

Color in a Material World: Margaret Cavendish Against the Early Modern Mechanists

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Abstract: Consider the distinctive qualitative property grass visually appears to have when it visually appears to be green. This property is an example of what I call *sensuous color*. Whereas early modern mechanists typically argue that bodies are not sensuously colored, Margaret Cavendish (1623-1673) disagrees. In cases of veridical perception, she holds that grass is green in precisely the way it visually appears to be. In defense of her realist approach to sensuous colors, Cavendish argues that (i) it is impossible to conceive of colorless bodies, (ii) the very possibility of color experience requires that bodies are sensuously colored, and (iii) the attribution of sensuous colors to bodies provides the best explanation of color constancy. Although some passages might suggest that Cavendish endorses a reductive account of sensuous color, according to which sensuous color reduces to a body's microscopic surface texture (or some other mechanistically respectable property), I argue that she accepts a non-reductive account, on which sensuous color is not thus reducible.

Key Words: Margaret Cavendish, color, color realism, resemblance, mechanism, Hobbes, Descartes

*Philosophers, which thought to reason well,
Say, Light, and Colour, in the Braine do dwell;
That Motion in the Braine doth Light beget,
And if no Braine, the World in darknesse Shut.*

Provided that the *Braine* hath *Eyes* to see,
So *Eyes*, and *Braine*, do make the *Light* to bee.
If so, poore *Donne* was out, when he did say,
If all the *World* were blind, 'twould still be day.
Say they, *Light* would not in the *Aire* reigne,
Unlesse (youle grant) the *World* were one great *Braine*.
- Margaret Cavendish, *Poems and Fancies* (1653)

The fundamental principle of [modern] philosophy is the opinion concerning colours, sounds, tastes, smells, heat and cold; which it asserts to be nothing but impressions in the mind, derived from the operation of external objects, and without any resemblance to the qualities of the objects . . .

- David Hume, *A Treatise of Human Nature* (1739)

Consider a perceiver looking at a field of grass.* The grass will visually appear to her to have various properties: a certain texture and expanse, a location relative to the perceiver, and

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greenness. Let us focus on the last property on this list: the property that the grass visually appears to have, or that is attributed by the perceiver's visual experience, when the grass appears to be green. In Descartes's terminology, let us focus on "the greenness which I perceive through my senses" (AT VII 82/CSM II 57).¹ This property is an example of what I will call *sensuous color*. Sensuous colors are the properties material things visually appear to have when they appear to be colored.²

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¹ For an explanation of abbreviations, please see the list of primary texts at the end of the paper.

² Philosophers use different terminology to pick out sensuous colors. Mackie refers to "colours as we see colours, as they occur as elements in our experiential content" (1976, 11). Boghossian and Velleman (1989) describe sensuous colors in terms of "colour concepts as they figure in visual experience" (81). Cottingham refers to "a certain qualitative fashion" in which "we represent colors to ourselves" (1990, 234). In Maund's terminology (1991, 2018), sensuous

Many early modern philosophers — like Galileo, Descartes, Hobbes, Charleton, Boyle, Malebranche, and Locke — argue that the grass is not sensuously green, and that material things in general are not sensuously colored, despite appearances to the contrary. Instead, these philosophers argue that sensuous colors exist only in the perceiver — in the eye of the beholder, as it were.³ As Galileo writes, “from the point of view of the subject in which they seem to

colors are “colors-as-we-experience-them” or “colors-as-we-see-them”. Keating (1999) refers to the “qualitative content” of color sensations (416). Byrne and Hilbert (2003) single out sensuous red as follows: “If someone with normal color vision looks at a tomato in good light, the tomato will appear to have a distinctive property — a property that strawberries and cherries also appear to have, and which we call ‘red’ in English” (3-4). Although these philosophers introduce sensuous colors in terms of their role in color experiences, this way of introducing them does *not* entail that sensuous colors are essentially experienced, any more than saying that Fred is the person I saw yesterday implies that Fred is essentially seen. As Boghossian and Velleman (1991) write: “One can pick out a property by means of a contingent fact about it [for example, a role the property plays]. And one can thereby specify the property whose nature is to be debated without preempting the debate . . . The role in which colors command attention, of course, is their role as the properties attributed to objects by a particular aspect of visual experience. They are the properties that objects appear to have when they look to be colored” (68). See also Jackson (1996, 199-200) and Chalmers (2006).

³ Sellars (1978) helpfully distinguishes two ways sensuous color might exist in the perceiver: either *representatively* or *literally*, or, in Cartesian terminology, either *objectively* or *formally*. On the first option, the perceiver has visual experiences that represent sensuous color, which

inhere, these tastes, odors, colors, etc., are nothing but empty names; rather they inhere only in the sensitive body, such that if one removes the animal, then all these qualities are taken away and annihilated” (Galileo 2008, 185). Or as Hobbes puts it: “The subject wherein colour and image are inherent, is *not* the object or thing seen. That there is nothing *without us* (really) which we call an *image* or colour”, but “the subject of their *inherence* is the *sentient*” (EL 4).⁴ These figures sometimes express this point by denying any resemblance between a perceiver’s visual experience of color and bodies. “There need be no resemblance”, Descartes argues, “between the ideas [of color and light] which the soul conceives and the motions which cause these ideas” (AT

need not imply that anything is actually colored, anymore than thinking about unicorns implies the actual existence of unicorns. On the second option, the perceiver has visual experiences that are actually or formally sensuously colored. Malebranche is one of the few early moderns who unambiguously goes for the second option: “The soul is painted with the colors of the rainbow when looking at it”, Malebranche argues, and “when we smell carrion the soul becomes formally rotten, and the taste of sugar, or of pepper or salt, is something belonging to the soul” (OCM III 166/LO 634). Given that Malebranche is an outlier, when I am discussing the early modern mechanists I will typically assume that sensuous colors exist “in the mind of the perceiver” in the objective or representative sense. I will have more to say about this point below, since there is some question as to where Cavendish comes down on this issue.

⁴ For helpful discussion of Hobbes’s view that bodies lack sensuous color, see Stroud (1983, 3-5), Prins (1996, 131-2 and 137-8), and Rickless (2017, 69-71).

VI 131/CSM I 167). We go astray if we believe that the “selfsame whiteness or greenness which I perceive through my senses is present in the body” (AT VII 82/CSM II 57).⁵

For these early modern mechanists, the problem with sensuous color is that it does not seem to fit with their best scientific understanding of what bodies are like. These philosophers accept the mechanical hypothesis, according to which all bodies are made of a single kind of homogenous stuff or matter that is (a) fully described in terms of a privileged set of mechanical or geometrical properties like size, shape, position, solidity, and motion, as well as (b) being divisible into microscopic parts that are characterized by the very same privileged set of

⁵ See also AT V 291-2/CSMK 369. Many scholars recognize Descartes’s exclusion of sensuous color from the physical world, or, in other words, his commitment to the “No Resemblance” thesis. See, for example, Cottingham (1990), Buroker (1991), Maund (1991), Garber (1992, 75), Cook (1996), Rozemond (1998, ch. 3; 1999, 452-3), Keating (2004), Nolan (2011), Downing (2011), and Simmons (2015). Locke also suggests that bodies are not sensuously colored, since he too insists that our ideas of color do not resemble anything in bodies (E 137). For commentators who interpret Locke along these lines, see, for example, Mackie (1976, 11), Alexander (1976-1977), Smith (1990, 232), and Wilson (1992, 226). See Stroud (2000, 8-12) and Van Cleve (2011, 276) for nice summaries of the early modern consensus. In what follows I will mostly focus on Descartes and Hobbes, since Cavendish responds to their work directly. But her criticisms apply broadly.

properties.⁶ All of a body's properties must somehow be reducible to the mechanical properties and relations of its constituent parts, along with its relations to other bodies and perceivers.⁷ The texture of the grass, for example, reduces to the size, shape, and position of its constituent parts; the fragility of a porcelain vase reduces to the way it relates to other bodies.

The early modern mechanists sometimes move directly from the mechanical hypothesis to the conclusion that bodies lack sensuous colors. "I observed that nothing at all belongs to the concept of body", writes Descartes in the *Sixth Replies*, "except the fact that it is something which has length, breadth and depth, admitting various shapes and motions; that its shapes and motions are merely modes which no power whatever can cause to exist apart from body", from which he concludes that "colors, smells, tastes, and so on, are merely sensations which exist in my thought" (AT VII 440/CSM II 297). We can sharpen up this argument as follows:

- (1) If bodies were sensuously colored, then bodies would have properties that are not reducible to the properties attributed to them by the mechanical hypothesis.⁸

⁶ I borrow this formulation of the mechanical hypothesis from Simmons (2015). For more extensive discussion of the mechanical hypothesis than is possible here, see, for example, Smith (1990), Garber (1992, 75), Hattab (2011), and Boyle (2018, 44-47).

⁷ I use the expressions 'mechanistically respectable properties' or 'properties attributed/recognized by the mechanical hypothesis' to refer to properties that either figure in the privileged set, or are reducible in this way.

⁸ More precisely: If bodies were sensuously colored, then bodies would have to possess properties that are (i) not in the privileged set of mechanical or geometrical properties, and that

(2) But, bodies do not possess any such irreducible properties.

Therefore,

(3) Bodies are not sensuously colored.

The first premise is the conceptual claim that if bodies were sensuously colored, then they would have properties that go above and beyond anything envisaged by the mechanical hypothesis. This premise assumes that sensuous colors cannot be identified with microscopic surface textures, a body's powers to interact with light or perceivers in various ways, or any other mechanistically respectable property, but are, rather, *sui generis*. As Descartes writes, for example, "colors, smells, tastes and so on are . . . as different from bodies as pain is different from the shape and motion of the weapon which produces it" (AT VII 440/CSM II 297).⁹

are neither reducible (ii) to the mechanical/geometrical properties and relations of its constituent parts nor (iii) to their relations to other bodies and perceivers.

⁹ See also AT XI 3-6/CSM I 81-2, AT VI 85/CSM I 153-4, and AT VIII B 359/CSM I 304. See Rozemond (1999, 450-3) for discussion of the irreducibility assumption. It is puzzling *that* Descartes is so confident that sensuous colors cannot be identified with any mechanistically respectable properties, given his commitment to what Simmons (2012, 12) labels the "representational obscurity" of sensory ideas. For Descartes, the content of sensory ideas — including ideas of color — is not transparent to the person having these ideas, and so we might have expected him to be more cautious about whether sensuous colors admit of mechanistic reduction (AT VII 43/CSM II 30; see also AT VII 232-4/CSM II 162-4).

