

CHAPTER ONE

Margaret Cavendish *Natural Philosopher and Feminist**

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At the turn of the seventeenth century, numerous upper-class “learned ladies” began studying and contributing to the “new science” by attending and discussing its advances in salons, by writing treatises, novels, and articles and by exchanging letters. This cluster of women, supported by the men of their class, contributed to the philosophy, science, and educational literature of the Scientific Revolution and Enlightenment. These women and their achievements deserve more detailed study and evaluation than has been accorded them. Women with great intellectual gifts were taken seriously by philosophers such as John Locke, Ralph Cudworth, and Gottfried Wilhelm Leibniz and the writer and philosopher Voltaire. They included Margaret Cavendish, Duchess of Newcastle (1623–73), subject of this chapter, Lady Anne Conway (1631–79), who was a major influence on Leibniz’s philosophy, and Gabrielle Émilie du Châtelet (1706–49), Voltaire’s mistress, who was a principal expounder of Leibniz’s system and translator of Newton’s *Principia Mathematica* into French.

Women and the “New Science”

Women who were educated in the “new science” of the seventeenth century included Sophie, the Electress of Hanover; her daughter Sophia Charlotte, queen of Prussia after 1701; the latter’s ward, Princess Caroline (1683–1737), later queen of Great Britain, in answer to whose questions the entire Leibniz–Clarke correspondence of 1716 was directed; and Lady

* Carolyn Merchant, University of California, Berkeley, emerita. Portions of this chapter are taken from Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (San Francisco: HarperCollins, 1980), pp. 268–74, copyright © 1980 by Carolyn Merchant and used by permission of HarperCollins, and from Carolyn Merchant, Keynote Address to the Margaret Cavendish Society, Bates College, Lewiston, Maine, June 23, 2017. Revised from “Margaret Cavendish,” in Carolyn Merchant, *Science and Nature: Past, Present and Future* (New York: Routledge, 2018), pp. 141–55, used with permission.

Damaris Masham (1658–1708), daughter of Ralph Cudworth (who educated her), friend and student of John Locke, and a theological writer with whom Leibniz carried on an extensive correspondence.¹ During this period, an expanding group of educated women began to participate in the philosophical and intellectual life of the period.

By the late seventeenth century, upper-class English women were noticing and reacting to the economic and educational advances men had made, while their own opportunities were by comparison significantly constricted. They argued that differences in male and female achievement stemmed not from female intellectual inferiority, but from differences in childrearing practices, educational opportunities, and social position. Hannah Wooley, writing in 1655, Bathsua Makin, writing in 1673, and Mary Astell, writing in 1694, deplored women's lack of education and advocated the study of philosophy, foreign languages, medical care, household accounts, and writing. Their ideal went far beyond the emphasis on morals, Christian virtue, chastity, and the reading of the scriptures that had characterized women's education in the Renaissance.²

Translations were made of Henry Cornelius Agrippa's 1529 essay *Declamation on the Nobility and Pre-Eminence of the Female Sex*, and François Poulain de la Barre's French treatise, *The Woman as Good as the Man* (written in 1673), which argued for the equality of the sexes.³ Agrippa's treatise had been presented to Margaret of Austria in 1509.⁴

¹ On Princess Caroline of Wales, pupil of Leibniz at Hanover, see Leibniz, "The Controversy Between Leibniz and Clarke," in Leroy E. Loemker (ed. and trans.), *Gottfried Wilhelm Leibniz: Philosophical Papers and Letters: A Selection*, 2 vols. (Chicago: University of Chicago Press, 1956), vol. 2, pp. 1095–1169; Leibniz, *Die philosophische Schriften*, ed. C. I. Gerhardt (Berlin, 1875–90), vol. 7, pp. 345–440. Leibniz's correspondence with Lady Masham is collected in Leibniz, *Philosophische Schriften*, vol. 3, pp. 336–75. On Gabrielle Émilie du Châtelet as an exponent of Leibnizian thought, see Carolyn [Merchant] Iltis, "Madame du Châtelet's Metaphysics and Mechanics," *Studies in History and Philosophy of Science*, 8 (1977), 29–48 and W. H. Barber, "Mme. du Châtelet and Leibnizianism: The Genesis of the *Institutions de Physique*," in W. H. Barber et al. (eds.), *The Age of the Enlightenment: Studies Presented to Theodore Besterman* (Edinburgh and London: Oliver & Boyd, 1967), pp. 200–22.

