

## The Function of Analogy in the Scientific Theories of Margaret Cavendish (1623-1673) and Anne Conway (1631-1679)

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Dealing with "*Instances Conformable, or of Analogy*" in the second part of his *New Organon*, Francis Bacon stated the essential role of analogy in the sciences:

Men's labor therefore should be turned to the investigation and observation of the resemblances and analogies of things, as well in wholes as in parts. For these it is that detect the unity of nature, and lay a foundation for the constitution of sciences.<sup>1</sup>

He nonetheless immediately added "a strict and earnest caution" since, as he had warned in Book I:

The human understanding is of its own nature prone to suppose the existence of more order and regularity in the world than it finds. And though there may be many things in nature which are singular and unmatched, yet it devises for them parallels and conjugates and relatives which do not exist.<sup>2</sup>

Following what they interpreted as Bacon's tenet, the Royal Society fought against all ambiguities of language in natural philosophy, calling for pure, univocal expression. Ironically though, many of the greatest discoveries of the seventeenth century were the result of a relevant use of analogy, such as William Harvey's theory of the circulation of the blood. Ever since, the debate on the use of analogy in the sciences and its parent faculty the imagination has revealed a common distrust of scientists and philosophers who only recognize with reluctance the potential heuristic value of analogy.

As a cognitive and rhetorical tool establishing a similitude between two relations, analogy in its broad sense may be said to illuminate the new and less

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<sup>1</sup> Francis Bacon, *The New Organon and Related Writings*, Fulton H. Anderson (ed.), New York, The Liberal Arts Press, 1960, 2: 27.

<sup>2</sup> *Ibid.*, 1: 45.

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known by likening it to the old and better known. Therefore, creating a good analogy supposes that one intuitively grasps a resemblance between the unfamiliar and a more familiar image or model. Metaphors may be considered as condensed analogies that however tend to go beyond the simple proportion<sup>3</sup>. In *The Order of Things*, Michel Foucault distinguishes four similitudes that he deems characteristic of the Renaissance period: convenience (*convenientia*), emulation (*aemulatio*), analogy and sympathies<sup>4</sup>. Analogy is presented as the most powerful similitude, as it can reveal an infinite number of resemblances and echoes throughout the world.

It is interesting to note the extensive use of analogy in the scientific works of Margaret Cavendish and Anne Conway, two contemporary women philosophers of the seventeenth century, who did not personally know each other. As vitalists, they both perceived such infinite echoes in the world. Not only is analogy a device used to explain or illustrate abstract considerations often dealing with motion and causation, but it also seems to be the very structure of their mind. Indeed, many passages in their treatises devoted to natural philosophy betray the workings of an analogical mind, a *forma mentis* revealing an analogical way of thinking.

I will first show that Cavendish and Conway use a great diversity of images, often borrowed from philosophers of their time such as Descartes or Bacon. Accidental analogies aim at illustrating complex doctrines and seem to evince an inductive approach to science, as opposed to structural analogy which tends to show a more deductive or rationalist way of thinking. I will then question the link between the analogical method and autodidacticism. As women, Cavendish and Conway had no access to formal education, and their knowledge of natural philosophy was mainly due to the help of guides (Henry More for Conway, her husband and brother-in-law for Cavendish) and to their own eclectic reading. Their lack of method may have led them to resort to intuition and imagination. And their reliance on intuition may have been encouraged by Descartes' innatism and his insistence on intellectual intuition<sup>5</sup>. Finally, their analogical mind coherently led them to the analogical hypothesis of vitalism as they tried to illustrate and defend the "order and method" of nature thanks to similar monistic theories.

### The use of analogy in Margaret Cavendish's and Anne Conway's texts

#### *A diversity of images*

<sup>3</sup> Line Cottegnies, *L'Eclipse du regard: la poésie du baroque au classicisme (1625-1660)*, Genève, Droz, 1997.

<sup>4</sup> Michel Foucault, *Les Mots et les choses. Une archéologie des sciences humaines*, Paris, Gallimard, 1966, p. 32-40.

<sup>5</sup> René Descartes, *Regulae ad directionem ingenii*, written 1628, published 1701, and *Discours de la méthode pour bien construire sa raison et chercher la vérité dans les sciences. Plus la Dioptrique, les Météores et la Géométrie, qui sont des essais de cette méthode*, Leyde, 1637.