Given the definition of sensuous color as color-as-it-visually-appears or color-as-experienced, the first premise might seem obviously correct. When our perceiver looks at the field of grass, the grass visually appears sensuously green to her. The grass does not thereby appear to have a particular microscopic surface texture, or any other mechanistically respectable property. The grass just looks *green*. This feature of color experience might tempt us to infer that sensuous green cannot be identified with any mechanistically respectable property.¹⁰ But this inference is fallacious. When someone looks at a glass of water, it might visually appear to her that there is water in the glass, without it visually appearing that there is H₂O in the glass, even though water just is H₂O. Visual experience might reveal only the tip of the metaphysical iceberg, by representing a property but not its true metaphysical nature. Hence, the fact that sensuous color does not visually appear to be a microscopic surface texture is compatible with its being reducible to some such texture, or some other mechanistically respectable property.¹¹ So the first

¹⁰ See, for example, AT XI 5/CSM I 82.

¹¹ I am grateful to two anonymous referees at *The Philosophical Review* for pressing me to clarify this point, and to one of these referees for suggesting the example of the glass of water. Whether color experiences accurately reveal the nature of color looms large in more recent discussions of color, often organized around Johnston's (1992) "Revelation": the thesis that the intrinsic or essential natures of (sensuous) colors are fully revealed in color experience. See, for example, Armstrong (1968), Johnston (1992), Byrne and Hilbert (2007), Gert (2008, 2017), and Allen (2016, ch. 7). Strictly speaking, *Revelation* is stronger than anything the mechanists need:

premise is *not* as innocent as it looks, even though the early modern mechanists take it for granted. The second premise makes a substantive claim about what bodies are actually like. It claims that the mechanical hypothesis provides a true and complete description of the bodies we encounter. The argument, then, is this: if a mechanical world excludes sensuous color, and if the physical world *is* a mechanical world, then the physical world excludes sensuous color.¹²

Despite exiling sensuous color from material things, these early modern philosophers do not recommend abandoning all talk of color. They suggest various options for the referents of color terms like ‘red’, ‘blue’, etc., which are compatible with the mechanical hypothesis: (a) a perceiver’s sensation or visual experience of color, (b) an object’s surface texture — that is, the arrangement of its microscopic parts — in virtue of which the object normally causes color sensations, (c) the kind of light that normally causes color sensations, or (d) an object’s power or disposition to produce color sensations in perceivers, grounded in the object’s mechanical properties. Although some figures privilege one or the other of these referents, it is common for these philosophers to hold that color terminology is equivocal or ambiguous between two or more options. Hobbes, for example, uses color terms to refer to sensations and different kinds of light; Descartes and Malebranche hold that color terms can be used to refer to either color

they might hold that color experience reveals that sensuous color is irreducible, without thinking that experience fully reveals the nature of sensuous color.

¹² See also Stroud (2000) for more on how a scientific theory of the physical world can be repurposed as a philosophical one, so as to entail the non-existence of color.

sensations or the physical structures that typically cause these sensations;¹³ and so forth. This suggests that the “famous controversie” between these options is, as Boyle puts it, “in great part a Nominal Dispute” (TC 75). The mechanists’ relaxed attitude towards using color terms like ‘red’ and ‘blue’ in these various ways should not obscure their unwavering commitment to the metaphysical point that *bodies are not sensuously colored*. Language is one thing for these philosophers, the nature of body another.

I argue that Margaret Cavendish offers a refreshing alternative to the early modern consensus about color. She holds that bodies are sensuously colored, and that, in cases of veridical perception, the grass is green in precisely the way it visually appears to be. Cavendish’s material world is in technicolor, as compared to the drab, geometrical world of the mechanists. Her world is Oz to their Kansas, colorful rather than colorless. Whereas the early modern mechanists convict color experience of systematic illusion, Cavendish holds that color experience is by and large veridical. She holds that sensuous color is an irreducible property of bodies, on a par with size and shape. Cavendish’s view is thus more in keeping with a naïve or common sense view of color than that of the other early moderns.¹⁴ In addition to articulating an alternative to the early modern consensus,

¹³ See, for example, Schmaltz (1995), Simmons, (2008) and Maund (2018). As Nolan (2011) and Maund (2018) point out, Descartes often signals when he is making a primarily *linguistic* point by using locutions like ‘what we call color’.

¹⁴ I follow Van Cleve’s understanding of the common sense or naïve view of color: “There is something the man in the street believes that Reid, along with the philosophers, denies. It is this: there is *sensuous color in external objects*. Call this naïve realism about color. A good emblem

Cavendish provides a vigorous defense of her common sense view by raising serious worries about the mechanist view of color, and by providing arguments for her own position that are at least as principled as those employed by her opponents.

Although commentators recognize Cavendish's opposition to various forms of mechanism — for example, mechanical accounts of change in terms of impact and transfer of motion — her opposition to the mechanist view that the physical world is devoid of sensuous color has not received the attention it deserves.¹⁵ A sustained scholarly discussion of Cavendish's views on color has not yet been published.¹⁶ Cunning recognizes Cavendish's realism about color, but claims that she “spends very little time defending this view” (2016, 51n.20).¹⁷ One recent commentator even goes so far as to claim that Cavendish “does not explain or even otherwise acknowledge” sensuous color, apart from a passing remark that it is impossible to imagine a colorless body (Peterman *unpublished*, 17). I disagree with these assessments. Although it is not always obvious

for naïve realism (as I once heard George Pappas say) is the ‘cover the earth’ logo of the Sherwin-Williams paint company, in which red paint pours out of a tilted bucket and coats the globe” (Van Cleve 2011, 289).

¹⁵ See, for example, James (1999), O'Neill (2001), Broad (2002, ch.2), Cunning (2006), Detlefsen (2006 and 2007), Michaelian (2009), Stewart (2012), Cunning (2016), Adams (2016), Boyle (2017), Peterman (*forthcoming*), and Lascano (*unpublished*).

¹⁶ This may be changing soon! After this paper was accepted, I became aware that Allen has a forthcoming paper entitled ‘Cavendish and Boyle on Color and Experimental Philosophy’, and I look forward to engaging with his reading of Cavendish in the future.

¹⁷ See also Moreman (1997, 138-9).

that Cavendish is talking about sensuous color, the way she situates herself in opposition to early modern mechanists like Descartes and Hobbes makes it clear that she is disagreeing with them about whether sensuous color is a property of bodies. In the *Grounds of Natural Philosophy* (hereafter *Grounds*), Cavendish refers to “the Opinion of many Learned Men . . . That all Colors are made by the several Positions of Light, and are not inherent in any Creature”, but then hastens to add, “of which Opinion I am not” (GNP 215). Cavendish summarizes the mechanist opinion that bodies are not sensuously colored, and then tells us that she rejects this opinion.

The plan for the remainder of the paper is as follows. In section one, I provide textual evidence that Cavendish holds that sensuous color is an irreducible property of bodies by looking at passages where she disagrees with Hobbes. In sections two through four, I consider three mechanist arguments for the claim that bodies lack sensuous colors, as well as Cavendish’s criticisms. The first mechanist argument is a conceptual or *a priori* argument, the second turns on the supposed explanatory idleness of color, while the third argument focuses on the way color experience varies depending on different illumination conditions. In response to these arguments, Cavendish defends her own realist approach to color by arguing that it is impossible to conceive of colorless bodies, that the very possibility of color experience requires that material things be sensuously colored, and that realism about sensuous colors provides the best explanation for color constancy. Finally, in section five, I defend my non-reductive reading of Cavendish against some apparent textual counterexamples.

1. Hobbes vs. Cavendish on Sensuous Color

Hobbes maintains that bodies are not sensuously colored:

That the subject wherein colour and image are inherent, is *not* the *object* or thing seen. That there is nothing *without us* (really) which we call an *image* of colour.

That the said image or colour is but an *apparition* unto us of the *motion*, agitation, or alteration, which the *object* worketh in the *brain*, or spirit, or some internal substance of the head. That as in *vision*, so also in conceptions that arise from the *other senses*, the subject of their *inherence* is not the *object*, but the *sentient*. (EL 4)

Hobbes's reference to the "image of colour" indicates that sensuous color — that is, color as it is represented in visual experience — is the topic of this passage, and he claims that it is "nothing *without us* (really)" and exists only in "the sentient" (*ibid.*). Hobbes's claim that sensuous color exists in "the sentient" is ambiguous. He could be saying that some part of the sentient's brain is sensuously colored. The problem with this reading is that it implies that material objects — namely, brains — are sensuously colored, since the sentient for Hobbes is material through and through. A more plausible reading is that some agitation or motion in the brain represents sensuous color, which need not imply that any sensuous color actually exists. For Hobbes, then, motions in the sentient represent sensuous color, but sensuous color does not have any actual or formal existence, anymore than unicorns do. Hobbes sometimes writes as if color qualifies matter. But this is a mere *façon de parler*. In a letter from October 16, 1636, Hobbes writes, "whereas I use the phrases, *the light passes*, or *the colour passes* or *diffuseth itselfe*, my meaning is that the motion is onely in the medium, and light and colour are but the effects of that motion in the brayne" (as cited in Prins 1996, 131-2).

Cavendish rejects Hobbes's position in the *Observations Upon Experimental Philosophy* (hereafter *Observations*). This rejection provides evidence that she adopts the opposite view, and holds that bodies are sensuously colored. Consider Cavendish's summary of Hobbes in the *Observations*: "Some of our modern philosophers are of the opinion, that the subject wherein colour and image are inherent, is not the object or thing seen . . ." (OEP 146, emphasis added). Although Cavendish does not mention Hobbes by name, he is clearly her target, since the italicized part of the above quote is Hobbes's language verbatim. Cavendish then goes on to reject his position: "The truth is, our optic sense could not perceive either the original, or copy of an exterior object, if it did not make those figures in its own parts: and *therefore figure and colour are both in the object, and the eye; and not, as they say, neither in the object nor in the eye . . .*" (OEP 147, emphasis added). The question under discussion is whether sensuous color is a property of bodies. More specifically, the question is whether sensuous color — conceived as an irreducible, non-mechanical property — qualifies bodies.¹⁸ Hobbes says no, Cavendish yes. When a perceiver looks at a balloon and has a visual experience of sensuous redness, Hobbes claims that this sensuous redness exists only in the mind of the

¹⁸ Given that Cavendish's mechanist opponents take the irreducibility of sensuous color for granted, Cavendish would presumably flag any disagreement she had on this point. But she doesn't. This suggests that she agrees with the mechanists about whether sensuous color is irreducible, but disagrees with them about whether sensuous color thus conceived qualifies bodies. I will say more about Cavendish's attitude towards the irreducibility of sensuous color in section five below.

perceiver, while Cavendish holds that sensuous redness exists in the balloon as well. The only way to resist this reading of Cavendish would be to accuse her of changing or misunderstanding the topic of conversation in her exchange with Hobbes. But that would hardly be charitable.

