

Leibniz on the Metaphysics of Color*

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Abstract

Drawing on remarks scattered through his writings, I argue that Leibniz has a highly distinctive and interesting theory of color. The central feature of the theory is the way in which it combines a nuanced subjectivism about color with a reductive approach of a sort usually associated with objectivist theories of color. After reconstructing Leibniz's theory and calling attention to some of its most notable attractions, I turn to the apparent incompatibility of its subjective and reductive components. I argue that this apparent tension vanishes in light of his rejection of a widely accepted doctrine concerning the nature of bodies and their geometrical qualities.

When we reflect on the contributions of early modern philosophy to our understanding of the metaphysics of “sensible” or “secondary” qualities such as color, those of Locke and Boyle readily spring to mind, as may those of Descartes, Berkeley, and others.¹ But one philosopher we aren't likely to think of in this connection is Leibniz. Despite all the attention his philosophy has received over the years, little has been written about his views on the nature of color. To make matters worse, what little has been written has not painted him in a particularly flattering light. Margaret Wilson, for instance, has argued that Leibniz does not even have a single consistent way of thinking about sensible qualities (Wilson, 1977). On her reading, his thought exhibits a “pervasive” and “unrationalized” ambivalence toward the nature of such qualities, which manifests itself in a tendency to vacillate uncritically and unselfconsciously between the view that they are reducible to the mechanical qualities of bodies (shapes, motions, etc.), and the incompatible view that they are something like experiences caused in us by such qualities.² In light of all this, we may well be tempted to conclude that Leibniz gave little thought to the question of the

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¹On Locke's theory of color, see, among others, Jackson 1929; Curley 1972; Alexander 1976/77; Rickless 1997; Stuart 2003; Jacovides 2007. On Boyle's, see Curley 1972; Keating 1993; Anstey 2000, Chapter 4. On Descartes', see Cottingham 1989/90; Nolan Forthcoming. On Berkeley's, see Wilson 1987; Faaborg 1999; Atherton 2003. The views of Malebranche (Schmaltz, 1995) and Reid (Ganson, 2002; McKittrick, 2002) have also garnered some attention.

²I will follow Leibniz throughout in referring to colors, sounds, odors, flavors, and the like as sensible qualities. In accordance with scholastic tradition, “sensible” in this context contrasts

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nature of color, and perhaps even that he has nothing interesting to say on the subject.

In reality, nothing could be further from the truth. Though to be sure, Leibniz never offers anything like a systematic presentation of a theory of color, his writings do nonetheless contain a rich array of remarks on the topic. Some of these remarks appear in familiar writings such as the *New Essays on Human Understanding*; others are scattered throughout various letters, notes, and essays that are neither as familiar nor as accessible. By bringing the most significant of these remarks together, I hope to show in what follows that it is indeed possible to reconstruct a distinctively Leibnizian theory of color. More importantly, I hope to show that this theory is worthy of our consideration. As I will argue, Leibniz aims to combine a nuanced subjectivism about color with a reduction of color to the microphysical (or micromechanical) qualities of the bodies that appear colored to us in perception. Such a combination of perspectives might seem contradictory, given that the reductive component appears to entail some kind of objectivism about color. As we will see, however, this is the case only given a certain view of the ontological status of bodies and their qualities that Leibniz explicitly rejects. By rejecting this view, he is able to harmonize two approaches to color that would otherwise be incompatible. The result, I will argue, is a highly distinctive and philosophically interesting, though perhaps ultimately unsatisfactory, theory of color.

My reconstruction of Leibniz's theory will proceed along the following lines. In the first section, I identify two important respects in which Leibniz can be considered a subjectivist about color. In the second, I argue that despite his subjectivist leanings, Leibniz parts company with many subjectivists by holding that color is not a sensation or any other modification of the mind. Instead, he insists that color is a modification of bodies. In the third section, I contend that Leibniz views colors not as primitive, irreducible qualities of bodies, but rather as reducible to qualities of the sort countenanced in physics. In this respect his view can be considered an ancestor of the position known as physicalism in contemporary debates about color. Finally, I turn to the apparent tension between Leibniz's subjectivism and his reductivist stance. After arguing that he has the resources to reconcile these apparently incompatible perspectives, I conclude that, ironically, the very move that allows him to avoid contradiction must be regarded as the most obvious drawback of his theory.³

not with "insensible" but with "intelligible," where intelligible qualities include sizes, shapes, and motions. The distinguishing feature of intelligible qualities is that they, unlike sensible qualities, can be given what Leibniz calls a *nominal definition*, that is, roughly, a definition that supplies marks sufficient for distinguishing the definiendum from other things (A 6.4:585–92/AG 23–27). Even though shapes, sizes, and motions can be sensed, then, in Leibniz's terminology they are classified as intelligible rather than sensible qualities.

³Though I will be arguing that Leibniz has a single, consistent theory of color, I will not in this essay be engaging directly with Wilson's arguments to the contrary. I have criticized those arguments in detail elsewhere (Puryear, Forthcoming-a) and will not rehash my criticisms here.

