OF THE PERCEPTION OF COLOURS: MARGARET CAVENDISH ON TRANSPARENCY

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Abstract

Margaret Cavendish, an early modern philosopher, argues that it is impossible to conceive of a colourless body. Transparent bodies, such as windows, transparent stones, and rarefied air, appear to challenge this claim since they are commonly understood to lack colour. I argue that this apparent tension is resolved through a previously unrecognised use of rational perception in Cavendish's natural philosophy.

In her mature philosophical works, Cavendish develops a vitalist materialism according to which all matter is self-moving and perceptive. On this account, she distinguishes between two types of perception: sensitive perception and rational perception. Sensitive perception occurs when the sensitive matter of the sense organs patterns the figure of an external object presented to it, whereas rational perception occurs when rational matter patterns the motions of sensitive matter. Deborah Boyle has argued that there is also a broader use of rational perception, whereby "the 'rational parts' [figure] themselves in ways that pertain to an external object but do not copy any occurrent motions of the sensitive matter," including "remembering, conceiving, imagining, supposing, understanding, reasoning, opining, musing, and other like mental states" (Deborah Boyle 2015, 440).

I argue that, given Cavendish claims that "matter, colour, figure, magnitude, etc. are but one thing" (OEP, 176), transparency must, in her natural philosophy, be understood as a colour. However, the corporeal figurative motions constituting this colour are "too subtle, rare, or little" (OEP, 82) to be distinctly perceived by the human eye through sensitive perception. Cavendish therefore maintains that "there are some objects which are not at all perceptible by any of our exterior senses… yet they are subject to our rational perception" (OEP, 47). By examining Cavendish's account of rational perception, I argue that her texts reveal a third use of rational perception. Although transparency appears colourless to the optic sense, rational perception does not infer from this appearance that transparent bodies genuinely lack colour. Rather, it recognises that transparent bodies, like all natural bodies, are constituted by corporeal figurative motions from which colour necessarily arises.

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Introduction: Of a Confusion about Colour

> [O]ur optic sense can perceive and see through a transparent body; but yet it cannot perceive what the transparent body's figurative motions are, or what is the true cause of its transparentness; neither is any art able to assist our sight with such optic instruments as may give us a true information thereof: for what a perfect natural eye cannot perceive, surely no glass will be able to present. (OEP, 59)[1]

In her natural philosophy, Margaret Cavendish (1623-73) rejects the mechanistic theories of colour advanced by many of her contemporaries, including Descartes, Robert Boyle, Galileo, and Hobbes.[2] Cavendish positioned herself against the Royal Society and experimental philosophy, being described as "a mad, conceited, ridiculous woman" by Pepys (Pepys, 18 March 1667). Despite the critical reception, Cavendish was not afraid to reject the view that the matter is inert and perceptual qualities, such as colour, exist only in the eye of the beholder. Instead, she maintained that colour is inseparable from matter itself, which is self-moving. For "colour is as much a body, as place and magnitude, which are but one thing with body." (OEP, 81) On Cavendish's view, there is therefore no room for a colourless body, a point she emphasises through satire when she remarks that the "Worm-men," or natural philosophers, "could not choose but laugh, when [they] heard of a colourless body." (BW, 42)

In the *Observations upon Experimental Philosophy* (hereafter, *Observations*), Cavendish considers bodies that are not perceptible to the exterior senses, noting that "there are some objects which are not at all perceptible by any of our exterior senses; as for example, rarefied air, and the like: But although they be not subject to our exterior sensitive perception, yet they are subject to our rational perception" (OEP, 47). Cavendish does not take such cases to show how these bodies lack colour or other perceptual qualities. Rather, they indicate that perception in nature is not exhausted by what is perceived through the sensitive organs of human bodies. This difference between the perceptions of human sense organs and the perceptions proper to perceptive matter is articulated by Cavendish through her distinction between sensitive and rational perception.

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[1] Throughout this dissertation, the following abbreviations are used when citing Cavendish's works: *Philosophical and Physical Opinions* (PPO), *Philosophical Letters* (PL), *Observations upon Experimental Philosophy* (OEP), *The Blazing World* (BW), and *Grounds of Natural Philosophy* (GNP).

[2] Note: I will refer to Robert Boyle (1627-1691), Cavendish's contemporary, as 'Robert Boyle', and Deborah Boyle, a contemporary philosopher who works on early modern philosophy, as 'Deborah Boyle' throughout.

This dissertation first examines Cavendish's vitalist materialism and theory of perception, with particular attention to her distinction between sensitive and rational perception, and argues that the distinction provides a materialist account of colour that resists mechanistic interpretation. Following, I address the apparent problem of colourlessness by explaining, through Cavendish's theory of perception, how transparent bodies, such as windows and transparent stones, only appear colourless despite the inseparability of colour and matter.

Cavendish has emerged as a significant interlocutor in early modern philosophy, particularly through renewed scholarly attention over the past three decades. Philosophers have paid particular attention to her vitalist materialism and fundamental worldview (most notably, James, 1999). While existing scholarship has provided detailed accounts of Cavendish's metaphysics and general theory of perception, the distinction between sensitive and rational perception has received less focus; and where perception is discussed, it is often treated in general terms or subsumed under broader epistemological concerns (e.g., Deborah Boyle, 2015).

Nonetheless, Cavendish's philosophy of colour has been explored by a handful of scholars over the last decade (Allen, 2019; Chamberlain, 2019; West, 2021; Sharp, 2023; Peterman, 2025). Allen argues that Cavendish offers a distinctive form of colour realism, where 'fixt and inherent' colours, which are found in natural things such as minerals, vegetables, and animals, are fundamental (Allen 2019, 60). Chamberlain emphasises that, for Cavendish, sensuous colour is not reducible to a body's microscopic surface texture or some other mechanistically respectable property (Chamberlain 2019, 1).[3] West defends Cavendish's claim that colours are real, mind-independent qualities by appealing to her argument that it is impossible to conceive of a colourless object and that if something is inconceivable, then it cannot exist in nature (West 2021, 456). Sharp, by contrast, contends that Cavendish's account of colour perception must accommodate the mediating role of light. According to Sharp, light plays the role of a reliable patterner, and we perceive the patterns of bodies in the body of light (Sharp 2023, 1492). Despite the consensus that Cavendish rejects mechanistic accounts of colour in favour of some form of colour realism, little attention has been paid to the role her distinction between sensitive and rational perception plays in resisting such accounts. This dissertation advances the thesis that Cavendish's distinction between sensitive and rational perception is central to her materialist account of colour, resisting mechanistic interpretation while also explaining how objects such as air or transparent bodies can appear to be colourless despite the inseparability of colour and matter.

[3] Chamberlain defines sensuous colour as the distinctive qualitative property an object (e.g., grass) visually appears to have when it visually appears to be coloured (e.g., green).

Section one outlines Cavendish's vitalist materialism and introduces perception in its broadest sense as patterning and figuring. Section two examines her distinction between sensitive and rational perception, while section three develops her account of colour realism and introduces the apparent problem of colourlessness. Finally, section four argues that transparent bodies remain coloured despite appearing colourless to human sense.

1. Perception in Nature

In this section, I outline Cavendish's vitalist materialism before introducing perception in its broadest sense, as patterning and figuring. In turn, I examine what Cavendish meant by sensitive and rational perception in section two. Below, I begin with an exposition of Cavendish's vitalist materialism and how self-moving matter is the cause of all perception in nature.[4]

At the beginning of the *Observations*, Cavendish observes "that nature was a self-moving body, and that all her parts and creatures were so too" (OEP, 24).[5] To explain how self-motion operates in nature, Cavendish developed her materialism. According to Cavendish, everything that exists in nature is composed of matter. There is just one kind of matter which is composed of several degrees. These are the animate and inanimate degrees; the animate degree divides further into the rational and sensitive degrees of matter. The animate degrees of matter are responsible for motion and actions while the inanimate degree prevents all actions falling into one moment. Cavendish argues,

> if there were no animate degree, there would be no motion, and so no action nor variety of figures, and if no inanimate, there would be no degree of natural figures and actions, but all actions would be done in a moment. (OEP, 24)[6]

To understand the three degrees of matter, Cavendish uses an analogy of building a house. To build a house, we require an architect, the labourers, and the materials for building (the bricks and mortar). The

[4] Cavendish uses 'nature' to refer to the entirety of matter.
[5] Cavendish uses 'creature' to denote a finite, composed part of nature (e.g., humans, animals, flowers, stones, and stars).
[6] Cavendish does not explain what she means by the claim that "all actions would be done in a moment," nor does she return to the remark elsewhere in the *Observations*, which makes this part of the passage somewhat enigmatic. Presumably, if nature consisted only of self-moving matter, its motions would occur instantaneously, since nothing would temper or constrain them. The inanimate, "dull and passive," degree of matter would therefore retard motion and introduce the degrees necessary for stable and perceptible figures.

architect is responsible for designing the house and instructing the labourers, while the labourers have the responsibility of building the house, working with the materials. Cavendish argues that you cannot build a house without an architect, labourers, and materials, and the same is true for all parts of nature. Rational matter is like the architect, sensitive matter is like the labourers, and inanimate matter is like the materials. For

> the rational being so pure, fine and subtle, that it gave only directions to the sensitive, and made figures in its own degree, left the working with and upon the inanimate part, to the sensitive degree of matter. (OEP, 24)

Sensitive matter is encumbered with working upon the inanimate matter. Further,

> those three degrees were so inseparably commixt in the body of nature, that none could be without the other in any part or creature of nature. (OEP, 24)

Since rational, sensitive, and inanimate matter are mixed in every part and creature of nature, there is no body without all three degrees, even the most minute particles. If all creatures are composed of all three degrees, where the animate degree is responsible for motion, then everything in nature must be self-moving. This is significant because, as Cavendish explains, “[s]elf-motion is the cause of all perceptions; and this triumvirate of the degrees of matter, said they, is so necessary to balance and poise nature’s actions” (OEP, 25). Perception arises from matter’s self-motion, and the three degrees of matter make possible the variety of nature’s actions. Thus, if every creature is self-moving, then every creature is also perceptive. It should be made clear that Cavendish does not mean that every creature has the same kind of perception. She explains “it is absurd to confine all perception of nature, either to pressure and reaction, or to the animal kind of perception," instead, “[p]articular parts make perceptions, according to the nature of their corporeal, figurative motions, and their perceptions are as numerous as their actions” (OEP, 140, 166). Furthermore, when Cavendish writes "it is absurd to confine all perception of nature to… pressure and reaction," she is being critical of her acquaintance Thomas Hobbes, who holds that perception is caused by the motion of external objects pressing upon the sense organs. Hobbes writes,

> sense in all cases is nothing else but original fancy caused (as I have said) by the pressure that is, by the motion of external things upon our eyes, ears, and other organs, thereunto ordained. (Hobbes 1651, ch. 1)

On Hobbes' account, perception is purely a mechanical process in which the motions of external bodies produce pressure upon the sense organs causing a resistance or counter-pressure resulting in a fancy, "[a]nd this Seeming, or *Fancy*, is that which men call sense" (Hobbes 1651, ch. 1, my emphasis). In the *Observations*, Cavendish does not just position her account against Hobbes' mechanical account of perception, she is critical of mechanism generally. For instance, she opposes Descartes and Robert Boyle, who treat matter as passive and define it in terms of extension. On these views, motion is transferred through contact, and natural phenomena, including perception, are explained through a mechanical process rather than matter's own self-motion. They argue that matter does not move itself, but is set in motion by external causes. James, when examining the *Philosophical Letters*, notes how Cavendish was unsatisfied with Descartes' idea of inert matter and how she found it incomprehensible for the pineal gland to mediate between thought and extension (James 1999, 224). Cavendish rejects the mechanical picture, insisting that self-motion is the cause of all perception.

