this, in the ordinarie course of Nature. For in Bodies, *Union* strengthneth and cherisheth any Naturall Action; And, on the other side, weakneth and dulleth any violent Impression: And euen so it is of Minds” (*Ess, OFB, XV, 83-84*).

⁵⁶ Bacon, *LL*, X, 93.

⁵⁷ *ibid.*, 94.

⁵⁸ *ibid.*, 94.

⁵⁹ *ibid.* Bacon says the new form is “*commune vinculum*” and without it there is “strife and discord” among the elements of the union, (*ibid.*). He refers to the Roman Empire as the exemplar of *mistio* to illustrate its superiority over *compositio* (see *LL*, X, 94-95). In this way Bacon as Magus has supplied his king with the natural philosophical principles supporting a policy decision.

In *De augmentis* Bacon applies identical reasoning and the same natural principles to morals. In his critique of the moral philosophers he intimates the source of good and evil in matter when he says the “inquiry concerning the roots of good and evil, and the strings of those roots” has not been dealt with.⁶⁰ Bacon proposes to “open and cleanse” the “fountains” of morality before he comes to a discussion of how good and evil are implemented in his “Georgics of the Mind.”⁶¹ According to Bacon, “there is formed and imprinted in everything an appetite toward two natures of good.”⁶² And here he repeats the explanation given to James: the double nature of “good” is in so far as a thing is a “substantive to itself” and “as part or member of a greater body.”⁶³ The latter, he says, is “worthier” because it tends to “conservation of a more general form.”⁶⁴ Bacon labels these respectively, “Individual or Self-good” and the “Good of Communion.”⁶⁵ Good of communion is, he says, “much more engraven upon man, if he be not degenerate.”⁶⁶ Whereas in the tract dedicated to James the topic is policy, in Book 7 of *De augmentis* Bacon’s topic is moral character. There his *desideratum* is:

[the] several features and simple lineaments of which [the characters of man] ... are composed, and by the various combinations and arrangements of which all characters whatever are made up, showing how many, and of what natures these are, and how connected and subordinate one to another; that so we may have a scientific and accurate dissection of the minds and characters and the secret dispositions of particular men may be revealed; and that for the knowledge thereof better rules may be framed for the treatment of the mind.⁶⁷

In his proposed segmenting of character, Bacon hopes to discover

⁶⁰ Bacon, *DAS, SEH*, V, 6, cf. I, 716.

⁶¹ Bacon, *DAS, SEH*, V, 6, cf. I, 717.

⁶² Bacon, *DAS, SEH*, V, 7, cf. I, 717.

⁶³ *ibid.*

⁶⁴ *ibid.*

⁶⁵ *ibid.*

⁶⁶ *ibid.*

⁶⁷ Bacon, *DAS, SEH*, V, 22, cf. I, 734.

how affections are kindled, and excited, and how pacified and restrained, and how again contained from act and further degree; how they disclose themselves, though repressed and concealed; how they work; how they vary; how they are enwrapped one within another; how they fight and encounter one with another.⁶⁸

His depiction of the motions of character is identical to his account of how natural experiment investigates the hidden virtues of matter in order to disclose the relationships among simple motions. In morals, experiment discloses the motions of the passions and appetites. In both cases, the object is control and manipulation of simple motions. Bacon's project is how to make use of this discovery of the analogy of simple motions, whether of the passions and appetites in natural, moral, civil, or theological action. As he puts it, the exercise is intended for the setting of "one faction against another" so as to "bridle" and control both the internal factions of the mind as much as the external factions in government.⁶⁹ The language used by Bacon is identical to that used in binding and constraining matter towards the superinduction of new forms. Mouton comments, "whereas earlier writers, and in particular the heathen poets, made the mistake of juxtaposing the moral law and the laws of nature, Bacon wishes to show that they are in fact identical how could it be otherwise since God is the author of both."⁷⁰

However, in agreement with McRae, I suggest that for Bacon matter is the author of both moral law and the laws of nature. The laws in Bacon's account of moral and political action are laws of appetitive matter, which determine that an increase in potency is observed when like is gathered to like. Mouton argues that configurations of motions account for the specific desires and aversions of matter. He makes the further observation that one can understand the unity of nature only by dealing with Bacon's concept of simple motions. However, using Rees's work on

⁶⁸ Bacon, *DAS, SEH*, V, 23-24, cf. I, 736.

⁶⁹ Bacon, *DAS, SEH*, V, 24, cf. I, 737.

⁷⁰ Mouton, "The Summary Law of Nature," in *Francis Bacon's Legacy of Texts*, 144.

Bacon's cosmology, he states that Bacon's theory of simple motions "is embedded in a moral theory of goods."⁷¹ This, I argue, has inverted Bacon's argument and Mouton is quite wrong to read the connection from the moral to the natural.⁷² The Persian magicians, according to Bacon, knew the laws (or forms) of nature and so knew the laws and forms of political and moral harmony. If there is a form of statecraft then it is imperative to discover it, and its discovery is the business of natural philosophy – the science that deals with actions and the discovery of forms. This governing science applies its principles to the forms of heat and death, no less than the forms of anger and political union.

The coherence between Bacon's materialism, the science of magic and the extent of natural philosophical explanation, although touched on by commentators, has not had adequate close commentary. This is mainly due to the fragmented approach to the Baconian corpus. Peltonen makes the assumption that a civic science or a science of politics would obviously be a political or moral theory. This demand is inappropriate and I suggest this is where commentators are largely misled. I suggest that Bacon's science of human beings, in so far as they act and are acted upon, is not anything political or ethical; it is a natural philosophical science. Furthermore, according to Bacon, politics is a subject "secret and retired," and we are told in *De augmentis* that the secrets of policy, philosophy and religion must be conveyed in fable. Unsurprisingly, the secrets of policy are not recorded by Bacon

⁷¹ Mouton, "The Summary Law of Nature," 142. Mouton calls Bacon's language "anthropomorphic" based on Bacon's use of the language of antipathies or sympathies. Thus inanimate bodies express "love" and "hate." This is quite in keeping with Bacon's notion of appetite but the direction is from matter to human passions. Mouton correctly says that the most important aspect is the rule that states sympathy and attraction occur between like, and antipathy and repulsion between unlike and that this translates into love and hate in human behaviour.

⁷² Martin likewise inverts the priority when discussing the "affinity between the laws of nature and those of the civil policy"; he attributes to Bacon "the primacy of discovering the latter," *Francis Bacon, the State, and the Reform of Natural Philosophy*, 145.

and his praise of Machiavellian strategies adds to the suspicion that such knowledge should be guarded and confined.

Having concentrated thus far on the philosophical unity of Bacon's theoretical and operative programme, it might prove useful to review what Rees refers to as Bacon's self-presentation.⁷³ This proposal is made on the basis that Bacon's self-portrayal reflects the radical nature of his project. In this way perhaps the vastness of Bacon's enterprise can be resurrected. Furthermore, more exhaustive attention to Bacon's self-representation would go some way towards uniting the fragmented "Bacon's" that now populate Baconian scholarship.⁷⁴ Any discussion of Bacon's self-presentations is bound to turn at some point to his religious persona. This is certainly pertinent here in view of my continually prioritising his materialism. Again my comments here are suggestive.

Lampert argues that to complete Bacon's fragmented writing "requires an interpretation that accords with the whole of the Baconian project."⁷⁵ He calls Bacon "the progenitor of a utopian dream, the founder of the modern faith in the technological conquest of nature as the means to prolong our lives and make them easy."⁷⁶ Lampert alerts us to Bacon's self-perception when he says that Bacon altered radically "the way human beings look at things."⁷⁷ Bacon's "realism led him to believe in the need for a new belief" and the "establishment of that faith requires a

⁷³ Rees comments that Bacon "does not shrink from likening himself to Alexander the Great and Christopher Columbus, and from sketching his own view of his originality," *OFB*, XI, lxii.

⁷⁴ Martin remarks "the most interesting and continuing feature of Baconian scholarship is that it has produced several Francis Bacons, none of whom significantly overlap ... To my knowledge there has been almost no interest in reintegrating these partial images," *Francis Bacon, the State, and the Reform of Natural Philosophy*, 2.

⁷⁵ Lampert, *Nietzsche and Modern Times*, 20.

⁷⁶ *ibid.*

⁷⁷ *ibid.*

holy war on its behalf.”⁷⁸ For Lampert, the “holy war” is aimed at current obsessions enslaving men’s minds, especially theology and its purveyors the theologians.⁷⁹ According to Lampert’s Nietzschean assessment of Bacon’s enterprise, it consists of “novel teachings” that “go against custom,” and that “overthrow a whole way of life.”⁸⁰ In the preceding chapters, I presented Bacon’s regeneration of the human mind in the language of *via negativa* spirituality, and Bacon’s texts are littered with classical, biblical and theological allusions. In what sense then was Bacon going against custom, and what were his self-perceptions of this radical turn? Furthermore, if Lampert’s characterisation of Bacon is correct, then why, for the most part, have Bacon’s self-perceptions and his substantive views been relegated to the history of scientific methodology, or to a contextual presentation which diminishes their radical nature through interminable comparison and association?

In presenting himself as the new Columbus, Bacon intimates something of the scale and scope of his project, whilst mitigating its improbability through linking it to the self-evidence of experimental confirmation:

Before his epic voyage across the Atlantic ... he [Columbus] gave reasons why he believed he could discover new lands and continents beyond those known then, reasons which, though rejected at first, were afterwards vindicated by his experiment, and were the origin and cause of events of vast consequence.⁸¹

On the one hand, this coheres with Bacon’s frequent claim to be only a guide, a trailblazer or pioneer who indicates the goal. On the other hand, this self-image should be compared to his more strident comments: “I will undertake not only to

⁷⁸ *ibid.*, 68.

⁷⁹ Lampert reads Bacon’s *Advertisement Touching an Holy War* as “warfare against sovereign religion,” *ibid.*, 68. Lampert also adheres to a Straussian reading of Bacon that highlights Bacon’s circumspection and duplicity in matters politic and religious. This interpretation focuses on the esoteric and acroamatic styles of writing promoted by Bacon. See Leo Strauss, *Persecution and the Art of Writing* (Glencoe, Illinois: The Free Press, 1952).

⁸⁰ Lampert, *Nietzsche and Modern Times*, 20-21.