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There are several founding analogies in both women's theories. These recurring analogies are central to their theories as they constitute the basis on which the doctrines are developed. The most striking instance is that of the analogy between the composition of matter and the building of a house<sup>6</sup>. In *Observations upon Experimental Philosophy* (1666), Cavendish explains that matter is composed of three parts, the rational, the sensitive and the inanimate parts, each corresponding to a different element necessary to the building of a house:

as in the exstruction of a house there is first required an architect or surveyor, who orders and designs the building, and puts the labourers to work; next the labourers or workmen themselves; and lastly the materials of which the house is built: so the rational part in the framing of natural effects, is, as it were, the surveyor or architect; the sensitive, the labouring or working part; and the inanimate, the materials: and all these degrees are necessarily required in every composed action of nature.<sup>7</sup>

In Conway's only treatise, entitled *Principles of the Most Ancient and Modern Philosophy* (published posthumously in 1690), the image of the house is used to show the unity between idea and will in the creation of nature by God:

Nevertheless the *Idea* alone doth not give being to the Creature; but the Will join'd with the *Idea*, as when a Master-Builder conceives in his Mind the *Idea* of an House, he doth not build that House by the *Idea* alone, but the Will is joined with the *Idea*, and co-operates therewith.<sup>8</sup>

Both women used the traditional analogy between the relations of men and women, and mind and body, the better to subvert it. In *The World's Olio* (1655), Cavendish mentions reason and the senses as properties of mind and body respectively:

The minde and the body must be married together; but so as the minde must be the husband; to govern, and command, and the body the wife to obey, and reason which is the judge of the minde, must keep the senses in awe; for as reason is the property of the minde, so the senses are the property of the body [...].<sup>9</sup>

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<sup>6</sup> The image of the house is also particularly frequent in Descartes' *Discourse*, parts II and III.

<sup>7</sup> Margaret Cavendish, *Observations upon Experimental Philosophy*, Eileen O'Neill (ed.), Cambridge, CUP, 2001, p. 24. There are numerous other analogies built on the image of the house in Cavendish's treatises: *Philosophical Letters*, p. 71, p. 531; *Grounds of Natural Philosophy*, p. 20, p. 109, and *Observations*, p. 176, p. 206.

<sup>8</sup> Anne Conway, *The Principles of the Most Ancient and Modern Philosophy*, Peter Lopton (ed.), Delmar / New York, Scolars' Facsimiles and Reprints, 1982, p. 150. Another analogy built on the image of the house is to be found p. 221 (against dualists).

<sup>9</sup> Margaret Cavendish, *The World's Olio*, London, 1655, p. 41.

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She adds that reason is corrupted and manipulated by the senses which are the bribers. Conway also explicitly resorts to this analogy in order to illustrate her own anti-dualism – although later the analogy becomes an identity when she explains that "every Body is a Spirit":<sup>10</sup>

In every visible Creature there is a Body and a Spirit [...] which may fitly be termed Male and Female, by reason of that Analogy a Husband hath with his Wife. For as the ordinary Generation of Men requires a Conjunction and Co-operation of Male and Female; so also all Generations and Productions whatsoever they be, require an Union, and conformable Operation of those Two Principles, to wit, Spirit and Body.<sup>11</sup>

As with Cavendish, the analogy between body and spirit is qualified immediately after this passage by the idea that there are "other Spirits" "in the Female", and the strongest spirit, "whether it be the Masculine or the Feminine [...] is predominant in the Seed, and forms the Body"<sup>12</sup>.

Far more numerous than these founding analogies are the accidental analogies aiming at illustrating an abstract and difficult point in the women's theories. These casual analogies show the similitude between the difficult aspect of the theory and a more familiar image drawn from experience. Thus, in *Philosophical Letters* (1664), Cavendish uses the model of the watch to expound her own conception of causation: as the watch-maker is only the occasion of a particular motion of the watch, so a creature is the occasion of a particular motion of another creature but both watch and creature have self-motion<sup>13</sup>. Conway also resorts to expository analogies in her account of transmutation for instance. She draws a parallel between transmutation and a man who "dungs and cleanses" "a Fruitful Tree in his Orchard, that prospereth well", but "heweth it down with an Ax, and burns it with Fire" if it is barren<sup>14</sup>. Both women were perfectly aware of this explanatory function of analogy: Conway admits that analogy "helps [the] Understanding"<sup>15</sup>, and Cavendish uses analogy "to make [her] meaning more intelligible to weaker capacities"<sup>16</sup>.

Finally, analogies are used by both women in order to criticize their adversaries<sup>17</sup>. These critical analogies often reveal Cavendish's humour, especially when she refers to Henry More's spirits which she compares to "the tricks and

<sup>10</sup> Anne Conway, *op. cit.*, p. 190.

<sup>11</sup> *Ibid.*, p. 188-189.

<sup>12</sup> *Ibid.*, p. 189.

<sup>13</sup> Margaret Cavendish, *Philosophical Letters*, 1664, p. 99-100. See also *Observations*, p. 212.

<sup>14</sup> Anne Conway, *op. cit.*, p. 184-185.

<sup>15</sup> *Ibid.*, p. 161.

<sup>16</sup> Margaret Cavendish, *Observations*, p. 178.

<sup>17</sup> Cavendish debunks van Helmont's analogy between sun and soul in *Philosophical Letters*, p. 329.