1 Subjectivism

Broadly speaking, a theory of color can be regarded as a form of subjectivism to the extent that it represents color as in some way bound up with perception or with the perceiving subject. For example, any theory which construes color as a perception-dependent feature of the world can be considered a kind of subjectivism, as can any theory on which color exists only in the mind of the perceiver. As we will see in this section, Leibniz endorses both of these closely related subjectivist ideas.⁴

Leibniz frequently characterizes colors as appearances or, equivalently, phenomena. To give just two examples, in a 1687 letter to Arnauld he claims that accidental unities such as mobs, machines, and societies “become realized only by thoughts and appearances, like colors and other phenomena, which we nevertheless call real” (GP 2:100/AG 89).⁵ Nearly thirty years later, toward the end of his life, he has this to say in a letter to Des Bosses:

[I] should prefer to say that there are no substances over and above monads, but only appearances, but that these are not illusory, like a dream, or like a sword pointing at us out of a concave mirror, or like Doctor Faust eating up a cartful of hay, but that they are true phenomena, that is, in the sense that a rainbow or parhelion is an appearance, and, in fact, in the sense that *colors are appearances according to the Cartesians and in reality*. (GP 2:504/L 614, emphasis mine)⁶

Such texts are significant because appearances and phenomena would seem to exist only insofar as something is being perceived. As Robert Adams (1994, 219) explains, “‘Phenomenon’ is a Greek word that means ‘appearance’, or

⁴These two subjectivist claims do not come to the same thing. One might hold that colors exist outside the mind even if they depend on perception for their existence, much as a theist might say that the universe, though existing outside of God, nevertheless depends upon God’s mental activity for its existence. Conversely, one might hold that colors exist only in the mind while at the same time denying that they depend on perception for their existence, much as a rationalist might say that innate ideas, which exist only in the mind, nevertheless exist there independently of our perception.

⁵The following abbreviations will be used for citations of Leibniz’s works. A: *Sämtliche Schriften und Briefe*, edited by Deutsche Akademie der Wissenschaften (Darmstadt und Berlin: Akademie-Verlag, 1923–), cited by series, volume, and page number; AG: *G.W. Leibniz: Philosophical Essays*, edited by R. Ariew and D. Garber (Indianapolis: Hackett, 1989); C: *Opusculs et fragments inédits de Leibniz*, edited by L. Couturat (Paris: Félix Alcan, 1903); DM: *Discourse on Metaphysics*, cited by section number; GM: *Leibnizens Mathematische Schriften*, edited by C. I. Gerhardt (Berlin: A. Asher, 1849–63), cited by volume and page number; GP: *Die philosophischen Schriften von Gottfried Wilhelm Leibniz*, edited by C. I. Gerhardt (Berlin: Weidmannsche Buchhandlung, 1875–90), cited by volume and page number; L: *Gottfried Wilhelm Leibniz: Philosophical Papers and Letters*, 2nd edition, edited by L. Loemker (Boston: Kluwer, 1989); LC: *The Labyrinth of the Continuum*, edited by R. A. T. Arthur (New Haven: Yale, 2001); LDB: *The Leibniz-Des Bosses Correspondence*, edited by B. Look and D. Rutherford (New Haven: Yale, 2007); NE: *New Essays on Human Understanding*, cited by page number from A 6.6; T: *Essays on Theodicy*, cited by section number; WF: *Leibniz’s “New System” and Associated Contemporary Texts*, edited by R. S. Woolhouse and R. Francks (New York: Oxford, 1997).

⁶See also, among others, GP 1:384/WF 53; L 343, 365, 390.

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more literally 'thing that appears'. Things that appear are objects of awareness to someone to whom they appear. . . . In calling them phenomena Leibniz means that they have their being in perceptions that represent this story to perceiving beings." Indeed Leibniz himself characterizes phenomena as "being[s] of the imagination or perception" (A 2.2:185/AG 86; cf. GP 6:586/AG 263). He also locates them in the soul (GP 6:589/AG 265) and likens them to "continual dreams" (GP 2:435–46/AG 199; cf. GP 1:374). In characterizing colors as phenomena, then, he is implicitly suggesting that such qualities exist only in the perceiving subject, and that they depend on that subject for their existence.

Other evidence points in the same direction. First, Leibniz characterizes what he calls "apparent qualities" as qualities that "are not in things absolutely, but only insofar as they act on us" (A 6.4:555). In calling colors appearances, however, he appears to be suggesting that they are just such qualities. So his thought is evidently that colors exist only insofar as we perceive them. Second, in the *New Essays* he characterizes colors and other sensible qualities as *phantômes*, akin to the "*phantôme* of transparency" that arises when a cogwheel spins so fast that its teeth disappear (NE 403-4; cf. 392). Yet elsewhere he describes heat as "a *phantôme* depending partly on our present constitution" (GP 6:568/WF 197). Assuming, plausibly enough, that *phantômes* in general have this property of depending on our constitution, it follows from what Leibniz says in the *New Essays* that color is a perceiver-dependent feature of the world. Finally, Leibniz emphasizes that our notions of color and other sensible qualities (or rather the *objects* of such notions) are imaginary.⁷ But he also characterizes imaginary notions as those which "are not in things outside of us, but the essence of which is to appear to us" (A 6.4:70/LC 231). Again the point seems to be that colors, as appearances, are not found in anything outside of us, but rather exist only within us.

Leibniz's most illuminating remarks about the subjectivity of color appear in his extensive commentary on Descartes' *Principles of Philosophy*. In Part 1 of the *Principles* Descartes discusses our propensity to make false judgments, as when "on seeing a color . . . we supposed we were seeing a thing located outside us which closely resembled the idea of color that we experience within us at the time" (§66, CSM 1:216).⁸ Such judgments are false, Descartes thinks, because colors do not exist outside of us. Like pains, they are "clearly and distinctly perceived when they are regarded merely as sensations or thoughts" rather than as "real things existing outside our mind" (§68, CSM 1:217).⁹ In Leibniz's commentary, these remarks receive a rather warm reception:

On Articles 65-68. Descartes, following the ancients, rendered a useful service in eradicating the prejudice that makes heat, colors,

⁷See *Discourse on Metaphysics*, §12; Leibniz to Foucher, n.d., GP 1:392/WF 55; *Specimen of Discoveries of the Admirable Secrets of Nature in General*, A 6.4:1623/GP 7:314/LC 315.