⁸¹ Bacon, *NO, OFB*, XI, 151.

survey these territories in my mind as seers do when consulting the omens, but enter them as generals do when bent on annexing them.”⁸² Consider too his self-depiction in quasi-messianic terms, “I am come in very truth leading to you Nature with all her children to bind her to your service and make her your slave.”⁸³ A similar ambivalence between Baconian modesty and aggressive expansionism can be gleaned from Bacon’s invocation of the empire-building of Alexander. In the *Advancement of learning* both Alexander and Caesar are lauded as men of wit, wisdom and virtue. Bacon claims that he and Alexander hold in common “nothing other than the nerve to despise foolish fears.”⁸⁴ This fits with Bacon’s claim that in time to come he will be seen to have done “*nothing great, but only made less of things thought to be great.*”⁸⁵ The phrase “*things thought to be great*” could bear multiple references, especially considering his castigations of institutional learning and superstition. In his castigation of current magic he also presents himself as Caesar when he characterises natural magic:

It [popular natural magic] is as far differing in truth of nature from such a knowledge as we require, as the story of King Arthur of Britain, or Hugh of Bordeaux, and such like imaginary heroes, differs from Caesar’s Commentaries in truth of story. For it is manifest that Caesar did greater things in reality than those imaginary heroes were feigned to do, but he did them not in that fabulous manner.⁸⁶

In religious terms, Bacon presents himself as “a high priest of the sense (from which all natural knowledge should, unless we prefer madness, be derived) and learned interpreter of its oracles.”⁸⁷ His recurrent use of the image of nature’s

⁸² Bacon, *DO, OFB*, XI, 29.

⁸³ Bacon, *TPM, BF*, 62, cf. *SEH*, III, 528.

⁸⁴ Bacon, *TPM, BF*, 62, cf. *SEH*, III, 528.

⁸⁵ Bacon, *NO, OFB*, XI, 155 (italics in original).

⁸⁶ Bacon, *DAS, SEH*, IV, 367, cf. I, 573.

⁸⁷ Bacon, *NO, OFB*, XI, 35.

oracles is grounded on the doctrine that the ultimate source of matter's potency is inscrutable and must be accepted on faith as something "positive." Its explicator must perforce be an interpreter. As a lawyer and judge whose professional function was to interpret the positive "Placets of Law," it is unsurprising that Bacon should present himself in this guise. However, he chooses the image of "high priest," which carries overtones of mystery and secrecy associated with elite cults and societies. Moreover, there is a clear suggestion in *Temporis partus masculus* and *Redargutio philosophiarum* that Bacon considered the setting up of an elite society of chosen disciples as a vehicle for promoting his project.⁸⁸ In Chapter 3 I showed how consistently and completely he constructs his programme as a parallel of conventional religious themes and practices. These parallels also extend to scripture and revelation. The comparable Baconian sacred book is the primary history, which is "to be written up with the most religious care" as "another kind of Holy Writ."⁸⁹ This natural revelation is the path to the relief of man's estate.⁹⁰ This is achieved by striving "to renew and increase the empire of humanity itself over the whole universe of things."⁹¹ Bacon also equates the "light of nature" with the Interpretation of Nature.⁹² As he frames it, "for the light itself [*Lumen ipsum*] ... is to be sought from the Interpretation of Nature, or the New Organon."⁹³ This is the "new light" he fears he may "be prevented by death to propound and reveal."⁹⁴ It is "the light of

⁸⁸ See *CV, BF*, 101, cf. *SEH*, III, 620; *RPh, BF*, 103-105, cf. *SEH*, III, 557-560. His "tables" were to play the role of the inner teaching or reserve doctrine "communicated ... only to a few" (*CV, BF*, 101, cf. *SEH*, III, 620).

⁸⁹ Bacon, *PAH, OFB*, XI, 469.

⁹⁰ Bacon, *VT, SEH*, III, 222.

⁹¹ Bacon, *NO, OFB*, XI, 195.

⁹² "*Lumen Naturae: seu formula Interpretationis*" is the second book of *Temporis partus masculus* (*SEH*, III, 528).

⁹³ Bacon, *DAS, SEH*, IV, 413, cf. I, 623.

⁹⁴ Bacon, *VT, OFB*, III, 233.

Nature ... which springeth from Reason, Sense, Induction, Argument, according to the lawes of heauen and earth.”⁹⁵ The parallels between religious and natural themes abound and can only be overlooked through inattention.

Linked with the above is Bacon’s continual invocation of the king and prophet Solomon, whose aphoristic writings he cites throughout and who succeeded in writing “a natural history of all that is green from the cedar to the moss ... and also of all that liveth and moveth.”⁹⁶ And just as the compilation of such a history is “a mighty work fit ... for a king,” so too the interpretation of nature is a kingly task:

Salomon the king affirmeth directly that the glory of God *is to conceal a thing, but the glory of the king is to find it out* ... for in naming the king he intendeth man, taking such a condition of man as hath most excellency and greatest commandment of wits and means ... ⁹⁷

This is conventionally read solely as an enticement to King James. In Book 1 of *Novum organum*, having invoked Solomon’s dictum, Bacon goes on to approve the just judgement of the ancients in awarding divine honours to the discoverers of things.⁹⁸ Moreover, he mentions how the difference in developments of the arts among the inhabitants of the New World and Europe is great enough to justify the remark that man (as inventor) is a God to man. He adds, no doubt in terms of his self-perception, “how much more noble will it seem to discover something to enable everything else to be rapidly discovered by means of it?”⁹⁹ Furthermore, the *New Atlantis* exhibits all of the above themes relating to Bacon’s self-perception as the restorer of monarchical empire aided by an elite priesthood.¹⁰⁰ These motifs,

⁹⁵ Bacon, *AL*, *OFB*, IV, 183.

⁹⁶ Bacon, *VT*, *SEH*, III, 220.

⁹⁷ Bacon, *NO*, *OFB*, XI, 171; *VT*, *SEH*, III, 220.

⁹⁸ See Bacon, *NO*, *OFB*, XI, 195.

⁹⁹ Bacon, *NO*, *OFB* XI, 195-197.

¹⁰⁰ The *New Atlantis* is governed by a ceremonial monarchy whose true power resides with the revered “Fellows of Salomon’s House” (the College of the Six Days Works), a brotherhood that

redolent of Renaissance images of magical and elite societies, appear *prima facie* to be at odds with the naturalising tenor of Baconian magic. However, the power to effect this Baconian vision comes from a science of restored ancient magic, rooted in a radical materialism, a vociferous defence of the senses, and a scathing attack on mystical obscurantism. This melange of apparently contradictory elements permeates Bacon's writings.

On the basis of the above discussion, an emphasis on Bacon's materialism can hardly avoid a confrontation with the issue of Bacon's religious sincerity, a notoriously divisive theme in Bacon scholarship. For example, what is one to make of Bacon's astute and adroit deployment of scriptural motifs and citations, and his prefatory and concluding prayers that seem to reflect the Reformation piety of a regenerate Christian.¹⁰¹ Others consider these merely dissimulation for atheistic materialism. Stephen McKnight takes the former view and attacks those such as Howard White and Jerry Weinberger who argue for Bacon's impiety. Expanding on his earlier article arguing for the influence of the *prisca theologia* on Bacon, McKnight emphasises and takes seriously Bacon's religious self-presentation. He focuses on the apocalyptic aspects of "instauration" in relation to overcoming the consequences of the Fall, the omnipresent role of Providence in Bacon's scheme, "Bacon's understanding of his vocation as a prophet and as a priest of nature," and the pre-eminent role of Christian charity.¹⁰² Attending to McKnight's arguments is

dispenses blessings and donatives. The "Brethren" are the keepers of secrets (even from the state), masters of deceptions and their actions include the artificial production of "miracles" (*NA, SEH*, III, 146).

¹⁰¹ In *Novum organum* Bacon states, "I am no founder of sects" (*OFB*, XI, 175). In his *Life of Bacon* Rawley says, "This lord was religious ... He repaired frequently, when his health would permit him, to the service of the church, to hear sermons, to the administration of the sacrament of the blessed body and blood of Christ; and died in the true faith, established in the church of England" (*SEH*, I, 14).

¹⁰² Stephen McKnight, *The Religious Foundations of Francis Bacon's Thought* (Columbia: University of Missouri Press, 2006), 151.

important in establishing the extent of Baconian reform and the extent of the unity of knowledge in terms of its incursion into the religious sphere.

Unfortunately, despite McKnight's claim that his approach to the Baconian corpus "involves close textual analysis," his commentary is often not anchored in the texts.¹⁰³ For example, – and this is especially pertinent to the question of natural philosophy's remit – much of his argument rests on Bacon's use of light symbolism. According to McKnight, Bacon makes it clear that "true knowledge comes through divine illumination ... Bacon's new epistemology establishes the procedures for enlightenment."¹⁰⁴ The trouble with McKnight's account is that it completely ignores Bacon's materialist cosmogony and never once addresses the importance of Baconian matter. Bacon is implacably hostile to talk of spiritual illumination; he repeatedly states that the light of creation is the light of sense. He points out that the lack of "investigation" into "the Form of light" is "an astonishing piece of negligence."¹⁰⁵ He says unmistakably that the manner in which "Light and its causes" has been handled is "somewhat superstitious, as if it were a thing half way between things divine and things natural."¹⁰⁶ Light as a subject of inquiry must be "handled physically and according to sense."¹⁰⁷ In that case light will, as Bacon puts it, come "at once to questions of radiation."¹⁰⁸ It is not possible to grasp Bacon's conception of light in the absence of an understanding of his radiative matter. Furthermore, as we have seen, in the concluding chapter of *De augmentis* Bacon demands that the soul be subject to physical investigation. Thus, although "Light" is

¹⁰³ McKnight, *The Religious Foundations of Francis Bacon's Thought*, 2.

¹⁰⁴ *ibid.*, 86.

¹⁰⁵ Bacon, *DAS, SEH*, IV, 403, cf. I, 612.

¹⁰⁶ *ibid.*

¹⁰⁷ *ibid.*

¹⁰⁸ *ibid.*

frequently mentioned in Bacon's texts, this alone tells us little about Bacon's attitude towards it.

McKnight also draws attention to the way Bacon uses the doctrine of the Fall, which was not due to the pursuit of "the pure knowledge of nature and universality" but to the pursuit of "the proud knowledge of good and evil" that would let men "become as gods."¹⁰⁹ Yet McKnight has paid no attention to Bacon's concept of the unity of the sciences, or to his urging for a deeper investigation "concerning the Rootes of Good and euill, and the Strings of those Rootes" through inquiry into nature.¹¹⁰ It is particularly regrettable that he makes no attempt to show that the key Baconian concept of "charity," whose importance McKnight rightly emphasises, has any Christian theological content whatsoever. I have argued above that there is a "bond" of union which in terms of cohesion and community is again traceable to matter's virtues.¹¹¹ I suggest that McKnight's historiography fails to distinguish between the *de facto* presence of materials and their usage in specific arguments.

It is undeniable that as a shrewd politique, Bacon regards religion as an indispensable element of a stable state. As he says, "Religion, custom and fear serve as keepers of the law, since the wills of men are moved by faith and opinions, customs and examples, or by affections."¹¹² Moreover, materialism is no barrier to either religious fervour as seen in the example of Bruno, or to piety and virtue,

¹⁰⁹ McKnight, *The Religious Foundations of Francis Bacon's Thought*, 86.

¹¹⁰ Bacon, *AL, OFB*, IV, 136.

¹¹¹ In its standard use in Bacon "charity" clearly coincides with the classical Stoic virtue of *philanthropia*. On the relationship of philanthropy to Bacon's programme see Masao Watanabe, "Francis Bacon: Philanthropy and the Instauration of Learning," *Annals of Science* 49 (1992), 163-173. As for the *prisca theologia*, Bacon was more preoccupied with the "thrice excellent" prophet Proteus than Thrice-Great Hermes (Bacon, *DSV, SEH*, VI, 725, cf. 651).