Hobbes and Cavendish also disagree about whether sensuous sound — that is, sound as it sensorily appears — is a property of bodies. Given that they both treat sound and color as on par, this disagreement provides additional evidence that Cavendish holds that sensuous color is a property of bodies. Here is Hobbes on sound:

As colour is not inherent in the object, but an effect thereof upon us, caused by such motion in the object, as hath been described: so neither is *sound* in the thing we hear, but in ourselves. . . . the *clapper* hath no sound in it, but *motion*, and maketh motion in the internal parts of the bell; so the *bell* hath motion, and not sound, that imparteth *motion* to the *air*; and the *air* hath motion, but not *sound*; the *air* imparteth motion by the *ear* and *nerve* unto the *brain*; and the *brain* hath motion but not sound; from the *brain*, it reboundeth back into the nerves *outward*, and thence it becometh an *apparition without, which we call sound*. (EL 7-8)

Hobbes again articulates the view that sensuous color and sound do not exist in bodies. When we consider the clapper, the bell, or the air, we find motion, not sound. Sound exists only as “an apparition”, that is, as an auditory experience or appearance. In the *Observations*, Cavendish summarizes Hobbes, practically reproducing his discussion word for word:

Next, as colour, according to their opinion, is not inherent any otherwise in the object, but by an effect thereof upon us, caused by such a motion in the object; so

neither (say they) is sound in the thing we hear, but in ourselves . . . for the clapper has no sound in it, but motion, and maketh motion in the inward parts of the bell; neither has the bell motion, but sound, and imparts motion to the air, the air again imparts motion to the ear and nerves, until it comes to the brain, which has motion, not sound: from the brain it rebounds back into the nerves outward, and then it becomes an apparition without, which we call sound. But, good Lord! what a confusion would all this produce, if it were thus! (OEP 147-8)

She then expresses her disagreement in no uncertain terms: “Both the clapper, and the bell, have each their own motion, by which they act in striking each other; *and the conjunction of such or such parts, makes a real sound, were there no ear to hear it*” (*ibid.*, emphasis added). Cavendish rejects Hobbes’s suggestion that motion is transferred along the causal chain.¹⁹ But she also rejects Hobbes’s claim that sensuous sound exists

¹⁹ Cavendish argues that motion is always motion *of* a body, and, hence, cannot exist without body. For Cavendish this means that a body can only transfer some of its motion to another body by transferring a part of itself, resulting in a decrease of bulk in the original body. But, Cavendish thinks, this kind of transfer of moving matter rarely occurs, and so cannot be what happens in most encounters between bodies. Here’s Cavendish: “If one body did give another body motion, it must needs give it also substance, for motion is either something or nothing, body or no body, substance or no substance; if nothing, it cannot enter into another body; if something, it must lessen the bulk of the body it quits, and increase the bulk of the body it enters, and so the Sun and Fire with giving light and heat, would become less, for they cannot both give and keep at once, for this is as impossible, as for a man to give to another creature his human

only in the perceiver. The bell would still make a “real sound”, a sensuous sound, even if there were no one around to hear it.²⁰

The way Cavendish situates herself in opposition to Hobbes shows that she holds that sensuous color, along with sensuous sound, hot and cold, are irreducible properties of bodies. Our question, then, is *why* Cavendish and her mechanist opponents hold their respective positions. In sections 2-4, I will survey three mechanist arguments for denying that bodies are sensuously colored, along with Cavendish’s responses to these arguments.

2. Conceivability Arguments

One common mechanist strategy is to argue that bodies are not sensuously colored on conceptual grounds. Galileo articulates an early version of this strategy:

As soon as I conceive of a corporeal or material substance, I feel drawn by the necessity of also conceiving that it is bounded and has this or that shape; that it is large or small in relation to other things; that it is in this or that location and exists at this or that time; that it moves or stands still; that it touches or does not touch another body; and that it is one, few, or many. Nor can I, by any stretch of the

Nature, and yet to keep it still” (PL 82; see also PL 97-8, 447-448, OEP 74-5, and 97). For more discussion of Cavendish on the transfer of motion, see Cuning (2016, 42-43 and 157-160), and Peterman (2017). For an account of what exactly Cavendish means by motion, see Peterman (*forthcoming*).

²⁰ Cavendish and Hobbes also disagree about whether sensuous hot and cold exist in bodies. See OEP 148.

imagination, separate it from these conditions. However, my mind does not feel forced to regard it as necessarily accompanied by such conditions as the following: that it is white or red, bitter or sweet, noisy or quiet, and pleasantly or unpleasantly smelling . . . Thus, from the point of view of the subject in which they seem to inhere, these tastes, odors, colors, etc., are nothing but empty names; rather they inhere only in the sensitive body, such that if one removes the animal, then all these qualities are taken away and annihilated (Galileo 2008, 184-5)

We cannot conceive of a body without size, shape, and so on, whereas we can conceive of a body that is not “white or red, bitter or sweet, noisy or silent, and of sweet or foul odor” (*ibid.*). From this conceptual asymmetry Galileo infers that “tastes, odors, colors and so on” do not exist in body. This argument is puzzling because it is unclear why we should expect conceptual analysis alone to tell us all the kinds of properties a thing can have. But the general idea is clear enough: if we consider our concept of body, we will see that bodies possess only those properties attributed to them by the mechanical hypothesis.²¹

Descartes develops a more sophisticated, two-stage version of this conceptual strategy.²² Descartes argues, first, that the nature or essence of body consists solely in extension, and then, second, that if the nature or essence of body consists solely in

²¹ For helpful discussion of this passage, see Hamou (2011) and Buyse (2015).

²² For discussion of Descartes’s conceptual or *a priori* argument for the claim that sensuous color is not a property of body, see, for example, Buroker (1991) Garber (1992, 75-93), Hatfield (2003, 291-296), Allen (2008, 274-278), and Downing (2011).

extension, then the only properties possessed by bodies are mechanistically respectable properties like size, shape, motion, and so forth. Both stages rely on conceivability claims. Let's start with the first stage. In *Principles* II.4, Descartes argues "that the nature of matter, or of body regarded in general does not consist in the fact that it is a thing that is hard or heavy or colored or affected with any other mode of sense, but only in the fact that it is a thing extended in length, breadth, and depth", on the grounds that extension — and only extension — is conceptually inseparable from body (AT VIII A 42/CSM I 224). He illustrates this point in *Principles* II.11:

Suppose we attend to the idea that we have of some body, for example, a stone, and leave out everything we know to be non-essential to the nature of body: we will first of all exclude hardness, since if the stone is melted or pulverized it will lose its hardness without thereby ceasing to be a body; next we will exclude color, since we have often seen stones so transparent as to lack color . . . After all this, we will see that nothing remains in the idea of the stone except that it is something extended in length, breadth, and depth. (AT VIII A 46/CSM I 227)

Descartes argues that we cannot conceive of a body without extension, whereas for every other property — for example, hardness, color, etc. — we can conceive of a body without this property, from which he concludes that the nature or essence of body consists solely in extension. At the second stage of his argument, Descartes then argues that all of a substance's modes or properties must be "conceived through" or "referred to" the substance's essence or principal attribute (AT VIII A 25/CSM I 210). As Cunning writes, "Descartes places a strong constraint on what can and cannot be the property of a body. He says that something is not a property of a body unless there is a conceptual tie

between it and the essence of body” (2006, 117). The only properties that pass this conceptual litmus test are mechanical properties like size, shape, motion, and so forth. Sensuous color, for Descartes, does not. As Downing puts it, “redness [and sensuous color more generally] is not intelligible through extension” (2011, 124n.34).²³ Given Descartes’s assumptions, it then follows that bodies are not sensuously colored.

Cavendish responds to this family of arguments by rejecting their common premise: namely, the claim that we can conceive of bodies not just as lacking this or that sensuous color, but as lacking any sensuous color whatsoever.²⁴ She writes:

²³ Downing (2011) helpfully distinguishes weaker and stronger versions of the “conceived through” or “conceptual tie” requirement. On the weaker version, a mode is “conceived through” extension just in case the mode cannot be conceived of without conceiving of extension, for example, in the way that sphericity presupposes extension. On the stronger version, a mode is “conceived through” extension just in case this kind of mode *follows from* extension, for example, in the way that having “some size, shape, and motion-or-rest” is arguably entailed by being an extended thing (Downing 2011, 124). Descartes’s argument requires the stronger version, since conceiving of color arguably entails conceiving of an *extended* color patch, whereas color does not (obviously) follow from extension.

²⁴ Berkeley often gets credit for this point. In the *New Theory of Vision* (1709), for example, Berkeley rhetorically asks, “Is not the Extension we see Colour’d, and is it possible for us, so much as in Thought, to separate and abstract Colour from Extension?” (NTV 187; see also PHK 45). The answer, of course, is supposed to be *no*. Berkeley is fairly clear that he is only concerned with visual extension at this point, however, and hastens to add, “I speak of those

For how can we *conceive* any corporeal part without a colour? In 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. But put the case all bodies that are not subject to exterior light were black as night, yet they would be of a colour, for black is as much a colour as green, or blew, or yellow, or the like; but if all the interior parts of Nature be black, then, in my opinion, Nature is a very sad and melancholy Lady; and those which are of such an opinion, surely their minds are more dark than the interior parts of Nature . . . (OEP 86, emphasis added)

Cavendish reiterates this point a few pages later: “There is no colour without body, nor a body without colour *for we cannot think* of a body without we think of colour too . . .” (OEP 88, emphasis added).²⁵ Whereas Galileo and Descartes claim that a colorless body is conceivable, Cavendish finds this idea unintelligible. Whenever Cavendish conceives of a body, she cannot help but conceive of it as colored, just as we cannot help but conceive of a body as having some size and shape. Even when she considers bodies in the dark, she conceives of them as colored: namely, as black, which “is as much a colour as green or blew, or yellow, or the like” (OEP 85-6; cf. PH 186). After all, black clashes with navy, but presumably only colors clash with colors.

[qualities] which are perceiv'd by Sight” (*ibid.*). Cavendish, writing in the 1660s, anticipates Berkeley here. See Wilson (1987) and Van Cleve (2011, 293) for more on Berkeley.

²⁵ As Cunning writes, “any idea that we have of a body is an imagistic picture with at least some color or other, and, hence, colorless bodies are inconceivable” (Cunning 2016, 51n.20).