⁸'CSM' abbreviates *The Philosophical Writings of Descartes*, edited by J. Cottingham, R. Stoothoff, and D. Murdoch (New York: Cambridge University Press), cited by volume and page number.

⁹Cf. §71 of the *Principles*, Part 1, where Descartes claims that "sensations of tastes, smells, sounds, heat, cold, light, colors and so on . . . do not represent anything located outside our thought."

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and other phenomena seem to be things outside of us, since it is evident that the same hand on which water seemed very hot soon finds it tepid; and a man who observes a green color in a powdered mixture no longer sees it as green when his eye is aided by an instrument but as a mixture of yellow and blue and can grasp the causes of these two colors with the use of better instruments and other observations or reasons. From these considerations it seems that no such thing exists outside of us the phantasm of which appears to our imagination. We are commonly like boys who have been convinced that there is a pot of gold at the very end of the rainbow where it touches the earth and who run toward it in a vain effort to find it. (GP 4:365/L 390–91)

Once again we find Leibniz characterizing colors as phenomena, phantasms, and things which appear (to our imagination), though here he goes even further, explicitly signaling his agreement with Descartes that colors do not exist outside of us. (His point is presumably not that they don't exist at all, but that they exist only within us.) What makes this passage particularly significant, though, is that it reveals at least part of Leibniz's rationale for adopting a subjectivist orientation toward sensible qualities. The argument is a familiar one. Which particular sensible qualities an object appears to have, says Leibniz, is highly sensitive to changes in the perceiver. For instance, the same water can feel at first hot and then tepid to the very same hand, even if the temperature of the water remains unchanged. Likewise, a powder that appears green to the naked eye can appear yellow and blue when viewed under a microscope.¹⁰ In all such cases, the appearances change not because of any intrinsic changes in the object perceived but because of changes either in the perceiver or in the relationship between the perceiver and the object. However, if such qualities truly inhered in the object, and did so independently of our perceptions, then according to Leibniz this would not be the case: the appearances to which they give rise would not be so fickle. Hence, he concludes that these qualities do not thus inhere in such objects, and instead exist only within us and depend on us for their existence. In short, the highly variable nature of sensible quality perception leads him to conclude that colors and other such qualities are not objective but subjective qualities.

As it stands, the argument suffers from a serious flaw. Properly speaking, the mere fact that sensible quality appearances are highly sensitive to changes in the perceiver does not show that the qualities themselves are subjective; rather, it shows only that the *appearances* of these qualities are subjective. It therefore remains open to the objectivist to admit that the appearances are subjective while denying that the qualities themselves are subjective. That is, the objectivist could hold that the qualities themselves are objective, even though the way they appear is highly sensitive to changes in the perceiver. Now, Leibniz does not himself address this wrinkle in the dispute between subjectivists

¹⁰Cf. Philonous' "microscope argument" in the first of Berkeley's *Three Dialogues between Hylas and Philonous*.

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and objectivists. However, I would like to suggest one way in which he might have responded to this objectivist line. In brief, the problem is that in taking this position the objectivist threatens to make it impossible for us to discover which particular sensible qualities belong to a given object. If there is such a thing as the true, objective color of an object, the only basis on which we could ever discover this color would be the way the object looks with respect to color. But generally speaking there isn't just one way an object looks with respect to color. Further, there seems to be no non-arbitrary way of deciding which of the many colors the object appears to have is its true, objective color.¹¹ Thus if we admit that objects have objective colors, then it seems that the subjectivity of color appearances prevents us from discovering which colors these are. In order for the particular colors of bodies to be knowable, then, it will be necessary to eschew objectivism in favor of some sort of subjectivism along the lines of the view that identifies the color of an object with its apparent color. Although there is no explicit evidence of it, I speculate that something like this consideration may have been operating in the background of Leibniz's thinking when he formulated the preceding argument for subjectivism.

Insofar as he thinks color has its being in perception and exists only within the perceiving subject, Leibniz's theory constitutes a broadly subjectivist approach. At the same time, however, he makes an important concession to the objectivist. For purposes of contrast, consider the radical subjectivist who goes so far as to say that the color of an object is always relative to individual perceivers. On this sort of view, there will generally speaking be no such thing as *the* color of an object, since objects typically appear differently colored to different perceivers; at most an object will have a certain color only relative to a given perceiver or range of perceivers. Now the point to note here is that Leibniz is not prepared to take his subjectivism this far. Although he admits that color depends on and exists only within individual perceivers, he denies that it is relative to individual perceivers. Instead, he holds that the color of an object is simply the color it appears to have to perceivers under the most usual circumstances. As he explains in the *New Essays*:

As for warmth, when our hand is very warm, the lesser warmth of the water does not make itself felt, and instead tempers that of the hand, and consequently the water seems cold to us. In the same way salt water from the Baltic Sea mixed with water from the Sea of Portugal diminishes its specific salinity, even though the former is salty itself. Thus in a way we can say that the warmth belongs to the water in a bath, even if it may appear cold to someone; just as

¹¹In the microscope case one might follow Armstrong (1969) in holding that the objective color of the object is the color it appears to have under the greatest magnification. On Leibniz's view, however, this will not work, because the color an object appears to have when magnified to any given degree will always give way to yet another color under further magnification. As he explains in the *New Essays*, "[I]f our eyes became better equipped or more penetrating, so that some colors or other qualities disappeared from our view, others would appear to arise out of them, and we should need a further increase in acuity to make them disappear too; and since matter is actually divided to infinity, this process could go on to infinity also" (NE 219).