² Hannah Wooley, *The Gentlewomen's Companion* (London, 1673; first published 1655); Bathsua Makin, *An Essay to Revive the Antient Education of Gentlewomen, in Religion, Manners, Arts, and Tongues* (London, 1673); Mary Astell, *A Serious Proposal to the Ladies for the Advancement of Their True and Greatest Interest* (London, 1694). On seventeenth-century feminist ideas concerning women's education, see Hilda Smith, *Reason's Disciples: Seventeenth Century English Feminists* (Urbana: University of Illinois Press, 1982), pp. 75–95. On women's learning, see Myra Reynolds, *The Learned Lady in England, 1650–1760* (Boston: Houghton Mifflin, 1920).

³ On the presentation of Agrippa's treatise to Margaret of Austria in 1509, see Marc Van Der Poel, *Cornelius Agrippa: The Humanist Theologian and His Declamations* (Leiden: Brill, 1997), see source on p. 186, note 4. On Poulain de la Barre, see Michael A. Seidel, "Poulain de la Barre's 'The Woman as Good as the Man'" *Journal of the History of Ideas*, 35.3 (1974), 499–508.

⁴ See Van Der Poel, *Cornelius Agrippa*.

Although not printed until 1529, it was subsequently reprinted many times before its English translations were published in 1652 and 1670. Agrippa marshaled numerous arguments to make a case for the superiority of women over men. Eve, whose name meant life, was created last in the chain of creatures and was therefore more perfect. Her body was more beautiful, her face unspoiled by a beard. As a mother, the woman contributed more in material and intellect to the embryo than the man. A female could conceive without a man: witness the Virgin Mary. Whereas Mary was the best human being the world has ever known, Judas, a man, was the worst known sinner. Although Jesus the Redeemer was a man, it was a man, Adam, who had committed the original sin. Great women had excelled in the past and were only prevented from achievement by the monopoly and tyranny of men in education.⁵

Margaret Cavendish, Duchess of Newcastle

While learned ladies had always been present among the educated nobility, and women had contributed to science and mathematics from earliest times, the “scientific lady” was a product of the Scientific Revolution. Leading the way toward recognition of women as students of the new philosophy was Margaret Cavendish, Duchess of Newcastle (1623–73), a member of the famous Newcastle circle, which in the mid-seventeenth century played a major role in the formation of the mechanical philosophy. She was educated at home along with her six siblings and during the English Civil War was exiled to France where she met and married William Cavendish, who later became Duke of Newcastle. There she studied and discussed philosophy with her husband and his brother in the salons they held in Paris that included such luminaries as Thomas Hobbes, René Descartes, Pierre Gassendi, Marin Mersenne, and Kenelm Digby. She later engaged with the ideas of the Cambridge Platonists such as Henry More and Ralph Cudworth. In her *Philosophical Letters*, published in 1664, she began: “You have been pleased to send me the Works of four Famous and Learned Authors, to wit, of two most Famous Philosophers of our Age,

⁵ Feminist books reprinted in England included Henry Cornelius Agrippa, *De Nobilitate et Praecellentia foeminei sexus* (1529). For Agrippa’s arguments on the superiority of women over men, see H. C. Agrippa, *The Glory of Women: or a Looking-glasse for Ladies* (London, 1652), pp. 3, 10, 13, 15, 20, 31; for other arguments on women’s superiority and/or equality, see H. C. Agrippa, *Female Pre-eminence; or the Dignity and Excellency of that Sex, Above the Male* (London, 1670); François Poulain de la Barre, *The Woman as Good as the Man; or the Equality of Both Sexes*, trans. A. L. (London: N. Brooks, 1677; first published 1673). On Poulain de la Barre, see Michael A. Seidel, “The Woman as Good as the Man,” *Journal of the History of Ideas*, 35 (1974), 499–508.

Descartes, and Hobbs, and of that Learned Philosopher and Divine Dr. More, as also of that Famous Physician and Chymist Van Helmont.” Throughout her work, however, she rarely mentioned names and only occasionally used initials when referring to individuals.⁶

A feminist who between 1653 and 1671 wrote some twenty-six works, including fourteen scientific books about atoms, matter and motion, butterflies, fleas, magnifying glasses, distant worlds, and infinity, Cavendish’s ideas and theories are at times inconsistent, contradictory, and eclectic, which is attributable at least in part to her lack of formal education – a lack she herself deplored. For example, her vitalist-materialist view that human beings are matter in motion that thinks would seem to contradict her view that we cannot understand “most things that happen in nature.”⁷ She was acutely aware of the problems of leisured ladies who were made “like birds in cages to hop up and down in their houses,” and wrote:

We are shut out of all power and authority by reason, we are never employed either in civil nor marshall affairs, our counsels are despised and laughed at, the best of our actions are trodden down with scorn by the overweening conceit men have of themselves and through a despisement of us.⁸

⁶ Eugene Marshall, “Margaret Cavendish (1623–1673),” *Internet Encyclopedia of Philosophy*, www.iep.utm.edu/cavend-m/. See Marshall’s discussion of Cavendish’s engagement with the philosophy of contemporaries such as Descartes, Hobbes, Gassendi, and others and later with Cambridge Platonism. Quotation from: Margaret Cavendish, *Philosophical Letters* (London, 1664), section 1.1 (spelling of Descartes modernized).

⁷ On Cavendish’s contradictions and eclecticism, see David Cuning, “Margaret Lucas Cavendish,” *Stanford Encyclopedia of Philosophy*, <https://plato.stanford.edu/entries/margaret-cavendish/> (2009): “There are some potential problems with Cavendish’s argumentation for the view that matter thinks. For example, her argument that it is inconceivable that minds could move and not be material might seem to contradict another argument that features prominently in her system (and that is considered more fully in section 4): namely, that most of the things that happen in nature are beyond our capacity to understand.”

⁸ Margaret Cavendish, *The Philosophical and Physical Opinions* (London: Martin and Allestrye, 1655), preface, “To the Two Universities.” Discussions of Margaret Cavendish’s feminism and scientific work include Hilda Smith, *Reason’s Disciples*, pp. 75–95; Douglas Grant, *Margaret the First: A Biography of Margaret Cavendish, Duchess of Newcastle, 1623–1673* (London: Hart-Davis, 1957); Gerald Dennis Meyer, *The Scientific Lady in England* (Berkeley and Los Angeles: University of California Press, 1955), pp. 1–15; R. H. Kargon, *Atomism in England from Harriot to Newton* (Oxford: Clarendon Press, 1966), pp. 73–6. More recent works on Cavendish include: Anna Battigelli, *Margaret Cavendish and the Exiles of the Mind* (Lexington: University Press of Kentucky, 1998); Line Cottagnies and Nancy Weitz (eds.), *Authorial Conquests: Essays on Genre in the Writings of Margaret Cavendish* (Madison, NJ: Fairleigh Dickinson University Press, 2003); Emma L. E. Rees, *Margaret Cavendish: Gender, Genre, Exile* (Manchester: Manchester University Press, 2003); Brandie R. Siegfried and Lisa T. Sarasohn (eds.), *God and Nature in the Thought of Margaret Cavendish* (Burlington, VT: Ashgate, 2014); Lisa Walters, *Margaret Cavendish: Gender, Science and Politics* (Cambridge: Cambridge University Press, 2014).

An epistle in her book *Poems and Fancies* (1653), written to her friend Mistress Toppe, lamented the “truth” that “our sex hath so much waste time, having but little employments, which makes our thoughts run wildly about, having nothing to fix them upon, which wild thoughts do not only produce unprofitable, but indiscreet actions, winding up the thread of our lives in snarls.”⁹

Another epistle in the same book, addressed “To All Writing Ladies,” noted that in different ages different types of spirits rule and have power; sometimes they are masculine, sometimes feminine. The present age had produced many feminine writers, rulers, actors, and preachers and was perhaps a feminine reign. “Let us take the advantage, and make the best of our time . . . in any thing that [might] bring honour to our Sex.”¹⁰

Cavendish’s preface to *Poems and Fancies* requested the support of her own sex for a work “belonging most properly to themselves.” She wrote:

All I desire, is Fame . . . but I imagine I shall be censured by my owne sex; and men will cast a smile of scorne upon my Book, because they think thereby, Women incroach too much upon their Prerogatives; for they hold books as their Crowne, and the Sword as their Scepter, by which they rule and governe.¹¹

She thus expressed her belief that thinking women would be condemned by men who consider it their own prerogative to write books and govern by wielding swords.

Poems and Fancies begins with Nature calling a council consisting of the female principles, Motion, Figure, Matter, and Life, to advise her on creating the world. Life, Figure, and Motion all agree that Death is the “great enemy” who does not obey Nature’s laws, undoes Form, and corrupts Matter.