> [F]or whatsoever is self-moving and active, is perceptive; and therefore since voluntary actions of sense and reason are made by self-moving parts, they must of necessity be perceptive actions: but I speak of perceptions properly so called, which are occasioned by foreign parts. (OEP, 19)

Cavendish explains that perception is 'occasioned' by external bodies to reject mechanical accounts that explain perception through causal impact or impressed motions. According to Cavendish, perception occurs when external bodies provide the occasion for matter to move itself. For example, when a man tosses a ball into the air, the hand is the occasion for the ball's perceptive matter to move itself. Cavendish argues that the ball might have some perception of the hand, according to the nature of its figure, but it does not move by the hand's motion, it is moved by its own self-motion (OEP, 140). Perception is the material response to external bodies, which do not directly cause perception but instead occasion it.

Furthermore, Cavendish maintains that "all perceptions are made by figuring," including "imaginations, fancies, conceptions, passions, and the like; [which] are made by the rational, corporeal, figurative motions, without taking any copies of foreign objects" (OEP, 170). Figuring, for Cavendish, is simply matter in motion and "a general action of nature: for all corporeal actions are figurative, whenas patterning is but a particular sort of figuring" (OEP, 170). Cavendish uses 'patterning' as a specific example of figuring.[7] She explains,

[7] Cavendish draws on the early modern use of 'figure' to denote the shape or arrangement of matter, so that 'figuring' refers to matter arranging itself into such shapes through motion. 'Patterning', by contrast, suggests copying a pattern and refers to cases in which perceptive motions resemble the external object.

> I do not mean, that all perception is made by patterning or imitation; but I speak only of the perception of the exterior senses in animals, at least in man, which I observe to be made by patterning or imitation; for, as no creature can know the infinite perceptions in nature, so he cannot describe what they are, or how they are made. (OEP, 15)

Patterning is the imitation or copying of corporeal figurative motions of an external object. To illustrate the action of patterning, Cavendish describes how "an animal which perceives or patterns out the figure of a mineral or vegetable, has perceptions of those creatures" (OEP, 142). It should be understood that when Cavendish claims that an animal "patterns out the figure" of a mineral or vegetable, and thereby has perception of it, she does not mean that the object's figure is transmitted to, or impressed upon, the perceiver. Rather, perception (or patterning) consists in the active self-figuration of sensitive matter in coordinated response to the motions of another body, whereby it imitates the object's motions, the act of figuring being occasioned by the external body. In the *Philosophical Letters*, Cavendish explains that,

> I am of an opinion, That all Perception is made by corporeal, figuring self-motions, as that the perception of foreign objects is made by patterning them out: as for example, The sensitive perception of foreign objects is by making or taking copies from these objects, so as the sensitive corporeal motions in the eyes copy out the object of sight. (PL, 1.42)

According to Cavendish, all perception is an act of figuring and where figuring is used in reference to perception, it is perception that occurs without the need for an external object, as in the cases of memory or imagination.[8] For example, the recollection of a previously perceived object involves the voluntary figuring of material motions without any present exterior pattern. Whereas an act of patterning occurs when an external object is present, as when a creature perceives an object immediately before it, and its perceptive motions move in correspondence (or sympathy) with that object, without any transfer of motion. Just as patterning is a specific example of figuring, Cavendish argues, there are 'infinite' perceptions in nature. However, no creature can describe what these kinds of perception are or know how they're made.[9] Take, for instance, the idea that bats navigate through echolocation. It's clear that bats have

[8] Cavendish does not draw a clear distinction between actions such as memory and imagination, frequently writing that "all fancies, imaginations, judgement, memory, remembrance, and the like, are nothing else but the actions of reason, or of the rational parts of animate matter" (OEP, 272). I discuss this further in section two. For recent discussion, see Sandoval (2025).

[9] Cavendish does not deny that perceptions arise from self-moving matter. Her point is that the particular internal motions by which individual perceptions are made are infinitely various and therefore unknowable to us.

a radically different perceptive experience from humans. Nagel, in 'What Is It Like to Be a Bat?', argues that we can imagine ourselves behaving like a bat by hanging upside down or emitting high-pitched sounds, but we can never access the bat's own point of view. It is in the same vein that Cavendish argues that no creature can describe what these 'infinite' perceptions in nature are or know how they're made. Therefore, when a man *tosses* a ball into the air, the ball moves itself in accordance with the motion of my hand, the ball has a perception of the hand. This perception, Cavendish expresses, is not necessarily patterning, as she explains,

> [n]either can I certainly affirm, that all perception consists in patterning out exterior objects, for although the perception of our human senses is made that way, yet nature's actions being so various, I dare not conclude from thence, that all perceptions of the infinitely various parts and figures of nature are all made after the same manner. (OEP, 140)

Patterning, Cavendish explains, is one instantiation of perception and it refers to animal sense perception. Cavendish does not believe that all perceptions are made by the patterning out of exterior figures. Instead, all perception is made by figuring (self-moving matter) and it is a fundamental property of all creatures.

1.1. Occasional Causation

In the previous section, I outlined Cavendish's materialism and account of perception. I introduced perception in its broadest sense as figuring, with animal sense perception, or patterning, as a particular instance. In such cases, sensitive matter comes to move in ways corresponding to the motions of another body. Cavendish rejects the view "that the species of objects, pass from the objects to the optic organ" (OEP, 174), denying that perception involves the transmission of a figure from object to perceiver. However, if no motion is transmitted between bodies and no figure or species passes from one to another, it is unclear how the motions of one body can be related to the motions of another in perception and in nature more generally. In this section, I examine this difficulty more closely by returning to a simple example.

When a man tosses a ball into the air, the hand is the *occasion* for the ball's perceptive matter to move itself. In this respect, the hand functions as an occasion rather than an efficient cause of the ball's motion. Cavendish offers a second example of an occasional cause in the case of a watchmaker and a watch. The watchmaker does not impart motion to the watch but merely occasions a particular pattern of motion, since the watch's motions are already "inherent in those parts ever since that matter was" (PL, 1.30). This

distinction between occasion and cause is central to Cavendish's account of motion. As she explains, "some things may be Occasional causes of other things, but not the Prime or Principal causes" (PL, 1.23), and the failure to distinguish between them generates "many confusions in natural Philosophy" (PL, 1.23). Like the example of the hand and the ball, the case of the watchmaker and the watch illustrates Cavendish's rejection of efficient causal accounts of motion. While this may appear to resemble occasionalism, Cavendish does not appeal to God as the source of motion.[10] Rather, the ball moves through its own self-motion, with the hand serving only as the occasion for that motion, since every body "moves by its own natural motion; for self-motion is the very nature of animate matter" (PL, 1.30). As she declares at the start of the *Philosophical Letters*, "I shall [merely] go upon the bare Ground of *Natural Philosophy*, and not mix Divinity with it, as many Philosophers use[d] to do" (PL, 1.1).

The hand does not cause the ball's motion or transfer motion to it. The motion of the ball nevertheless occurs in relation to the hand's motions, insofar as the hand functions as an occasion for the ball's self-motion. An occasion does not produce motion, but helps explain why a body moves in a particular way on a particular occasion rather than another. The main concern at present is how the hand functions as an occasion for the ball's self-motion. Cavendish's plenum and account of sympathy between parts provides part of the answer. For Cavendish, nature is a continuous plenum. In a plenum, there is no vacuum interposed between parts of matter. Rather, all parts of nature are contiguous, and every part moves within the same continued corporeal whole. Cavendish argues,

> I conceive nature to be an infinite body, bulk or magnitude, which by its own self-motion, is divided into infinite parts; not single or indivisible parts, but parts of one continued body, only discernible from each other by their proper figures, caused by the changes of particular motions. (OEP, 126)

The plenum illustrated by Cavendish is not merely a denial of empty space, but that nature is one continued body of self-moving matter. Though infinitely divided, its parts are not separate parts standing apart from one another, but portions of the same infinite bulk, distinguished by their particular figures and

[10] Detlefsen makes the same point since "Cavendish does not appeal to God as the mediator between occasional and principal causes in their interactions as per occasionalism." (Detlefsen 2009, 425)

motions.[11, 12] A part of nature does not perceive an external body by receiving its figure, but through its own self-motion which is occasioned within the continued body of nature. Thus, Cavendish argues, the hand and ball are not "grains of corn… separable from each other" (OEP, 126) because the motions of the hand and ball occur within one continued body and move in sympathy with one another. Cavendish's plenum does not by itself account for how the hand functions as an occasion for the ball's self-motion, but it helps to explain how such relations are possible, insofar as bodies exist within a continuous material world in which motions may be perceived and responded to by other neighbouring parts of matter.

For the hand to occasion the ball's motion, the ball must in some sense take notice of the hand's motions. Cavendish describes how the ball takes notice through the perceptive capacities of matter itself. As she writes,

> by reason there is knowledge and perception in every part, by which each part doth not only know itself, and its own actions; but has also a perception of some actions of its neighbouring parts. (OEP, 152)

Since every part of nature has perception and knowledge, bodies are capable of perceiving the actions of neighbouring bodies. As I've explained, the hand does not transfer motion to the ball, the ball perceives the motions of the hand and responds through its own self-motion. A useful analogy to understand the occasional causation between the hand and ball is that of a person turning their head in response to a bell. The bell does not move the person's head. Rather, the person moves themselves upon perceiving the sound. Likewise, the hand does not move the ball by transferring motion to it. Instead, the ball responds through its own self-motion upon perceiving the motions of the hand. In each case, one body not only takes notice of another's motions but responds to them through its own self-motion. Cavendish describes this responsiveness between bodies in terms of sympathy. The ball moves in a particular way because there is sympathy between the hand and the ball, just as the person turns their head in response to the bell.

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[11] In Mad Madge, Whitaker argues that Cavendish may have been the first person in England to propose an atomist theory of nature, since the newly revived theories of atomism were then centred in France, particularly in the work of Descartes and Gassendi. However, Cavendish later moves away from this early atomist position, replacing the four-element atomism of *Poems and Fancies* (1653) with a theory of a single kind of matter. In this later account, rather than positing distinct atoms of earth, air, fire, and water as the basic constituents of nature, Cavendish argues that all matter consists of a single substance with different degrees of density, hardness, weight, and motion. She also rejects her earlier view of motion as a separate principle acting upon atoms, instead arguing that motion is inherent to all matter itself (Whitaker 2004, 160-161).