¹¹² From aphorism 20 of the *Aphorismi de jure gentium maiore, sive de fontibus justitiae et juris*, quoted in D. R. Coquillette, *Francis Bacon* (Edinburgh: Edinburgh University Press, 1992), 242.

typified by Boyle's later promotion of a sanitised and Christianised version of ancient materialism. Moreover, the either/or framing of the question of Bacon's religious outlook bespeaks a crude historiography and in those terms it is likely to remain undecidable. What is incontestable is Bacon's self-image as critic of a degenerate intellectual milieu. Bacon believed he lived in an age of deep-rooted and widespread cultural insanity.¹¹³ Central to the contemporary institutions of learning, both of church and state, was the Organon of Aristotle. In Bacon's terms "an art or manual of madness ... [that] made us slaves of words."¹¹⁴ Bacon's regenerative project includes the replacement of the Aristotelian Organon by his *Novum organum* because without it, he says, "all our choice meditations, speculations and controversies are mere madness, except there is no one to tell us so."¹¹⁵ Bacon's association of madness with philosophical decadence indicates that contemporary religion rests on insecure grounds and so is not exempt from the taint of insanity. However, certain scholars such as McRae have taken very seriously Bacon's statement that "*all knowledge is to be limited by religion.*"¹¹⁶ In view of Bacon's extreme naturalising of all knowledge, what possible limits could be imposed by religion? What is excluded from Bacon's *philosophia prima*? McRae suggests a domain utterly distinct from physical investigation. But that excludes only those things that do not require investigation, not divine things *tout court* because Bacon includes them in his *philosophia prima*. If Bacon is taken at face value then "religion" must have some clear-cut, definable sense. The excluded region, Bacon's sacred and inspired Divinity, "is grounded onely vpon the word & oracle of God,

¹¹³ See Bacon, *NO, OFB*, XI, 55.

¹¹⁴ Bacon, *TPM, BF*, 63, cf. *SEH*, III, 530.

¹¹⁵ Bacon, *NO, OFB*, XI, 67.

¹¹⁶ Bacon, *VT, SEH*, III, 218 (italics in original).

and not vpon the light of nature.”¹¹⁷ On the other hand, he states that “the vse notwithstanding of Reason in spirituall things, and the latitude thereof is very great and generall: for it is not for nothing, that the Apostle calleth Religion *our reasonable seruice of God*.”¹¹⁸ Furthermore, he says:

there is allowed vs an vse of Reason, and argument, secondarie and respectiue; although not originall and absolute: For after the Articles and principles of Religion are placed and exempted from examination of reason: It is then permitted vnto vs to make deriuations and inferences from, and according to the Analogie of them, for our better direction. In Nature this holdeth not, for both the principles are examinable by Induction, though not by a *Medium* or *Sillogisme*: and besides those principles or first positions, haue noe discordance with that reason which draweth downe and diduceth the inferiour positions.¹¹⁹

However, even here Bacon turns the question into one of inquiry. The “*true limits and vse of reason in spirituall things*,” he says, has not been “sufficiently enquired & handled.”¹²⁰ Ultimately, all rests upon “the true and sound Interpretation of the Scriptures.”¹²¹ One sort of interpretation – the “Methodical” – he rejects as divinity “reduce[d] ... into an Art.”¹²² The other – “Solute, or at large” – he favours and it bears an odd resemblance to the recursive and cybernetic approach that he applies to inquiry generally.¹²³ He tells us: “I doe much condemne that Interpretation of the Scripture, which is onely after the manner as Men vse to interprete a prophane booke.”¹²⁴ The Scriptures

are not to be interpreted only according to the latitude of the proper sense of the place, and respectiue towards that present occasion, whereupon the wordes were vttered; or in precise congruitie or contexture with the wordes before or after, or in contemplation of the principall scope of the place, but

¹¹⁷ Bacon, *AL OFB*, IV, 182.

¹¹⁸ *ibid.* (italics in original).

¹¹⁹ *ibid.*, 184.

¹²⁰ *ibid.* (italics in original).

¹²¹ *ibid.*, 186.

¹²² *ibid.*, 186-187.

¹²³ *ibid.*, 186.

¹²⁴ *ibid.*, 189.

haue in themselves not onely totally or collectiue, but distributiue in clauses and wordes, infinite springs and streames of doctrine to water the Church in euerie part.¹²⁵

In brief, the interpretation of the oracle of God's Word is to deliver the sense most appropriate to "whereof the Church hath most vse."¹²⁶ In this way there is no conflict between right reason (*ratio recte*) and sound religion and as in any other sphere of knowledge both mutually adapt and grow in consequence of the growth of the art of discovery with discovery. Thus scriptural interpretation is a recursive art tending to utility and the practical requirements of ecclesiastical governance.

All these themes undergo a curious convergence in the closing paragraph of *Sylva sylvarum*. Here Bacon speaks of men's susceptibility to be influenced by what others say and think, which leads them to take delight variously "in popularity, fame, honour, submission and subjection of other men's minds, wills, or affections."¹²⁷ These are in themselves "grateful and agreeable to the nature of man," which suggests (Bacon thinks) that "all spirits and souls of men came forth out of one divine limbus."¹²⁸ He continues:

The best temper of minds desireth good name and true honour: the lighter, popularity and applause: the more depraved [minds], subjection and tyranny; as is seen in great conquerors and troublers of the world [such as the formerly praised Alexander and Caesar]; and yet more in arch-heretics [such as the antichrist figure of Aristotle]; for the introducing of new doctrines is likewise an affectation of tyranny over the understandings and beliefs of men.¹²⁹

It therefore seems reasonable to assume that the role of arch-heretic is the last of his self-personations.

¹²⁵ *ibid.*

¹²⁶ *ibid.*

¹²⁷ Bacon, *SS, SEH*, II, 672.

¹²⁸ *ibid.*

¹²⁹ *ibid.* Rawley's letter to the reader preceding the *Sylva* informs us that Bacon was not serving "the glory of his own name" (*SS, SEH*, II, 335).

In terms of self-representation, I should note that the final paragraph in which he presents himself as “arch-heretic” is the culmination of the century dealing with “*immateriate virtues, and the force of imagination.*”¹³⁰ Bacon has at least two reasons for choosing to focus on the powers of imagination. First, as explained in Chapter 3, the imagination, supported by philosophical and spiritual authority and embodied in cultural institutions, is the source of the madness all around him. By drawing forensic attention to its modes and manner of working, he may provoke the reader to reflect on how men’s minds came to be “bound and, as it were, maleficiate by the charms of deceiving notions and theories, and thereby made impotent for generation of works.”¹³¹ Second, imagination is the trigger for all voluntary action: “the insecta have voluntary motion, and therefore imagination.”¹³² Thus a tyrant over men’s minds, such as Bacon perceives himself to be, should be fully acquainted with the potency of the imagination if governance and control of minds and bodies is to be achieved. I suggest that *Sylva sylvarum* is yet another Baconian labyrinth and should be read as dispersed writing. By noting such clues as the casual way in which manna is referred to as a normal herbal exudation, or how the spirit of man, formerly the lamp of God, has undergone a demotion or transformation in the *Sylva*, one can learn to navigate it and even come to recognise the forest despite the density of trees.¹³³

The inexplicable neglect of *Sylva sylvarum* is evidence for the over-contextualisation of current scholarship in the history of science. In Baconian scholarship the *Sylva* is regarded as an embarrassing farrago of borrowings. Nothing

¹³⁰ Bacon, *SS, SEH*, II, 640 (italics in original).

¹³¹ Rawley, *SEH*, II, 335.

¹³² Bacon, *SS, SEH*, II, 560.

¹³³ Bacon states: “But we ... hold firm to the works of God, and to the sense, which is God’s lamp, (*lucerna Dei spiraculum hominis*) ...” (*SS, SEH*, II, 641).

could be further from the truth and the concept of borrowings has yet again sidetracked attention away from Bacon's texts. Commentators have failed to grasp the significance of Rawley's comment that the *Sylva* "may seem an indigested heap of particulars."¹³⁴ I have already cited and defended the importance of the *Sylva* several times in this thesis. In lieu of the full and detailed commentary which is a future project, I offer the following brief comments. I suggest that as the *New Atlantis* can be seen as the summation of Bacon's political doctrine appropriately expressed in the guise of a fable, so *Sylva sylvarum* is an illustrative epitome of Bacon's natural philosophy. It foregrounds the omnipresent working of spirits throughout the entire natural realm, including of course the human world. Pneumatical explanation is applied equally to the mineral, vegetable, animal and human realms of physical nature. Viewing *Sylva sylvarum* as an array of disparate particulars is inexplicable, as throughout the text Bacon explains the transformations of bodies in terms of the all-pervading activities of attenuated material spirits. Thus as a final comment, I suggest that the *Sylva* demonstrates beyond doubt that thorough and detailed exegesis of the Baconian corpus is essential to fully grasp the radical nature of Baconian reform.

¹³⁴ Rawley, *SEH*, II, 335 (my emphasis).

Appendix 1

Francis Bacon

De Interpretatione Naturæ Sententiæ XII

A note on the translation

De Interpretatione Naturæ Sententiæ XII is transcribed from a first edition of *Scripta in naturali et vniuersali philosophia* published in 1653.¹ The *Scripta* was printed from a transcription of certain Bacon manuscripts in an edition prepared by the Dutch scholar Isaac Gruter (1610-80).² This work was not translated by Bacon's nineteenth-century editors even though James Spedding describes it as "most remarkable for weight, condensation, and comprehensiveness."³

This is intended to be a word-for-word translation. I have chosen to translate the text this way to enable the reader to detect the intricacies of the original. This work is written in what Bacon later referred to as aphorisms. Each *sententia* is extremely dense and requires unfolding. Elsewhere Bacon discusses his remarkable ingenuity in contracting and reducing his intentions "almost to singular words."⁴ He hoped this mode of delivery would enable him to "as it were single and adopt his reader."⁵ The only clues Bacon gives his readers take the form of particular terms which function as signposts – enabling the interpreter to navigate the labyrinth of his philosophy. When these threads are traced through the whole range of his works and the relevant passages juxtaposed, a coherent programme begins to emerge. The only way the translator can preserve these signposts in translation is, as Allan Bloom says, "by a slavish, even if sometimes cumbersome literalness – insofar as possible always using the same English equivalent."⁶ Thus I have endeavoured to render the same Latin word by the same English word.

¹ Copy in Brotherton Collection, University of Leeds (shelfmark Sc BAC). For a bibliographical description of the *Scripta* see *OFB*, VI, 451-459. *De Interpretatione Naturæ Sententiæ XII* is forthcoming in *OFB*, III. Spedding is unable to determine when the piece was composed, *SEH*, III, 783. Judging by the style and content, it was probably composed between 1600 and 1605.