First Matter she brought the Materials in,
And Motion cut, and carv’d out everything,
And Figure she did draw the Formes and Plots,
And Life divided all out into Lots.
And Nature she survey’d, directed all,
With the foure Elements built the World’s Ball.¹²

Though Death finally submits, he continues his attempt to obstruct and hinder Nature in all her efforts. Nevertheless, Nature creates a world made

⁹ Margaret Cavendish, *Poems and Fancies* (London: Martin and Allestrye, 1653), “An Epistle to Mistris Toppe,” p. A4.

¹⁰ Ibid., “To All Writing Ladies.”

¹¹ Ibid., Preface, “To All Noble, and Worthy Ladies,” p. A3. Poetry quotations on pp. 3, 5.

¹² Poetry quotations from *ibid.* on pp. 3, 5.

up of atoms – square, round, long, sharp, and so on – which form the vegetables, minerals, and animals of the everyday world. By their combinations atoms make heat and cold, life and death, and cause illnesses such as dropsy, consumption, and colic.

Small Atomes of themselves a World may make,
As being subtle, and of every shape:
And as they dance about, fit places finde,
Such formes as best agree, make every kinde.

Thus nature was made of vitalistic material atoms of all shapes that had their own motion within them and by joining together created the beings of the world we inhabit (see discussion below on *The Blazing World*).

In an attempt to gain recognition for her achievements, Margaret Cavendish insisted in 1667 on a visit to the all-male scientific society, the Royal Society of London, where scientific experiments and instruments were displayed for her surveillance. Samuel Pepys, the London gossip and journalist, “did not like her at all,” but John Evelyn was “pleased with her fanciful habit, garb, and discourse.”¹³ Excluded from membership in the Royal Society because of her sex, she invented her own scientific community in *The Blazing World* (1666), which would bring her the fame and recognition for which she hungered. “I am not covetous, but as ambitious as ever any of my sex is, or can be; which though I cannot be Henry the Fifth or Charles II, yet I endeavor to be Margaret the First.”¹⁴ The sole survivor of a shipwreck, in which all the men have been killed, a lady finds herself on an island where she marries the Emperor and becomes an Empress who resembles Margaret I. She founds schools and societies and receives scientific instruction from beast-men who walk upright. Bear-men and bird-men are her experimental philosophers, who bring telescopes and microscopes for her investigations. Fish-men and worm-men answer her questions about the sea and earth, while the ape-men, her chemists, give an account of transmutations. Fox-men are her politicians, and spider- and lice-men teach her mathematics. Thus the Duchess, in her fantasies, poems, and many prefaces to her voluminous writings presented one of the earliest explicitly feminist perspectives on science.¹⁵

¹³ Emma Wilkins, “Margaret Cavendish and the Royal Society,” *Notes and Records, The Royal Society Journal of the History of Science*, 68.3 (2014), 245–60.

¹⁴ Margaret Cavendish, *The Description of a New World, Called the Blazing-World* (London: A. Maxwell, 1668), from the preface, “To All Noble, and Worthy Ladies.”

¹⁵ Meyer, *The Scientific Lady in England*, pp. 10–11; Cavendish, *The Description of a New World Called the Blazing World*, preface, “To the Reader,” and pp. 4, 15, and passim.

Cavendish's Grounds of Natural Philosophy

Margaret Cavendish's *Grounds of Natural Philosophy* (1668) represented the culmination of her writing career as a feminist natural philosopher. The *Grounds* was the third edition of her earlier book, *Philosophical and Physical Opinions*, published in 1655, but in her own words, "much altered." The updated *Grounds of Natural Philosophy*, published in London in 1668, was "written by the thrice Noble, Illustrious, and excellent Princess, the Duchess of Newcastle." Indeed this book was a substantial revision of many of her earlier writings and can be considered an innovative revision and synthesis of her life work that expressed a vitalist-materialist philosophy.¹⁶

Cavendish, like many writers of the period, did not often identify her sources of information although she engaged with and often opposed the assumptions of many of the philosophers she met in the salons of Paris where she and her husband had lived in exile. In her *Observations upon Experimental Philosophy* (1666) she included a chapter titled "Observations upon the Opinions of Some Ancient Philosophers." Here she drew on the summary of ancient and modern philosophers discussed by

that learned author Mr. Stanley, wherein he describes the lives and opinions of the ancient philosophers; in which I found so much difference betwixt their conceptions and my own, in natural philosophy that were it allowable or usual for our sex, I might set up a sect or school for myself.