Cavendish's appeal to what is imaginable shows that she is talking about *sensuous* color in these passages.²⁶ When she claims that we cannot "conceive any corporeal part without a colour", she means that we cannot imagine a body without color (OEP 86). But the imagination reproduces and recombines properties represented by the senses, and, hence, reproduces the colors represented by visual experience — namely, sensuous colors.²⁷ To imagine color just is to imagine *sensuous* color. Hence, when Cavendish says that we cannot conceive-cum-imagine a body without conceiving-cum-imagining it as having color, her target is sensuous color. Galileo and Descartes might complain that they weren't using the imagination when they made their conceivability claims, but the pure

²⁶ She also also aligns imagining and conceiving in the argument for complete blending (OEP 158). For more on conceivability and imagination in Cavendish, see Boyle (2015, 444) and Cuning (2016, 34-37).

²⁷ Indeed, Cavendish suggests that (almost) all of our ideas derive from the senses: "There is nothing in the understanding, that is not first in the senses, which is more probable, for the senses bring all the materials into the brain, and then the brain cuts and divides them, and gives them quite other forms, then the senses many times presented them" (WO 20-1). In the *Grounds*, she writes that "to prove that the Rational (if Regular) moves with the Sense, is, That all the several Sensitive perceptions of the Sensitive Organs, (as all the several Sights, Sounds, Scents, Tasts, and Touches) are thoughts of the same" (GNP 58). See Cuning (2016, 34-7) for helpful discussion of what he calls Cavendish's "moderated empiricism".

intellect or understanding, construed as a non-imagistic faculty of representation. But Cavendish rejects the pure intellect as a fantasy (OEP 47, 88).²⁸

Galileo and Descartes might object that there are empirical examples of bodies lacking any color whatsoever, such as perfectly clear glass or air, and there doesn't seem to be any difficulty conceiving of these. In *Principles* II.11, for example, Descartes argues that "we have often seen stones so transparent as to lack color" (AT VIII A 46/CSM I 227). Remarkably, Cavendish denies that we encounter such cases, and suggests that the very idea of a "colourless body" is laughable (BW 43):

The Empress seem'd well pleased with this answer of the Worm-men; and asked them further, *Whether Minerals and all other Creatures within the Earth were colourless? At which question they could not forbear laughing; and when the Empress asked the reason why they laught?* We most humbly beg your Majesties pardon, replied they; for we could not chuse but laugh, when we heard of a colourless Body. Why, said the Empress, Colour is onely an accident, which is an immaterial thing, and has no being of it self, but in

²⁸ Another option for Cavendish would be to reject the second stage of Descartes's argument, where Descartes argues that all of a substance's modes must be "conceived through" its nature, in this case, extension. As Cuning (2006) points out, Cavendish rejects Descartes's view that there *always* needs to be such a "conceptual tie" between the properties and essence of matter. But given that Cavendish holds that there *is* a conceptual tie between color and body, in so far as one cannot be conceived without the other, it would be somewhat odd for her to appeal *in this context* to her view that reality is "not wholly intelligible" (Cuning 2006, 123). I will have more to say about this point below.

another body. Those, replied they, that informed your Majesty thus, surely their rational motions were very irregular; For how is it possible, that a Natural nothing can have a being in Nature? . . . your Majesty may firmly believe, that 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. *The Empress was so wonderfully taken with this Discourse of the Worm-men, that she not only pardoned the rudeness they committed in laughing at first at her question, but yielded a full assent to their opinion, which she thought the most rational that ever she had heard yet . . .* (BW 43-4, emphasis added)

The Worm-men convince the Empress — and, presumably, Cavendish herself — that there can be no colorless minerals, because “there is no Body without colour, nor no Colour without body” (*ibid.*).

Still, it seems that Cavendish should have *something* to say about the apparent counterexamples — namely, objects like glass and air that seem to lack color. Cavendish might argue that the apparent examples of colorless bodies, like air or glass, are at best *imperfectly* transparent, such that glass, air, and water always have a colored tint. Cavendish’s claim that transparency comes in degrees might suggest this kind of response (OEP 92). The denial of any perfectly transparent things might seem plausible to someone living in a time when glass was riddled with imperfections, and the air was often smoky.²⁹ Given that Cavendish is trying to

²⁹ In 1661, for example, John Evelyn, a member of the Royal Society, published *Fumifugium*, documenting the air pollution in London that resulted from burning coal. See Brake (1975) for helpful discussion. I am indebted to Sam Rickless for suggesting this response.

establish that a colorless body is literally inconceivable, however, quibbling over these sorts of examples is probably not the best strategy. Her discussion of sensory processing suggests a better tactic for dealing with transparent bodies: Cavendish might argue that even perfectly transparent bodies are in fact colored — namely, colored by the things we see *through them*.³⁰ 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 (OEP 147; see also PL 80-81 and 88-89).³¹

³⁰ Aristotle defends a similar view: “I call transparent that which is visible not, strictly speaking, in itself but because of the colour of something else” (DA 418b4-6). Burnyeat glosses this passage as follows: “The transparent does not have within itself the cause of its visibility. That is to say, it has no colour of its own; it is not coloured in the way the visible object is. When it is illuminated, it is visible and coloured in a derivative way, thanks to the presence of a colour which belongs to a body. But what is the meaning of ‘coloured in a derivative way’? Here is a very simple reply. The transparent is coloured in a derivative way when the colour of a body appears through it” (Burnyeat 1995, 425). Given that Cavendish read Thomas Stanley’s *History of Philosophy*, which describes Aristotle’s approach to transparency, she may well have been familiar with it.

³¹ One objection to this approach to transparency is that it seems to imply that a single region of air might have incompatible colors. If 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 be both derivatively red and green. In reply, we may observe that one and the same material

Assuming, then, that transparent bodies are colored by the things we see through them, transparent bodies will only help us conceive of a colorless body *if* we can conceive of the transparent body in complete isolation, *not* against any colored background. And that is not an easy thing to do.³²

object can have incompatible colors on different sides, which are revealed from different viewing angles. A completed Rubik's cube, for example, presents different colors depending where you see it from. And so too for transparent bodies. Another objection to reading Cavendish as adopting this approach to transparency is that she says that "the parts or motion of the distance or medium" are "invisible, and not subject to the perception of sight" (PL 510-11). This passage is awkward for my reading, since the claim that transparent bodies are derivatively colored arguably presupposes the visibility of these derivative colors. In response to this objection, we can emphasize Cavendish's claim that the *parts* of the medium are invisible. Cavendish presumably holds that the microscopic parts of the medium — for example, air particles — have non-derivative colors of their own, which we would be able to see if we had microscopical eyes (OEP 81-2). Thus, we might read Cavendish as saying that the non-derivative colors of these microscopic parts are invisible to us, which is consistent with the derivative colors of the medium being visible. I am grateful to Marcy Lascano for bringing this passage to my attention.

³² Someone might object that Cavendish's view only seems plausible when we confine ourselves to visual imagination. But we might wonder about the possibility of a purely tactile conception of a body. Consider what it is like to hold an object in your hands with your eyes closed, for example. In this case, it seems as though you can think of the body without thinking of the body as colored. In reply: Cavendish's view that some blind people have access to colors via touch

Cavendish does not stop at criticizing the mechanists' conceivability arguments. She constructs her own conceivability arguments to show that bodies *are* sensuously colored.³³ When Cavendish considers her concept of body, *she* finds that bodies cannot lack sensuous color, any more than they can lack size or shape, from which Cavendish concludes that sensuous color is inseparable from body. Every body everywhere and at every scale has this property. We have seen this passage before, but it is worth revisiting: "For how can we *conceive* any corporeal part without a colour? In 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, emphasis added). Cavendish moves from the claim that we cannot "conceive any corporeal part without a colour", or, equivalently, that we cannot "imagine a body without colour", to the metaphysical conclusion that

might suggest that she thinks that even a tactile conception of body involves color (OEP 87).

That might be difficult to swallow. But if Cavendish holds that color *follows from* body, in roughly the same way that size, shape, and motion-or-rest follow from extension for Descartes, then it seems like *any* conception of body will involve color. In effect, I am suggesting that, for Cavendish, color might pass the strong version of Downing's (2011) "conceived through" test. Another option would be for Cavendish to retreat, along Berkeleyan lines, to the claim that "we cannot think of a body without we think of" some sensuous quality or other, even if it isn't color (OEP 88). Given that Cavendish singles out color as conceptually inseparable from body, however, she might not be happy about this retreat.

³³ Cunning (2016, 51n.20) and Peterman (*unpublished*) recognize this point.

bodies — both pure and gross — “cannot be colourless” (*ibid.*; see also OEP 88).³⁴ One upshot of this argument is that even microscopic particles have sensuous colors, a conclusion Cavendish happily embraces:

For as no particle of matter can be lost in nature, nor no particular motion; so neither can colour: and therefor the opinion of those who say, that when flax or silk is divided into very small threads, or fine parts, those parts lose their colours, and being twisted, regain their colours, seems not conformable to truth: For the division of their parts doth not destroy their colours, nor the composing of those

³⁴ This inference is puzzling. Why assume that the impossibility of conceiving a body without color implies that bodies cannot be without color? Whatever its philosophical merits, Cavendish is entitled to this assumption in her dialectical context, given that it mirrors similar inferences by Descartes. Admittedly, in *Principles* II.4, Descartes relies on the principle that conceivability implies possibility to argue that extension constitutes the essence or nature of body, whereas Cavendish relies on the principle that inconceivability implies impossibility. But Descartes also assumes that inconceivability implies impossibility, at least in the case of clear and distinct perceptions. In *Meditation 5*, for example, he argues that “from the fact that I cannot think of a mountain without a valley, it does not follow that a mountain and valley exist anywhere, but simply that a mountain and a valley, whether they exist or not, are mutually inseparable. But from the fact that I cannot think of God except as existing, it follows that existence is inseparable from God, and hence that he really exists” (AT VII 66-7/CSM II 46). In this passage, Descartes argues from conceptual inseparability to metaphysical inseparability. I am grateful to an anonymous referee at *The Philosophical Review* for encouraging me to clarify this point.

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 be subject to our optic perception . . . (OEP 81-2).³⁵

Matter *at every scale* is sensuously colored, according to Cavendish. Divide a grain of wheat as many times as you like, and the resulting parts of matter will always have some color or other. Any other conclusion, Cavendish suggests, is inconceivable.

Cavendish thus seems to agree with the early modern mechanists that all of physical nature is made up a single kind of homogenous stuff or matter that is (a) fully described in terms of a privileged set of properties, as well as (b) being divisible into microscopic parts that are characterized by this very same set of privileged properties. In addition, she agrees that our concept of body can give us insight into which properties this set includes. But whereas the early modern mechanists argue that the privileged set is restricted to mechanical or geometrical properties, Cavendish argues that this set includes color too (as well as many other interesting properties like sense, reason, and self-motion).³⁶ As Cavendish writes:

³⁵ Cavendish also embraces the conclusion that the mind is colored. Given her view that the mind is material, this conclusion follows from her view that all matter is colored (OEP 88).