² For details of the manuscripts' transmission from Bacon to William Boswell, from Boswell to Gruter, and from manuscript to print see *OFB*, VI, lxx-xcv.

³ *SEH*, III, 783.

⁴ My trans., *TPM* (*OFB* abbreviations are used for the titles of Bacon's works, parts of works and plans), *SEH*, III, 536-537.

⁵ *VT*, *SEH*, III, 248; cf. *DIN*, 7. Even Bacon's mother despaired of his enfolded writing. In a letter to Anthony Bacon dated 18 April 1593 she writes: "I send herein your brother's [Francis'] letter. Construe the interpretation. I do not understand his enigmatical folded writing," *LL*, VIII, 245.

⁶ *The Republic of Plato*, ed. and tr. Allan Bloom, 2nd edn. (Paris: Harper Collins, 1991), xi.

De
INTERPRETATIONE
NATURÆ
SENTENTIÆ XII

De Conditione Hominis.

- I. HOMO Naturæ minister & Interpres tantum facit aut intelligit, quantum de Naturæ ordine re vel mente observabit, ipse interim Naturæ legibus obsessus.
- II. Terminus itaque humanæ potentiæ ac scientiæ in dotibus quibus ipse præditus est à natura ad movendum & percipiendum tum etiam in statu rerum præsentium. Ultra enim has bases illa instrumenta non proficiunt.
- III. Dotes hæ per se tenues & ineptæ, rite tamen & ordine administratæ tantum possunt, ut res à sensu & actu remotissimas iudicio & usui coram sistant, majoremque & operum difficultatem & scientiæ obscuritatem superent, quam quis adhuc optare didicerit.
- IV. Una veritas, una Interpretatio: Sensus autem obliquus, animus alienus, res importuna, ipsum tamen Interpretationis opus magis declinans quam difficile.

TWELVE SENTENCES
ON
THE INTERPRETATION
OF NATURE

Concerning the condition of man.

1. Man, the minister and interpreter of nature, does or understands only as much as he shall observe, in actuality or in the mind,ⁱ concerning the order of nature, being himself in the meantime hemmed in by the laws of nature.
2. And so the limit of human power and knowledge <is>ⁱⁱ in the endowments with which he himself is provided by nature for moving and perceiving, then also in the state of present things. For beyond these bases those instruments are of no avail.
3. These endowments though in themselves slight and inept, yet, duly and in order administered, have so much power that they set things most remote from sense and action before judgement and experience, and overcome a difficulty of works and an obscurity of knowledge greater than anyone hitherto could learn to wish for.
4. <There is> one truth, one interpretation, but the sense is aslant, the mindⁱⁱⁱ is mad, the thing is awkward, yet the work of interpretation is itself more elusive than difficult.

De impedimentis Interpretationis.

- V. Quisquis dubitationis impos, & asserendi avidus principia demum statuet probata (ut credit) concessa & manifesta, ad quorum immotam veritatem cætera ut pugnancia vel obsecundantia recipiet vel rejiciet, is res cum verbis rationem cum insania, Mundum cum fabula commutabit, interpretari non poterit.
- VI. Qui omnem rerum distinctionem, quæ in constitutis vulgo speciebus, vel etiam inditis nominibus elucescit, non miscuerit, confuderit, & in massam redegerit, non unitatem Naturæ, non legitimas rerum lineas videbit, non interpretari poterit.
- VII. Qui primum & ante alia omnia animi motus humani penitus non explorarit, ibique Scientiæ meatus & errorum sedes, accuratissime descriptas non habuerit, is omnia larvata et veluti incantata reperiet, fascinum nî solverit, interpretari non poterit.
- VIII. Qui in rerum obviarum & compositarum causis exquirendis veluti flammæ, somnii, febris, versabitur, nec se ad naturas simplices conferet, ad istas primo, quæ populari⁷ ratione tales sunt; deinde etiam ad eas, quæ arte ad veriolem simplicitatem reductæ sunt & veluti sublimatæ, is fortasse si cætera non peccat, addet inventis quædam non spernenda, et Inventis proxima. Sed nil contra majores rerum secularitates movebit, nec Interpres dicendus erit.

⁷ populari] popolare / silently emended thus in *SEH*, III, 786.

Concerning the impediments to interpretation.

5. Whoever, unable to control doubt and eager of assertion, will then establish principles proved (as he believes) conceded and manifest, in respect of whose immovable truth he will accept or reject other things as conflicting or complying, that man will exchange things for words, reason for insanity, the world for a fiction, <and> he will not be able to interpret.
6. He who has not mixed, confused and reduced to a mass^{iv} the whole distinction of things which is manifest in species popularly established, or even in the names bestowed, will not see the unity of nature, nor the legitimate lines of things,^v <and> he will not be able to interpret.
7. He who first and before all other things has not thoroughly examined the motions of the human mind, and has not painstakingly described the paths of knowledge and the seats of errors there, that man will find all things masked and as it were enchanted, <and> unless he breaks the spell he will not be able to interpret.
8. He who busies himself with inquiring into the causes of things which are obvious and composite, for instance flame, dream, fever, and who does not betake himself to simple natures, to those first of all which in popular thinking are such, then also to those which have been reduced and as it were sublimated by art to a truer simplicity, that man perhaps if he does not go astray in other respects will add to things invented certain things not to be disparaged and similar to things invented. But he will move nothing against the greater secularities of things,^{vi} nor will he deserve to be called an interpreter.

De moribus Interpretis.

IX. Qui ad interpretandum accesserit, ita se comparet & componat; sit nec novitatis, nec consuetudinis, vel Antiquitatis sectator, nec contradicendi licentiam, nec authoritatis servitutum amplectatur. Non affirmandi sit properus, nec in dubitationem solutus, sed singula gradu quodam probationis insignita provehat. Spes ei laboris, non otii author sit; Res non raritate, difficultate, aut laude, sed veris momentis æstimet. Privata negotia personatus administret, rerum tamen provisus subvenerans. Errorum in veritates, & veritatum in errores subingressus prudenter advertat, nihil contemnens aut admirans. Naturæ suæ commoditates norit. Naturæ aliorum morem gerat, cum nemo lapidi impingenti succenseat. Uno veluti oculo rerum naturas, altero humanos usus pererret. Verborum mixtam naturam & juvamenti & nocumenti inprimis participem distincte sciat. Artem Inveniendi cum Invento adolescere statuat. Sit etiam in scientia, quam adeptus est, nec occultanda nec proferenda vanus, sed ingenuus & prudens, tradatque Inventa non ambitiose, aut maligne, sed modo primum maxime vivaci & vegeto, id est ad injurias temporis munitissimo, & ad scientiam propagandam fortissimo, deinde ad errores pariendos innocentissimo, & ante omnia, qui sibi legitimum lectorem seponat.

Concerning the conduct of the interpreter.

9. He who has undertaken to interpret, let him prepare and compose himself in the following manner. Let him not be an admirer of novelty, nor of custom or of antiquity, and let him not embrace the licence of contradiction nor the servitude of authority. Let him not be hasty in affirmation, nor dissolved into doubt, but let him advance particulars distinguished by a certain degree of testing. Let him have hope of work, let him not be the author of idleness. Let him determine the worth of things not according to rarity, difficulty or fame, but true moments.^{vii} Let him administer his personal affairs masked,^{viii} but with some small consideration for the provisions of things.^{ix} Entering a little into the truths of errors and the errors of truths, let him take prudent note, despising or admiring nothing. Let him know the good points of his nature.^x Let him humour the nature of others, since no one gets angry with a stone which bumps into one.^{xi} Let him with one eye, as it were, survey the natures of things, with the other human practices.^{xii} Let him know with due distinction the mixed nature of words, which above all shares in helping and hindering. Let him resolve that the art of invention grows with invention. Let him also not be boastful but ingenuous and prudent in hiding and bringing forward the knowledge which he has attained, and let him impart his discoveries not fulsomely or stingily, but in a way which is in the first place particularly lively and vigorous, that is, well fortified against the injuries of time and most powerful for propagating knowledge, then most innocent as regards engendering errors, and above all which selects for itself the legitimate reader.^{xiii}

De officio Interpretis.

X. Ita moratus & comparatus Interpres ad hunc modum procedat. Conditionem hominis reputabit, impedimenta Interpretationis removebit, tum ad opus accinctus Historiam parabit & ordinatas chartarum sequelas, unaque usus, coordinationes, occurrentias & Schedulas instituet. Rerum solitudinem & sui similitudinem repræsentabit. Quin & rerum delectum habebit, quæque maxime primitivæ sunt vel instantes, id est vel rerum aliarum inventioni;⁸ vel humanis necessitatibus præcipue conducunt, præordinabit. Instantiarum etiam præminentias observabit, quæ ad operis compendium plurimum possunt. Atque ita instructus reordinationes demum, & chartas novellas ac ipsam Interpretationem facilem jam & sponte sequentem, imo mente fere præreptam mature & feliciter aggredietur & perficiet. Quod ubi fecerit, continuo veros æternos & simplicissimos Naturæ motus, ex quorum ordinato & calculatissimo progressu infinita hæc tum præsentis tum omnis ævi varietas emergit, pura et nativa luce videbit & numerabit. Interimque ab initio operis humanis rebus multa & incognita, veluti fœnus, assidue recipere non omittet. Sed hinc denuo totus in humanos usus rerumque præsentium statum conversus & intentus, omnia diversa via & ad actionem ordinabit & disponet. Naturis secretissimis alias declaratorias, & absentissimis alias superinductorias assignabit. Et deinde tandem veluti altera Natura plerumquitates condet, quarum errores pro monstris sint, salva etiam tamen sibi Artis prærogativa.

⁸ inventioni] inventione / silently emended thus in *SEH*, III, 787.

Concerning the office of the interpreter.

10. Conducting himself and having prepared himself in this way, let the interpreter advance in this fashion. He will think over the human condition, he will remove impediments to interpretation, then, equipped for the work, he will prepare a history and ordered sequences of charts and at the same time he will begin work on uses, co-ordinations, occurrences and schedules.^{xiv} He will set forth the uniqueness of things and the likeness of things to one another. Moreover he will make a selection of things and will arrange first those things which are most primordial or urgent, that is, which contribute especially either to the invention of other things or to human needs. He will also watch for the pre-eminences of instances which have the most efficacy for abridging the work.^{xv} And, so prepared, he will only then speedily and felicitously embark upon and accomplish the reorderings and the new charts and the interpretation itself which is easy now, following instinctively, nay, more or less seized by the mind in advance.

When he has done this he will at once see and count in their pure and native light the true, eternal and most simple motions of nature, from whose ordered and most calculated progress this infinite variety of both the present age and of every age emerges.^{xvi} And meanwhile, from the beginning of the work, he will not omit to take in constantly, as it were in interest, many things unknown to human affairs.^{xvii} But from here, turning anew and intent entirely on human practices and the state of present things, he will order and arrange all things by diverse ways and for action.^{xviii} To most hidden natures he will assign some declaratory, and to most absent natures he will assign others superinductory.^{xix} And then at last as it were another nature^{xx} will establish its manifoldnesses whose wanderings are to be as marvels; yet with the prerogative of art also retained for itself.^{xxi}

De provisu rerum.