[12] Cavendish rejected contemporary forms of atomism and corpuscularianism, including Gassendi's atomism and Robert Boyle's corpuscularianism, which explained natural phenomena through the motion of atoms or corpuscles within a void. See Detlefsen (2006) and Deborah Boyle (2017) for further discussion.

As she explains in the *Philosophical Letters*, “Sympathy and Antipathy are nothing else but the actions of bodies, and are made in bodies," and does not work “by the power of immaterial spirits, or rays, issuing out their bodies, [but] by agreeable or disagreeable corporeal motions” (PL, 3.41).[13] Sympathy, then, is the action and agreement of corporeal motions within one continued body. It is not an occult power, nor an action at distance, but a bodily action made in bodies. When the motions of parts are agreeable, they join or move together. The action remains an act of self-motion, yet its self-motion is occasioned by the motions of another part of the same infinite body. Through sympathy with the motions of the hand, the ball moves itself in a way corresponding to those motions. As Cavendish explains, the ball “would not move by such an exterior local motion, did not the motion of the hand, or any other exterior moving body give it occasion to move that way” (PL, 4.6).

Similarly, in her introduction to the *Observations*, O’Neill asks how, according to Cavendish, an occasional cause could induce the primary cause to bring about change. In response, O’Neill offers the following interpretation:

> The hand does not transfer its motion to the ball upon impact. Rather, the rational matter in the ball, as part of the same organic body as the hand, has a sympathetic affinity with its matter; it “perceives” that the hand is about to so change its own configuration that it is about to diminish its motion by n degrees. (OEP, xxxiii)

O’Neill describes how the hand does not transfer motion to the ball, rather it is the occasion for the ball’s motion because the ball’s matter sympathetically perceives the motions of the hand and responds through its own self-motion. This, however, raises the question of how an occasional cause can bring about the relevant perception in the absence of direct physical causation. The difficulty is not simply that the ball moves itself, but that it moves itself in response to the hand in this particular way. O’Neill explains how Cavendish acknowledges the broader problem of harmony and agreement in nature, but appears to regard it as more of a problem for competing systems of nature than for her own.

O’Neill suggests that Cavendish’s account requires an explanation that she would not be able to provide. This is because once it is accepted that a body possesses an inherent power of self-motion, and that an

[13] Antipathy is when the corporeal motions disagree, as Cavendish explains that “if the motions be… disagreeable, there is Antipathy” (PL, 3.41). Cavendish offers relatively few examples of antipathy, though she suggests that the effects of poison may be understood in these terms, insofar as its motions are disagreeable to the natural motions of the body.

occasional cause can trigger that power, Cavendish may take the explanatory work to be complete. O'Neill describes this view of explaining motion as analogous to explaining how an external push causes a cylinder to roll. For instance, once we recognise that the cylinder has, by its own nature, the power to roll, the appeal to the push as an occasional cause is sufficient to account for its movement in a given instance. To ask further how the push activates this power, or why the cylinder has such a power at all, is to demand an explanation of causal power. This is something which, O'Neill argues, neither the scholastic, mechanist, nor Cavendish's own system can provide. O'Neill concludes that causal power is not explainable (OEP, xxxiv). For this reason, I set this difficulty aside and turn to Cavendish's distinction between sensitive and rational perception.

2. Sensitive and Rational Perception

The preceding section introduced Cavendish's vitalist materialism and her notion of the degrees of matter. On Cavendish's account, nature is composed of animate and inanimate matter, which are inseparably commixed in every part and creature. The animate degrees (rational and sensitive) are the cause of all motion and action, such "that nature was a self-moving body, and that all her parts and creatures were so too" (OEP, 24). Because all action in nature arises from self-motion, Cavendish further maintains that self-motion is also the cause of all perception (OEP, 25). Section one presented a general account of perception as figuring, with a specific example of patterning as animal sense perception.

This section expands on Cavendish's theory of perception, examining what Cavendish meant by sensitive and rational perception. In the introduction, I explained that Cavendish's distinction between sensitive and rational perception has received little focus in the literature on her theory of perception. Where this distinction is discussed, it is often treated in general terms or subsumed under broader epistemological concerns.[14] Here I expand on Deborah Boyle's reading of sensitive and rational perception, before examining how Cavendish uses these notions in relation to colour in section four. In her paper, 'Margaret Cavendish on Perception, Self-Knowledge, and Probable Opinion', Deborah Boyle explains how sensitive and rational perception are types of 'exterior' perception because they are both directed towards exterior objects. The difference between sensitive and rational perception, Deborah Boyle argues, is due to the type of matter that is involved. Sensitive perception arises from the activity of sensitive matter, and rational perception from that of rational matter. Before turning to Deborah Boyle's reading, I first examine what Cavendish means by sensitive and rational matter in the *Observations*. In section one, I outlined two degrees of matter, animate and inanimate, with the animate degree further divided into the sensitive and

[14] See Deborah Boyle (2015).

rational. The animate degrees of matter are responsible for motion and actions, as Cavendish argues, "self-moving matter, which is sensitive and rational, [is] the only cause and principle of all natural effects." (OEP, 18) Self-motion, Cavendish explains, "is the cause of all particular effects, figures, actions, varieties, changes, lives, knowledges, [and] perceptions" in nature, "and makes the only difference between animate and inanimate matter." (OEP, 191) The distinction between animate and inanimate matter is motion. In addition to the distinction between animate and inanimate matter, Cavendish posits a further distinction in the animate degree of matter, between sensitive and rational matter. She explains how,

> the rational parts were more agile, quick, and subtle in their corporeal actions, than the sensitive, by reason they were of a purer and finer degree of matter, and free from labouring on the inanimate parts. (OEP, 33)

Cavendish treats rational, sensitive, and inanimate matter as different *degrees* of the same matter rather than distinct kinds, though they perform different roles in natural action. Rational matter, for instance, is capable of quicker and more subtle motions than sensitive matter because it does not directly labour upon inanimate matter, whose dullness slows the activity of the sensitive parts. Cavendish illustrates how the capacity for such motions may be more or less developed across creatures. For instance, a butterfly can fly as soon as it comes out of the chrysalis, whereas a bird can neither feed itself nor fly as soon as it has hatched. They require time before they can feed themselves and fly. Similarly, although speech is natural to humankind, a child must know or learn a language before they can speak. Cavendish explains that, at birth, "the sensitive matter did compose the bulk of creatures" (OEP, 29), and that the self-moving parts which compose what is called the mind are not yet brought to that degree of perception which is proper to their figure. Cavendish maintains that no part of matter is ever figureless, since all corporeal matter is always figured through its self-moving actions (OEP, 29). However, certain compositions of nature are perfected sooner than others. Take, for example, a newborn baby or young child. They do not possess understanding as soon as they are born. Cavendish explains that "some creatures' [children's] bodies [are] not finished or perfected [as] soon as others," and that the self-moving parts which "[compose] that which is named the mind of man" do not bring their understanding to "such an understanding as was proper to their figure" as quickly as in other animals (OEP, 29). Simply, at birth, the 'bulk' of a baby is composed of sensitive matter, and although it has rational matter, its motions are not yet brought to the degree of perception which is proper to the creature's figure.

The distinction between sensitive and rational matter therefore has important consequences for Cavendish's account of perception. Because perception arises from the motions of these kinds of matter, different kinds of perceptual activity correspond to the different motions of sensitive and rational matter. As Deborah Boyle explains,

> when the sensitive matter in one of the senses of a human (or similar animal) patterns out an external object, sensitive perception occurs; when the rational matter patterns out the motions of sensitive matter, rational perception (in Cavendish's paradigmatic use of that phrase) occurs. (Deborah Boyle 2015, 439)

In other words, sensitive perception is directed toward external objects, whereas rational perception consists in rational matter perceiving the motions of sensitive matter. In what follows, I expand on Cavendish's account of sensitive perception, rational perception, and double perception (where the two operate together). For the sake of simplicity, I explain sensitive and rational perception in terms of human perception.[15] Sensitive perception occurs when the sensitive motions in the sense organs pattern the figure of an external object presented to them. This action is involuntary because it is occasioned when external objects (or what Cavendish sometimes calls "foreign parts" or "outward objects" [OEP, 19, 20]) present themselves to a sense (e.g., the optic sense), which determines the figure patterned by the sensitive motions. Cavendish refers to sensitive perception as perception "properly so called," that is, the perception of external objects by the exterior senses (seeing, hearing, tasting, touching, and smelling) which is performed by way of patterning and imitation, through the innate figurative motions of the sensitive parts.

By contrast, she also allows for voluntary actions produced internally by the sensitive motions, which she nevertheless calls perceptive since "whatsoever is self-moving and active, is perceptive" (OEP, 19). In such cases, the sensitive motions of a sense organ may produce figures "by rote, and of their own accord," as in dreams or "distempers" (OEP, 20).[16] Cavendish calls these actions voluntary because they are not occasioned by external objects. These voluntary actions should not be confused with rational perception because they are caused by the sensitive motions of the sense organ. The figures produced in dreams or

[15] Cavendish does not restrict sensitive and rational perception to humans. She holds that perception is "in all parts and actions of nature," and attributes "sensitive and rational knowledge and perception" to non-animal creatures (e.g., trees), although these differ from animal knowledge and perception (OEP, 170).

[16] In the seventeenth-century, *distemper* commonly referred to a bodily disorder or illness, such as fever, melancholy, or delirium. Early modern writers often associated such conditions with hallucinations or other disturbances of the senses. Cavendish's example therefore illustrates cases in which the sensitive motions of a sense organ produce figures internally, rather than patterning an external object.

distempers arise from the motions of sensitive matter rather than rational matter patterning those sensitive motions.

Having outlined sensitive perception above, I now expand on Cavendish's account of rational perception. It should be made clear, as Sharp expresses, that "no consensus exists in the secondary literature on how to interpret rational perception." (Sharp 2024, 1474n10) Deborah Boyle, for instance, distinguishes between two types of rational perception. First, the so-called paradigmatic use of rational perception where rational matter patterns out the motions of sensitive matter. Second, a broader use of rational perception, which refers to any process of "the 'rational parts' 'figuring' themselves in ways that pertain to an external object but do not copy any occurrent motions of the sensitive matter" (Deborah Boyle 2015, 440). This includes activities such as "remembering, conceiving, imagining, supposing, understanding, reasoning, opining, musing, and other like mental states." (Deborah Boyle 2015, 440) Deborah Boyle refers to all these activities as 'reasoning'.[17] Cavendish illustrates this broader sense of rational perception with an example of a man engaged in deep contemplative study, which she contrasts with sensitive perception. In this deep state, the man is touched or pinched (e.g., on his arm). Cavendish argues that it happens frequently enough that he takes no notice of being touched, nor does he feel it. Nonetheless, his arm, being sensible, has sensitive perception of the touch. He does not have rational perception of the touch because his rational motions are busily employed in contemplation. Cavendish argues that his mind, or rational motions, work to another perception than his sensitive motions. Similarly, Cavendish's remarks about a newborn baby demonstrates the same point more generally. Cavendish maintains that, at birth, "the sensitive matter did compose the bulk of creatures," while the self-moving parts that compose the mind are not yet brought to the degree of understanding proper to their figure. In such cases, newborns and young children do not possess an understanding proper to their figure because the rational parts are not sufficiently developed to pattern the motions occurring in the senses.