³⁶ Cavendish's inclusion of sensuous color in this privileged set provides additional evidence that she takes sensuous color to be an irreducible property of bodies. I will have more to say about this point in section five below.

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, emphasis added)

As for *Colour*, it is the same with Body: for surely, there is no such thing in Nature, as a Colourless Body, were it as small as an Atom; nor no such thing as a Figureless Body; or such a thing as a Placeless Body: so that Matter, Colour, Figure, and Place, is but one thing, as one and the same Body . . . (GNP 214)³⁷

Color is as intimately related to body as “figure, place, and magnitude” in that they are “all but one thing, without any separation or abstraction from each other” (BW 43).³⁸

³⁷ Given Cavendish’s realism about sensible qualities in general — including sound, hot and cold, in addition to color — we might wonder whether she thinks that all these sensible qualities are inseparable from matter, both in conception and in reality. Unfortunately, Cavendish does not indicate whether her conceivability arguments are supposed to generalize, though it might seem easier to conceive of a soundless body than a colorless one. I am grateful to an anonymous referee at *The Philosophical Review* for pressing this objection.

³⁸ Cavendish’s claim that color is “one thing” with body might suggest that color belongs to the essence or nature of body, in roughly the same way that extension belongs to the essence or nature of body for Descartes. But we should be cautious here: Descartes holds that all of a body’s other properties must be “conceived through” its nature or essence, whereas Cavendish does not endorse this principle (Cunning 2006; 2017, 31-4). So even *if* Cavendish holds that color belongs to the essence or nature of body, this claim would have a very different significance in their respective systems.

3. Explanatory Arguments

A second strategy for excluding sensuous colors from the physical world appeals to the supposed explanatory idleness of color. When a perceiver looks at a field of grass, for example, the mechanists hold that insensibly small bodies in motion — in this case, light reflecting off the grass — impinge on her sense organs, setting up various local motions in her body, nerves, and eventually her brain, which give rise to her visual experience as of green. Here is Hobbes's description of the causal process by which visual perception occurs:

The cause of sense is the external body, or object, which presseth the organ proper to each sense, either immediately, as in the taste and touch; or mediately, as in seeing, hearing, and smelling; which pressure, by the mediation of nerves and other strings and membranes of the body, continued inwards to the brain and heart, causeth there a resistance, or counter-pressure, or endeavour, because outward, seemeth to be some matter without. And this seeming, or fancy, is that which men call sense; and consisteth, as to the eye, in a light, of colour figured . . . All which qualities called sensible are in the object that causeth them but so many several motions of the matter, by which it presseth our organs diversely. (LV 1-2)

There is no mention of sensuous color in this process until we get to the “seeming or fancy” of color. Up until this point, pressure and motion do all the explanatory work. So it looks like the attribution of sensuous colors to bodies is explanatorily idle, from which

the mechanists conclude that bodies are not sensuously colored.³⁹ As Hobbes writes, “colour is not inherent in the object, but an effect thereof upon us, *caused by such motions in the object*” (EL 7, emphasis added). Attributing sensuous colors to bodies does not explain why objects *look* sensuously colored; sensuous colors don’t seem like they *do* anything. Hence, there is no reason to believe that objects *are* sensuously colored, and Ockham’s razor recommends excising sensuous colors from the physical world.

Descartes formulates a version of this argument in *Principles* IV.189-199 that highlights the mechanist assumption that local motion and impact explain all change in the physical world.⁴⁰ In *Principles* IV.189, Descartes appeals to his neurophysiology to argue that sensory experience in general, and color experience in particular, results from the mechanical stimulation of the perceiver’s sense organs, and the subsequent local motions of the nerves, brain, and pineal gland (AT VIIIA 315-6/CSM I 279-80). Given this assumption, the only contribution an external object can make to the sensory process is by imparting motion to the perceiver’s sense organs. In the case of vision, the external

³⁹ One presupposition of this argument is that *if* sensuous colors have any explanatory work to do, it will be to explain the production of color experiences. But, as Broackes (1992) points out, there are other explanatory contexts where we appeal to colors. For additional present day discussion of whether (sensuous) color has a causal role, see, for example, Campbell (1993), Johnston (1992, 139), Jackson (1996), and Allen (2016, ch. 5).

⁴⁰ Indeed, Descartes tells Chanut that *Principles IV* contains his central argument for the rejection of sensible qualities (AT V 291–2/CSMK III 369).

object imparts motion to the perceiver's optic nerve indirectly via the perceptual medium, typically air. But still, the mechanical stimulation of the perceiver's visual system is the key. Descartes then argues that sensuous colors, even if there were such things, would be incapable of imparting motion. As Descartes writes in *Principles* IV.198:

We understand very well how the different size, shape, and motion of the particles of one body can produce various local motions in another body. But there is no way of understanding how these same attributes can produce something else whose nature is quite different from their own — like the substantial forms and real qualities which many philosophers suppose to inhere in things; and *we cannot understand how these qualities or forms could have the power to produce local motions in other bodies*. Not only is all this unintelligible, but we know that the nature of our soul is such that different local motions are quite sufficient to produce all the sensations in the soul. (AT VIII A 322/CSM I 285, emphasis added)⁴¹

Even if the grass were sensuously green, its sensuous greenness would be irrelevant to the way the grass impinges on the perceiver's visual system, and, hence, superfluous to the causal process by which the perceiver's color experience is produced. From the explanatory idleness of sensuous colors, Descartes then infers that “we have every reason to conclude that the properties in external objects to which we apply the terms light, color, smell, taste, sound, heat, and cold . . . are, so far as we can see, simply various

⁴¹ See also AT VII 434-5/CSM II 293.

dispositions in those objects in the shapes, sizes, positions and movements of their parts” (AT VIIA 322/CSM I 285).⁴²

The question of how motions in the perceiver’s brain give rise to the perceiver’s conscious experience of color is fraught. As Simmons (2015, 86) notes, dualists like Descartes need to explain how these motions *cause* conscious experiences of color in an immaterial mind, whereas materialists like Hobbes need to explain how these motions *constitute* experiences. Neither problem is easy. But these figures typically assume that solving these problems will not require attributing sensuous color to bodies, since these problems seem to be downstream from the contribution the external object makes to sensory processing.

Cavendish criticizes this argument on multiple fronts. First, she criticizes the role that light plays in the mechanists’ explanation of color experience. In their explanations of visual processing, the early modern mechanists typically assume a neat correlation between the kind of light an object reflects and the resulting color sensations produced in the mind of the perceiver.⁴³ In the *Meteors*, for example, Descartes writes: “The nature of colors that appear . . . consists in *nothing* besides the fact that the particles of subtle matter, which transmit the action of light, tend to turn with more force than to move in a straight line, such that those whose tendency is much stronger, cause the color red, and

⁴² For helpful discussion of this argument, see Cottingham (1990), Keating (2004) and Downing (2011, 111-5).

⁴³ For helpful discussion of the connection between light and color in the period, see Guerlac (1986) and Adams (2015).

those whose tendency is a only bit stronger, cause yellow” (AT VI 333). Different sensations of color are produced by the different “spin” of light particles, as compared to their tendency towards forward motion. Sensations of red are typically caused by light particles with an especially strong relative spin, sensations of yellow by a slightly weaker one.⁴⁴ Charleton similarly holds that a perceiver’s visual experience of color results from its “determinate Reflection and Refraction” of light, and suggests that if two objects reflect the same kind of light, they will appear to have the same color (PH 185). A rainbow in the sky appears to have the same colors as a rainbow painted on a table because they reflect the same kind of light, despite significant differences in their physical constitutions (PH 188). More generally, there is broad consensus that: (i) the kind of light an object reflects correlates nicely with a perceiver’s visual experience of color, and (ii) this correlation helps explain why a perceiver sees the particular colors that she does.⁴⁵

⁴⁴ See also AT VI 85/CSM I 153, AT VI 91-92, and AT XI 255/CSM I 323. See Sabra (1967) for extensive discussion of Descartes on light.

⁴⁵ The posited correlation between the kind of light an object reflects and the color sensation produced in the perceiver explains, I think, why so many of these early modern mechanists suggest that we should use color terms like ‘red’ and ‘blue’ to refer to different kinds of light. To be clear, I take this to be a primarily *linguistic* point, which in no way undermines their commitment to an austere view of matter. As Hobbes writes, “Colour is light, but troubled light, namely, such as is generated by perturbed motion; as shall be made manifest by the red, yellow, blue and purple, which are generated by the interposition of a diaphanous prism” (EP 459).

Cavendish attacks these points of consensus by appealing to the phenomenon of color constancy. ‘Color constancy’ refers to the fact that perceivers often experience an object’s color as remaining constant across variations in illumination conditions. Consider looking at a scarlet cloth under direct sunlight streaming in through the window, and then pulling the curtains shut to consider it in artificial light. As the illumination conditions change from direct sunlight to artificial light, the cloth does not look like its color changes, as if it were being dyed. A perceiver’s visual experience typically attributes a constant color to the cloth, while the lighting appears to change. As Cavendish writes, “we see that natural and inherent colours continue always the same, let the position and reflexion of light be as it will” (OEP 75). Cavendish then argues that color constancy undermines any straightforward correlation between the kind of light an object reflects and a perceiver’s resulting experience of color: “For the opinion which holds that all colours are caused by the various reflexion of light, has but a weak and

Charleton, for example, claims that light is “the Complement, nay the principal part of colour” (PH 187), and Boyle says that color “when the word is taken in its most Proper sense” is nothing “but Modify’d light” (TC 78). Admittedly, in the *Origins of Forms and Qualities*, Boyle offers a power-based or dispositionalist analysis of sensible qualities in general, including color. But, as Anstey (2000, 92-4) observes, when Boyle focuses specifically on color, he describes color as a modification of light. Cavendish herself expresses sympathy to this approach to color in the early work *Physical and Philosophical Opinions* (1655). In a chapter entitled “Of Colours”, she writes, “some say colours are made by perturbed or obstructed light, but in my opinion, colors are broken lines of light” (PPO 82).

uncertain ground, by reason the refraction or reflexion of light is so inconstant, as it varies and alters continually; and there being so many reflexions and positions of light, if they were the true cause of colours, no colour would appear constantly the same, but change variously, according to the various reflexion of light . . .” (OEP 75).⁴⁶ A scarlet cloth can appear to have a constant color despite reflecting very different kinds of light. Hence, changes in reflected light do *not* always produce changes in a perceiver’s color sensations, and there is *no* tidy correlation between kinds of light and visual experiences of color. Cavendish suggests that the mismatch between light and apparent color goes in the other direction as well: “Besides, there being different coloured creatures, if all had the same position and reflexion of light, they would not appear of diverse, but all of one colour: the contrary whereof is proved by experience” (OEP 75). Two objects may appear to have different colors, and yet reflect exactly the same kind of light. It is unclear exactly what example Cavendish is thinking of. But there are many cases of this type. An object’s apparent color depends not simply on the kind of light it reflects, but also on contrast effects. A blue circle against an orange background presents a different shade of blue than a blue circle against a white background, even if the two blue circles reflect the same kind of light.⁴⁷ So Cavendish is correct that the supposed correlation between kinds of light and visual experiences of color breaks down.