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flights of Juglers, 'tis here, 'tis gone"<sup>18</sup>. She also satirizes Descartes's dualism by means of an analogy:

Neither can I apprehend, that the Mind's or Soul's seat should be in the *Glandula* or kernel of the Brain, and there sit like a Spider in a Cobweb, to whom the least motion of the Cobweb gives intelligence of a Flye, which he is ready to assault, and that the Brain should get intelligence by the animal spirits as his servants, which run to and fro like Ants to inform it [...].<sup>19</sup>

This image might actually be borrowed from Bacon and his comparison between "reasoners" and spiders "who make cobwebs out of their own substance"<sup>20</sup>. Likewise, Conway, defending her idea of a plurality of worlds, compares her opponents to "a few little Bees shut up within the limits of an Hive, containing the measure of a few inches"<sup>21</sup>. The reference to bees might also be an allusion to the same passage in Bacon's *New Organon*, in which he praises men (called bees), whose scientific method takes a middle course between ants (experimentalists) and spiders (rationalists).

Most of the time, analogy is used to reflect and thus defend the order of nature that seemed to be jeopardized by the new mechanistic theories. Conway and Cavendish give the image of the neat hierarchy of an army or a commonwealth to show by analogy the order of nature<sup>22</sup>. In this regard, analogy seems to correspond to the two meanings of method defined by Zabarella in the sixteenth century: a logical technique of discovery (*methodus*) and the overall ordering of a subject matter (*ordo*). Indeed, method, according to Peter Dear in his article "Method and the Study of Nature"<sup>23</sup>, may be defined as a term designating a way of discovering things unknown from things known. This is the very definition of analogy; analogy might be legitimately considered as a heuristic tool. Peter Dear adds that method is also a way of reasoning and we may wonder if analogy might not also be considered as a method in this sense: in a word, is there some kind of "analectics"!

<sup>18</sup> *Ibid.*, p. 333.

<sup>19</sup> *Ibid.*, p. 111. See also p. 95, 105, 120, 146, 187, 189, 218, 242, 333, 352, and *Observations*, p. 8, 52, 53, 74, 95, 212.

<sup>20</sup> Francis Bacon, *op. cit.*, 1: 95.

<sup>21</sup> Anne Conway, *op. cit.*, p. 160.

<sup>22</sup> Cavendish compares the body of man to a commonwealth in *Grounds of Natural Philosophy*, 1668, p. 51: "every Part, or Corporeal Motion, knows its own Office; like as Officers in a Common-wealth, although they may not be acquainted with each other, yet they know their Employments: So every particular Man in a Common-wealth, knows his own Employment, although he knows not every Man in the Common-wealth. The same do the Parts of a Man's Body, and Mind." Conway uses a very similar image to prop up her own hierarchy of beings and parts: "The Spirit of a Man, or Beast, is nothing else but an innumerable multitude of Spirits united together in the said Body, which have their Order and Government so, that there is one Captain, or Chief Governor, another a Lieutenant [...]" (p. 190).

<sup>23</sup> Peter Dear, "Method and the Study of Nature", in *The Cambridge History of Seventeenth-Century Philosophy*, Daniel Garber & Michael Ayers (eds.), 2 vols, Cambridge, CUP, 1998, p. 147-177.

*Structural analogy or the analogical mind*

All the analogies previously quoted use familiar and often traditional images borrowed from the imagination and observation of the world. However, there is another distinct type of analogy pervading both women's scientific works, an analogy which evinces the analogical mind of the authors. This structural analogy does not resort to the imagination; it can be detected in the texts thanks to multiple analogies or analogies *en abyme* (inclusive analogies), revealing endless resemblances. It also appears most clearly in the syntax with the systematic use of "so... as" or "likewise" or "the like may be said of" or "in the same manner". This way of thinking, modelled on Russian dolls, is best illustrated by a passage from *Observations* in which Cavendish gives her opinion of perception:

**As** there are several kinds of creatures [...] **so** there are also several kinds of perceptions [...] And **as** there are different particular sorts of these mentioned kinds of creatures, **so** there are also of perceptions; nay, **as** one particular creature of these sorts, consists of different parts; **so** every part has also different perceptions.<sup>24</sup>

Although the relations discovered in this passage are improper analogies – there are only three terms –, they bring out the analogical mind of Cavendish. Conway's *Principles* also offers such examples of multiple analogies. In chapter V, for instance, she defines the position of Christ in her hierarchy of beings:

This Middle Being is not to be understood in so gross a manner, **as if** it stood in a Middle Place, between two Extrems, **as** the Trunk of the Body is between the Head and Feet; but is a *Medium* in respect of its Nature, **as** Silver is Between Tinn and Gold or Water between Air and Earth.<sup>25</sup>

This evidence of an analogical mind, and therefore of an analogical way of reasoning, may testify to the legitimacy of analogy as a method in terms of a way of reasoning.