Rational perception, in its paradigmatic sense, also occurs simultaneously with sensitive perception, so that there is a "double perception" of one and the same object (OEP, 179). If the man's rational motions were to pattern the sensitive motions in his arm, double perception would occur, and he would both notice and feel the touch. Similarly, in her paper, Deborah Boyle describes the double perception of a person perceiving a cat. To perceive the cat's shape, she argues, the sensitive matter in their eyes patterns the shape; the fur is perceived through the sensitive matter in the fingers patterning out the texture, and so on. (Deborah Boyle 2015, 443) These are instances of sensitive perception. However,

[17] To reiterate, dreams and distempers are not included in this list because Cavendish attributes them to the voluntary motions of sensitive matter in the sense organs.

> it is rational matter's patterning out all those motions of the sensitive matter together that constitute the person's rational and conscious perception of the whole cat. (Deborah Boyle 2015, 443)

In this sense, rational perception is more general as it unifies the various motions of the sensitive matter, patterning out the object, to perceive it as one. This is reinforced in the *Grounds of Natural Philosophy* (hereafter, *Grounds*) when Cavendish argues "the Rational parts can make a Whole Perception of a Whole Object: Whereas the Sensitive makes but Perceptions in parts, of one and the same Object" (GNP, 9).

Thus far, I have outlined sensitive and rational perception, and what Cavendish calls 'double perception'. Sensitive perception occurs when sensitive matter patterns out the figure of an external object, while rational perception occurs when rational matter patterns the motions of sensitive matter. However, some of Cavendish's observations about rational perception are not easily accommodated by this account. In particular, she sometimes describes objects that are not perceptible by the exterior senses as nevertheless being objects of rational perception. For instance,

> [i]t is true, there are some objects which are not at all perceptible by any of our exterior senses; as for example, rarefied air, and the like: But although they be not subject to our exterior sensitive perception, yet they are subject to our rational perception. (OEP, 47)

This claim does not fit neatly with the account of rational perception outlined above. If rational perception consists in rational matter patterning the motions of sensitive matter, it is not clear how objects that are not perceptible by the exterior senses could be objects of rational perception. In other words, it remains unclear how rational perception can provide knowledge of objects that are not first presented through sense, such as rarefied air and transparent bodies. This suggests that Boyle's account does not exhaust the ways in which Cavendish understands rational perception. For instance, although colour is ordinarily taken to be the proper object of sight, Cavendish's discussion of transparent bodies challenges this assumption. Such bodies appear to be without colour to sensitive perception, yet Cavendish denies that they are genuinely colourless and maintains that this is knowable through rational perception. This raises the question of how rational perception can provide knowledge of objects that are not first presented through sensitive perception, a possibility not readily accommodated by either of Deborah Boyle's accounts, and one to which I return in section four.

3. Of Colour

The foregoing account of sensitive and rational perception is developed from Cavendish's vitalist materialism, according to which everything that exists in nature is corporeal and all natural phenomena can be explained in terms of matter's self-motion. It is in these terms that Cavendish's account of colour is to be understood.

In the *Observations*, Cavendish affirms that "colours are made by the corporeal figurative motions of nature" (OEP, 80). Colour, for Cavendish, is a real feature of bodies caused by the motions of matter itself, and is therefore material. This claim is reinforced by her insistence that "the colour of a creature is as well corporeal, as the creature itself… colour is as much a body, as place and magnitude, which are but one thing with body." (OEP, 81) Cavendish rejects the view of her contemporaries when she claims that colour is as much a body as place and magnitude. Nolan argues that Descartes, for instance, makes a "distinction between the mechanical properties of bodies that figure into scientific explanations and, the merely nominal properties that play a useful role in our ordinary, pre-scientific conception of the world, but are ultimately dispensable within science." (Nolan 2011, 106) The mechanical properties, which are often referred to as 'primary' qualities, are things such as extension and shape, while the nominal properties, sometimes called 'secondary' qualities, are things such as colours, sounds, odours, and tastes.[18] According to the Cartesian account, a body cannot exist without its mechanical properties, but nominal properties are not features of bodies in themselves, but ways in which bodies produce sensations in perceivers. For example, a body may reflect light in a certain way due to its mechanical structure, and when this interacts with the sensory organs of a perceiver it produces the sensation of colour, such as redness. In this way, nominal properties such as colour and sound arise from the relation between bodies and perceivers. Cavendish firmly rejects any such distinction between properties, maintaining that colour is as much a body as place and magnitude. To say that colour "is but one thing with body" is to deny any real distinction between a body and its colour. This is further affirmed when Cavendish argues that "such Colours as are Inherent, Light onely shews them to the Eye, but does not make them in their Substance, for Grass is Green, whether the Eye seeth it or not" (PPO, 216). Colour, on this view, is not dependent upon perception for its existence, but is an inherent feature of the body itself.

[18] The terms 'primary' and 'secondary' qualities were introduced by John Locke in *An Essay Concerning Humane Understanding* (1689) and are not used by Descartes or Cavendish, although related distinctions appear in earlier seventeenth-century philosophy (e.g., Galileo).

If colour is inherent to bodies, and all of nature is material, then the nature of colours must be understood in corporeal terms. Cavendish makes this point explicit in her claim that "colours are made by the corporeal figurative motions of nature, and according to the various changes of those motions, there are also various and different lights and colours" (OEP, 80). To demonstrate that colours are the result of corporeal motions, Cavendish appeals to Robert Boyle's tempering-steel experiment in his work *Experiments and Considerations Touching Colours* (1664). During this experiment, Robert Boyle observes that when a piece of polished steel is heated and then slowly reheated in a flame, the surface successively changes from one colour to another. These colours, Robert Boyle argues, indicate the steel's temper. For instance, if the steel is quenched when it appears yellow, it becomes hard enough to be used for tools such as drills; whereas if it is heated until it turns blue, it becomes softer and suitable for springs. These colours, Robert Boyle maintains, are not fundamental qualities of the metal itself. Rather, Robert Boyle argues that colours arise when the surface of a body acquires a disposition that "alter[s] the Light that reflects thence to the Eye after the manner requisite to make the Object appear Green [or] Blew" (Robert Boyle 1664, 28). On this account, the colours produced during the tempering process result from changes in the surface of the steel that modify the way light is reflected from it. Robert Boyle supports this claim by describing how, when the coloured surface is scraped away, the colour disappears and the ordinary metallic appearance is revealed. Thus, if steel is broken, the interior does not appear yellow or blue. He concludes that colour does not belong to the steel as an intrinsic feature of the body, since when "we scrap'd off the Surface of the Lead, we did in such places scrape off all the Colour, and discover only that which is natural to the Metall it self" (Robert Boyle 1664, 24). Robert Boyle takes this experiment to show that colour is merely an adventitious effect produced by changes in the surface of bodies. Cavendish, however, draws a different conclusion from the same phenomenon. For Cavendish, the changing colours observed during the tempering process reveals alterations in the corporeal motions of matter that produce different colours. Cavendish explains that the successive changes in colour should not be taken to show that colour is merely an effect produced by alterations at the surface of bodies. Rather, the experiment demonstrates that the change in colour occurs concurrently with a change in the temper of the steel, such as when the metal shifts from hard to soft or from tough to brittle. As she outlines, these alterations "prove, that colours are material, as well as steel; so that the alteration of the corporeal parts, is the alteration of the corporeal figures of colour" (OEP, 80). Accordingly, Cavendish argues that the changing colours observed during the tempering process result from changes in the corporeal figurative motions of matter.

In response to Robert Boyle's observation that the interior of broken steel does not appear yellow or blue, Cavendish contends that different parts of a single body might have different colours because they consist

of different corporeal parts. As she explains, “most creatures, as they have different parts, so those different parts have also different colours; and as those parts do alter, so do their colours” (OEP, 80). The absence of these colours in the interior does not show that colour is confined to the surface; it merely indicates that the exterior of the steel has undergone changes in its corporeal motions, producing colours that differ from those of the interior. Cavendish supports this view by appealing to a familiar distinction in early modern natural philosophy between homogeneous and heterogeneous bodies. Homogeneous bodies are made up of parts of the same kind or figure, such as water, whereas heterogeneous bodies contain different kinds of parts or figures, such as animals and other living creatures. Cavendish suggests that colours may be composed in a similar way. Some bodies may be entirely one colour throughout, like homogeneous bodies, while others may contain several colours in different parts, like heterogeneous bodies. For instance, the skin, hair, and eyes of a man possess different colours because the material parts and motions of which they are composed differ. A similar point applies in the case of tempered steel. Robert Boyle takes the fact that the interior of tempered steel does not appear yellow or blue to show that such colours do not belong to the steel itself, but arise only from alterations at its surface that affect how light is reflected. Cavendish, however, argues that colour in steel should not be understood as homogeneous throughout the body, but rather as heterogeneous. Different parts of the body possess different material figures and motions and therefore produce different colours.

Furthermore, Cavendish rejects Robert Boyle’s view that colours arise when light is reflected from the surface of bodies, arguing that if colour depended upon light alone, bodies could not possess stable colours. Cavendish writes that “if it were so, then there would be no stayed or solid colours; insomuch, as a horse, or any other creature, would be of more various colours than a rainbow” (OEP, 83). Creatures, however, do not continually change colour with every alteration of light. Cavendish instead maintains that colours correspond to different material figures within bodies. As she explains, “several colours, are of several figures” and the change of colours “proceeds from the alteration of their figures” (OEP, 83-84). Colours therefore arise from the corporeal figures and motions of matter, and when those figures alter, the colours alter accordingly.