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honey is called sweet absolutely, and silver white, although the one appears sour, the other yellow to some sick people: for things are named according to what is most ordinary (NE 132)

According to this passage, there is a sense in which objects can be considered to have a certain sensible quality *tout court*, even though they may not appear to have this quality to all perceivers at all times. For the quality that truly belongs to the thing, Leibniz says, is the one it appears to have under the most ordinary circumstances. Thus, even though an object's color will be relative to perceivers in general, since the colors things appear to have to perceivers under the most usual circumstances will be a function of the constitution of those perceivers, it will not be relative to individual perceivers.

This nuance in Leibniz's subjectivism is important for two reasons. First, it allows him to capture at least part of what we find attractive about objectivist approaches to color: namely, the thought that every object has a single, determinate color or combination of colors despite appearing to have different colors to different perceivers and to the same perceivers at different times. Second, the nuance is important because it makes room for the possibility of color *misperception*. One of the most pressing problems for the more extreme form of subjectivism described above is that it threatens to make errors in color perception impossible, something that many philosophers would consider objectionable.¹² The problem is that if an object appears to have a certain color to some person, then according to this view it really is so colored (relative to that person). So an object can never appear to have a color that it doesn't actually have, at least relative to that perceiver. By tying a thing's color to its most usual appearance, however, Leibniz is able to accommodate the natural thought that a thing's apparent color can differ from its true color. On his view, errors in color perception are quite within the realm of possibility. In fact they happen whenever an object appears to have a color to some perceiver that differs from the color it appears to have under the most ordinary circumstances.¹³

2 Colors as Modifications of Bodies

While most early modern philosophers would have agreed with Leibniz that colors exist only in the mind, most of these same philosophers were convinced that bodies, together with all their real qualities (e.g., sizes, shapes, motions), exist *outside* the mind. From their point of view, then, it stood to reason that colors are not really properties of bodies; for a property is a way of being, and the

¹²For more on why this seems problematic, see Cohen 2007, §2.1. This issue is closely related to the objection raised against some theories of representation that they do not allow for misrepresentation.

¹³The viability of this proposal obviously hinges on whether we can know what color an object most frequently appears to have. If we cannot know this, then we will not be able to know the particular colors of objects, and Leibniz's view will fall prey to the same objection just raised against objectivism. It would seem, however, that our prospects for discovering the most common apparent color of an object are much brighter than our prospects for discovering its objective color on the basis of its highly variable appearances.

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way of being of a thing, it seems, could hardly exist elsewhere than where the thing itself exists. Thus Descartes appears to hold that colors are really just sensations in the mind, rather than anything in external objects, and in this he was followed by the Cartesians, including Malebranche, and many others.¹⁴ Indeed by the time Pierre Bayle published his *Historical and Critical Dictionary* in 1697, he could write without qualification that the modern philosophers “teach that all these qualities are perceptions of our mind, and do not exist in the objects of our senses.” (1697/1991, 365). In a similar vein, Hume, writing in 1739, could characterize the opinion that colors and other sensible qualities are “nothing but impressions in the mind, derived from the operation of external objects, and without any resemblance to the qualities of the objects” as the “fundamental principle of the modern philosophy” (1739, 1.4.4).

If colors are not properties of external objects, then what, if anything, do they modify? One answer offered by some seventeenth-century philosophers is that since colors are not properties of things outside the mind, they must be properties or modifications of the mind itself. Perhaps the most conspicuous defender of this view is Malebranche, who states quite explicitly that on his view colors are sensations, and as such are modifications of the soul.¹⁵ The problem is that this way of viewing the matter has some rather counterintuitive consequences. In the first place, it appears to convict our senses of widespread error, since our perceptions seem to present colors not as properties of the mind but as properties of the surfaces of bodies. That may not be a fatal difficulty, but it should strike us as at least a significant drawback. Even worse, the thesis that colors are modifications of the mind seems to be either incoherent or empirically suspect. If the mind is understood to be immaterial, as most early modern philosophers did understand it, then the view seems incoherent, since it would appear to be impossible for something immaterial to have a color. But if the mind is taken to be something material, such as the brain, then the view appears to be simply false, since evidently neither the brain nor any other part of the body takes on the colors that our senses present us with in perception. In either case, the thesis seems highly implausible.

To Leibniz's credit, this is one point on which he parts company with Malebranche and his cohorts. As we have seen, he agrees with his fellow subjectivists that colors exist only in the mind. At the same time, however, he expressly denies that they are modifications of the mind. Instead, he upholds the more common-sense position that they are modifications of the bodies that appear to have those colors in perception. One place where this emerges clearly is his review of François Lamy's *On the Knowledge of the Self*. As Leibniz explains, Lamy objects that “God leads us into error through our senses, in making us assign to bodies certain sensible qualities that are only modes [*manières*] of our minds.” But in raising this objection, Leibniz says, Lamy supposes something

¹⁴For Descartes' view, see CSM 1:217, 3:369, *inter alia*. See also Desgabets 1983a; 1983b, Chapter 3; Malebranche 1674/75, 1.1.1, 1.12.5; Newton 2004, 13. For a cogent case that even Boyle should be read as a subjectivist in something like this sense, see Keating 1993.