**Autodidacticism and the analogical method**


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<sup>24</sup> Margaret Cavendish, *Observations*, p. 166-167 (my emphasis). This structural analogy is also particularly clear in her condemnation of the variety of opinions in philosophy: "The truth is, some opinions in philosophy, are **like** the opinions in several religions, which endeavouring to avoid each other, most commonly do meet each other; **like** men in a wood, parting from one another in opposite ways, oftentimes do meet again; or **like** ships which travel toward east and west [...]; **in the same manner** do the Epicurean, and some of our modern philosophers meet [...] so that their several opinions make **as** great a noise to little purpose, **as** the dogs barking and howling at the moon" (p. 209, my emphasis).

<sup>25</sup> Anne Conway, *op. cit.*, p. 169 (my emphasis).

*"Function of Analogy in Scientific Theories"**Education and method*

Cavendish and Conway were both highly interested in method. Conway even goes so far as to affirm that method is what best distinguishes her philosophy from that of the other critics of Spinoza, Hobbes or Descartes in chapter IX of *The Principles*<sup>26</sup>. In "To the Reader", the preface to *Observations*, Cavendish defines her own method as "sense and reason"<sup>27</sup>. Her "natural education", as she puts it, makes it impossible for her to have an academic method, so that she is forced to rely on her natural faculties and to devote herself to "contemplative philosophy"<sup>28</sup>. As autodidacts therefore, Cavendish and Conway had to resort to analogy in their search for truth in nature. Indeed, cognitive sciences show that analogy is at the core of human cognition and that it develops spontaneously in human beings<sup>29</sup>. Therefore, its use in science is only a relevant "extension of its use in commonsense reasoning"<sup>30</sup>. Because analogy was used in the seventeenth century in the discovery of new systems, many such discoveries were made by autodidacts. Willem Frijhoff, in an article on autodidacticism as an object of historical research<sup>31</sup>, gives the example of van Leeuwenhoek and the microscope: because they naturally resorted to analogical intuition, self-taught dabblers in science could more easily make the audacious "mental leap"<sup>32</sup> (seeing one thing as if it were another) required in scientific discoveries.

*Intuition and imagination*

In his study of scientific models<sup>33</sup>, Max Black explains that, to make good use of a model or an analogy, we usually need an intuitive grasp ("Gestalt knowledge") of its capacities. Intuition is necessary in order to create a relevant analogy. The debate on philosophical method in the seventeenth century entailed for some a new trust in intuition after Descartes' *Discourse on Method*, and especially *Rules on the Direction of the Mind*. Although the latter, written in Latin around 1628, was not published until 1701, Cartesian ideas were already known to

<sup>26</sup> *Ibid.*, p. 221.

<sup>27</sup> Margaret Cavendish, *Observations*, p. 21.

<sup>28</sup> *Ibid.*, p. 99, 241. In her Preface "To all the Universities in Europe", in *Grounds*, Cavendish writes: "If you expect fair Proportions in the Parts, and a Beautiful Symmetry in the Whole, having never been taught at all, and having read but little; I acknowledge my self too illiterate to afford it, and too impatient to labour much for Method."

<sup>29</sup> Dedre Gentner, Keith J. Holyoak & Boicho N. Kokinov, "Introduction: The Place of Analogy in Cognition", in *The Analogical Mind: Perspectives from Cognitive Science*, Dedre Gentner, Keith J. Holyoak & Boicho N. Kokinov (eds.), MIT Press, 2001, p. 1-19.

<sup>30</sup> Dedre Gentner & Michael Jeziorski, "The Shift from Metaphor to Analogy in Western Science", in *Metaphor and Thought*, Andrew Ortony (ed.), Cambridge, CUP, 1993, p. 447-480.

<sup>31</sup> Willem Frijhoff, "Autodidaxies, XVIIe-XIXe siècles: jalons pour la construction d'un objet historique", *Histoire de l'éducation*, 70, May 1996, p. 5-27.

<sup>32</sup> Keith J. Holyoak & Paul Thagard, *Mental Leaps: Analogy in Creative Thought*, MIT Press, 1995.

<sup>33</sup> Max Black, *Models and Metaphors*, New York, Cornell University Press, 1962.

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English readers from the 1640s, and an anonymous translation of the *Discourse* was published in 1649<sup>34</sup>. Moreover, as Sarah Hutton has clearly shown<sup>35</sup>, Conway studied Cartesian philosophy thoroughly in her life-long correspondence with her mentor Henry More. Cavendish also had access to Descartes' philosophy: she probably heard a great deal about Cartesian theories in the conversations of the Cavendish circle gathering around William and Charles Cavendish in Paris from 1645 to 1648, and then in Antwerp from 1648 to 1660. Hobbes, Sir Kenelm Digby and Walter Charleton were members of this circle, and they were in close contact with Descartes, Gassendi and Mersenne. Descartes' influence is therefore possibly what led Cavendish to the assertion in *Grounds* that "there is an innate Notion of God, in all the Parts of Nature". Conway also mentions the "inbred Notions and dictates of truth, which Men generally find in themselves"<sup>36</sup>.