And in *The Blazing World*, also of 1666, she mentions "Aristotle, Pythagoras, Plato, and Epicurus" along with "modern writers" including "Galileo, Gassendus, Des Cartes, Helmont, Hobbes, H. More, etc."¹⁷

We can nevertheless make some assumptions about her sources based on the ideas she pulled together to create her own unique philosophy and also identify philosophers whose ideas she anticipated. She wrote within "substance theory" or the "theory of being" (ontology) that was prevalent during the seventeenth century. Her perspective stemmed from Aristotle's

¹⁶ Margaret Cavendish, *Grounds of Natural Philosophy* (London: A. Maxwell, 1668). On Cavendish's vitalistic materialism, see Eugene Marshall, "Margaret Cavendish (1623–1673)," *Internet Encyclopedia of Philosophy*, www.iep.utm.edu/cavend-m/. On her early vitalism, see Walters, *Margaret Cavendish*, pp. 18–19, 37, 119; see also chap. 1 on gender in her theory of matter. On Cavendish, see also David Cunning, "Margaret Lucas Cavendish," <https://plato.stanford.edu/entries/margaret-cavendish/>.

¹⁷ Cavendish, "Observations upon the Opinions of Some Ancient Philosophers," in *Observations upon Experimental Philosophy*, ed. Eileen O'Neill (New York: Cambridge University Press, 2001; originally published London, 1666), pp. 249–75. Cavendish, *The Blazing World*, pp. 37, 39–41.

concept of substantial forms (or form within matter). In the above chapter, "Observations upon the Opinions of Some Ancient Philosophers," in opposition to Plato, she wrote: "Form and matter are but one thing; for it is impossible to separate matter from form, or form from matter." In opposition to Aristotle she stated, "nature and all her parts are perpetually self-moving." She also opposed the idea of occult powers prevalent in the Aristotelianism of the medieval Scholastics. She accepted Heraclitus's theory of change that, "there are not only real, but also apparent or seeming contraries in nature, which are her irregularities." She opposed Descartes' dualism of mind and body, while assuming Hobbes's monist position that all substance was material and that only matter existed. But unlike Hobbes, in her later work she held a vitalist-materialist view that all of nature was self-moving, perceptive, and animate.¹⁸ She was not a follower of these male philosophers, but instead modified their ideas in forming her own philosophy.

While many of her early writings emphasized the empirical methodology of the telescope and the microscope, Cavendish's later works shifted toward a rationalist critique of empiricism and developed a materialist ontology. In the *Grounds of Natural Philosophy* (1668), she engaged with the most fundamental questions of philosophy: (1) How was the world created? What is it made of? (the ontological question, or theory of being); (2) What is knowing? How do we know? (the epistemological question, or theory of knowledge); and (3) How does change occur? (the theory of process). In examining the underlying assumptions in her *Grounds of*

¹⁸ On substance theory, see Howard Robinson, "Substance," *Stanford Encyclopedia of Philosophy*, <https://plato.stanford.edu/entries/substance/#DesSpiLei>, section 2.2: "Substances for Aristotle are individuals, but it is much debated whether they are individualized forms or composites of form and matter." Cavendish, "Observations upon the Opinions of Some Ancient Philosophers," in *Observations upon Experimental Philosophy*, quotation in opposition to Plato, p. 252; in opposition to Aristotle, p. 268, see also p. 270; on Heraclitus, see p. 273. On Cavendish's differences with her contemporary philosophers, see Eugene Marshall, "Margaret Cavendish (1623–1673)," *Internet Encyclopedia of Philosophy*, www.iep.utm.edu/cavend-m/, Oct. 27, 2019: "Against Descartes, however, she rejected dualism and incorporeal substance of any kind. Against Hobbes, on the other hand, she argued for a vitalist materialism, according to which all things in nature were composed of self-moving, animate matter. Specifically, she argued that the variety and orderliness of natural phenomena cannot be explained by blind mechanism and atomism, but instead require the parts of nature to move themselves in regular ways, according to their distinctive motions. And in order to explain that, she argued for panpsychism, the view that all things in nature possess minds or mental properties. . . . In several ways, Cavendish can be seen as one of the first philosophers to take up several interesting positions against the mechanism of the modern scientific worldview of her time. Thus it is possible to add that she presages thinkers such as Spinoza and Leibniz."