¹⁵See, e.g., Malebranche 1674/75, 1.1.1, 1.12.5. For a helpful discussion of Malebranche's view and other examples of Cartesians who thought this way, see Schmaltz 1996, 78–84.

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which is false: "For these sensible qualities are modes [*manières*] or modifications of bodies and not of our mind; and our sensations are in truth ways of being of the soul, but ones which represent those of bodies" (GP 4:576/WF 142). Clearly Leibniz wants to resist the move to thinking of colors as modifications or ways of being of the mind, such as sensations. Though he agrees that they exist in the mind, he nevertheless wants them to be ways of being of *bodies*. Whether such a view is coherent is a question we will take up in due time.

Another text which bears on this point comes from the *New Essays*. In Book II, Chapter viii, Leibniz has Locke's representative, Philalethes, raise the following objection: "But if the relation between the object and the sensation were natural, how could it happen, as we in fact observe, that *the same water can appear hot to one hand and cold to the other?*—something which also shows that heat is not in the water any more than pain in the pin" (NE 132). We have already seen that more than a decade earlier, in his commentary on Descartes' *Principles*, Leibniz cited this very same example of perceptual variability as evidence that heat is merely a phantasm appearing to our imagination and not a quality existing outside of us. But here, Philalethes tries to draw a further conclusion from this example: that the warmth which seems to be in the water is in fact not in the water at all. Leibniz's response, communicated through Theophilus, is illuminating:

That [example] proves at most that warmth is not an entirely absolute sensible quality . . . , but that it is relative to the appropriate organs: for a suitable motion in the hand can get mixed there and alter the appearance. . . . Even the primary qualities (following your terminology), for example unity and number, can fail to appear as they should; for as M. Descartes has already reported, a globe touching the fingers in a certain way appears double, and mirrors or lenses cut to have facets multiply the object. It does not therefore follow that what does not always appear the same is not a quality of the object, and that its image does not resemble it. (NE 132)¹⁶

Leibniz's point here is this. The perceptual variability of warmth does indeed show that it is not an absolute quality—a quality the water has in and of itself—and that it depends in some way on the organs of perceiving subjects. In other words, perceptual variability shows that the quality is subjective, just as Leibniz had argued in his commentary on the *Principles*. But it does not follow at all that warmth is not a quality of the water itself, because if it did we would also have to say that intelligible or "primary" qualities such as unity and number are not truly qualities of bodies themselves—something that everyone, including Locke, agrees is false. In short, then, the perceptual variability of warmth shows that it is a subjective quality, but not that it isn't a quality of the water.

¹⁶In place of the first set of ellipses Leibniz has "(i.e., a power of being sensorily detected)." This parenthetical might be taken as evidence that Leibniz, like Locke, conceives of sensible qualities as powers or dispositions. However, he is probably just accommodating himself to Locke's way of speaking.

And though Leibniz stops short of explicitly affirming that warmth is a quality of the water, the implication is that this is his view.

We may therefore conclude that on Leibniz's view colors are properties *in* the mind, without being properties *of* the mind. In this respect they are akin to qualities instantiated only in our dreams, which can plausibly be said to be within the mind but are by no means qualities of the mind.¹⁷ In contrast to philosophers such as Malebranche, Leibniz does not believe that every property in the mind must be a property of the mind. Rather, he allows for a distinction within the category of modifications in the mind between those which actually modify the mind itself, such as perceptions, sensations, and thoughts, and those which modify objects that are at least distinct from, if not external to, the mind. This nuance in his philosophy of mind represents a major advance over the seemingly cruder conceptions of Malebranche and his fellow Cartesians.

3 The Reducibility of Color

Having established that on Leibniz's view color is a corporeal modification, let us consider what sort of corporeal modification it is. In particular, is color a fundamental, irreducible quality of the things it modifies, or is it reducible to more fundamental qualities of those things? And if the latter, what are these more fundamental qualities? Over the years most color theorists have favored one form or another of the reductive approach. More exactly, they have tended to view colors as reducible either to states or qualities of the mind (e.g., sensations) or to some sort of property of bodies, either dispositional (e.g., the disposition to cause certain experiences in perceivers) or categorical (e.g., the complex microphysical property responsible for a body's reflective characteristics). As we will see in this section, Leibniz too opts for a reductive approach, though unlike most of his fellow early modern philosophers, he does not seek to reduce colors either to sensations or bodily dispositions. Instead, he seeks to reduce them to qualities of the sort considered acceptable by the lights of the physics of his day, that is, mechanical qualities such as shape and motion.

Not all color theorists favor a reductive approach. Those known as "primitivists" hold that colors are just what they seem to be from a pre-theoretical point of view: namely, primitive, irreducible properties of bodies. Perhaps the chief reason these theorists have offered in support of their position is that the nature of color seems to be fully revealed in our casual perceptions of it. As Russell (1912, 47) famously put the point,

The particular shade of colour that I am seeing may have many things said about it But such statements, though they make

¹⁷Cf. Adams' suggestion that Leibnizian phenomena have the status of "intentional objects." What this means, according to Adams, is that "bodies, as phenomena, may be thought of as the objects of a story—a story told or approximated by perception, common sense, and science. In calling them phenomena Leibniz means that they have their being in perceptions that represent this story to perceiving beings" (Adams, 1994, 219).

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me know truths about the colour, do not make me know the colour itself any better than I did before: so far as concerns the knowledge of truths about it, I know the colour perfectly and completely when I see it, and no further knowledge of it itself is even theoretically possible.¹⁸

This doctrine, which has come to be known as “revelation” (Johnston, 1992), appears to entail the truth of primitivism, since the whole point of a reductive approach is that colors are something other than what they appear to be to the casual observer (e.g., sensations, dispositions, physical properties). If the doctrine of revelation is true, then, any attempt to reduce colors to mechanical qualities such as shapes and motions will be doomed from the start.