Descartes' insistence on intellectual intuition as a valid faculty in the search for truth encouraged and legitimised the intervention of autodidacts, and therefore women, in the scientific debate. The first pages of the *Discourse*, written in the vernacular on purpose, and their insistence on the universality of reason and the simplicity of the propounded method, could naturally address women as well as men. This was confirmed by a letter Descartes wrote to Father Vatier in February 1638:

Ces pensées [on the existence of God] ne m'ont pas semblé être propres à mettre dans un livre [*Discourse*], où j'ai voulu que les femmes mêmes pussent entendre quelque chose, et cependant que les plus subtils trouvassent aussi assez de matière pour occuper leur attention.<sup>37</sup>

And indeed we must admit that far from leading to an assimilation of women and body, as several feminist studies have suggested<sup>38</sup>, Cartesianism made it possible for women to participate in serious mainstream philosophical discourse, despite their being untaught<sup>39</sup>. In his *Rules*, Descartes explains that knowledge must

<sup>34</sup> There were also other texts spreading Descartes' ideas in England, such as John Davies's *Reflections upon Monsieur Des Cartes's Discourse of a Method* (1654), a translation from the French. Other works by Descartes were translated into English: *Compendium of Musick* (1653), *Discourses of the Mechanicks* (1661) and *The Passions of the Soule* (1650). Henry More also mentioned Descartes in his second book, *The Infinitie of Worlds*, as early as 1647.

<sup>35</sup> Sarah Hutton, "Anne Conway, Margaret Cavendish and Seventeenth-Century Scientific Thought", in *Women, Science and Medicine 1500-1700*, Lynette Hunter & Sarah Hutton (eds.), Stroud, Sutton Publishing, 1997, p. 218-234, and *Anne Conway: A Woman Philosopher*, Cambridge, CUP, 2004. See also *The Conway Letters, The Correspondence of Anne, Viscountess Conway, Henry More and their Friends 1642-1684* (1930), Marjorie Nicolson (ed.), rev. ed. Sarah Hutton, Oxford / New York, Clarendon Press, 1992.

<sup>36</sup> Margaret Cavendish, *Grounds*, p. 240. Conway, *op. cit.*, p. 176 (VI, 2).

<sup>37</sup> René Descartes, *Discours de la méthode*, Geneviève Rodis-Lewis (ed.), Paris, Flammarion, p. 246.

<sup>38</sup> See for instance Genevieve Lloyd, "Reason, Science and the Domination of Matter", in *Feminism and Science*, E. F. Keller & H. E. Longino (eds.), Oxford, OUP, 1996, p. 41-53.

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begin with "simple matters", namely matters that can be grasped by direct intuition<sup>40</sup>. The link between intuition and analogy is made clear by the assertion that intuition consists in grasping a necessary connection between two propositions. In Rule XIV, Descartes mentions the use that must be made of the imagination in the search for scientific truth, and he explains, like Bacon in the *New Organon*, that the first stage of scientific enquiry is the discovery of proportions:

La nature commune ne se trouve pas dans les deux objets d'une manière identique, mais selon certains autres rapports ou proportions qui l'enveloppent. Et dans sa plus grande partie, l'industrie humaine ne consiste pas à autre chose qu'à transformer ces proportions de manière à voir clairement l'égalité qui existe entre ce qu'on cherche et ce qu'il y a de connu.<sup>41</sup>

This metaphysics of intuition or *lumen naturale* may have been an incentive to deal with natural philosophy for those who only had their "natural education" to rely on.

*Analogy and metaphor*

There was however a strong ambivalence about the use of imagination in science in the seventeenth century<sup>42</sup>. The analogizing power of the imagination had to be disciplined by the new method. But Bacon paradoxically denounces the excessive use of images in scientific discourse by referring to what he calls "the Idols of the Market-Place", a metaphor<sup>43</sup>. A similar ambivalence about the use of imagination can be read in Cavendish's texts. On the one hand, she considers imagination as a "rational perception"<sup>44</sup>, and she herself makes an extensive use of

<sup>39</sup> See also René Descartes, *Règles pour la direction de l'esprit*, J. Sirven (ed.), Paris, Vrin, 2003, règle IV, p. 19. Descartes shows that those who have never academically studied nature often have a stronger judgement than those who spent their whole life at school. Again, in *Discours*: "Et si j'écris en français, qui est la langue de mon pays, plutôt qu'en latin, qui est celle de mes précepteurs, c'est à cause que j'espère que ceux qui ne se servent que de leur raison naturelle toute pure jugeront mieux de mes opinions que ceux qui ne croient qu'aux livres anciens" (p. 95).