On this account, Cavendish recognises two kinds of colour: fixed and inherent colours, and superficial and changeable colours. Fixed and inherent colours belong to the “more solid” parts of bodies. Superficial colours depend upon changing arrangements of matter and may vary as bodies are divided, mixed, or otherwise altered. They also vary according to the conditions under which bodies are perceived, particularly the presence and direction of light, which may render colours more or less visible without producing them. There are also colours produced by art, such as those created through dyeing or painting,

which imitate the colours of natural bodies but are often less permanent. Cavendish identifies these two kinds of colour to account for their variety in nature while maintaining that colour arises from the corporeal motions of matter. By distinguishing fixed and inherent colours from superficial and artificial ones, she can explain why some colours appear stable while others vary with alterations in the figures and arrangements of material parts. This distinction also supports Cavendish's rejection of mechanical explanations of colour. In *Experiments and Considerations Touching Colours*, Robert Boyle develops a corpuscular account according to which colours arise from the interaction between light and the minute particles composing bodies. Robert Boyle maintains that colour is "but modify'd light," arguing that different colours arise when the motion of light is altered by the corpuscular structure of bodies (Robert Boyle 1664, 77). On this view, bodies do not possess colours in themselves; their corpuscular structure modifies the motion of light as it is reflected or refracted, thereby producing the various colours that appear to the eye. Cavendish, however, argues that if colours were "made by dusty atoms, flying about as flies in sunshine," they would be unstable and irregular (OEP, 82).[19] Since atoms move so variously and inconsistently, she maintains that they could not produce fixed and inherent colours or generate the "several reflexions and refractions" of light required by such accounts (OEP, 87). Colours therefore cannot arise from the chance interaction of atoms and light but must instead arise from the corporeal motions of matter and belong to bodies themselves.

3.1. The Perception and Patterning of Colour

The discussion so far has argued that, in Cavendish's view, colours are produced by the corporeal figurative motions of matter. As Cavendish states,

> I have declared how colours are made by the figurative corporeal motions, and that they are as various and different as all other creatures; and when they appear either more or less, it is by the variation of their parts. (OEP, 85)

This section examines how colours are perceived. For Cavendish, the perception of colour is explained through her account of sensitive perception, according to which "the sensitive perception doth pattern out the exterior figure of colours" (OEP, 79). As outlined in section two, perception arises from the internal

[19] Cavendish does not draw a strict distinction between atomism and corpuscularianism when she refers to "dusty atoms, flying about as flies in sunshine." Instead, she uses the language of atoms loosely to criticise particle-based explanations of natural phenomena more generally, grouping together several forms of mechanical philosophy, including those advanced by Robert Boyle, who speaks of corpuscles rather than atoms, as well as Gassendi and Hobbes.

motions of the perceiving body rather than from any causal action of external objects upon the senses. Cavendish explains that "neither is any perception made by exterior objects, but by interior, corporeal, figurative motions; for the object doth not print or act any way upon the eye" (OEP, 79). To perceive colour, the perceiver's sensitive matter patterns or copies the figure of the external body which thereby gives rise to the perception of colour. This can be illustrated by returning to the example of perceiving grass. In this case, the sensitive matter in the eye patterns out the figure of the grass, bringing about the perception of its colour.

The perception of colour also requires the presence of light, although light does not produce colour itself but merely renders it visible to the eye. For "such Colours as are Inherent, Light onely shews them to the Eye" (PPO, 216). Cavendish's position stands in contrast to many seventeenth-century accounts that closely associate colour with the action of light upon the senses. Sharp argues that early modern discussions of colour frequently treated light as central to the production of colour. Cavendish, however, maintains that colour is already present in bodies themselves and that light merely reveals what is already there. She explains that "Grass is Green, whether the Eye seeth it or not, as much in the Night as in the Day, and the darkness of the Night doth only Obscure Colours, not Alter there Inherent Nature" (PPO, 216). According to Cavendish, colour persists in darkness, and its visibility under light does not affect its existence. Simply, darkness obscures rather than alters the inherent nature of colour. The colour belongs to the body itself rather than arising in perception. This position directly challenges the primary-secondary quality distinction, since, unlike John Locke, who restricts colour to perception as a secondary quality, Cavendish instead identifies colour with the corporeal motions of matter itself, making it inseparable from the body and no less mind-independent than so-called primary qualities.

I have argued that, for Cavendish, light merely reveals colour to the optic sense. Sharp, however, gives light a more active role in perception, claiming that it patterns colour, which is then patterned by the optic sense on the basis of her interpretation of Cavendish's claim that "light only doth present exterior objects to our view, so as we may the better perceive them" (OEP, 77). She begins by examining what it means for light to 'present' objects in perception. In the *Philosophical Letters*, Cavendish provides an example of *patterns of patterns* which Sharp uses as a basis for her argument. In the case of echoes, air patterns the copy of a sound and then the sensitive matter in the ear patterns this copy from the air. In the case of reflections, Cavendish writes,

> the glass in its own substance doth figure out the copy of the face, or the like, and from that copy the sensitive motions in the eyes take another copy. (PL, 1.24)

The sensitive matter in the eyes is then patterned by the rational matter to produce sight and knowledge. Sharp argues that this suggests patterns of patterns occur throughout the entire process of perception, extending even through the visual medium. The visual medium, she explains, "is a heterogeneous body consisting of light, air, and sometimes water" (Sharp 2024, 1473). However, Sharp notes that Cavendish consistently identifies light as the object of visual perception, rather than air, as Cavendish writes, "pure Air is only subject to the Perception of Respiration" (GNP, 212). Light, Sharp argues, acts as a 'chameleon' or 'reliable patterner' and its role in visual perception is to present patterns of external objects to our optic sense (Sharp 2024, 1482). To act as a chameleon is for light to pattern objects and we see these patterns.[20] Thus, Sharp concludes, we see a 'veil of light' rather than the object themselves when patterning.

However, I disagree with Sharp's interpretation. Sharp is correct to state that, for Cavendish, light is an object of visual perception, whereas air is only subject to perception via respiration. This is because, in the *Grounds*, Cavendish writes, "though Light seems to be [extremely] Rare and Fluid; yet, Light is not so Rare and Fluid, as pure Air is, because it is subject to that sort of Human Perception we name *Sight*" (GNP, 12.27). However, light does not need to act like a chameleon in order for an external body to be perceived. Cavendish continues, "there are many sorts of Lights… not subject to our Perception" (GNP, 12.27), suggesting that light does not have a fixed perceptual role and need not function as a veil in our perception of external objects.

Instead, I argue that although light is a perceptible material body, and may be perceived alongside external objects, this does not entail that perception proceeds by means of patterns of patterns, for Cavendish. Cavendish's discussion of patterns of patterns is limited to special cases such as echoes and reflections, where the figure is taken from a copy rather than directly from the original object, and she does not present it as a general account of perception. For instance, in the *Observations*, Cavendish explains that in cases of distant perception "the said object is chiefly, and of purpose patterned out by the sensitive and rational figurative motions of the eye," whereas the intermediate or adjoining parts "are but superficially and slightly looked over." (OEP, 168) The optic sense is thus directed towards the external object itself, while intervening bodies are only incidentally perceived. The presence of a material medium in a plenum does not entail that perception proceeds by way of that medium. Rather, the eye may pattern the figure of

[20] Sharp adopts this view from Colin Chamberlain (2019) who argues that transparent bodies are chameleons rather than colourless because they take on the colours of their environment through the process of patterning. I reject Chamberlain's view in section four.

the external object itself, even while other perceptible bodies are present between it and the object. This is further supported by Cavendish's claim that "when the eye patterns out an exterior object presented by light, it patterns also out the object of light" (PL, 1.20), showing that the eye does not take the figure of the object from light, but patterns both the object and the light together. Cavendish maintains throughout her work that perception consists in the sensitive matter of the eye patterning, or imitating, the motions of external objects (PL, 4.33), and the role of light must therefore be understood in relation to this process of figuring.

Cavendish argues, in the *Philosophical and Physical Opinions*, that "that which makes the natural Light so Pure and Clear, is, that it is not of a Mixt substance, nor hath Perturbed motions in it self" (PPO, 183). To understand what it means for light to be neither mixed nor perturbed, we can turn to her account of the relation between light and air. Cavendish describes natural air as composed of "interweaving" lines, like a cobweb, whereas light spreads "upon" rather than intermixing with it, since "what is intermixed, doth nor cannot suddenly separate" (PPO, 182). If light were intermixed with air, their motions would be perturbed, and the world would appear as "millions of several colours, and not any pure, clear light" (PPO, 183). Light is "Pure and Clear" because it remains unmixed and unperturbed, and it presents objects without altering or obscuring them. Cavendish's claim that "light only doth present exterior objects to our view, so as we may the better perceive them" (OEP, 77) is crucial here. Properly understood, this does not imply that light carries or copies the figure of the object. Rather, to "present" is to make the object available to the sensitive motions of the eye, which then pattern the object's figure itself.

In the chapter 'Of Darkness' in the *Grounds*, Cavendish describes how,

> [t]he Figurative Motions of *Light* and *Darkness*, are quite opposite; and the Figurative Motions of Colours, are as a Mean between both, being partly of the Nature of both: but, as the Figurative Motions of Light, in my opinion, are rare, straight, equal, even, smooth Figurative Motions. (GNP, 12.28)

In this passage, Cavendish describes the figurative motions of light as "rare, straight, equal, even, [and] smooth." Her description of the figurative motions of light is similar to her account of transparent bodies. In the *Observations*, Cavendish describes the figurative motions constituting transparent bodies as too "subtle, rare, or little" to be perceived (OEP, 82). Although Cavendish does not explicitly identify light as a transparent body, both are characterised by the refinement of their material composition. Indeed,

Cavendish observes that “there are many sorts of Light… not subject to our Perception” (GNP, 12.27), suggesting that the figurative motions of light may likewise be too subtle and rare to become the primary object of sensitive perception. Rather than interposing its own perceptible pattern between the perceiver and the object, light is “Pure and Clear," allowing the object's own figurative motions to be presented to the senses.

Furthermore, Cavendish rejects the view that darkness is merely the “privation or absence of light,” since this would entail that its perception is no perception at all, contradicting ordinary experience (OEP, 77).[21] Instead, she argues that darkness is perceived because its “corporeal figurative motions are quite contrary to the motions of light, and therefore must also of necessity have contrary effects,” including concealing rather than revealing objects (OEP, 77). To illustrate this point, “light doth come forth, and darkness remove by degrees,” whereas at night “light removes, and darkness succeeds” (PL, 2.23). Cavendish therefore suggests that changes in illumination may be understood as the succession of two corporeal bodies with contrary figurative motions.[22] However, she does not provide a detailed account of how these contrary motions produce varying degrees of illumination, although she explains that light is a “subtil, rare, piercing and active body,” whose motions are “much quicker than those of grosser bodies” (PL, 2.23).

This account of light is consistent with Cavendish’s broader theory of perception as sympathetic imitation where sensitive matter of the eye directs its motions towards the external object and patterns it by agreement, for “the object… is only patterned out by the perceptive motions in the optic sense” (OEP, 147). Because light is unmixed and unperturbed, it does not interfere with this process of figuring. Rather, it enables the optic sense to pattern the external object itself. Although light is present in perception, it does not ordinarily present itself as a veil. Light, then, is not a medium in which objects are re-patterned, but that which enables the optic sense to pattern the object’s figure itself. Sharp’s account, by contrast, attributes to light a mediating role it does not require; on her view, light patterns the object and the optic sense patterns those copies. However, since “the Figurative Motions of Light… are rare, straight, equal, even, [and] smooth” (GNP, 12.28), they do not disturb the motions of other bodies, and so do not reconfigure or carry the object’s figure, but allow the eye to pattern the object itself.