XI. Tu autem spe & studio languidis hæc hauris (*fili*) mirarisque si tanta supersit operum fructuosissimorum et prorsus incognitorum ubertas, ea non ante hac, aut jam subito esse inventa, simul etiam, cujusmodi ea sint, nominatim requiris, visque tibi aut immortalitatem, aut Indolentiam, aut voluptatem transportantem promitti. Verum tu tibi largire (*fili*) spemque ex Scientia aucupabere, ut ex ignorantia desperationem cepisti.⁹ An etiam Arte adoptandum est opus? At dubitationi tuæ quoad licet satisfaciam, moremque tibi geram. Quod hæc subito nota sint, nil mirum (*fili*). Scientia celeris, tempus tardi partus est. Etiam nobilia, quæ ante hæc inventa sunt, non luce prioris cogitationis sensim, sed casu (ut loquuntur) affatim inventa sunt. In Mechanicis autem est quædam rei jam inventæ extensio, sed novæ inventionis nomen non meretur. Non longum (*fili*) sed ambiguum est iter. Quod autem hæc non ante hoc tempus in conspectum se dedisse ais¹⁰, An tibi compertum est quantum omni Antiquitati, vel omnibus in regionibus, vel etiam singulis hominibus innotuerit? Sed fere assentior tibi (*fili*) teque altius manu ducam. Non dubitas quin si homines non forent, multa eorum quæ Arte (ut loquuntur) facta sunt, defutura fuissent, ut statuam marmoream, stragulam vestem. Age vero & homines an non habent & ipsi suos motus quibus obtemperant? Sane (*fili*) magis subtiles, & difficilius à scientia comprehensos, sed æque certos. Profecto, inquires, homines Voluntati parent. Audio, sed hoc nihil est. Qualis causa est fortuna in Vniverso, talis est Voluntas in homine. Si quid ergo nec sine homine producitur, & jacet etiam extra hominis vias, an non nihilo æquale est? Homo etiam in quædam veluti occurrentia impingit, alia fine præviso & mediis cognitis exequitur. Mediorum tamen Notitiam ex obviis sumit. Quo igitur in numero reponentur ea, quæ nec effectum obviium, nec operationis modum & lucem ex obviis sortiuntur. Talia opera *Epistemides* vocantur id est scientiæ filiæ, quæ non alias in actum veniunt, quam per scientiam et Interpretationem meram, cum nihil obvii contineant. Inter hæc autem & obvia quot gradus numerari putas? Tene (*fili*) et obsigna.

⁹ cepisti] cœpisti / emended thus in *SEH*, III, 787.

¹⁰ ais] ajo / emended thus in *SEH*, III, 788.

Concerning the provision of things.^{xxii}

11. But you, my son,^{xxiii} drink these things in with faint hope and zeal and you marvel, if there be remaining so great an abundance of works most fruitful and utterly unknown, that those things have not been invented before now or have now suddenly been invented; at the same time also you inquire of what kind those things are by name and you wish to have promised to you either immortality or freedom from pain, or transporting pleasure.^{xxiv} But do you give generously to yourself, my son, and hunt for hope from knowledge as you have captured despair from ignorance.^{xxv} Or is the work to be striven after even by art? But I will satisfy your doubt as far as I may, and I will humour you. That these things have suddenly become known is not surprising, my son. Knowledge is swift; time is of slow birth. Even noble things which have been invented before these, were not invented gradually by the light of prior cogitation but by chance, as they say, at once. On the other hand in things mechanical there is a sort of extension of a thing already invented but it does not merit the name of a new invention.^{xxvi} The way is not long, my son, but winding. But as for your saying that these things have not presented themselves to the gaze before this time, I ask you whether you have ascertained how much was known to the whole of antiquity, whether in every region or even to individual men?^{xxvii} But I largely agree with you, my son, and I will lead you deeper by the hand.^{xxviii}

You do not doubt that if men did not exist many of those things which are made by art (as they say) would have been lacking, as for example marble statues or coverings of tapestry. Come now, do not men also themselves have their own motions to which they submit? To be sure, my son, <motions> more subtle and comprehended with more difficulty by science but equally certain. Indeed, you will say, men obey the will. That is granted, but this is nothing. Just as fortune is the cause in the universe, so the will is the cause in man. If anything therefore is not brought forth without man and also lies outside the ways of man, is it not equal to nothing? Man also stumbles across certain things that lie in his way as it were,^{xxix} other things he pursues foreseeing the end and recognizing things intermediate. But the awareness of things intermediate he acquires from things obvious. In what number therefore shall those things be placed which are allotted neither an obvious effect nor a mode and light of operation from things obvious? Such works are called *Epistemides*, that is, daughters of knowledge, which do not come into actuality otherwise than through knowledge and pure interpretation since they comprise nothing obvious. But between these things and things obvious how many steps do you think are counted? Remember, my son, and seal!^{xxx}

XII. Postremo loco tibi consulo (*fili*) quod facto inprimis opus est, hoc est ut mente illuminata & sobria interpretationem rerum divinarum & naturalium distinguas, neve has ullo modo inter se committi patiare. Satis erratum est in hoc genere. Nihil hic nisi per rerum inter se similitudines addiscitur. Quæ licet dissimillimæ videantur, premunt tamen similitudinem germanam interpreti notam. Deus autem sibi¹¹ tantum similis est absque tropo. Quare nullam ad ejus cognitionem hinc lucis sufficientiam expecta. Da fidei, quæ fidei sunt.

¹¹ sibi] tibi / emended thus in *SEH*, III, 788.

12. In the final place I advise you, my son, of what needs above all to be done, namely that, with mind illumined and sober, you separate the interpretation of things divine and natural and do not allow these in any way to be joined together. There has been enough error in this respect. Nothing here is learned additionally except through the likenesses of things amongst themselves. Which things, although they seem most unlike, nevertheless conceal a genuine likeness known to the interpreter.^{xxxii} But God is like only to himself, without trope. Therefore expect no sufficiency of light from here for learning about him. Give to faith those things which are faith's.

ⁱ A similar formulation is found in aphorism 1 of *NO*: "Homo Naturæ minister, & Interpres, tantum facit, & intelligit, quantum de Naturæ Ordine, re vel mente, obseruauerit, nec ampliùs scit, aut potest" (*NO*, *OFB*, XI, 64). Robert Ellis notes that this is "perhaps the most often quoted sentence in the *Novum organum*" (*SEH*, I, 88). *DO* (*OFB*, XI, 44) and *AC* (*SEH*, III, 793) have "Opere" instead of "re."

G. W. Kitchin (commenting on *NO*) observes that this aphorism "has been usually spoiled in translations," *Novum organum: sive indicia vera de interpretatione naturæ* (Oxford: Oxford University Press, 1855), 8, n. 3. The meaning of "re vel mente" has proved particularly problematic. Kitchin suggests that because *DO* substitutes "opera" for "re," the "re vel mente" distinction is "between our observation of things, facts, effects in the Universe, and our mental operations on them: 're' by observation, 'mente' by contemplation" (*ibid.*). Similarly, Benjamin Farrington renders the clause in the first aphorism of *NO* "practice or theory," adding that "the word *re* is unclear," *The Philosophy of Francis Bacon* (Liverpool: Liverpool University Press, 1964), 54. He goes so far as to state that "A. Lipschutz, *Tres Medicos Contemporaneos*, Buenos Aires, 1958, 198, is surely right in treating *re* as a mistake of transcription" (*ibid.*). This is highly unlikely given that the phrase "re vel mente" occurs in both *NO* and *DIN*. Thomas Fowler acknowledges an alternative reading of the passage: the distinction is either between "the observation of facts and the subsequent process of meditation or reflexion on such observation" or between "the observation of the external world and that of our own minds," *Bacon's Novum Organum*, ed. Thomas Fowler, 2nd edn. corrected and revised (Oxford: Clarendon Press, 1889), 191. Graham Rees with Fowler favours the first alternative (*OFB*, XI, 502). Hence he renders aphorism 1 of *NO*: "Man, the servant and interpreter of nature, does and understands only as much as he has observed, by fact or mental activity, concerning the order of nature; beyond that he has neither knowledge nor power" (*OFB*, XI, 65). For other translations see *Novum organum with other parts of the Great Instauration*, tr. and ed. Peter Urbach and John Gibson (Chicago and La Salle: Open Court, 1994), 43; *The New Organon*, ed. Lisa Jardine and Michael Silverthorne (Cambridge: Cambridge University Press, 2000), 33.

Sententia 1 is a paradigmatic instance of Bacon's enfolded writing – it sets out the problem which *Novum organum* proposes to solve. The "re vel mente" clause is intended to be incongruous. Why is it there? Why does Bacon distinguish between what is observed in actuality and what is observed in the mind? He is drawing attention to the mind's failure to observe anything in actuality, and hence to observe anything concerning the order of nature. The *res/mens* antithesis is the obstacle which must be overcome in order for Bacon's goal of dominion over nature to be realized.

According to Fowler, “though the precise meaning of the words is obscure, the purport of the Aphorism is plain” (*op. cit.*, 191). Given the dense nature of this aphorism, it seems more plausible that knowledge of the precise meaning of the words is a prerequisite to comprehending the whole. The phrase “de Naturæ ordine” refers to what is “ex analogiâ Vniuersi” and not “ex analogiâ Hominis” (see *DO, OFB, XI, 32; NO, OFB, XI, 80, 358*). “Re” refers to the *ipsissimæ res* which is “existens,” “interius” and “in ordine ad universum” (*NO, OFB, XI, 236*). Hence Bacon is not talking about “the observation of the external world” in the sense of “things, facts, effects in the Universe” but the essence of things. This confusion springs from Bacon’s use of “opera” in the *DO* and *AC* formulations. There he substitutes “re” with “opere” because he is making the point – highlighted by Paolo Rossi – that “things as they really are, considered ... not in relation to man but in relation to the universe, offer conjointly truth and utility,” *Philosophy, Technology, and the Arts in the Early Modern Era*, tr. Salvator Attanasio (New York: Harper and Row, 1970), 160. In the same paragraph of *DO*, Bacon states that “human Knowledge and Power, do in fact come together, and lack of success with works stems mainly from ignorance of causes” (*OFB, XI, 45*). In other words, power to carry out *opera* depends upon knowledge of things as they really are (*res*). As he puts it in *sententia 11*: “Talia opera *Epistemides* vocantur id est scientiæ filiæ, quæ non alias in actum veniunt, quam per scientiam et Interpretationem meram.” Both “opere” and “re” are intended to highlight the need to observe the essences of things.