A mechanist might respond to this line of criticism by arguing that the postulated correlation between light and experienced colors is inessential to their explanation. The mechanist just needs *some* kind of mechanistically respectable explanation for color

⁴⁶ OEP 83 and 87, PL 122, and GNP 215-6.

⁴⁷ See Hardin (1993, 496-8) for the philosophical importance of contrast effects.

constancy and contrast effects, and so long as this explanation refrains from attributing sensuous colors to bodies, the mechanist will *still* be able to use Ockham's razor to argue that bodies are not sensuously colored. That response is fair enough so far as it goes. But it is to Cavendish's credit, I think, that she identified weaknesses in the particular mechanistic explanations that confronted her.

In addition to raising worries about the details, Cavendish raises deeper problems about the mechanists' approach. The objection is this: the mechanists assume that we are capable of having experiences that represent sensuous colors, and then focus on the causal process by which bodies trigger the capacity for these experiences in the perceiver. But the mechanists do not adequately explain how it is that we are capable of having these kinds of experiences in the first place. Cavendish points out that there is something deeply puzzling about the idea that experience could represent sensuous colors if, as the early modern mechanists claim, sensuous colors do not exist in the physical world.⁴⁸ Suppose, for example, that a causal account of representation were correct, such that an experience represents its (normal) distal cause.⁴⁹ If our color experiences were caused by sensuous colors, then we could understand how these experiences could represent sensuous colors. But the early modern mechanists cannot avail themselves of this kind of

⁴⁸ Stroud (2000, ch. 7) and Byrne and Hilbert (2007), also raise objections, albeit in very different ways, to the idea that *all* color experiences could be illusory.

⁴⁹ Commentators who interpret Descartes as endorsing a causal account of sensory representation include Larmore (1980), Schmaltz (1992), and Wilson (1990). Barnouw (1980) also interprets Hobbes as adopting a causal account.

explanation, or, more generally, any account of sensory representation that presupposes contact with the represented properties in the physical world.⁵⁰ They cannot explain our ability to represent sensuous redness and greenness by our encountering sensuously red and green things. Cavendish's question, then, is this: how do we manage to represent sensuous colors? How does sensuous color end up in the mind if sensuous color exists *only* in the mind?⁵¹

Cavendish presses this objection by arguing that visual experience can only represent sensuous colors if bodies are sensuously colored. In her disagreement with Hobbes, she writes: "The truth is, our optic sense could not perceive either the original, or copy of an exterior object, if it did not make those figures in its own parts: and therefore figure and colour are both in the object, and the eye; and not, as they say, neither in the object, nor in the eye . . ." (OEP 147; see also OEP 177). Cavendish is responding to Hobbes's suggestion that cases of reflection — for example, when we see a red balloon reflected in a mirror — show that a perceiver may come to have an experience of color in the absence of sensuous color in the physical world (EL 4-5). Cavendish denies this: she holds that a perceiver would be incapable of having a visual experience of color reflected

⁵⁰ In Mendelovici's (2013) terminology, the early modern mechanists cannot avail themselves of "tracking theories of mental representation". See also Campbell (1993) and Schellenberg (2010).

⁵¹ This question is *especially* pointed for Descartes if we interpret him as endorsing Clatterbaugh's (1980) "Objective Reality Principle", which states that a property cannot exist objectively in a thinker unless it exists formally in a substance. See also MacKenzie (1989, 181-4; 1990, 117). I will have more to say about this point below.

in a mirror, or in the original object, unless sensuous redness exists in the original object. More generally, Cavendish holds that the visual experience of color requires that bodies be sensuously colored.

In the background of this objection is Cavendish's view that visual experience is a matter of copying, or, in her terminology, "patterning out". According to Cavendish, when a perceiver looks at a balloon, she has a visual experience of the balloon in virtue of the fact that some of her own parts organize themselves so that they resemble the balloon, in roughly the same way that a piece of wax takes on the shape of a seal pressed into it (PL 540). In the *Observations*, Cavendish analyzes perception in terms of patterning: "The perception of the exterior senses in animals, at least in man" is "made by patterning or imitation" (OEP 15). Patterning implies copying, imitation, or resemblance. "To pattern out", Cavendish explains, "is nothing else but to imitate, and to make a figure in its own substance or parts of Matter like another figure" (PL 421). And she is clear that this account applies to color experience: "Sensitive perception doth pattern out the exterior figure of colours, as easily as of any other object" (OEP 79). For Cavendish, then, visual perception occurs as a result of the perceiver becoming like the object perceived. As Peterman writes, representation for Cavendish "is a kind of identity or assimilation", such that "better knowledge is represented by more complete identity or assimilation" (Peterman 2017, 8).⁵²

⁵² Cavendish's account of sensory representation in terms of patterning may strike some readers as strange. Here it may be helpful to distinguish two aspects of this doctrine. First, Cavendish holds that external objects are *occasions* rather than *causes* of a perceiver's sensory experiences,

Applied to the case of the red balloon, a perceiver's visual experience of red occurs as a result of the perceiver becoming like the balloon. Here's Cavendish:

The truth is, it is as easy for several senses to pattern out the several proprieties of one body, as it is for several painters to draw the several parts of one figure . . .

Sight may pattern out the figure and light of a candle; touch may pattern out its weight, hardness or smoothness; the nose may pattern out its smell; the ears may

such that a perceiver causes *herself* to pattern out an object when she is suitably related to it. This might seem odd, since we normally assume that a perceiver's experience of an apple is caused by the apple. But, as other commentators have shown, Cavendish has compelling arguments for this aspect of her view. As Adams (2016) demonstrates, Cavendish subjects Hobbes's alternative — according to which external objects produce sensory experiences through *pressing* or *stamping themselves* on the perceiver's sensory organs — to scathing criticism. More generally, Cunning (2016, 42-3) appeals to Cavendish's arguments against the possibility of the transfer of motion in this regard, and points out that sensory processing was a problem for everyone in the period. As Cunning writes, "in defense of Cavendish, however, the bulk of seventeenth-century attempts to make sense of the transfer of motion, and to make sense of the motions involved in the production of sensory perception, are peculiar. They were peculiar just because the phenomenon in question — the transfer of motion — is peculiar, and becomes resistant to explanation as soon as we begin to press on it" (Cunning 2016, 43). Second, we might worry about Cavendish's view that patterning implies that the perceiver *becomes like* the object perceived. In effect, Cavendish assumes that representation requires some kind of similarity or isomorphism. But that would not have been an outlandish assumption in the period.

pattern out its sparkling noise, etc. All which does evidently prove, that perception cannot be made by pressure and reaction . . . Besides, it proves that all objects are material; for, were light, colour, figure, heat, cold, etc. immaterial, they would never be patterned out by corporeal motions; for, no painter is able to copy out, or draw an immaterial mode or motion . . . (OEP 177)

We should not take Cavendish's talk of "becoming like" the object too literally, however. Cavendish does not hold that the perceiver becomes *actually* red when she sees red.⁵³ She intends a weaker form of likeness or similitude. A few pages later, she clarifies:

But then, you will say, If the eye did pattern out the figure of light, it would become light itself; and if touch did pattern out the figure of heat, it would become fire. I answer: No more than when a painter draws fire or light, the copy should be a natural fire or light. For there is difference betwixt the copy and the original. . . . I say, of the heat which is the effect of fire; for that is only patterned out, and not the substance of the flame or fire itself. (OEP 186)⁵⁴

⁵³ Though Cavendish does say that ideas have the same colors as the objects they represent: "Again, they may ask, Whether an idea have a color? . . . To which I answer, If the ideas be of corporeal finite figures, they have colors according to the nature, or property, or figure of the original" (OEP 88). This passage might push us towards a more literal construal of the resemblance between the perceiver and the object perceived.

⁵⁴ I am grateful to Marcy Lascano for bringing this passage to my attention. See also OEP 178-9. Aristotle and his Scholastic followers similarly hold that sensory perception involves the reception of an object's form, so that when a perceiver sees a red balloon, the form of redness

The crucial point for us is just this: Cavendish's account of sensory representation presupposes that bodies are sensuously red, since we cannot have a visual experience of

comes to exist in the perceiver. Aristotle qualifies this claim, however, by arguing that sensory perception involves the reception of an object's form *without its matter* (DA 424a17).

Commentators disagree about what this means. At one end of the spectrum, Sorabji (1992) argues that a material change occurs in the perceiver such that a part of the perceiver literally becomes red when she looks at a red balloon, such that the perceiver is red in the same sense as the balloon, in roughly the same way that part of a mirror literally becomes red when it reflects the balloon. At the other end of the spectrum, Burnyeat (1992, 1995) argues that the only change that occurs in the perceiver is that redness comes to have a spiritual or intentional existence in the perceiver, without any corresponding material change. Irwin (1988), Shields (1997), and Caston (2005) carve out a middle ground between these extremes, according to which the perceiver undergoes a material change that *expresses, encodes, or represents* the form of redness, without the perceiver literally becoming red. Caston, for example, argues that the perceiver undergoes a material change that is isomorphic to, or exhibits the same proportions as, the sensible form of redness (Caston 2005, 314). Cavendish was familiar with Thomas Stanley's *History of Philosophy*, which describes the Aristotelian account of sensory perception in terms of the reception of "sensible Species without matter, as Wax the Impression of a Seal without the Gold" (TS 257). This may help explain the Aristotelian flavor of Cavendish's account.

red unless there is red in the world to be copied or patterned.⁵⁵ To adapt an empiricist slogan: no color in the senses that was not first in the world.