[21] Cavendish’s rejection of darkness as a privation is directed against a common early modern account of darkness as the absence of light. As she explains, “privation is a non-being, and therefore cannot be a principle of natural bodies.” (OEP, 270) If darkness were merely a privation of light, it would be a non-being rather than a corporeal body; and, since non-beings cannot be conceived, they cannot be perceived.

[22] In Cavendishian terms, light provides the occasion for the optic sense to pattern the external body through its own figurative motions, which sympathetically respond to the object’s motions. In darkness, intervening motions obscure the object’s figurative motions from being patterned by the optic sense.

3.2. The Inconceivability of a Colourless Body

Having examined the perception of colour and the role of light, I now turn to Cavendish's claim that colour is inherent to the body and cannot be separated from it. In the *Observations*, Cavendish writes that "it is to be observed that matter, colour, figure, magnitude, etc. are all but one thing" (OEP, 176), thereby affirming that colour belongs to body as one and the same, and thus cannot be separated from body. This claim becomes clearer in her discussion on the divisibility of bodies, where she rejects the view that colour is lost when a body is divided into increasingly small parts, arguing instead that colour persists even when such parts become too small to be perceived. For instance, when a flax seed is broken down into extremely subtle parts, or when silk is divided into very fine threads, its colour is not destroyed, but is no longer subject to human perception. Similarly, when those threads are twisted together again, they do not regain their colour. The colour was never lost, but only imperceptible to the optic sense. The apparent loss of colour is therefore not a real change in the body, but a limitation of the optic sense. Colour is still in the body, even when it is no longer visible.

Cavendish outlines several conditions required for the perception of colour. First, the object must not be "too subtle, rare, or little, but of a certain degree of magnitude" (OEP, 82). That is, it must be large enough to be perceived by the optic sense, since bodies divided into extremely fine parts, such as threads of silk, may evade perception. Secondly, the object must not be too distant, or beyond the reach of sight, as objects far away or outside the line of vision cannot be clearly perceived. For Cavendish, this condition depends upon whether the figurative motions can be accommodated by the capacities of the senses. As she explains, "the perception of seeing an exterior object, is nothing else but a patterning out of the figure of that same object by the sensitive figurative and perceptive motions" (OEP, 82). When objects are too distant, their figurative motions are too subtle and fine to be patterned by the optic sense. Thirdly, the medium must not be obstructed, since intervening bodies may hinder perception; for example, fog or smoke may hinder the object from being visible. Finally, the optic "sensorium" must have regular sensitive motions, since disturbed motions in the eye may distort perception or prevent it altogether.[23] Cavendish argues that when any of these conditions are lacking, perception is either impaired or does not occur at all. This absence of perception reflects the limitation of the optic sense, rather than any absence of colour in the object itself.

If Cavendish denies that a body can exist without colour, then a colourless body cannot be conceived. This claim is stated directly in the *Observations*, where she argues,

[23] The optic "sensorium" is the organ of sight together with its sensitive (and rational) motions.

> [i]n my opinion, it is as impossible to imagine a body without colour, as it is impossible for the mind to conceive a natural immaterial substance; and if so pure a body as the mind, cannot be colourless, much less are grosser bodies. (OEP, 86)

This point is further reinforced in *The Blazing World*, an appendix to the *Observations* and a philosophical satire, when the Empress asks whether minerals and other subterranean creatures are colourless. The Worm-men (natural philosophers) respond,

> we most humbly beg your Majesty's pardon… for we could not choose but laugh, when we heard of a colourless body. (BW, 42)

These passages demonstrate that, for Cavendish, it is impossible to conceive of a corporeal object without colour. To conceive of a colourless body is to imagine one, and for Cavendish, ideas are corporeal, finite figures which have "colours according to the nature, or property, or figure of the original" (OEP, 88). In this sense, ideas resemble the properties of bodies they conceive, including their colour. An idea cannot therefore represent a body as colourless, and so any object of conception must be figured and coloured. However, this conclusion appears to conflict with ordinary experience. It seems that certain bodies can be conceived without colour, such as glass, water, or transparent stones. These objects are often described as colourless, and so appear to provide counterexamples to Cavendish's claim. This challenge is reflected in the theories of colour advanced by Descartes and Hooke.

In *Principles of Philosophy*, Descartes argues that several properties commonly attributed to a pebble, including hardness, weight, colour, and temperature, are not essential to its bodily nature. He writes, "we'll exclude colour, because we have often seen stones so transparent that they have no colour" (Descartes 1644, 25). Here, transparency is treated as synonymous with the absence of colour, and transparent bodies serve as evidence that colour can be separated from body without altering its essential nature, which for Descartes consists solely in being "extended in length, breadth, and depth" (Descartes 1644, 25). Transparent stones thus support the view that colour is not constitutive of body itself. A similar account of transparency is offered in the experimental philosophy of Robert Hooke in *Micrographia*. Hooke rejects the view that colour is an intrinsic feature of bodies, arguing instead that it is produced through the interaction of light with the surface of matter. On his account, colour depends upon the refraction and reflection of light from bodies, and therefore upon the "superficies" (surface) and texture of their parts rather than upon any essential property of body. Hooke argues that "all colours whatsoever,

whether in fluid or solid, whether in very transparent or seemingly *opacous*, have the same efficient cause, to wit, some kind of *refraction*" (Hooke 1664, obs. 10). His point is not that transparency is the absence of colour. Rather, transparent bodies, like all other bodies, refract light, and it is this refraction that accounts for the production of colour. Unlike Descartes, Hooke allows that some bodies may "appear transparent and colourless" (Hooke 1664, obs. 9), yet such appearances are contingent upon the structure and disposition of their parts, rather than evidence that colour is wholly absent from body.

The accounts advanced by Descartes and Hooke challenge Cavendish's claim that it is impossible to conceive of a colourless body by presenting transparency as a significant difficulty for her position. Descartes argues that transparent bodies demonstrate colour can be separated from body without altering its essential nature, while Hooke explains transparency through the refractive structure of bodies, allowing that some may appear colourless under certain conditions. In the following section, I consider two potential responses Cavendish could offer in defence of her position against the objection that it is possible to conceive of a colourless body.

4. Transparency is a Colour

The conceivability of seemingly colourless bodies presents a significant challenge to Cavendish's inconceivability argument. If bodies such as glass, water, or transparent stones can be conceived without colour, then Cavendish's claim that colour is inseparable from body is undermined. However, Cavendish's broader natural philosophy provides resources for responding to this objection. In this section, I consider two possible responses. First, I examine Chamberlain's suggestion that transparent bodies function as *chameleons*, taking on the colours of their surroundings through a process of patterning. Second, I argue that *transparency* may itself be understood as a colour, such that transparent bodies possess an 'inherent' colour through their own corporeal figurative motions, not a colour derived from their environment.

In 'Color in a Material World: Margaret Cavendish against the Early Modern Mechanists', Chamberlain accepts that "[w]henever Cavendish conceives of a body, she cannot help but conceive of it as colored" (Chamberlain 2019, 22). He further notes that if bodies such as air, water, and glass appear to lack colour in ordinary experience, then it would seem to suggest that bodies can, in fact, exist without colour. However, in defence of Cavendish's inconceivability argument, Chamberlain proposes:

> Cavendish might argue that even perfectly transparent bodies are in fact colored–namely, colored by the thing we see *through them*. On this proposal, transparent bodies are *chameleons* rather than

> colorless, taking on the colors of their surroundings. This response is suggested by Cavendish's view that perceptual media like air, water, or glass "pattern out"–that is, reproduce or copy–the properties we see through them, such as the redness of a maraschino cherry. (Chamberlain 2019, 26)

Chamberlain's point is that even if a body were perfectly transparent, it would not be genuinely colourless, but would instead be coloured by the objects perceived through it. Transparent bodies such as air, water, or glass, would function like chameleons, taking on and reproducing the colours of their surroundings by patterning out the qualities of external objects. Rather than lacking colour altogether, these bodies possess a derivative form of colour, patterned from what is seen through them. Chamberlain's proposal that transparent bodies pattern the qualities perceived through them draws on Cavendish's broader theory of perception when she claims

> there is knowledge and perception in every part, by which each part doth not only know itself, and its own actions; but has also a perception of some actions of its neighbouring parts. (OEP, 152)

Cavendish does not restrict sensitive and rational perception to humans. Rather, she argues that all parts of nature possess knowledge and perception of themselves and their neighbouring parts, though this differs from animal perception. On this view, transparent bodies are not passive or inert substances but perceptive bodies that pattern and reproduce surrounding qualities. This supports Chamberlain's claim that transparent bodies are not truly colourless. Instead, because they perceive and copy nearby objects, they take on surrounding colours. Perceptual media therefore appear colourless only because their colour is derivative–patterned from what is perceived through them.

West extends Chamberlain's reading by arguing that, although Cavendish does not explicitly offer this response, her materialism could support it. He suggests that Cavendish might hold that transparent bodies are never genuinely perceived as colourless, since they are always perceived as having the colour of whatever lies behind them. In her discussion of transparent stones, Cavendish describes them as being "somewhat [like] the nature" of glass (PPO, 188). Rather than treating transparency as evidence of colourlessness, Cavendish explains that transparent stones are "made by such kinds of Motions" as other stones, though they "seem to be made by Stronger motions, and more Pure Tempered Matter" (PPO, 188). If transparent stones share the nature of glass, then, like glass, their transparency would not indicate the absence of colour but would reflect the way they pattern and reproduce the qualities of surrounding

objects. This supports the view that transparent bodies are conceived as having the colour of what lies behind them.[24] A transparent body can only be conceived in relation to what is perceived through it. As Cavendish writes, "our optic sense, can perceive and see through a transparent body" (OEP, 59). To imagine a transparent body is therefore to imagine it as mediating another object's qualities, since transparency is understood through the perception of what lies beyond it. Through this process of patterning, transparent bodies are never conceived as genuinely colourless, but as possessing colour through the qualities they reproduce or copy.