According to Bacon, “testimonium & informatio sensûs semper est ex analogiâ Hominis, non ex analogiâ Vniuersi: atque magno prorsûs errore asseritur, Sensum esse mensuram rerum” (*DO, OFB, XI, 80*). He speaks of the need to make clear “what may be assigned to the nature of things and what to the nature of the mind” (*DO, OFB, XI, 37*). *Mens* – the locus of the intellectual processes – must be subjected to thorough examination. As Bacon says in *sententia 7* of *DIN*: “He who first and before all other things has not thoroughly examined the motions of the human mind, and has not painstakingly described the paths of knowledge and the seats of errors there” will not be able to interpret. Man (without Bacon’s *Novum organum*) observes nothing in actuality because “the human intellect is to the rays of things like an uneven mirror which mingles its own nature with the nature of things, and distorts and stains it” (*NO, OFB, XI, 81*).

In order to understand the “re vel mente” clause we must look for other instances of this pairing (see *IM, OFB, XI, 2, 6; DO, OFB, XI, 36; NO, OFB, XI, 270, 442; DPAO, OFB, VI, 208; RPh, SEH, III, 583; TPM, SEH, III, 538*). The opening paragraph of the *Instauratio magna* states that, “omni ope connitendum existimavit, si quo modo commercium istud *Mentis, & Rerum* ... restitui posset in integrum, aut saltem in melius deduci” (*OFB, XI, 3*). The purpose of *Novum organum* is to unite *mens* and *res* so that “non solùm ex Naturâ Mentis, sed ex Natura Rerum quoque hæc Scientia emanet” (*NO, OFB, XI, 442*). The goal of Bacon’s programme – the production of all things possible – depends upon knowledge of forms. Bacon’s form is “in ordine ad Vniuersum, non relatiuus tantummodò ad Sensum” (*NO, OFB, XI, 270*). In other words, forms are a true reflection of the essences of things in the mirror of the mind. From the discovery of forms, which requires a union “of the mind and the universe,” will “spring helps for men and a line of discoveries which may to some degree subdue and mitigate their needs and miseries” (*NO, OFB, XI, 37*).

My translation of *sententia 1* entails an alternative interpretation of the “re vel mente” clause which, briefly stated, is as follows: Man does and understands only so much as he observes concerning the order of nature. Things observed in actuality are according to the order of nature. But

man can only observe things in the mind. Because the mind (in its present state) is estranged, what man observes in the mind is not concerning the order of nature, but concerning the order of man. Man therefore observes nothing in actuality. Thus he does and understands nothing. Hence the problem is how to enable the mind to observe the order of nature. In other words, how to unite the mind with things in actuality (*res*). For a detailed treatment of this topic see Chapter 3.

ⁱⁱ I have used < > to indicate a supplement.

ⁱⁱⁱ I have used the English term “mind” to cover both “mens” and “animus” because of the indiscriminate latitude of the modern English.

^{iv} *Massa* refers to a lump of any substance in the raw state and Ovid applies it to Chaos, *Fasti*, I, 107-108 (Loeb Classical Library), tr. J. G. Frazer, (London and New York: Harvard University Press, 1931), 10: “ut semel haec rerum secessit lite suarum / inque novas abiit massa soluta domos”; cf. *Metamorphoses*, I, 69-71, at 70, MS H^{2c} F⁴LP, *P. Ovidi Nasonis Metamorphoses*, ed. R. J. Tarrant, (Oxford: Clarendon Press, 2004), 4: “uix ita limitibus dissaepserat omnia certis, / cum quae pressa diu massa latuere sub ipsa / sidera coeperunt toto efferuere caelo.” On the role of chaos and putrefaction in Bacon’s natural philosophy see Chapters 2 and 5.

^v This suggests a chemical procedure. In *NO* Bacon says: “Itaque facienda est corporum separatio & solutio, non per ignem certè, sed per rationem & *Inductionem* veram, cum Experimentis auxiliaribus; & per comparationem ad alia corpora, & reductionem ad Naturas simplices, & earum formas, quæ in composito conueniunt & complicantur; & transeundum planè à *Vulcano* ad *Mineruam*, si in animo sit veras corporum texturas & *Schematismos* ... in lucem protrahere” (*OFB*, XI, 212). On *linea* see *NO*, *OFB*, XI, 92, 186, 358, 412. Cf. Plato, *Phaedrus* 265E, tr. Alexander Nehamas and Paul Woodruff (Indianapolis and Cambridge: Hackett Publishing Company, Inc., 1995), 64: “This [other thing which it would be quite wonderful to grasp by means of a systematic art] is to be able to cut up each kind according to its species along its natural joints, and to try not to splinter any part, as a bad butcher might do.”

^{vi} Ellis suggests that *secularitas* signifies “popular opinions, or such as flourish in the *sæculum* or world, or through ages, *sæcula*” (*SEH*, III, 786). Bacon uses the term in *TPM* where it seems to have this sense (*SEH*, III, 537). In this passage, however, “popular opinions” seems inappropriate. In *NO* Bacon says: “Itaque sperandum omninò est, esse adhuc in Naturæ sinu, multa excellentis vsùs recondita, quæ nullam cum iam Inuentis cognationem habent, aut parallelismum; sed omninò sita sunt extra vias phantasiæ, quæ tamen adhuc inuenta non sunt; quæ proculdubiò *per multos sæculorum circuitus & ambages*, & ipsa quandoquè prodibunt, sicut illa superiora prodierant; sed per viam quam nunc tractamus, properè, & subitò, & simul repræsentari, & anticipari possunt” (my emphasis, *OFB*, XI, 166-168). Similarly, he says in *VT* that the work of interpretation “is to abridge experience and to make things as certainly found out by Axiom in short time, as by infinite experiences in ages” (*SEH*, III, 247). I suggest that Bacon is expressing this thought in *sententia* 8, in which case “majores secularitates” signifies “the greater ages.”

^{vii} Bacon appears to be thinking of *momentum stateræ* – the moment of a balance, a particle sufficient to turn the scales. *Momentum* here also has the figurative sense of weight, influence.

^{viii} Ellis renders this phrase “affecting more interest in [personal affairs] than he feels” (*SEH*, III, 786, n. 2). James Spedding says that he does not clearly understand the sentence but thinks “it must refer to the necessity of using popular ideas for popular purposes” (*ibid.*). He cites *RPh*: “Servate itaque et illam alteram, et prout commodum vobis erit adhibete; atque aliter cum natura, aliter cum populo

negotiamini. Nemo enim est qui plus multo quam alius quis intelligit, quin ad minus intelligentem *tanquam personatus sit, ut se exuat, alteri det*" (my emphasis, *SEH*, III, 562). On this basis he suggests that "there should be a full stop after *administret*, and a comma after *subvenerans*" (*SEH*, III, 786). I can see little justification for making this alteration. However, the passage from *RPh* is pertinent. Farrington renders this passage: "Therefore keep your old philosophy. Use it when convenient. Keep one [philosophy] to deal with nature and the other to deal with the populace. Every man of superior understanding in contact with inferiors wears a mask" (Farrington, *op. cit.*, 108). The notion of a mask of philosophy is found in Cicero, *Tusculan disputations*, V, 73 (Loeb Classical Library), tr. J. E. King, rev. edn. (Cambridge, Mass. and London: Harvard University Press, 1945), 500: according to Marcus Tullius, Epicurus "induit personam philosophi". Farrington adds that he has omitted the last five words of the *RPh* passage – "ut se exuat, alteri det" – because he has been unable "to extract a satisfactory sense" from them (Farrington, *op. cit.*, 108, n. 1). I suggest, "laying aside himself and giving himself to another." If this is correct, *sententia* 9 expresses the same thought viz., that the interpreter should not disclose his true self when conducting his personal affairs. This notion is found in *CDSH*: "Prudentia autem Civilis innumeras formas, easque maxime inter se contrarias, quæ rebus, personis, temporibus, convenient, desiderat. Adeo ut mirum minime sit si fabula Protei ad viros prudentes transferatur; qui ab occasionibus constricti in omnes formas se vertunt, donec liberi ad naturas suas redeant" (*SEH*, III, 197). The final clause implies that one's true nature is laid aside in order to take on other forms. On Bacon and secrecy see John C. Briggs, *Francis Bacon and the Rhetoric of Nature* (Cambridge, Mass.: Harvard University Press, 1989), 246-247. Spedding and Farrington fail to mention a second *RPh* passage where Bacon resolves to deal with his audience "simpliciter et absque persona" (*RPh*, *SEH*, III, 570).

^{ix} The meaning of "provisus rerum" is unclear (see *sententia* 11). Bacon seems to be using the phrase in the same way in which he uses "provisions" in *VT*, where it refers to inventions "further to be provided" (*SEH*, III, 234). Cf. Tacitus, *Annals*, IV, 38 (Cambridge Greek and Latin Texts), ed. R. H. Martin and A. J. Woodman (Cambridge: Cambridge University Press, 1989), 56: "rerum uestrarum prouidum."

^x In *DAS* Bacon discusses the following proverb of Solomon: "Prudens advertit ad gressus suos; stultus divertit ad dolos" (*SEH*, I, 766; see also *Ess*, *OFB*, XV, 73). Samuel Reynolds proposes that Bacon has in fact conflated two Vulgate passages, Prov. 14: 8 and 15, *The Essays or Counsels, Civil and Moral*, ed. Samuel Harvey Reynolds (Oxford: Clarendon Press, 1890), 166. The former states "sapientia callidi est intellegere via suam et imprudentia stultorum errans," and the latter "astutus considerat gressus suos." As Bacon interprets this so-called proverb, "Duæ sunt prudentiæ species; altera vera et sana, altera degener et falsa, quam Salomon *stultitiæ* nomine appellare non dubitat. Qui priori se dederit, viis et vestigiis propriis cavet; periculis prospiciens, meditans remedia, proborum opera utens, contra improbos seipsum muniens; cautus inceptu, receptu non imparatus; in occasiones attentus, contra impedimenta strenuus; cum innumeris aliis, quæ ad sui ipsius actiones et gressus regendos spectant. At altera species tota est consuta ex fallaciis et astutiis ..." (*SEH*, I, 766). In *sententia* 9 he says: "Errorum in veritates, & veritatum in errores *subingressus prudenter advertat*, nihil contemnens aut admirans. Naturæ suæ commoditates norit" (my emphasis; cf. Prov. 14: 8). The same thought appears to be expressed here, namely, that the wise man should be well-informed yet focused on himself.

^{xi} The phrase “lapidi impingenti” is obscure. *Lapis* is a common trope for stupidity, e.g., “egomet credidi homini docto rem mandere, is lapidi mando maximo,” Plautus, *Mercator* III, iv, 47 (Loeb Classical Library), 5 vols. (London and New York: Harvard University Press, 1924), III, 70. This use of *lapis* as a term of abuse is found in Johannes Ferrerius of Riva, *Historia Abbatum de Kynlos*, ed. W. D. Wilson (Edinburgh: Bannatyne Club, 1839), 52: “ne alius forte ad hunc lapidem imprudenter impingat.” Prof. J. B. Hall kindly checked this reference for me and he tells me that the *mise en scène* is roughly this. One of the abbots has had one of his books stolen (as he sees it) by a former inmate of the house and wants it back. The inmate rejoins that it was not his at all. The abbot then proceeds to a cautionary account of the affair in detail, “ne alius forte ad hunc [the miscreant] lapidem imprudenter impingat.” If Bacon is drawing on this meaning of *lapis* then the sense is “let him humour the nature of others, since no one gets angry with a blockhead who offends one.”