<sup>40</sup> Rule III reveals the essential role of intuition in science: "Ce n'est pas ce que pense autrui ou ce que nous conjecturons nous-mêmes qu'il faut rechercher, mais ce que nous pouvons voir par intuition avec clarté et évidence, ou ce que nous pouvons déduire avec certitude: ce n'est pas autrement, en effet, que s'acquiert la science" (p. 11).

<sup>41</sup> *Ibid.*, p. 108-109.

<sup>42</sup> W. H. Leatherdale, *The Role of Analogy, Model and Metaphor in Science*, Amsterdam, 1974, p. 229.

<sup>43</sup> Francis Bacon, *op. cit.*, 1: 39. This contradiction is probably the reason why, in the XXth century Bacon could be considered by Foucault as an opponent to the "episteme of similitude" (Foucault, *op. cit.*, p. 65), whereas Bachelard saw him, on the contrary, as the emblem of a pre-scientific thought that praised intuition, variety and unity (Gaston Bachelard, *La Formation de l'esprit scientifique. Contribution à une psychanalyse de la connaissance objective*, Paris, Vrin, 1969, p. 59).

<sup>44</sup> Margaret Cavendish, *Philosophical Letters*, p. 26; *Observations*, p. 272.

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images in her philosophical texts. Yet, she criticizes rather harshly those, like van Helmont and the alchemists, who resort to "similizing":

I think it best to avoid Metaphorical, similizing, and improper expressions in Natural Philosophy, as much as one can; for they do rather obscure then explain the truth of Nature; nay, your *Author* himself [van Helmont] is of this opinion, and yet he doth nothing more frequent then bring in Metaphors and similitudes.<sup>45</sup>

On the contrary, Conway praises the use of analogy in science. Whereas Cavendish assimilates almost all kinds of images as "similizing", Conway tends to distinguish between metaphors and analogies. The former seem to be banned from scientific discourse as being always "strained metaphors"<sup>46</sup>, while analogies may be useful in science and philosophy. Conway first uses analogy to show the falseness of a theory:

Now what Attributes or Perfections can be attributed to dead Matter, which do analogically Answer to those which are in God ! If we diligently enquire thereinto, we shall find none at all; for all his Attributes are living.<sup>47</sup>

The fact that no fourth term can be found in this analogy shows that the theory is wrong, and therefore those who affirm the existence of dead matter are mistaken. The analogical reasoning is thus a valid demonstration. Analogy is considered by Conway as the foundation of all philosophical enquiry, and any hypothesis that does not answer to this principle is wrong:

If now the Attributes of Body and Spirit are compared together, they are so far from being like one another, or having any Analogy of Nature (in which nevertheless the true Foundation of Love and Unity doth consist, as before was said,) that they are plainly contrary.<sup>48</sup>

Conway's conception of analogy led her to a clear distinction between analogy and metaphor. The difference between the two women on this point may be due to the fact that Conway probably wrote in the late 1670s, whereas Cavendish finished her last book more than ten years earlier. It might also be a consequence of the difference in their levels of knowledge. Indeed, Conway had received an epistolary course in Cartesian philosophy and had also studied Euclid, and she may actually have been influenced by book 5 of *The Elements* dealing with proportions and similitudes<sup>49</sup>. Cavendish's education, on the other hand, was

<sup>45</sup> Margaret Cavendish, *Philosophical Letters*, p. 279.

<sup>46</sup> Anne Conway, *op. cit.*, p. 231.

<sup>47</sup> Anne Conway, *op. cit.*, p. 197.

<sup>48</sup> Anne Conway, *op. cit.*, p. 201. In this passage Conway refers to the theory of body as dead matter, a theory she opposes.

<sup>49</sup> Conway, contrary to Cavendish, uses mathematical or geometrical analogies which are given as valid images in a scientific discourse: "For true Justice or Goodness hath in it self no Intitude or

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rudimentary, since she probably only gleaned information from conversations at which she was present, without actively taking part in them. Despite these differences between the two women, their analogical mind and their common use of similitude led them to a similar vitalistic apprehension of the world.

**The universal analogy: harmony and vitalism**

*The "episteme of similitude"*

As Foucault clearly puts it in his account of the "episteme of similitude", analogy, more than any other figure of resemblance, entails the infinite transfer of a proportion<sup>50</sup>. Again, this contagious power of analogy was shown in William Harvey's treatise on the circulation of the blood, *De Motu Cordis*, in the preface to which he wrote:

The heart of creatures is the foundation of life, the prime of all, the sun of their microcosm, on which all vegetation does depend, from whence all vigour and strength does flow. Likewise the King is the foundation of his kingdoms, and the sun of his microcosm, the heart of his commonwealth, from whence all power and mercy proceeds.<sup>51</sup>

Thus, in 1628, William Harvey perceived a clear resemblance between the king, the sun and the heart. In a slightly different account, Cavendish uses the theory of humours and the four elements to underline the similitude between microcosm and macrocosm in *Grounds*:

there should be an Equality in the Four Elements, to balance the World: for, if one sort should superabound, it would occasion such an Irregularity, that would cause a Dissolution of this World; as, when some particular Humour in Man's Body superabounds, or there is a scarcity of some Humours, it causes such Irregularities, that do, many times, occasion his Destruction. The same may be said of the Four Elements of the World.<sup>52</sup>

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Indifference; but is like unto a certain right line, drawn from one point to another, where it cannot be said two or more Lines can be indifferently drawn between two Points, and yet all right Lines; because there can be but one that is a right Line, and the rest will be crooked or bending [...]" (*op. cit.*, p. 158).