Although the doctrine of revelation was not explicitly formulated until many years later, it is clear from Leibniz's discussions of color that he rejects the doctrine, and along with it, the argument from that doctrine to primitivism. As he explains in a prominent letter to the queen of Prussia, Sophie Charlotte,

We use the external senses as a blind man uses his stick, . . . and they allow us to know their particular objects, which are colors, sounds, odors, flavors, and tactile qualities. But they do not allow us to know what these sensible qualities are, nor in what they consist. For example, whether red is the rotation of certain small globes that supposedly make up light; whether heat is a vortex of very fine dust; whether sound is produced in air as circles are in water when we toss a stone into it, as some philosophers suppose . . . (GP 6:499/AG 186; cf. GP 4:550/WF 105)

Texts such as this clearly indicate that on Leibniz's view the true nature of color is not, *contra* Russell, laid bare in perception. Though the senses acquaint us with colors, they do not reveal what those colors are, or in what they consist. The doctrine of revelation is therefore false. Moreover, primitivism must be false as well; for it follows from what Leibniz says that colors must be reducible, at least in principle, to some underlying reality—that is, to what they are or in what they consist.

More or less explicit affirmations of the reducibility of color can be found in many of Leibniz's writings. For instance, in a 1669 letter to his teacher Jacob Thomasius, he writes: “[I]t is clear that the explanation of all qualities and changes must be found in magnitude, figure, motion, etc., and that heat, color, etc., are merely subtle motions and figures.” (GP 1:26/L 102). Nearly a decade later, in a 1678 letter to Herman Conring, he makes essentially the same point: “What is more probable than that all sensible qualities are merely tactual qualities varying according to the variety of sense organs? But touch recognizes only magnitude, motion, situation, or figure and various degrees of resistance in bodies” (GP 1:197/L 189). Similarly, in other texts probably written around this same time (i.e., the late 1670s), Leibniz emphasizes that on his view the

¹⁸This doctrine has also been endorsed by Strawson 1989, among others. For discussion see Johnston 1992.

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“confused” attributes of the senses, including color, can always be reduced to (or resolved into) “distinct” attributes such as size, shape, and motion (A 6.4:1961–62; A 6.4:2002–09/L 285–89). Remarks this explicit are hard to find in later writings, but as we will see, those writings do contain indications that Leibniz continues to think of color in this way.

As to which particular distinct qualities colors are to be reduced, Leibniz is typically rather non-committal. We saw in the previous paragraph that he evinces an awareness of the idea that red is “the rotation of certain small globes” (GP 6:499/AG 186; cf. A 6.4:2002/L 285); yet he usually stops short of endorsing such proposals. Still, his reluctance appears to spring solely from doubts about the details of these accounts, and not about their general form: he clearly thinks these are the right *sorts* of accounts to give of sensible qualities. The only cases in which he does endorse a specific proposal are those of white and black. He believes that “white is what reflects the most light and black what reflects the least” (GP 1:19/L 96). Some years later, he refines his proposal for white: “[W]hite bears no resemblance to a spherical convex mirror, even though it is nothing but the assemblage of a number of small spherical mirrors, such as we see in froth upon close inspection.” (GP 4:575–76/WF 141). In characterizing white in this way, Leibniz seems to be suggesting that the color really reduces to certain tiny shapes in the bodies that reflect light.¹⁹

Other remarks provide less explicit evidence for reading Leibniz this way. For instance, in his *Meditations on Knowledge, Truth, and Ideas*, he explains that

when we perceive colors or smells, we certainly have no perception other than that of shapes and motions, though so very numerous and so very small that our mind cannot distinctly consider each individual one in this, its present state, and thus does not notice that its perception is composed of perceptions of minute shapes and motions alone, just as when we perceive the color green in a mixture of yellow and blue powder, we sense only yellow and blue finely mixed, even though we do not notice this, but rather fashion some new thing for ourselves. (GP 4:426/AG 27)

When Leibniz claims that in perceiving colors “we certainly have no perception other than that of shapes and motions,” the clear implication is that colors really just are shapes and motions; for otherwise in perceiving a color we would be perceiving more than just those mechanical qualities. Furthermore, Leibniz indicates in this text that our perceptions of color and other sensible qualities are composed of *petites perceptions* of minute shapes and motions (cf. NE 56). This point is significant because Leibniz also believes that if a perception P is composed of perceptions p_1, p_2, \dots, p_n , then that which P represents is composed of those things which p_1, p_2, \dots, p_n represent. As he explains in a letter to Samuel Masson, “when there is a perception of the whole, there are at the

¹⁹At least one text suggests that Leibniz wants to reduce (reflective) colors not just to the mechanical qualities of reflective bodies, but also to those involved in the light itself, the medium, and so forth (see GP 4:550/WF 105). This does not, however, appear to have been his considered view.

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same time perceptions of the actual parts," and "that which is composition of parts outside is represented only by the composition of modifications in the monad" (GP 6:628/AG 229; cf. NE 54). In claiming that our perceptions of color are composed of perceptions of shapes and motions, therefore, Leibniz appears to be suggesting that colors themselves are composed of shapes and motions—that, in other words, colors are really just complexes of shapes and motions.