Chamberlain's chameleon proposal is compatible with Cavendish's broader theory of perception. However, it does not align with her commitment to colour as an intrinsic property of bodies. Cavendish consistently maintains that colour cannot be separated from matter itself. While Chamberlain's proposal may explain how transparent objects appear differently according to their background, it risks reducing colour to an unstable feature of bodies. Chamberlain acknowledges this difficulty when he writes,

> [i]f one person sees green grass through a certain region of air, while another person sees a field of poppies through that very same region, then this region of air will both be derivatively red and green. (Chamberlain 2019, 26n31)

Chamberlain is not troubled by this implication because an object, such as a Rubik's Cube, can have different colours on different sides, which become visible from different viewing angles. He claims that the same is true of transparent bodies. However, a more pressing difficulty arises from Cavendish's claim that "the parts or motions of the distance or medium" are "invisible, and not subject to the perception of sight" (PL, 4.28); this creates a tension within Chamberlain's account. If air or other transparent media possess derivative colours by patterning surrounding objects, Chamberlain must explain how such colours can be perceptible while the medium itself remains imperceptible. Chamberlain attempts to address this by conceding that "Cavendish presumably holds that the microscopic parts of the medium–for example, air particles–have non-derivative colours of their own, which we would be able to see if we had microscopical eyes" (Chamberlain 2019, 27n32). Because these non-derivative colours remain imperceptible to ordinary sight, what we perceive instead are the derivative colours patterned by the medium. However, this does not mean that transparency is merely the absence of colour or nothing more than derivative colour. Rather, transparency can be understood as a non-derivative colour proper to

[24] In the *Philosophical Letters*, Cavendish affirms that transparent bodies such as glass "doth figure out the copy of the face" (PL, 1.24). Passages such as these appear to suggest that the sensible appearance of transparent bodies derives from the figure they reflect.

transparent bodies themselves, although the corporeal figurative motions constituting this colour are so pure and refined that they cannot be distinctly perceived by the human eye.

I propose that transparency may itself be understood as a colour, such that transparent bodies possess an intrinsic colour produced through their own corporeal figurative motions rather than derived from surrounding bodies. This follows from Cavendish's claim that "colours are made by the corporeal figurative motions of nature" (OEP, 80). In section three, I outlined that, for Cavendish, colour belongs to body and cannot be separated from it. As Cavendish writes in the *Observations*, "for as no particle of matter can be lost in nature, nor no particular motion; so neither can colour" (OEP, 81). If colour cannot be separated from matter, then no body, including transparent bodies, can genuinely be colourless. Similarly, Cavendish's insistence that a colourless body is inconceivable suggests that transparency cannot be identified with the absence of colour, since all bodies are composed of self-moving matter and colour arises from these corporeal figurative motions.

For Cavendish, as West explains, whatever exists in nature must be both perceivable and conceivable (West 2021, 464). Because all corporeal bodies are constituted by self-moving matter whose figurative motions produce sensible qualities such as colour and figure, bodies are necessarily perceived through sensible appearance. However, a colourless body, lacking the sensible appearance of colour, could never be perceived. Likewise, since Cavendish uses conceiving and imagining interchangeably, a colourless body could not be conceived because "no creature can have imagination without figure and colour" (OEP, 86). Since such bodies can neither be perceived nor conceived, they are metaphysically impossible within Cavendish's natural philosophy.[25] Transparent bodies must consequently remain coloured despite their apparent colourlessness, since the self-moving matter constituting them necessarily produces colour through its figurative motions. In a specifically Cavendishian sense, transparency is a colour insofar as all bodies consist of corporeal figurative motions, even though in transparent bodies these motions are too fine to be distinctly patterned by the human eye. Cavendish's description of transparent stones as composed of "Stronger motions, and more Pure Tempered Matter" supports this reading by suggesting that transparency arises from the refinement and purity of those motions rather than from the absence of colour itself.

[25] As O'Leary argues, strictly speaking, West's argument from inconceivability to impossibility concerns only what *Cavendish* cannot conceive (O'Leary 2024, 12). Rather, what is inconceivable, and therefore impossible, in nature is what is contradictory (O'Leary 2024, 15).

In the chapter ‘Of Transparent Stones’ in the *Philosophical and Physical Opinions*, Cavendish develops this account of transparency.[26, 27] Cavendish explains that transparent stones, including diamonds, rubies, emeralds, and crystal, are produced through the same kind of corporeal motions as other stones, but differ in that their motions are “Stronger” and their matter “more Pure Tempered." Transparent stones are not a different kind of substance from opaque stones, but different compositions of the same self-moving matter. Since, in Cavendish’s natural philosophy, sensible qualities arise from the self-motion of matter, differences in motion produce differences in appearance. Transparent stones have a distinctive visual quality because their matter is organised through more refined corporeal motions than opaque stones, suggesting transparency arises from the particular composition and tempering of matter itself.

To illustrate this point, Cavendish compares the difference between transparent and opaque stones to the difference between “Coarse Iron and Fine Steel” and “Coarse Powder-sugar and Sugar Candi’d." In both examples, the materials differ in appearance while remaining the same kinds of substance. Coarse iron and fine steel are both forms of metal, just as powdered sugar and candied sugar are both forms of sugar. Cavendish continues that all transparent stones, like glass, are “Calcin’d earth." Transparent stones are calcined by nature, whereas glass is calcined by art. Transparency does not arise from a different kind of matter, but from a different material composition of the same earthly substance. Cavendish identifies “Clarefactions and Densations” as the motions through which transparency is produced, suggesting that transparent bodies arise from particular ways in which matter is clarified and condensed (PPO, 188). Furthermore, because transparent stones differ from opaque stones only in the refinement and tempering of their motions, differences in colour arise from differences in the corporeal motions constituting bodies. As Cavendish explains, nature contains “different degrees of Dense and Weighty bodies” as well as “Rare and Light bodies," together with “Infinite several Particulars in each Kind and Sort.” (PPO, 135) Transparent bodies therefore differ from opaque bodies not by lacking colour, but by possessing corporeal motions of different degrees. Transparency, on this reading, supports Cavendish’s claim that “colours are made by the corporeal figurative motions of nature” (OEP, 80).

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[26] It should be made clear that Cavendish’s mature philosophical views are most clearly developed in the *Philosophical Letters* (1664), *Observations* (1666), and *Grounds* (1668). I nevertheless examine and develop Cavendish’s chapter ‘Of Transparent Stones’ from the *Philosophical and Physical Opinions* (1663) in order to clarify her account of colour and her claim that it is impossible to conceive of a colourless body. As Cavendish herself acknowledges, “I have not expressed myself in my philosophical works, especially in my *Philosophical and Physical Opinions*, so clearly and plainly as I might have done” (OEP, 11).

[27] *Philosophical and Physical Opinions* (1663) was substantially revised and republished as *Grounds of Natural Philosophy* (1668). During this revision, Cavendish omitted the chapter ‘Of Transparent Stones’, though her reasons for doing so are unclear.

Both Allen and West support this interpretation of transparency and colour in Cavendish's philosophy. Allen explains that putative examples of colourless objects (e.g., transparent stones), for Cavendish, "are not genuinely colourless, we are just unable to perceive their colours in specific circumstances" (Allen 2019, 72). Similarly, West affirms that, "for Cavendish, transparent stones *have* a colour, but one that cannot be seen by the human eye." (West 2021, 473)

Transparent bodies remain coloured, although the corporeal figurative motions constituting their colour are so pure and refined that they cannot be distinctly perceived by the human eye. Nevertheless, transparent bodies are perceived as bodies that do not obstruct sight. As Cavendish writes,

> our optic sense can perceive and see through a transparent body; but yet it cannot perceive what the transparent body's figurative motions are, or what is the true cause of transparentness. (OEP, 59)

The corporeal figurative motions responsible for producing the colour of a transparent body are not visible to the optic sense. This is because "for what is very small or rare, is not subject to the human optic sense" (OEP, 81-82). Here, "rare" refers not to the size of a body, but to the rarity and refinement of its material composition. Transparent stones are visible bodies, although the figurative motions constituting their colour are too "subtle, rare, or little" to be perceived. Their transparency arises through processes of "Clarefactions and Densations," which produce motions too refined for the optic sense to perceive. Although transparent bodies themselves remain visible to the optic sense, the rare and subtle motions constituting their transparency are not perceptible. Cavendish nevertheless maintains that such imperceptible motions remain accessible to rational perception:

> It is true, there are some objects which are not at all perceptible by any of our exterior senses; as for example, rarefied air, and the like: But although they be not subject to our exterior sensitive perception, yet they are subject to our rational perception. (OEP, 47)

I explore this distinction between sensitive and rational perception in the following section.

4.1. Regular Reason

In the previous section, I examined two possible responses Cavendish could offer in defence of the inconceivability argument. I rejected Chamberlain's proposal that transparent bodies possess a derivative

colour by patterning the colours of their surroundings, since this is incompatible with Cavendish's claim that colour is inseparable from body. Instead, I argue that, for Cavendish, transparent bodies are perceptible through sensitive perception and possess a non-derivative colour, namely transparency, which arises from corporeal figurative motions too refined to be detected by sense. These motions are instead accessible through rational perception.

Presently, an objection may be raised against the foregoing account of transparency. If human sight cannot perceive the colour of a transparent body, then perhaps transparent bodies are simply colourless. Descartes appears to endorse this view when he writes that "we'll exclude colour, because we often see stones so transparent that they have no colour" (Descartes 1644, 25). Here, on the basis of what is presented to sense, Descartes takes the apparent colourlessness of transparent bodies as sufficient grounds for concluding that they genuinely lack colour. Cavendish, however, rejects this assumption that the nature of bodies can be determined solely through their appearance to sense.

There are three possible responses Cavendish could offer to this objection. First, although mankind may be unable to perceive the corporeal figurative motions constituting the colour of transparent bodies, this does not entail that such motions are imperceptible to all creatures in nature. Cavendish maintains that "as no part can be without self-motion and self-knowledge, so none can be without perception." For example, "a tree, although it has sensitive and rational knowledge and perception, yet it has not an animal knowledge and perception" (OEP, 170). Perception varies according to the nature of each creature, such that a tree possesses vegetable perception, a man animal perception, and a stone mineral perception. It could consequently be argued that some creature in nature possesses perception of the figurative motions constituting the colour of transparent bodies, even if such motions remain imperceptible to human sight. Similarly, since Cavendish maintains that all creatures possess self-knowledge of themselves and their own actions, transparent bodies themselves may possess knowledge of the figurative motions constituting their colour. However, Cavendish concedes that "how all these particular perceptions are made, no particular creature is able to know, by reason of their variety; for, as the actions of nature vary, so do the perceptions." (OEP, 140) Thus, while this response remains possible within Cavendish's metaphysics, her account provides no clear basis for identifying which creatures might perceive the figurative motions constituting transparent colour. A second possible response might instead appeal to optic instruments, such as microscopes or telescopes, as a means of revealing the figurative motions of transparent bodies.

The seventeenth century saw significant developments in microscopy, which contributed to the rise of experimental philosophy. Optical instruments, most notably the microscope, were popularised in works

such as *Micrographia*, and were associated with the work of the Royal Society. Cavendish was, however, critical of this reliance on optical instruments, referring to them as "deluding glasses" in the *Observations*. Her scepticism is also developed in her philosophical satire *The Blazing World*, which critiques experimental methods and the reliability of optical instruments in natural philosophy. The Empress, in discussion with the Bear-men (experimental philosophers), explains how microscopes "make a louse appear as big as an elephant, and a mite as big as a whale." (BW, 30) Similarly, in the *Observations*, Cavendish argues that optical instruments distort the natural figures of bodies rather than revealing their true nature. Microscopes do not reveal the body itself, but merely produce mediated images or "copies" of nature, such that "mistakes may easily be committed in taking copies from copies." (OEP, 51) For Cavendish, microscopes cannot overcome the limitations of natural sight, since anything beyond the capacity of the "perfect natural eye" cannot properly be presented through "art" (OEP, 59). She therefore rejects the idea that optical instruments can provide a more accurate access to nature than sense itself. However, she does not deny that such instruments may sometimes present an accurate representation of objects, even while they "may, and oftentimes present falsely the picture of an exterior object" (OEP, 50).