<sup>50</sup> Michel Foucault, *op. cit.*, p. 36-37.

<sup>51</sup> William Harvey, *De Motu Cordis*, in *The Anatomical Exercises of Dr. William Harvey*, G. Keynes (ed.), London, 1928, p. vii-viii. Harvey was Anne Conway's physician and a member of the Conway family through the marriage of the younger Heneage Finch, Anne's brother, to Elizabeth Harvey, daughter of William Harvey's brother Daniel. See *The Conway Letters*, *op. cit.*, p. 15.

<sup>52</sup> Margaret Cavendish, *Grounds*, p. 181. The theory of the four elements is borrowed from Empedocles, taken over by Plato in *Timaeus*. The four elements are ruled alternately by love and strife. In *Philosophical Letters*, Cavendish also mentions the parallels between God, nature and man: "[...] Whether Nature be the Art of God, Man the Art of Nature, and a Politick Government the Art of Man ! To which I answer, 'Tis probable it may be so [...]" (p. 47).

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The correspondence of macrocosm and microcosm, in which the influence of Paracelsus and neoplatonism is perceptible, is also clearly expressed in *The Principles*, in which Conway reveals her shrewd understanding of these echoes:

He [Christ] took upon him somewhat of our Nature, and by consequence the Nature of all Things, (because the Nature of Man hath in it the Nature of all Creatures, whence also he is called the *Microcosm*) [...].<sup>53</sup>

This theory of universal analogy is naturally based on a monistic apprehension of nature. Indeed, the theory of a general harmony presupposes the natural likeness of all things. This general unity causes relations of sympathy and antipathy, or even love in Conway's philosophy<sup>54</sup>. Cosmic affinities secure a solid balance in nature, some form of *coincidentia oppositorum* which ensures what Conway calls "the excellent natural Order of Things"<sup>55</sup>. Cavendish mentions this agreement of opposites in *Grounds*: "Although Nature be Infinite, yet all her Actions seem to be *poysed*, or *balanced*, by Opposition"<sup>56</sup>.

This theory of general likeness and agreement was also applied by both women to philosophy itself in the form of a *coincidentia disciplinarum* that aimed at reconciling all the different opinions of all ages. The eclectic philosophies of Cavendish and Conway perceived resemblances between apparently opposed doctrines, encouraged as they may have been by the encyclopedic tendencies of natural philosophy.

#### *Vitalism: an analogical hypothesis*

In this intellectual and philosophical context, vitalism may have been particularly attractive to both women. Indeed, vitalism saved the correspondences between all things by resorting to the universally shared principle of life. Cavendish was a materialist, but the matter she described was endowed with life and perception, a conception which led to the implicit condemnation of her doctrine by Ralph Cudworth in his *True Intellectual System of the Universe* in 1678. Cudworth denounced Cavendish's theory as hylozoistic (giving life and perception to matter), and therefore as atheistic<sup>57</sup>. Since, on the contrary, everything is spiritual in Conway's account of substance, then everything is also alive, and

<sup>53</sup> Anne Conway, *op. cit.*, p. 172.

<sup>54</sup> *Ibid.*, p. 179, 199.

<sup>55</sup> *Ibid.*, p. 180.

<sup>56</sup> Margaret Cavendish, *Grounds*, p. 12. The same view is expressed in *Observations*: "Were there no degree of inanimate matter, nature's actions would run into extremes; but because all her actions are balanced by opposites, they hinder both extremes in nature, and produce all that harmonious variety that is found in nature's parts" (p. 33-34).

<sup>57</sup> See Stephen Clucas, "The Duchess and the Viscountess: Negotiations between Mechanism and Vitalism in the Natural Philosophies of Margaret Cavendish and Anne Conway", in *In-Between: Essays and Studies in Literary Criticism*, 9, 2000, p. 125-136.

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body has motion and life<sup>58</sup>, as she expresses in chapter VII of *The Principles*, in a sentence remarkably close to what Cavendish wrote so many times in her own treatises: "there is no where any such Body that hath not Motion, and by consequence Life and Spirit"<sup>59</sup>. Vitalism authorizes any kind of similitude, since it is itself an analogical world hypothesis. Robin G. Collingwood, in his *Idea of Nature*, gives a rather basic account of the history of cosmology. Interestingly though, he distinguishes the various analogies that have governed the philosophical views of the world: to the analogy of vitalism are added the mechanical system and the analogy of history<sup>60</sup>. However, as opposed to vitalism, mechanism cannot be a perfect universal analogy, since its dualistic approach necessarily puts an end to the infinite analogical transfer.