However, I think the remark is unflattering rather than simply abusive. It is strongly suggestive of a proverb. Erasmus, *Adagia*, IV, ii, 23, *Opera Omnia Desiderii Erasmi Roterodami: recognita et adnotatione critica instructa notisque illustrata*, ed. R. Hoven, 9 vols. (Amsterdam and New York: North-Holland Pub. Co., 1969–), II, vii, 108) states: “CANIS SAEVIENS IN LAPIDEM. Κύων εἰς τὸν λίθον ἀγανακτοῦσα, id est *Canis indignans in lapidem*. Competit in eos qui mali sui causam imputant non ipsi auctori, sed alteri cuiquam. Veluti si quis iracundiae vitium iuventae, non stultitiae, attribueret, vnde proficiscitur. Plato libro de Republica quinto damnans eos qui caesorum cadauera despoliant, ait *hos perinde facere vt solent canes saeuientes in lapidem, eo qui iecit omisso*. Pacuuius apud Nonium in Armorum iudicio:

Nam canis, cum est percussa lapide, non tam petit illum

Qui se icit, quam eum ipsum lapidem, quo icta est, petit.”

See Plato, *Republic*, 5.469E (quoted in *Adagia*, I, x, 34); Nonius Marcellus 124M; Otto 322; Tilley D 542. In Bacon’s terms, when struck by a stone, it is not the striking stone that one gets angry with. In other words, a person (unlike a dog) rightly attributes the cause of their misfortune not to the stone but to its source. The implication – as in *sententiae* 10 and 11 – is that all things, including man, are governed by a calculus of motions which exact obedience. This does not mean that Bacon precludes the need for praise or blame. Although innate character traits are determined by the laws of matter, individuals are capable of moral reformation.

^{xii} Cf. *DAS, SEH*, I, 631.

^{xiii} Cf. *VT, SEH*, III, 248; *AL, OFB*, IV, 90-91; *TPM, SEH*, III, 529; *RPh, SEH*, III, 558.

^{xiv} Cf. *NO, OFB*, XI, 214.

^{xv} Ellis suggests that the pre-eminences of instances are what Bacon later designated prerogative instances (*SEH*, III, 787). Bacon uses the term *insignitus* to describe the prerogative instances: “Sunt enim Instantiæ Prærogatiuis istis insignitæ & donatæ Animæ instar, inter vulgares Instantias Comparentiæ” (*NO, OFB*, XI, 444). However, the pre-eminences of instances may be a more general preliminary category. The notion of abridging the work ties in with the concept of moving against the greater secularities of things (see *sententia* 8). The purpose of Bacon’s so-called method is to short-circuit the long revolutions of ages.

^{xvi} To my knowledge this is the only place where Bacon describes creation *ex chao* without inserting a parenthetical reference to God’s role. Cf. “Utrum vero Materia illa creata, per longos seculorum circuitus, ex vi primo indita, se in illum optimum Schematismum colligere & vertere potuisset, (quod

missis ambagibus ex verbi imperio continuo fecit) non inquirendum fortasse est" (*OFB, DPAO, VI, 252*).

^{xvii} Cf. "At quinta pars ad tempus tantum, donec reliqua perficiantur, adhibetur; & tanquam fœnus redditur, vsque dum sors haberi possit" (*DO, OFB, XI, 42*). Rees argues that "Part V of *IM* ... was to have been devoted to Bacon's own system of substantive theories" (*OFB, XI, 499*). See *OFB, VI, xviii-xix, xxxv, xxxvi-xxxvii; OFB, XIII, xix-xx, 337*.

^{xviii} In *NO* Bacon describes the form as "disponens, siue in ordine ad actionem" (*OFB, XI, 204*). The notion of "latæ viæ" recurs throughout his works. For example, *NO, OFB, XI, 214; AL, OFB, IV, 85; DAS, SEH, I, 568; VT, SEH, III, 235*. He refers to the proverb "Latæ vndique sunt sapientibus viæ" which he attributes to Solomon; cf. Prov. 4: 11-12.

^{xix} Bacon's use of the term *superinducere* is significant. In a general sense it means to engraft new things upon old (see *NO, OFB, XI, 76*). E.g., "Nature createth Brotherhood in Families, & Arts Mechanicall contract Brotherhoods in communalities, & the Anoyntment of God superinduceth a Brotherhood in Kings and Bishops" (*AL, OFB, IV, 60*). The prefix "super" is necessary because the new nature is brought in over and above the old natures. Hence in *NO* Bacon says, "Svper datum Corpus nouam Naturam, siue nouas Naturas generare & superinducere, Opus & Intentio est humanæ Potentiæ" (*OFB, XI, 200*). In *NA* the "Inoculators" graft new natures upon bodies (*SEH, III, 165*). On the superinduction of forms see Chapter 5.

^{xx} On the face of it, there is a striking similarity between this passage and the following passage from Cicero, *De natura deorum*, II, 60 (Loeb Classical Library), tr. H. Rackham (Cambridge, Mass. and London: Harvard University Press, 1933), 270: "Terrenorum item commodorum omnis est in homine dominatus: nos campis nos montibus fruimur, nostri sunt amnes nostri lacus, nos fruges serimus nos arbores, nos aquarum inductionibus terris fecunditatem damus, nos flumina arcemus derigimus avertimus, nostris denique manibus in rerum natura quasi alteram naturam efficere conamur." Cf. *De Finibus*, V, 74: "consuetudine quasi alteram quandam naturam effici"; Macrobius, *Saturnalia*, VII, ix, 7: "consuetudo, quam secundam naturam pronuntiavit usus"; St. Augustine, *De Musicâ*, VI, vii, 19: "consuetudo quasi secunda et quasi affabricata natura"; *Contra Iulianum (opus imperfectum)*, I, 69: "consuetudinem malam vocabat, quae ab eruditis etiam saeculi dici solet secunda natura"; I, 105: "quantum valet nunc in homine uno secunda natura"; IV, 103: "in vi consuetudinis ... quae non frustra dicta est a quibusdam secunda natura". According to F. W. Lenz, the notion of habit as a second nature derives from Democritus ("Ἔθος Δευτέρη Φύσις: A New Fragment of Democritus?" *Transactions of the American Philological Association*, 73, 1942, 214-224). On the concept of creating a second nature see Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley and Los Angeles: University of California Press, 1967), 116-149. In *DAS* Bacon says, "Sunt et alia multa quæ utiliter præcipi possint de regimine Consuetudinis. Consuetudo enim, si prudenter et perite inducatur, fit revera (ut vulgo dicitur) altera natura; quod si imperite et fortuito administratur, erit tantum simia naturæ; quæ nihil ad vivum imitetur, sed inscite tantum deformiter" (*SEH, I, 738; cf. AL, OFB, IV, 152*). On Bacon's concept of "altera natura" see Chapters 2 and 5. In *DAS* Bacon remarks that the alchemists' saying that "Vulcanum alteram naturam esse; quinetiam id celeriter perficere, quod natura per ambages et temporis moras solet" is not a bad one (my emphasis, *SEH, I, 547*). Magical effects are brought about by art which "breui tempore illud facere possit, quod Natura per multas

ambages molitur” (*OFB*, XI, 442). However, in *DSV* the deformed Erichthonius represents the “opera manca” which result from the unskilful use of art.

^{xxi} The concept of “artis prærogativam et vigorem” occurs in *DSV* (*SEH*, VII, 668). Atalanta’s gift of speed is her natural advantage. In Bacon’s interpretation, Atalanta’s advantage signifies the prerogative of art viz., its swiftness. In *sententia* 10 Bacon is saying that, through the efforts of man, another nature will establish itself but this will not require many ages (see *sententia* 8). Rather, knowledge of nature’s simple motions will permit man to superinduce new natures directly so that things “can be speedily, suddenly and simultaneously anticipated and made manifest” (*NO*, *OFB*, XI, 169). The swiftness of art will be preserved even though the purpose of art (according to Bacon) is to bring forth marvels, which are traditionally a product of nature’s infrequent “wanderings.” According to Bacon, the discovery of forms (or simple motions) “repræsentat aut anticipat Casum (cuius mos est, vt tantùm per longa sæcula operetur)” (*NO*, *OFB*, XI, 302; cf. *DPAO*, *OFB*, VI, 252).

^{xxii} See above n. ix. Again, the sense seems to be concerning “things to come” or “things further to be provided.”

^{xxiii} This form of writing – “Methodum ad Filios” – is explained in *DAS* where Bacon distinguishes the magistral from the initiative method of transmitting knowledge: “(vocabulum a Sacris mutuantes) eam dicimus Methodum Initiativam, quæ ipsa scientiarum mysteria recludat et denudet. Magistralis siquidem docet; Initiativa intimat. Magistralis poscit ut fides habeatur iis quæ dicuntur; Initiativa vero potius ut examen subeant. Altera scientias discentium vulgo; altera tanquam filiis scientiarum tradit” (*SEH*, I, 663-664). According to Ellis, “by [son] we are to understand those who are qualified to be disciples” (*SEH*, I, 664). He notes that “Artefius records the conservation wherein his master, Boemund, transmitted to him the first principles of all knowledge; and it is remarkable that in this and similar cases the disciple is called ‘mi fili’ by his instructor – a circumstance which shows from what source Bacon derived the phrase ‘ad filios’” (*SEH*, I, 86). Spedding disagrees – in his view *fili* alludes “not so much [to] those who are qualified to be disciples, as those who will carry on the work” (*SEH*, I, 664). Thus “Methodum ad Filios” is rendered “Method of Delivery to Posterity” (*DAS*, *SEH*, I, 664; cf. *SEH*, IV, 450). Ellis’s and Spedding’s differing interpretations reflect their differing views on Bacon’s attitude to secrecy (see *SEH*, I, 85-87, 107-113). Ellis argues that Bacon chose to veil his doctrine “in an abrupt and obscure style, such as, to use his own expression, would choose its reader, – that is, would remain unread except by worthy recipients of its hidden meaning” (*SEH*, I, 85). Spedding vehemently rejects this claim: “we must not suppose that the process of singling [out] and adopting the fit reader was to be effected by any restraint in communication, or any obscurity in style, which should exclude others” (*SEH*, I, 112). For a detailed treatment of this aspect of Bacon’s writing see Chapter 1. Bacon includes *fili*/son in parenthesis in *TPM* and *NA*; he also addresses the “true sons of the sciences” in *NO* (*TPM*, *SEH*, III, 528-530, 535-539; *NA*, *SEH*, III, 156, 164, 166; *NO*, *OFB*, XI, 58). However, I argue that Bacon’s writing is always “ad filios,” whether or not this is made explicit.