Natural Philosophy, we can discern her approaches to these ultimate philosophical questions.¹⁹

1. The Ontological Question: How was the world created and what is it made of? In her 1655 *Philosophical Opinions*, Cavendish had argued that both God and Nature were eternal, a version of “pantheism” that by 1668 she now denied. In the 1655 book, she began Chapter One with the statement: “There is no first matter nor first motion for matter and motion are infinite, and being infinite, must consequently be Eternal.” In Chapter 3, she had written, “Nature is infinite and eternal,” and in Chapter 17 on “The Order of Nature,” she stated, “Eternal matter is always one and the same.” These statements implied that Nature was an eternally-existing substance like God – statements that she later came to repudiate.²⁰

In the *Grounds of Natural Philosophy* (her revision of the *Philosophical Opinions*), Nature (although still infinite) was no longer eternal. Here she moved away from an atheistic pantheism and toward the view that an incorporeal God created a separate corporeal Nature. In her chapter, “Of the Differences between God and Nature,” she differentiated between the two. Although God was an infinite creator, Nature was separate from God and was his infinite creature. “God is an Infinite and Eternal Immaterial Being: Nature, an Infinite Corporeal Being,” she wrote. “God is Immovable, and Immutable: Nature, Moving, and Mutable.” God is without error while nature is full of irregularities. “God is Infinitely and Eternally Worshipped: Nature is the Eternal and Infinite Worshipper.”²¹

The second part of the ontological question is: What is the world made of? As philosopher Eugene Marshall argues, Cavendish’s ontology was a vitalistic-materialism in which the world consisted of a plenum of material, self-living, self-moving parts. In Chapter 1 of *The Grounds of Natural*

¹⁹ Cavendish, *Grounds of Natural Philosophy*, pp. 1–3; Smith, *Reason’s Disciples*, pp. 75–95, 110–12.

²⁰ Cavendish, *Philosophical Opinions*, pp. 1, 3, 5. See also p. 59: “As I said before in my first part of my Book, that there is no first Matter, nor no first Motion, because Eternal, and Infinite. . . .” p. 30. Lisa Sarasohn, in *God and Nature in the Thought of Margaret Cavendish* (Siegfried and Sarasohn, chap. 7), writes: “Cavendish’s most detailed analysis of specific Christian beliefs appear in Letter 3 of *Philosophical Letters* addressed to an unidentified “Madam” – who, Cavendish says, is ‘offended at my Opinion that Nature is Eternal without beginning, which you say is to make her God, or at least coequal with God.’ . . . Cavendish realized that her belief in the eternity of nature was suspect, particularly in relation to the scriptural account of creation” (Sarasohn, p. 102).

²¹ Cavendish, *Grounds of Natural Philosophy*, p. 241. See also Appendix I to the *Grounds of Natural Philosophy*, p. 239: “I cannot conceive how an Immaterial can be in Nature: for, first, an Immaterial cannot, in my opinion, be naturally created . . . an Immaterial in my opinion, must be some uncreated Being; which can be no other than God alone.”

Philosophy, she set out the proposition that all substance was material and that matter and body were one and the same thing. There could be no motion that was not attached to matter. She denied the existence of spirits, arguing that there were no spirits or minds that somehow existed in the realm between body and not-body. Moreover, something immaterial could not have material motion. Matter might be motionless, but all motion must be the motion of matter. Corporeal bodies (matter) could not have incorporeal (mental) perceptions; thoughts were actually corporeal motions united by conjunction.²²

Consistent with a materialist view, the universe was full of matter. There could be no vacuum or empty spaces in nature; no pores or void space between the parts. All parts therefore influence each other. Chance was merely an effect produced by an invisible cause.²³

2. The Epistemological Question: What is knowing and how do we know? Cavendish's epistemology was one in which all parts of the world were not only alive, but knowing and perceptive, a view identified by Eugene Marshall as pan-psychism, or the view that everything material has an element of consciousness within it. In her 1666 *Observations Upon Experimental Philosophy*, she held that "there can be no regular motion without knowledge, sense, and reason."²⁴

In the *Grounds of Natural Philosophy*, Cavendish elaborated further that "all the self-moving parts are perceptive." "Nature," she stated, "is self-knowing, self-living and also perceptive." Everything is alive; all parts of nature have life and knowledge. "And though all her parts, even the inanimate parts are self-knowing and self-living; yet only her self-moving parts have an active life, and a perceptive knowledge."²⁵

Nature was thus a material whole comprising infinite self-knowing parts united in one infinite material body. Moreover, Nature knows herself. "She" has unified knowledge and unified power. But although God has given her self-knowledge and power, that power is limited, "for she cannot move beyond her nature" or "create or annihilate any part." And although she is infinite, Nature has an "exact figure" – an exact frame and form.