Finally, the political implications of vitalism should also be mentioned since the analogy of nature and the commonwealth which vitalism implies entails the intrusion of life and nature into politics, leading to ideology. Cavendish expresses this political analogy in *Observations*, for instance when she compares disease in man to disorder in the commonwealth: "And as it is with a commonwealth, so it is also with an animal body; for if there be factions amongst the parts of an animal body, then straight arises a civil war"<sup>61</sup>. Georges Canguilhem explains that seventeenth-century vitalism tended to be politically reactionary or counter-revolutionary because of its relation with animism. He added in a lecture given in 1946 that nazism, for instance, was based on a vitalistic biology, since the concept of an organic whole was analogically transferred to the political realm<sup>62</sup>. Coming back to Cavendish and Conway, John Rogers in his book *The Matter of Revolution*, analyses the conceptual alliance between politics and science in what he calls "the Vitalist Moment", between 1649 and 1652. According to him, and against Canguilhem,

The philosophy of monistic vitalism emerged in this period to provide a conceptual framework for that social and political structure of self-determination we recognize as liberalism.<sup>63</sup>

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<sup>58</sup> However, these conceptions should be qualified since Cavendish also recognized the existence of a supernatural, immaterial soul added to the natural, material soul, as she explained in *Observations*, p. 190. Conway's monism was also slightly heterodox: she maintained that there was only spirit in the world, yet spirit had for her the attributes of matter. What is more, she defended the idea of a continuum of substance at both ends of which spirit and body could be found, showing that body was not altogether excluded from her conception of substance.

<sup>59</sup> Anne Conway, *op. cit.*, p. 205.

<sup>60</sup> Robin G. Collingwood, *The Idea of Nature* (1945), Oxford, OUP, 2002, p. 9.

<sup>61</sup> Margaret Cavendish, *Observations*, p. 81.

<sup>62</sup> Georges Canguilhem, "Aspects du vitalisme", in *La Connaissance de la vie* (1952), Paris, Vrin, 2006, p. 123-127. "Aspects du vitalisme" was first a conference given in 1946.

<sup>63</sup> John Rogers, *The Matter of Revolution: Science, Poetry and Politics in the Age of Milton*, Ithaca & London, Cornell University Press, 1996, p. xi.

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Insisting on "the volitional power of motion" in Cavendish's theory, Rogers tries to show how Cavendish's decentralized yet hierarchical physics corresponds to "the republican Puritan ideal of the rule of the godly few"<sup>64</sup> and to "a discourse we can identify as feminist"<sup>65</sup>. Although this interpretation seems slightly excessive in its mention of liberalism, it may be argued that Cavendish, as early as 1664, was to some extent attracted to the philosophical idea of "republic", despite her being a dyed-in-the-wool royalist and conservative:

[...] it is impossible, that one single part should be King of the whole Creature, since Rational and Sensitive Matter is divided into so many parts, which have equal power and force of action in their turns and severall employments; though Nature is a Monarchess over all her Creatures, yet in every particular Creature is a Republick, and not a Monarchy; for no part of any Creature has a sole supreme Power over the rest.<sup>66</sup>

Strangely enough, this passage is not quoted by Rogers in his study of Cavendish's "vitalist utopia", and yet it is highly interesting as it also shows how politics could be transferred onto nature and physics, and not only the other way round. Similarly, the necessary political implications of vitalism through analogy are clear in William Harvey's revision of his treatise on the circulation of the blood. Indeed, in 1649, the year in which Charles I was executed, Harvey renounced his analogy of 1628 and dethroned the heart.

The study of analogy gives a precious insight into seventeenth-century intellectual life, as it reveals the deep interest in method shared by all philosophers, whether they be renowned academics or amateurs. The accidental, rhetorical use of analogy, the cognitive dimension of structural analogy, and analogy as a world hypothesis all join the different aspects of the building and writing of science, suggesting the omnipresence of analogy at the time. Indeed, the analysis of Cavendish's and Conway's theories shows that the figures of resemblance were still influential in the seventeenth century. Foucault based his mistaken analysis on the study of avant-garde writers who may not give a faithful image of their time: the study of lesser writers should enable one to correct this biased description. In this regard, the comparison of Cavendish and Conway, two women coming from similar educational and social backgrounds and both interested in the debate on the new science, is particularly eloquent as it reveals the extent to which analogy was used at the time. Finally, as well as the contribution of women to the scientific enquiry of their time, the study of Cavendish's and Conway's texts reveals how women could philosophize in a patriarchal society.

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<sup>64</sup> *Ibid.*, p. 198.

<sup>65</sup> *Ibid.*, p. 199.

<sup>66</sup> Margaret Cavendish, *Philosophical Letters*, p. 337.