In other passages Leibniz claims that our ideas and perceptions of sensible qualities, including colors, represent tiny shapes and motions in bodies. For instance, in the *New Essays* Theophilus argues that our ideas of sensible qualities "depend on the detail of shapes and motions and express [i.e., represent] them exactly, though we cannot disentangle this detail in the confusion of the surpassing multitude and smallness of the mechanical actions which strike our senses" (NE 403).²⁰ But to say that an idea or perception represents a certain thing is just to say that it is an idea or perception of that thing. Hence, if ideas of sensible qualities represent shapes and motions, then the implication is that these qualities just are shapes and motions.

The view Leibniz is espousing in these passages can plausibly be construed as a forerunner of the view known as "physicalism" in contemporary discussions of color. In saying this, of course, I do not mean to suggest that he is anything like a physicalist in the more general sense according to which all things are ultimately reducible to or supervenient on the physical. No doubt Leibniz would have categorically rejected such a view, as he admits an infinity of immaterial beings—monads or simple substances—that neither are nor supervene on anything material or physical.²¹ But he does espouse something close to the view known as physicalism about color, that is, the view that colors are reducible to physical properties. For physical properties are roughly speaking those properties accepted as legitimate in physics, and in Leibniz's day the properties fitting this description were mechanical qualities such as shape and motion. In suggesting that colors can be reduced to such qualities, then, Leibniz is fundamentally in agreement with the contemporary color physicalist, even though of course they differ concerning precisely which properties should count as physical.

Perhaps a less misleading label for Leibniz's view would be "mechanism," since the qualities to which he proposes to reduce colors are specifically mechanical.²² If we use this label, however, we must take care not to confuse mechanism in this special sense with the sort of mechanism or "mechanical philosophy" that prevailed during the early modern period. The latter view is first and foremost a thesis about the *explanation* of natural phenomena. In

²⁰Leibniz uses "expression" and "representation" interchangeably, so the claim being made here is therefore that our ideas of sensible qualities *represent* the shapes and motions in bodies. Cf. NE 131–33, 165–66, GP 4:575/WF 141–42.

²¹Note that this more general form of physicalism does not entail physicalism about color, since it is also consistent with the view that colors do not exist (eliminativism). Nor does physicalism about color entail physicalism in the more general sense, since it is compatible with the existence of non-physical entities such as souls.

²²The name "mechanism" was suggested to me by David Hilbert.

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essence, it says that every occurrence in nature can (and should) be explained in mechanical terms, that is, in terms of the shapes, sizes, and motions of bodies. But to say this is not to say, or even to imply, that colors and other qualities must *reduce* to the mechanical. For it is open to the mechanist to deny that colors are part of the natural world. And in fact this is precisely the position most early modern mechanists took. They construed colors as mere sensations in the mind, and even though they allowed that these sensations have a mechanical cause, they no more considered them to be reducible to the mechanical than they considered the mind to be reducible to the material. Thus, most early modern philosophers who were mechanists in the more familiar sense were not mechanists in the special sense introduced here: they were mechanists in the explanatory sense, but not in the reductive sense. Leibniz, in contrast, was a mechanist in both senses. He agreed with his contemporaries that everything in nature can and should be explained mechanically, but unlike most of them he also thought that colors and other sensible qualities could be reduced to the mechanical qualities of bodies.²³

This sort of physicalist or mechanist approach to color is important to Leibniz for two closely related reasons. The first is his conviction that God has created a maximally intelligible world, a world in which nothing is in principle inexplicable. Why is this relevant to the nature of color? Because on Leibniz's view sensible qualities such as color are in themselves merely confused, "occult" qualities. If colors were fundamental features of the universe, then, it would follow that the universe is fundamentally inexplicable to the extent that it is colored. Colors must therefore not be fundamental features of the universe. They must be reducible to, and explicable in terms of, more distinct and intelligible qualities of bodies. But according to Leibniz the only such qualities are mechanical qualities, and so sensible qualities must be reducible to such qualities.²⁴

A second reason for reducing colors to mechanical qualities stems from Leibniz's celebrated principle of sufficient reason (PSR), according to which there is always a sufficient reason why things are one way rather than another. As Leibniz has it, one corollary of this principle is that causes must always be connected in some non-arbitrary fashion with their effects. Thus, there must be some non-arbitrary connection between my ideas (and perceptions) of color and their causes.²⁵ According to Leibniz, however, such a connection could obtain only if my ideas of color resembled their causes, which are mechanical qualities. Hence, in order to satisfy the principle of sufficient reason, Leibniz

²³Other philosophers from this period, including Boyle, Locke, and even Descartes, have been read as advocating the view that sensible qualities can be reduced to mechanical ones (Alexander 1976/77, 206; Cottingham 1989/90). However, such readings tend to rest on flimsy evidence and moreover conflict squarely with some things these philosophers say about sensible qualities (cf. Keating 1993; Stuart 2003). In contrast, as I have argued, the evidence for ascribing this sort of view to Leibniz is quite strong.

²⁴See A 6.4:1961–62; A 6.4:2002–09/L 285–89.

²⁵The causation in view here is "ideal" rather than "real" or "physical." For a full account of the difference, see Puryear 2010.

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thinks, my ideas of color must be similarly complex.²⁶ More exactly, they must be composed of simpler ideas which are themselves ideas of the mechanical qualities that enter into their cause. As I pointed out above, however, to say that our ideas of color are composed of ideas of mechanical qualities is just to say that colors really are such qualities. So according to Leibniz, the principle of sufficient reason requires that colors be reducible to the causes of our ideas of color, that is, to certain mechanical qualities in bodies.