²² Ibid., Ch. I, "Of Matter," p. 1, Ch. II, "Of Motion," p. 2.

²³ Ibid., pp. 3, 4, 16. See *ibid.*, Ch. 4, "Of Vacuum," p. 4: "In my opinion, there cannot possibly be any vacuum: for though Nature being material, is divisible and compoundable; and having self-motion, is in perpetual action: yet Nature cannot divide or compose from her self."

²⁴ Eugene Marshall, "Margaret Cavendish (1623–1673)," *Internet Encyclopedia of Philosophy*, section 2c. www.iep.utm.edu/cavend-m/#SH2c.

²⁵ Cavendish, *Grounds of Natural Philosophy*, pp. 6–7.

Each being is unique. Nature cannot give the knowledge, life, motion, or perception embedded in one part to another part. “[O]ne creature cannot have the properties or faculties of another; they may have the like, but not the same.”²⁶

Consistent with pan-psychism, the living creatures of the world are individual beings comprising self-moving parts all of which have the ability to perceive. “All Creatures being composed of these sorts of parts must have a sensitive and rational knowledge and perception as animals, vegetables, minerals, elements, or what else there is in Nature.” Nevertheless individual creatures have “different lives, knowledges, and perceptions.” The self-moving parts when united in an individual creature move according to the nature of that particular individual as a whole; it is the “whole creature” that comprises the individual within it. But individual creatures cannot perceive the mind and thoughts that are within the body of another individual or even the information shared by the parts within its own body. Information can, nevertheless, be communicated between creatures.²⁷

The second part of the epistemological question is: How do we know? In her writings, Cavendish demonstrated a dialectical, or Socratic, method of knowing and reasoning. In her *Philosophical Letters* (1664), she used the device of two women debating each other as “Madam.”²⁸ In other writings, she introduced chapters as a debate between parts of her own self. Thus in *The Grounds*, in a chapter on irregular and regular worlds, she began: “Some parts of my mind were of [the] opinion, that there might be a world composed only of irregularities; and another only of regularities, and some that were partly composed of the one and the other.” She then gave the “minor part’s opinion” followed by the “major part’s opinion,” concluding “after which discourse they generally agreed, there might be regular and irregular worlds.”²⁹

3. The Theory of Process: How does change occur? In answer to this question, Cavendish offered a dialectical theory of change. Drawing on assumptions going as far back as Heraclitus’s idea that all is in flux and constantly changing and anticipating the dialectical theories of Friedrich Engels and Karl Marx, she argued that Nature operated in a

²⁶ Ibid., pp. 11–12, quotations on 11 and 12. ²⁷ Ibid., pp. 17–21, quotations on p. 18.

²⁸ Stephen Clucas, “A Double Perception in All Creatures’: Margaret Cavendish’s *Philosophical Letters* and Seventeenth-Century Natural Philosophy,” in Siegfried and Sarasohn (eds.), *God and Nature in the Thought of Margaret Cavendish*, p. 125.

²⁹ Cavendish, *Grounds of Natural Philosophy*, quotations on p. 254.

series of opposed, but balanced actions. Nature acted both by dividing and composing, dilating and contracting, and with regularity and irregularity. Oppositions included life and death, peace and war, hot and cold, light and dark, wet and dry, soft and hard, heavy and light, etc. Matter, she said, was divided into three parts – the rational, the sensitive, and the inanimate (which although it did not move in space, was nevertheless composed of self-moving parts). Human beings were the rational; other animals and vegetables the sensitive; and minerals and the elements the inanimate.³⁰

The elements – fire, air, water, and earth – divided and joined, changed and re-changed, while retaining their own innate properties. The four elements acted and interacted through such means as flames, lightning, thunder, tides, floods, ice, snow, wind, smoke, and clouds. Metals could be transformed by melting, burning, boiling, and evaporating, vegetables by dividing and growing down into the earth or above its surface. Both natural and artificially created productions came from the composing, joining, and mixing of similar or “foreign” (external) parts. Likewise, artificial motion is an imitation of natural (internal) motion. Concerning artificial things, Cavendish asked, do they have “sense, reason, and perception?” Her answer was yes, everything exists within a unified system. Since “all the rational and sensitive parts of nature are perceptive and . . . no part is without perception, then all artificial productions are perceptive.” These answers buttressed her vitalism and pan-psychism.³¹

Cavendish identified the process of change as “production.” The self-moving parts of nature, or corporeal motions, produced the creatures of the world (animals, vegetables, minerals, and elements). Consistent with her theory of opposed, but balanced actions, corporeal motions were the “laboring parts” through which individual beings were produced and then dissociated. “Matter is a perpetual motion that is always dividing and composing.” Individual productions are compositions of parts. Through the process of production, creatures are composed and then dissolved, they live and then die. Creatures are produced by creatures. All creatures are produced and then in turn become producers, some in a few hours, others in a few years. Productions are both natural and artificial.³²

The production of individual creatures, however, takes time. Creatures are not produced in a single act or moment, but by degrees. The

³⁰ *Ibid.*, pp. 9, 12–13, 235.