The main limitation of microscopes, according to Cavendish, is their inability to reveal the interior corporeal motions constituting natural bodies. She suggests that optical instruments would be valuable if they could show the motions and causes of sensible appearances. As she writes,

> [f]or unless they could discover their interior, corporeal, figurative motions, and the obscure actions of nature, or the causes which make such or such creatures; I see no great benefit or advantage they yield to man. (OEP, 9)

This passage suggests that the usefulness of microscopes depends upon their ability to reveal the corporeal figurative motions responsible for natural phenomena. In the case of transparent bodies, if such motions could be made perceptible to the eye, then the colour arising from them would likewise become subject to sensitive perception. Yet Cavendish's own account ultimately denies that optical instruments can perform this function, since they cannot reveal what lies beyond the capacities of natural sight. She writes, "for what a perfect natural eye cannot perceive, surely no glass will be able to present." (OEP, 59) West makes a similar point, arguing that "sensitive perception can go no further than the exterior shape, figure and actions of an object" (West 2021, 465, citing OEP, 175). He contends that Cavendish's criticisms of microscopy make it clear that the interior motions of objects could never be perceived, and that her account of perception is therefore restricted to the exterior motions of parts of nature (West 2021, 465n23). West's reading reinforces the idea that sensitive perception is restricted to the exterior motions

of bodies. However, if neither the naked senses nor optical instruments can access the interior figurative motions of natural bodies, a further account is required to explain how such motions are knowable. This leads to a third response that turns to rational perception.

In section two, I outlined Deborah Boyle's account of sensitive and rational perception. Sensitive perception occurs when the sensitive matter in the sense organs pattern the figure of an external object presented to them. For example, when the optic sense is presented with a transparent body, the sensitive matter in the eye patterns the sensible figure of that body. Rational perception, in its paradigmatic use, occurs when rational matter patterns out the motions of sensitive matter. In perceiving a transparent stone, rational matter patterns out the sensible figure and qualities presented through sensitive perception, thereby perceiving the object as a unified body. Rational perception also operates in a second sense, where rational matter figures in ways that pertain to an external object without copying the occurrent motions of sensitive matter. Deborah Boyle associates this activity with acts such as remembering, conceiving, reasoning, and other mental states. (Deborah Boyle 2015, 440) However, Cavendish's claim that certain objects, such as rarefied air, are not perceptible by any exterior sense but are nevertheless subject to rational perception suggests that this account does not fully exhaust the scope of rational perception.

Cavendish explains that rational perception is "much purer and subtler than the sensitive" and that "whatsoever the sensitive perception is either defective in, or ignorant of, the rational perception supplies" (OEP, 47). She continues, "by rational perception and knowledge, I mean regular reason" (OEP, 47).[28] Cavendish's appeal to 'regular reason' is directed against experimental philosophers and the Royal Society, whom she criticises for relying too heavily upon sense perception and optical instruments. Transparency may appear colourless to the eye, but regular reason does not conclude from this appearance that transparent bodies genuinely lack colour. Rather, reason recognises that transparent bodies, like all natural bodies, are constituted by corporeal figurative motions from which colour arises. As she writes,

> some… doth prefer sense before reason; and trusts more to the deceiving sight of their eyes, and deluding glasses, than to the perception of clear and regular reason: nay, many will not admit of rational arguments; but the bare authority of an experimental philosopher is sufficient to them to decide all controversies, and to pronounce the truth without any appeal to reason. (OEP, 196-197)

[28] I use 'rational perception' and 'regular reason' interchangeably.

Cavendish objects to the view that the nature of bodies can be determined solely through their appearance to sense. The eye may perceive transparent bodies as colourless because the figurative motions constituting their colour are too "subtle, rare, or little" to appear to sense. Nevertheless, regular reason makes clear that transparent bodies cannot genuinely lack colour, since all natural bodies are constituted by corporeal figurative motions from which colour arises. Rational perception therefore explains how transparent bodies may appear colourless to sensitive perception while nevertheless remaining coloured bodies. This account of perception can be illuminated by the earlier example of the silk thread. When silk is divided into increasingly fine threads, its colour becomes imperceptible to the optic sense. Cavendish argues that the colour is not destroyed through this division, but only imperceptible to human sight. When the threads are twisted back together, the colour is visible again, showing that it was never lost, only imperceptible to sense. As Cavendish explains,

> [f]or the division of their parts doth not destroy their colours, nor the composing of those parts regain them; but they being divided into such small and fine parts, it makes their colours, which are the finest of their exterior parts, not to be subject to our optic perception. (OEP, 81)

Here, Cavendish reasons beyond what is immediately presented to sense. Although the colour of silk becomes imperceptible when divided into parts too fine for the optic sense to perceive, the colour itself is not destroyed. The example illustrates Cavendish's claim that rational perception supplies what sensitive perception cannot apprehend. It is through rational perception that one understands the continued existence of colour despite its imperceptibility to sense. Cavendish consequently maintains,

> natural philosophy is the only study that teaches men to know the particular natures, figures and motions of the several composed parts of nature, and the rational perception is more intelligent than the sensitive. (OEP, 244)

Rational perception is associated with understanding the figures and motions constituting natural bodies beyond what is immediately available to sensitive perception.

At the beginning of this section, I raised the concern that if human sight cannot perceive the colour of a transparent body, then perhaps transparent bodies are simply colourless. Cavendish rejects this conclusion. She denies that the nature of bodies can be determined solely through their appearance to sensitive perception and insists that transparent bodies possess colours even when those colours are not perceptible to human sight. Despite the colour of transparent bodies not being visible through sensitive

perception, its colour is knowable through rational perception. Cavendish argues, as I have outlined above, that regular reason is not limited to figuring in ways that pertain to an external object without copying the occurrent motions of sensitive matter, as Boyle argues. Rather, rational perception can provide knowledge of features of bodies that are unavailable to sensitive perception. Cavendish writes,

> although the interior, figurative motions of natural creatures are not subject to the exterior, animal, sensitive perceptions, yet by their rational perception they may judge of them, and of their productions if they be regular. (BW, 41)

I have argued that regular reason makes clear that transparent bodies cannot genuinely lack colour, since all natural bodies are constituted by corporeal figurative motions from which colour arises. Rational perception therefore explains how transparent bodies may appear colourless to sensitive perception while nevertheless remaining coloured bodies.

Conclusion

This dissertation examined the role of transparency within Cavendish's theory of perception. For Cavendish, colours are made by the corporeal figurative motions of self-moving matter in nature, and no body can exist without colour. In the *Blazing World*, she writes,

> there is no body without colour, nor no colour without body; for colour, figure, place, magnitude, and body, are all but one thing, without any separation or abstraction from each other. (BW, 43)

Yet transparent bodies present a difficulty for this account, since they appear to human sensitive perception as lacking colour. Given Cavendish's materialism, however, this apparent colourlessness cannot indicate the absence of colour in the object. Rather, it raises the problem of how transparency can be known as a colour when it is not perceived as such by the senses. I have argued that rational perception and regular reason show transparency to be a colour, despite its apparent colourlessness to sensitive perception.

This conclusion depends upon Cavendish's account of self-moving matter. Because all of nature is composed of self-moving matter, and because the properties of bodies arise from their corporeal figurative motions, colour cannot be separated from matter itself. As Cavendish insists, "there is no body without colour, nor no colour without body" (BW, 43). Transparent bodies cannot be genuinely

colourless. Their apparent colourlessness arises not from any absence of colour in the body itself, but from the inability of sensitive perception to perceive the figurative motions that constitute their transparency.

Sensitive perception occurs when the sensitive matter of a human or animal patterns out external objects; through this process, the motions of external bodies are figured in the perceptive matter of the senses. When rational matter patterns the motions of sensitive matter, rational perception occurs in its paradigmatic sense. Deborah Boyle identifies a second use of rational perception in which the rational parts figure themselves in relation to an external object without reproducing the motions present in sensitive perception. For example, a person may think of the sun even when it is hidden from sight, so that rational perception is directed towards the object without reproducing any occurrent motions of sensitive perception. However, some of Cavendish's remarks about rational perception are not easily accommodated by this account. She often treats objects imperceptible to the exterior senses as nevertheless available to rational perception, such as rarefied air. Transparency can be understood in the same way. The colour of a transparent body is imperceptible to human sight because its figurative motions are too fine and rarefied to be distinctly patterned by sensitive perception. In the *Observations*, Cavendish writes,

> our optic sense can perceive and see through a transparent body; but yet it cannot perceive what the transparent body's figurative motions are, or what is the true cause of its transparentness; neither is any art able to assist our sight with such optic instruments as may give use a true information thereof. (OEP, 59)

Cavendish's point is not that transparent bodies lack colour or figurative motions, but that their motions are not available to sense. Sight can perceive through a transparent body, but it cannot perceive the corporeal motions that constitute its transparency, nor can optical instruments overcome this limitation. Transparency is not an absence of colour in the body itself, but a case in which sensitive perception cannot perceive it. However, Cavendish maintains that rational perception and regular reason can provide an understanding of the figurative motions of bodies that are not subject to sensitive perception and this provides the basis for what I have called a third use of rational perception.

In this third use, rational perception is directed towards the corporeal motions of bodies whose properties are not available to the exterior senses, not because those bodies are absent from sense, but because their motions are too "subtle, rare, or little" to be perceived by sensitive matter. Transparency is one such case.

Although the colour of a transparent body is not presented to human sight as colour, rational perception and regular reason show that this apparent colourlessness cannot amount to a genuine absence of colour. Transparent bodies remain coloured bodies because, like all natural bodies, they are constituted by corporeal figurative motions from which colour arises. In this way, rational perception shows that the apparent colourlessness of transparent bodies does not conflict with Cavendish's materialism.

To conclude, in this dissertation I have shown how Cavendish's account of transparency and colour reveals the limits of sensitive perception and, in turn, illuminates the role of rational perception. I argued that, within Cavendish's account of colour and the distinction between sensitive and rational perception, transparency must be understood as a colour even when it is not presented as such to sight. In doing so, I have shown that Cavendish's account of rational perception extends beyond the patterning of sensitive motions to include bodies whose figurative motions are too subtle or rarefied to be distinctly perceived by the senses. The problem of transparency is therefore not resolved by denying the evidence of sense, but by situating it within Cavendish's wider account of nature and by allowing regular reason to judge where sense cannot. As Cavendish herself puts it,

> I only endeavour to deliver my judgement as reason directs me, and not as sense informs, or rather deludes me; and I chose rather to follow the guidance of regular reason, than of deluding art. (OEP, 136)

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