^{xxiv} In chapter 10 of *VT* where Bacon discusses things that “are to be compassed and procured”, he speaks of the need to guard against on the one hand “the poverty of experiences and probations”, and on the other hand “the vanity of credulous imaginations” (*SEH*, III, 234). Regarding the latter, he says “it will be as fit to check and control the vain and void assignations and gifts whereby certain ignorant, extravagant, and abusing wits have pretended to indue the state of man with wonders” (*ibid.*). On false hope see *NO*, *OFB*, XI, 136-138. The same thought is expressed in *sententia* 11: his

initiate does not have much interest or enthusiasm in these matters, he is sceptical of his claims of undiscovered plenty while at the same time wanting to play name games for things that are as yet wholly unknown, asking for the fulfilment of every idle wish he has ever daydreamed of. However, hope based on knowledge (acquired via interpretation) is a good thing because it spurs men to action. Prolongation of life, mitigation of pain and greater pleasures of the senses are included in the list of *magnalia naturæ* appended to *NA* (*SEH*, III, 167-168). In *VT* Bacon states that the true end of knowledge “is a discovery of all operations and possibilities of operations from immortality (if it were possible) to the meanest mechanical practice” (*SEH*, III, 222).

^{xxv} Because well-founded hope is desirable, Bacon tells his initiate to indulge himself: “hunt for hope from knowledge as you have captured despair from ignorance.” The phrase “Verum tu tibi largire” is obscure. In *AL* he says, “weigh that quicke and acute reply, which [Alexander] made when he gaue so large gifts to his friends, & seruantes, and was asked what he did reserue for himselfe, and he answered, *Hope*: Weigh I say, whether he had not cast vp his account aright, because *Hope* must bee the portion of all that resolute vpon great enterprises” (*OFB*, IV, 46). This might explain Bacon’s use of the term *largire*. The remainder of *sententia* 11 explains why there are good grounds for hope; cf. *NO*, *OFB*, XI, 148-172.

^{xxvi} Cf. *DAS* (*SEH*, I, 627-629) where this “extension of a thing already invented” is discussed under the heading of “Literata Experientia, sive Venatio Panis” which treats of methods of experimenting, *SEH*, 1: 623. There Bacon terms the extension of a thing in the mechanical arts “Translatio Experimenti.”

^{xxvii} See *NO*, *OFB*, XI, 14: “Neque enim nobis magnâ ex parte notum est, quid in Scientijs & Artibus, varijs sæculis & locis, innotuerit, & in publicum emanârit.”

^{xxviii} Cf. *NO*, *OFB*, XI, 58, 149, 210.

^{xxix} Cf. *DO*, *OFB*, XI, 42: “Neque enim finem nostrum ita petimus occæcati; vt, quæ occurrunt in viâ vtilia, negligamus.”

^{xxx} Cf. Lucretius, *De rerum natura*, II, 581-582 (Loeb Classical Library), tr. W. D. Rouse and ed. M. F. Smith, rev. edn. (Cambridge, Mass. and London: Harvard University Press, 1982), 140: “Illud in his obsignatum quoque rebus habere / convenit et memori mandatum mente tenere.” This notion of keeping something sealed and treasured up in the mind is probably what Bacon has in mind here. “Obsigna” may also be an oblique reference to Daniel 12: 4. The Vulgate has: “tu autem Danihel clude sermones et signa librum usque ad tempus statutum, pertransibunt plurimi et multiplex erit scientia.” Bacon’s use of the motto “Multi pertransibunt & augebitur scientia” on the engraved title of *Instauratio magna* is well-known (see *OFB*, XI, xxxii, 489-490; cf. *NO*, *OFB*, XI, 150). See also, Isaiah 8: 16: “liga testimonium signa legem in discipulis meis.” By “Tene (*fili*) et obsigna” Bacon may intend that the work be reserved for his disciples – the sons of science. In *VT* he says, “That the discretion anciently observed, though by the precedent of many vain persons and deceivers abused, of publishing part and reserving part to a private succession, ... is not to be laid aside; both for the avoiding of abuse in the excluded, and the strengthening of affection in the admitted” (*SEH*, III, 248).

However, Bacon also uses the term *obsignare* when he speaks of closing up the divine realm: “Sensus enim (instar Solis) Globi terrestris faciem aperit, cœlestis claudit, & obsignat” (*NO*, *OFB*, XI, 22). This idea is found in *DSV*: “Pentheus cum sacrificiorum Bacchi occultorum, conscensa arbore, spectator esse voluisset, furore percitus est. Fuit autem Penthei dementia ejus generis, ut res congeminasse existimaret, et duo soles et rursus duæ Thebæ ei ob oculos versarentur; adeo ut cum

Thebas properaret, statim alteris Thebis conspectis retraheretur: atque hoc modo perpetuo et irriquite sursum et deorsum ferretur ... Qui enim ausu temerario, mortalitatis parum memores, per excelsa naturæ et philosophiæ fastigia (tanquam arbore conscensa) ad mysteria divina aspirant, his pœna proposita est perpetuæ inconstantiae et iudicii vacillantis et perplexi. Cum enim aliud sit lumen naturæ, aliud divinum; ita cum illis fit, ac si duos soles viderent” (*SEH*, VI, 646). In *sententia* 12 the injunction to keep things divine and natural apart because “Deus ... sibi tantum similis est absque tropo. Quare nullam ad ejus cognitionem hinc lucis sufficientiam expecta” immediately follows the imperative “obsigna.”

^{xxx} This “genuine likeness known to the interpreter” is what Bacon later calls the form. In *NO* he explains: “Quòd si cuiquam videantur etiam Formæ nostræ habere nonnihil abstracti, quòd misceant & coniungant heterogenea (videntur enim valde esse heterogenea Calor Cœlestium, & Ignis; rubor fixus in rosâ, aut similibus, & apparens in Iride, aut radijs Opalij, aut Adamantis; Mors ex summersione, ex crematione, ex puncturâ gladij, ex Apoplexiâ, ex Atrophiâ; & tamen conueniunt ista in Naturâ Calidi, Ruboris, Mortis) is se habere intellectum nôrit consuetudine, & integralitate rerum, & opinionibus captum & detentum. Certissimum enim est, ista, vtcunque heterogenea & aliena, coire in Formam, siue Legem eam quæ ordinat Calorem, aut ruborem, aut mortem” (*OFB*, XI, 256).

Appendix 2

Francis Bacon

Inquisitio legitima in Commentarius solutus

A note on the translation

Commentarius solutus is held at the British Library, Additional Manuscripts 27278, folios 16^r-17^v. As James Spedding explains, *Inquisitio legitima* “is the last of many memoranda which appear to have been transferred from an old note-book (*transportata ex commentario vetere*) on the 26th July, 1608.”¹ *Inquisitio legitima* is significant because it demonstrates the cybernetic nature of Baconian inquiry. Although Spedding published *Inquisitio legitima*, he failed to align the numbering correctly.² The findings of the inferior machine of the intellect (stages 1-15 of the inquiry) feed back into the superior machine of the intellect.

Editorial intervention in the text has been kept to a minimum. All matter deleted by Bacon has been restored. These deletions are delimited by <<...>>. Conjectural reconstructions of illegible words are set in square brackets. Illegible words for which no conjecture can be supplied are represented thus: [...]. Punctuation has not been emended in the edited text. All contractions have been expanded. Initial capitals and lower-case letters have not been emended. All marginalia have been positioned in the text and delimited by braces ({}).

¹ Spedding, *SEH*, III, 625. Speaking of *Commentarius solutus*, Spedding writes: “As the pages all bear a running title of *Transportata*, that is, notes transferred from a former note-book, I suppose that he [Bacon] had looked through all the memoranda of this kind that he had by him, and gathered whatever he judged worth keeping into this volume. He would probably alter and add while he transcribed, as well as omit; and therefore, though many of the notes may have been of older date, we cannot distinguish the old from the new, and must treat them generally as belonging to this period [c. 1608]. He calls the collection *Commentarius solutus*, which may be translated a book of loose notes” (*LL*, XI, 21-22). Spedding cites Bacon who describes *Commentarius solutus* as “like a merchant’s waste book; where to enter all manner of remembrance of matter, form, business, study, touching myself, service, others; either sparsim or in schedules, without any manner of restraint; only this to be divided into 2 books: The one *transportata ex commentario vetere*, containing all manner notes already taken in several paper books fit to be retained (except it be such as are reduced to some more perfect form); the other *Commentarius novus*” (*LL*, XI, 22). Spedding adds that there is no trace of the latter book.

² For Spedding’s edition see *SEH*, III, 625 and *LL*, XI, 67.

Inquisitio legitima; <<de motu.>>

{Sectio ordinis}

{Nova opera}

1. Carta electionis et præoptionis
2. Sylva, sive Carta Mater
3. Meta posita, sive Carta terminans.
4. Loci, sive Carta Articulorum
5. Vena exterior, sive Carta divisionis primæ

{Apparentia secunda}

6. Carta assignationis vel collocationis <<et resolutionis [sue]>>

{Sectio rerum}

7. 1. Carta Historiæ ordinatæ ad [...] divisiones primas, et reliquos articulos
8. 2. Carta Amanuensis, sive super Instantias

{Sectio lucis}

9. 1. Carta Analysis motus compositi, vel de spelling
10. 2. <<Cart>> Vena interior, sive Carta divisionis secundæ
11. 3. Carta observationis, sive axiomatis
12. 4. Carta humana optativa
13. 5. Carta humana activa, sive practica
14. 6. Carta Anticipationis, sive interpretationis sylvestris
15. 7. Carta Indicationis, sive ad cartas novellas

Nota Interpretationem legitimam non fieri, nec clavem Interpretationis adoperari, usque ad reordinationes et cartas novellas finitas, ut duæ sint machinæ Intellectus, una Inferior quam descripsimus, altera Superior quæ est novellarum.

The legitimate inquisition <<concerning motion>>

{Section of order}

{New works}

1. The chart of election and preoption
2. The Sylva, or the Mother Chart
3. The fixed goal or the terminating chart
4. The *loci*, or the chart of articles
5. The exterior vein, or the chart of first division

{Second appearance}

6. The chart of assignation or collocation <<and resolution>>

{Section of things}

7. 1. The chart of history arranged by [...] first divisions and the remaining articles
8. 2. The chart of the Amanuensis, or upon instances

{Section of light}

9. 1. The chart of the analysis of composite motion, or concerning spelling
10. 2. The interior vein, or the chart of second division
11. 3. The chart of observation, or of axiom
12. 4. The human optative chart
13. 5. The human active or practical chart
14. 6. The chart of anticipation or interpretation of the *sylva*
15. 7. The chart of indication or with reference to the new charts

Note that a legitimate interpretation is not made, nor is the key of interpretation employed up to the reorderings and the finishing of the new charts, so that there are two machines of the intellect, one the inferior which we have described, the other the superior which is that of the new charts.

Appendix 3

The Prerogatives of Instances

Appendix 3 (see foldout in pocket) is a summary of the 27 Prerogatives of Instances outlined in Book 2 of *Novum organum*.¹ They fall into three main groups: those that assist the intellect, those that assist the sense, and those that assist operation. Those which are underlined need to be collected at the outset (as part of the mother history) rather than waiting until metaphysics.

¹ Bacon, *NO, OFB*, XI, 273-447.

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