³¹ *Ibid.*, pp. 163–4, 181, 185, 181–96, 229–32, quotations on pp. 163–4, 233.

³² *Ibid.*, pp. 28, 31, 34–5, 163, 180, quotation on p. 28.

production of a “human creature,” for example, takes nine months. Cavendish described human gestation as a process taking place over a specific period of time, and

The reason that a woman or such like animal, doth not feel her child so soon as it is produced is, that the child cannot have an animal nature . . . until it be perfectly an animal creature; and as soon as it is a perfect child, she feels it to move.

However, when the child moves, the mother only feels the sensitive or moving parts of the child. She cannot perceive the child’s rational parts as they are unique to that individual. But consistent with her theory of change, nature acts both regularly and irregularly. The gestation process can proceed with regularity and result in a perfect child at the end of the nine-month period or irregularly, resulting in a miscarriage or a deformed child.³³

The tension (or dialectic) between regularity and irregularity was an important aspect of Cavendish’s theory of change. In her 1666 *Observations upon Experimental Philosophy*, she wrote: “all her actions are balanced by their opposites . . . there is no animate without inanimate; no regularity without irregularity: all [of] which produces a peaceable, orderly and wise government in Nature’s kingdoms.” In the *Grounds of Natural Philosophy*, she stated: “Nature being poised, there must of necessity be Irregularities, as well as Regularities.” And in her chapter, “Of the Irregularity of Nature’s Parts,” she asserted: “Nature’s fundamental actions are so poised, that irregular actions are as natural as regular.” And later, “Infinite self-moving matter hath infinite varieties of actions.” In fact, irregularity was necessary in order to account for diseases, deformities, disasters, and disorder. Regularity and irregularity operated in tension with each other to produce the ordered world of nature in which we live.³⁴

Having dealt with these three fundamental questions of philosophy, Cavendish culminated her *Grounds of Natural Philosophy* by speculating about the existence of other worlds. There were other kinds of worlds, she believed, with other kinds of creatures. All such worlds, however, were material and self-moving. The creatures of these other worlds might respond differently to different properties such as light and dark, hot and cold, wet and dry. Or, they might not need them at all. “The properties of a human creature are quite different from other kinds of creatures . . . but

³³ Ibid., p. 41.

³⁴ Cavendish, *Observations* (1666), p. 232; *Grounds of Natural Philosophy*, quotations on pp. 60, 106 and 177–8^v. See also Walters, *Margaret Cavendish*, p. 179.

in all material worlds, there are self-moving parts.” In these worlds “there is perception amongst the parts or creatures of nature; and what worlds or creatures soever are in nature, they have sense and reason, life and knowledge.” Yet in all these worlds the same “dialectical” processes of change exist. There are regularities and irregularities, uniting and dividing, composing and dissolving. She thus held to her firm belief in a vitalistic, dialectical form of materialism.³⁵

Writing during the 1650s to 1670s in England, Margaret Cavendish was indeed a pioneer, both as a feminist and a natural philosopher. While not only standing up for the rights and intellectual abilities of women, she attempted to address the most fundamental ontological and epistemological questions of philosophy. Over the course of her career she drew on elements of systems that went back as far as those of Greek philosophers Heraclitus, Plato, and Aristotle, while engaging with and differing from contemporaries such as Descartes, Hobbes, Gassendi, and Digby and later with the Cambridge Platonists such as Henry More and Ralph Cudworth. At various points in her writings, she also anticipated and articulated ideas associated with future philosophers, such as Spinoza’s pantheism, Leibniz’s vitalism, Hegel’s dialectics, and Marx and Engels’s dialectical materialism. In synthesizing ideas into her own system of a vitalistic dialectical form of materialism, Margaret Cavendish paved the way both for the “new science” and the “new philosophy” that emerged during the seventeenth-century Scientific Revolution.

³⁵ Cavendish, *Grounds of Natural Philosophy*, pp. 234–6, quotations on p. 236.