In response to Cavendish's question about how the mind could represent sensuous colors if there were no sensuous colors in reality, Descartes might answer that the mind is built to do this kind of thing. The mind has certain innate dispositions to represent sensuous colors and other sensory qualities, which dispositions are triggered through a natural institution by certain causal impacts on the sensory organs. And that's not any more mysterious than the mind representing numbers or other abstracta, which lack formal reality. As Rozemond argues, for example, Descartes's puzzling claims in the

⁵⁵ Two clarifications are in order. First, Cavendish's objection does not depend on the *details* of her preferred account of sensory representation in terms of patterning. All she needs is the generic claim that sensory experience of color depends on the existence of sensuous color in bodies. Second, Cavendish does not need to assume that every time someone has a sensory experience of color — red, say — there is something in her vicinity that is sensuously red. Cavendish knows that dreams and hallucinations occur. Rather, Cavendish just needs the claim that our capacity to have sensory experiences of color in general depends on there being sensuous colors in the material world somewhere along the line. Cavendish might appeal to the model of sensory experience suggested by Descartes's painter analogy in *Meditation 1*, according to which illusions, hallucinations, and dreams are restricted to combining and recombining the likenesses "of things that are real", with the crucial twist that *sensuous colors* are among "the real colors from which we form all the images of things, whether true or false, that occur in our thoughts" (AT VII 19/CSM II 13).

Comments to the effect that sensory ideas are “innate” suggest that *the mind*, rather than the bodies we encounter, is the source of the representational content of sensory ideas (1999, 457). I’m not sure that we should be impressed by Descartes’s purported explanation, however. Positing innate dispositions to represent sensuous colors seems more like a placeholder than an actual account of how we are capable of representing uninstantiated sensory qualities.⁵⁶ And Cavendish certainly would not be impressed, given that she thinks the very idea of an immaterial things is unintelligible. Also, this placeholder is unavailable to Hobbes. Given Hobbes’s materialism, he cannot appeal to anything like the Cartesian mind to do last ditch explanatory work.⁵⁷ So I think that

⁵⁶ Moreover, as I mentioned in n.51 above, some commentators interpret Descartes as endorsing the “Objective Reality Principle”, according to which the objective reality of a property implies the formal reality of that property, either in minds or bodies. If that’s right, then he cannot help himself to uninstantiated sensory qualities. Descartes might claim that sensory qualities are formal properties of the mind. But few besides Malebranche will be happy with that result.

⁵⁷ Alternatively, the mechanists might argue that our experiences of sensuous color are cobbled together from other less problematic representational materials, in roughly the same way that our idea of a unicorn is made from our idea of a horse and that of a horn. But, as Stroud points out, it is hard to see how this would work in the case of color: “There do not seem to be properties that are not colours at all which we could somehow put together to give us the thought of colour in general. It seems that our understanding and recognition of the colours of things cannot be built up out of noncolour building blocks in the way we can perhaps build up a thought of a unicorn from thoughts of a horselike body and a well-placed horn” (Stroud 2000, 147).

Cavendish has formulated a powerful objection to the mechanist view of color. The mechanical hypothesis might seem alluring in its apparent intelligibility. But, as Cavendish reminds us, appearances of intelligibility can be deceiving. The mechanical hypothesis makes it completely unintelligible as to how bodies give rise to subjective experiences of color. And that's a real problem for the mechanists.⁵⁸

4. Variability Arguments

Another mechanist strategy for the exclusion of sensuous color from the physical world appeals to the perceptual variability of color, and, more specifically, the way a body's color appears to change depending on the lighting conditions. Locke uses this strategy in his discussion of the porphyry in *An Essay on Human Understanding* II.viii.19. When the lights are on, the porphyry looks red and white. Turn off the lights, and these colors vanish. Whether the lights are on or off does not really have any effect on the porphyry, however. The illumination conditions do not seem to change any of the porphyry's non-relational or intrinsic properties. Thus, if the porphyry changes color depending on the lighting conditions, while its non-relational or intrinsic properties

⁵⁸ This is especially problematic if, as Cunning suggests, one of the primary motivations for mechanism is the "belief that reality is wholly intelligible" (Cunning 2006, 123). I am grateful to an anonymous referee at *The Philosophical Review* for encouraging me to emphasize this point.

remain constant, then the colors we see are not among the porphyry's non-relational or intrinsic properties, and, perhaps, not properties of the porphyry at all.⁵⁹

Locke's *Essay* was published in 1689, a few decades later than Cavendish was writing, so she could not have been responding to his version of this argument. But perceptual variability arguments occur in earlier mechanist writings, with which Cavendish would have been familiar. Writing in 1654, Walter Charleton considers "a yard of Scarlet Cloth", stretched out on a table in uniform light (PH 186).⁶⁰ In this situation, the cloth appears to be a uniform shade of scarlet. If we change the lighting conditions, so that one half of the cloth is illuminated by "the direct rayes of the Sun", while the other half is illuminated by a dimmer light source, like a lamp, the two halves of the cloth will appear to be different shades of red: "If you engage a skillful Painter to portray it to the life, as it is then posited, He must represent the Directly illuminate half, with one Colour, viz. a bright and lightsome Red, and the Reflexly illuminate half, with

⁵⁹ To get this further conclusion, we need to add the assumption that if sensuous colors were properties of bodies, then they would have to be non-relational or intrinsic. Many philosophers since Locke have argued that we can read this conditional off the phenomenology. See, for example, Boghossian and Velleman (1989, 85), Johnston (1992, 226–227), McGinn (1996, 543–544), Tye (2000, 152–153), Chalmers (2006, 56), and Averill and Hazlett (2010). I am grateful to Patrick Connolly for suggesting this way of formulating the argument.

⁶⁰ Charleton served as a physician to the Newcastles, and Cavendish developed a friendship with him. So it seems quite likely that she would have been familiar with his views, as Boyle (2018, 43) argues. For more on Cavendish's relationship with Charleton, see O'Neill (2001, xiii-xv).

another, i.e. with a Dusky or more obscure Red, or shamefully betray his ignorance of *Albert Durers* excellent Rules of shadowing” (PH 186). If we move the cloth through “various degrees of Light and shadow”, fold the cloth, or “lay it in waves or pleights of different magnitudes”, we will “admire the variety of Colours apparent thereon” (*ibid.*). But, as Charleton points out, there does not seem to be any principled reason to privilege one of these apparent shades as the “true” or “inherent” color of the cloth. If we assume that sensuous color could be a property of bodies only if there were some principled way of picking out the “true” colors of bodies, it follows that bodies are not sensuously colored (PH 187). Charleton thus concludes that the cloth does not contain any sensuous color, but only a disposition to produce various sensations of color depending on the illumination conditions, grounded in the cloth’s mechanical or geometrical properties (*ibid.*).⁶¹

Charleton’s argument is different from Locke’s. Whereas Locke’s argument turns on the assumption that changing illumination conditions do not have any real effect on the object, Charleton’s argument turns on the difficulty of identifying an object’s “true” sensuous color given the multiplicity of options. The important point, for our purposes, is the common phenomenological premise on which these arguments depend: namely, that an object visually appears to have different sensuous colors in different illumination conditions.

⁶¹ See Cohen (2004) for an updated version of Charleton’s argument, though Cohen appeals to the variability of color to argue for a relational view of color rather than an eliminativist one.

Cavendish responds to this family of arguments by attacking this common premise. She appeals to the phenomenon of color constancy, as described in the previous section, to argue that sensuous color is not as finicky as Locke and Charleton suggest. As Cavendish writes, “we see that natural and inherent colors continue always the same, let the position and reflexion of light be as it will” (OEP 75). This is not a passing remark either, but one that Cavendish insists upon in a number of different contexts. In the *Grounds*, Cavendish illustrates the phenomenon by imagining what it would be like if color constancy *did not* obtain, that is, if the colors were perceived to change color with every change in illumination:

For, if that were so, every Creature would be of many several Colours; neither would any Creature produce after their own *Species*: for, a Parrot would not produce so fine a Bird as her self; neither would any Creature appear of one and the same Colour, but their Colour would change according to the Positions of Light; and in a dark day, in my opinion, all fine colored Birds, would appear like Crows; and fine colored Flowers, appear like the Herb named *Night-shade*; which is not so. (GNP 215-6)

If the apparent colors of things were hostage to every change in illumination, “in a dark day . . . all fine coloured Birds, would appear like Crows” (*ibid.*). But that is not how fine

colored birds appear. This suggests that the scarlet cloth does not look to have different sensuous colors in the way presupposed by Charleton's argument.⁶²

Cavendish also appeals to color constancy to argue for her view that bodies are sensuously colored. She takes color constancy to suggest that objects have a "natural" or "inherent" color that remains the same through changes in illumination:

For the opinion which holds that all colours are caused by the various reflexion of light, has but a weak and uncertain ground, by reason the refraction or reflexion of light is so inconstant, as it varies and alters continually; and there being so many reflexions and positions of light, if they were the true cause of colours, no colour would appear constantly the same, but change variously, according to the various reflexion of light; whereas, on the contrary, we see that natural and inherent colours continue always the same, let the position and reflexion of light be as it will. (OEP 75)

This argument begins with color constancy as a phenomenological datum: an object's color can "appear constantly the same" through variations in "the refraction or reflexion of light". What explains this fact? We cannot explain this constancy just in terms of the light reflected off the object, given that the light is "so inconstant". The best explanation, rather, is that an object appears to have a constant color *because it does*: "We see that natural and inherent colours continue always the same" (*ibid.*). This argument suggests a

⁶² I am not sure whether Cavendish was the first philosopher to recognize the phenomenon of color constancy. Further investigation is required here. Her *use* of this phenomenon to resist Charleton's argument seems novel, however.

principled way of picking out the cloth's "true" sensuous color, *pace* Charleton. An object's true color is the one that appears constant through changes in illumination.⁶³

5. The Irreducibility of Sensuous Color

Descartes, Hobbes and other early modern mechanists hold that sensuous color — conceived as an irreducible, non-mechanical property — does *not* qualify bodies. The way Cavendish situates herself in opposition to these figures suggests that she holds the opposite view, according to which sensuous color is an irreducible property of bodies. One objection to my reading is that there are texts where Cavendish seems to endorse a reductive account of sensuous color, rather than a non-reductive one. In this section, I argue that my non-reductive reading of Cavendish can accommodate these texts.

To get a sense of the difference between reductive and non-reductive accounts of color, let us revisit an argument we saw above:

⁶³ Contemporary realists about color still use this form of argument. As Allen writes, for example, "the claim that colours are mind-independent properties whose nature and existence is independent of the varying appearances presented across different perceptual conditions provides a straightforward explanation of the phenomenon of color constancy" (Allen 2016, 18). Cavendish's appeal to color constancy would thus seem to be remarkably prescient. Indeed, color constancy plays a large role in contemporary philosophical discussions of color. In addition to Allen (2016), see, for example, Hilbert (1987), Byrne and Hilbert (1997), Tye (2000), and Gert (2017).

(1) If bodies were sensuously colored, then bodies would have to possess properties that do not reduce to the properties attributed to them by the mechanical hypothesis.

(2) But, bodies do not possess any such irreducible properties.

Therefore,

(3) Bodies are not sensuously colored.

Reductive and non-reductive accounts of color respond to this argument in different ways. A reductive account rejects the first premise. Although a cursory inward glance might suggest that sensuous color — that is, color-as-it-visually-appears or color-as-experienced — is very different from size, shape, and motion, a reductionist will claim that sensuous colors *are* mechanistically respectable properties, but with the qualification that visual experience conceals their mechanical nature. In contrast, a non-reductive account rejects the second premise: the claim that bodies *only* have mechanistically respectable properties. A non-reductionist agrees that sensuous colors are irreducible to anything envisaged by the mechanical hypothesis, and yet nevertheless insists that bodies are sensuously colored.

Some of Cavendish's texts point towards a reductive account. Although she rejects the mechanical hypothesis, Cavendish describes color as a "figure", a "corporeal

figurative motion”, or a “figurative motion”.⁶⁴ In the *Philosophical Letters*, for example, she writes:

Wherefore Light, Heat and Colour, are not bare and bodiless qualities; but such figures made by corporeal self-motions, and are as well real and corporeal objects as other figures are; and when these figures change or alter, it is only that their motions alter, which may alter and change heat into cold, and light into darkness, and black colour into white. (PL 63)

Also Colours are made after the like manner, viz. so many several Colours, so many several Figures; and as these Figures are less or more different, so are the Colours. (PL 65)

In the *Observations*, she refers to the “exterior figure of colours” (OEP 79), and the “corporeal figures of colours” (OEP 80). She writes that “colours *are* corporeal figurative motions . . .” (OEP 83, emphasis added), that “colours are figurative parts”, (OEP 81) and that colors are “the finest of [an object’s] exterior parts” (OEP 81). Similarly, in the *Grounds*, she writes that colors “are only several figurative motions” (GNP 214-5). If by “figure” and similar expressions, Cavendish means the spatial arrangement of an object’s parts, then she would be reducing color to mechanistically respectable properties.⁶⁵ If

⁶⁴ For the purposes of my current discussion, I treat these three terms as equivalent. Peterman (*forthcoming*) examines what Cavendish means by ‘motion’. But more work needs to be done, I think, to explain what Cavendish means when she talks about *corporeal figurative* motions.

⁶⁵ Peterman hints at this kind of reading, in so far as she argues that “for qualities that are sometimes categorized as ‘secondary’, like color, heat, rarity, density, hardness, light and so on,

Cavendish accepts a reductive account of color, she would still differ from the mechanists in holding that bodies are sensuously colored, that is, in holding that bodies exemplify the very qualities represented in color experience. But her disagreement would not be so much about the nature of body, but about whether sensuous color admits of reduction to figures and motions.

These passages are not decisive, however. Cavendish often uses the term ‘figure’ as a catch-all for anything bodily or material. As Peterman writes, “Cavendish clearly thinks that ‘figures’ in some sense are real features of nature. But you’d be forgiven for thinking that her use of ‘figure’ is, well, figurative, since often, the phrase ‘figurative motions’ seems to have little do with the shapes of things or motions and more like an underspecified stand-in for the essence, nature, or property of some part of matter” (2017, 11). Given Cavendish’s view that sensuous color is a property of bodies, it would thus be trivial that sensuous color is a figure in this quasi-technical sense, and would not imply any commitment to the reducibility of color. Indeed, Cavendish sometimes says that color is “material” or “corporeal”, without suggesting that colors admit of any reductive analysis (OEP 80). This means that the non-reductive reading of Cavendish is fully compatible with her frequent claims that colors are “figures”.

Cavendish means that they are nothing over and above matter, *arranged in a certain way*)” (*unpublished*, 33, emphasis added). Cavendish’s claim that a blind person might be able to detect an object’s color might also suggest that color reduces to texture (OEP 83).

In addition to the way Cavendish situates herself in opposition to the early modern mechanists, her claim that colors are ‘one thing’ with body strongly supports the non-reductive reading:

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, emphasis added)

As for *Colour*, it is the same with Body: for surely, there is no such thing in Nature, as a Colourless Body, were it as small as an Atom; nor no such thing as a Figureless Body; or such a thing as a Placeless Body: so that Matter, Colour, Figure, and Place, is but one thing, as one and the same Body . . . (GNP 214)

When Cavendish says that color, figure, magnitude, and place are all “one thing” with body, she is saying, at least, that they all have a similar ontological status, in being equally fundamental and inseparable from body.⁶⁶ But if these properties are equally fundamental and inseparable, then it is hard to see how color could be *reducible* to figure, magnitude, place, and so forth. Rather, this passage suggests that color is among a privileged set of fundamental or irreducible properties, albeit one that differs from the privileged set admitted by the mechanists. Moreover, Cavendish takes her “one thing” claim to imply that every piece of matter, at every scale, is sensuously colored. If Cavendish held that sensuous color were a reducible property of bodies — say, a complicated disjunction of surface textures — then she would be committed to saying that every piece of matter, at every scale, has one of the surface textures that is sufficient

⁶⁶ I am grateful to an anonymous referee at *The Philosophical Review* for suggesting this point.

for being sensuously colored. But it is implausible that Cavendish would think that.

These considerations provide further evidence that Cavendish accepts a non-reductive view of sensuous color.⁶⁷

Conclusion

Sensuous colors are the properties material things visually appear to have when they appear to be colored. Whereas the early modern mechanists argue that bodies are *not*

⁶⁷ Peterman (2017, 5-6) suggests an objection to my reading. Whereas I am proposing that the force of Cavendish's "one thing" claim is that color, figure, magnitude, and place are among the fundamental or irreducible properties of body, Peterman argues that Cavendish is saying that these items — namely, color, figure, magnitude, and place — are *matter itself*. On this proposal, redness is not a property of the tomato, but *just is* (a kind of?) matter, which might seem like a kind of reduction. This reading finds support in Cavendish's claim that "redness is as well in blood, as blood is in a bloody cloth, or any other color in anything else, for there is no color without a body, but every color hath as well a body as anything else" (PL 52). The view that color *just is* matter is difficult to understand. But it does not support a reductive account of color in the sense defined above. It does not suggest that Cavendish is reducing color to any mechanistically respectable property. Rather, if Cavendish is saying that color *just is matter itself*, we might interpret her as identifying color with primitive color particles or pigments diffused throughout nature. On this proposal, she would hold that colors are irreducible kinds of matter, rather than irreducible properties. Cavendish would still endorse a non-reductive account of color, albeit with a radically nominalist twist.

sensuously colored, Margaret Cavendish disagrees. In cases of veridical perception, Cavendish holds that the yard of cloth is scarlet in precisely the way it visually appears to be. She holds that sensuous colors are properties of bodies that are *not* reducible to figure, motion, or any other mechanistically respectable properties. Cavendish does not merely offer an alternative to mainstream early modern thinking about color, but develops penetrating critiques of her contemporaries' approaches to color. She objects to their claims that colorless bodies are conceivable, that color is explanatorily idle, and that objects look to have changing colors as illumination conditions change. Cavendish shows that the early modern consensus about color is more problematic, and requires more defense, than is often assumed. She reminds us how *strange* the mechanist view really is.

Unfortunately, her contemporaries did not take notice of her reminders, dismissing her work as mad and deranged, with the result that her prescient work on color was ignored.⁶⁸ Despite their friendship, for example, Charleton is dismissive of her philosophy: "For your Natural Philosophy; it is ingenious and free, and may be, for ought I know, Excellent: but give me leave Madam, to confess, I have not yet been so happy, as to discover much therein that's Apodictical, or wherein I think my self much obliged to acquiesce" (cited in Battigelli 1998, 56). The tendency to ignore Cavendish's work on color continues to the present day. Recent scholarship on the history of the philosophy of color barely mentions Cavendish. Nolan's (2011) otherwise excellent collection of essays on the primary and secondary quality distinction does not mention her. Adam's *On the*

⁶⁸ For more extensive discussion of Cavendish's reception than is possible here, see, for example, Battigelli (1998), Wilson (2001), and O'Neill (2001).

Genealogy of Color (2015) mentions Cavendish in a footnote to an epigraph to a chapter, but does not meaningfully engage with her work. The brief history Stroud (2000) includes in *The Quest for Reality* omits Cavendish, as do the histories told by Chirimuuta (2015) in *Outside Color* and Allen (2016) in *A Naive Realist Theory of Colour*.⁶⁹

The standard narrative recounted in these works goes something like this: naïve or common sense realism about sensuous colors enjoyed its heyday among the Scholastic Aristotelians, before falling out of favor in the early modern period.⁷⁰ It then remained the minority position, with a sprinkling of defenders in the twentieth and twenty-first centuries. The way this story is often told, the transition from the colorful world of the Scholastic Aristotelians to the colorless world of the early modern mechanists is presented as occurring overnight, as if everybody went to bed in Oz and woke up the next morning in Kansas. But of course the transition was more complicated than that, and color was not lost without a fight. Although she was *not* a card-carrying Aristotelian by any stretch of the imagination, we might see Cavendish as a heterodox member of the Aristotelian resistance, in so far as she uses recognizably Aristotelian principles — for

⁶⁹ In fairness to Allen, he now has a forthcoming paper about Cavendish and Boyle on color, as I mentioned above.

⁷⁰ Whether the Scholastic Aristotelians are best understood as naïve realists about sensuous color is a topic of scholarly dispute. See, for example, Pasnau (2011). If the Scholastic Aristotelians were not naïve realists, then Cavendish's place in the history of color would be even more interesting than I am suggesting here, since she would be even more unusual in arguing that bodies are sensuously colored.

example, the idea that sensory representation involves the reception and hence reality of sensible qualities — to keep sensuous color in the physical world.⁷¹ In defending a realist and non-reductive account of sensuous color during the early modern ascendance of eliminativist views, Cavendish complicates our understanding of standard historical narratives about the fate of color in this period. In addition to her unique historical role, Cavendish’s investigation of color anticipates many themes that later became important: for instance, Berkeley’s suspicion of conceiving of colorless bodies, Stroud’s (2000) worries about the possibility of color experience being systematically in error, as well as the philosophical significance of color constancy. Cavendish’s story deserves to be told.

Cavendish was surrounded by, and immersed in, the early modern mechanist tradition. This meant she had targets to argue against, and her engagement with the mechanists’ arguments was fruitful. It is a shame that the mechanists did not reciprocate. Fortunately, it’s not too late for us.

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⁷¹ See Irwin (1988, 311-2) for more discussion of Aristotle’s realism about sensible qualities than possible here. By embedding this Aristotelian principle in a very different philosophical context — namely, her vital materialism — Cavendish also illustrates the extent to which this principle is independent of a hylomorphic framework. In future research, I hope to investigate how more orthodox Aristotelians resisted the eliminativist approaches to color found in Descartes and Hobbes in order to get a better appreciation of the extent to which the nature of Cavendish’s resistance is novel. But that is a project for another day.

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