Whatever we might think of these reasons, one advantage of Leibniz's version of reductionism is that it allows him to say that a body's color is ordinarily at least part of what causes it to look colored, since he proposes to reduce colors to properties of precisely the sort that cause bodies to reflect light as they do. In contrast, it is far from clear that either the primitivist or the dispositionalist can say this, since the former construes colors as properties of a sort that do not figure into our best scientific accounts of how bodies reflect light, and dispositions, even dispositions to reflect light, do not cause bodies to reflect light.²⁷

Let us conclude this section by considering a notorious complication for the sort of physicalist or mechanist approach Leibniz endorses. In brief, the problem is that there appears to be no single, non-dispositional physical property to which all instances of a given color can be reduced. At best a color could be reduced only to a rather heterogeneous class of physical properties, or else to a single, highly disjunctive physical property. This might not seem to be much of a problem, and in fact some color physicalists have been happy to concede that colors are really something like highly disjunctive physical properties.²⁸ Nevertheless, the worry remains that insofar as the physicalist approach involves reducing colors to rather heterogeneous groups of physical properties, it seems to run roughshod over the apparent fact that colors are "natural" properties, properties that carve nature at the joints.

This point about the diversity of the physical bases of color has come to the fore in recent years as physicalist theories have become more popular and as our understanding of these bases has improved. But the basic point is not a new one; it had been made as far back as the seventeenth century by the French physicist Edmé Mariotte (1681/1717). As Leibniz tells us in the *New Essays*, Mariotte was of the opinion that "the blue of the rainbow has an entirely different origin from the blue of a turquoise" (NE 309). Leibniz was therefore quite alive to the possibility that the physical bases of any given color might be rather diverse, and he readily admits that "although there is no outer appearance that is not grounded in the inner constitution, it is nevertheless true that a single appearance can sometimes result from two different constitutions" (ibid.). At the same time, however, he acknowledges the point that colors should be seen as natural properties, or in his terminology, "real species." Hence, he insists that no matter how different these inner constitutions may be, they must have

²⁶See GP 4:575–76/WF 141–42; NE 56, 131–32, 165–66, 381–82; LDB 51; T 340, 356.

²⁷As Jackson & Pargetter (1987, 69) put the point, dispositions do not cause their realizations. For a defense of primitivism in connection with this point, see Watkins 2002.

²⁸See, e.g., Smart 1975; Armstrong 1987.

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some distinguishing feature in common which sets them apart from all other constitutions:

[A]lthough no outer appearance fails to be grounded in an inner constitution, it is nevertheless true that a single appearance can sometimes result from two different constitutions. However, they will have something in common, and this is what we philosophers call the *immediate formal cause*. But even if that were not so, as if according to M. Mariotte the blue of the rainbow has an entirely different origin from the blue of a turquoise, without a common formal cause (on this I am not of his opinion), and even if we agreed that certain apparent natures ... had nothing internal in common, our definitions would still be grounded in real species; for the phenomena themselves are realities. We can therefore say that everything that we truthfully distinguish or compare is also distinguished or made alike by nature (ibid.)

On Leibniz's view, then, the various mechanical qualities to which the instances of a given color reduce (i.e., the various inner constitutions that give rise to that appearance) must share at least the same "immediate formal cause" (whatever exactly this amounts to). Yet even if this were not the case, as Mariotte believes in the case of blue, and even if these inner constitutions had nothing in common internally, Leibniz thinks they would still have something in common *externally*, because "the phenomena themselves are realities." What he means by this is not entirely clear, but the thought is apparently that these rather diverse inner constitutions tend to produce qualitatively identical phenomena in perceivers, and for this reason form a real species. By Leibniz's lights, then, the diversity of the reductive bases of color does not prevent color from being a kind of natural property.

4 The Threat of Incoherence

According to the argument so far, Leibniz combines a nuanced subjectivism about color with a reduction of colors to the micromechanical qualities of bodies, the result being a distinctive approach with a number of advantages. As a form of subjectivism, his view explains how we can know the colors of particular objects in spite of the highly variable nature of color appearances. But at the same time, he wisely refuses to construe colors as modifications of the mind, as many subjectivists have, and he stops short of the sort of radical subjectivism that precludes errors in color perception. Finally, by adopting a mechanist approach, he is able to preserve the insight that the colors of bodies are ordinarily part of what causes them to appear colored—an insight that primitivists and dispositionalists struggle to preserve.

All in all, an impressive array of advantages. Yet the attentive reader will have begun to suspect that these advantages can be had only at the expense of coherence. For if colors exist only in the mind, as Leibniz holds, it seems

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incoherent to suppose that they can be reduced to the shapes and motions of bodies, the latter being qualities that apparently exist outside the mind. Likewise, if colors are perception-*dependent* features of the world, it's hard to see how they can be reduced without remainder to shapes and motions, which are widely believed to be perception-*independent* features of the world. Further, if colors exist only in the mind and bodies exist outside the mind, then how could the former be modifications of the latter? After all, a modification is simply a way of being, and it's hard to see how the way of being of a thing could be anywhere but where the being itself exists. As Leibniz himself admits, "Accidents cannot be detached, nor can they go about outside of substances, as the sensible species of the Scholastics once did" (GP 6:607–8/AG 214). For all its advantages, then, Leibniz's theory of color appears to bristle with tensions.

Let us begin with the first of these problems. One point Leibniz might make in his defense turns on his view of the ontological status of aggregates. As we have seen, he proposes to reduce colors to shapes and motions. But properly speaking the idea is not that a given color reduces to some one shape or motion. For given that bodies are divided to infinity, there can be no shape in bodies which is not itself composed of many smaller shapes; and the motions to which colors reduce would appear to be composed of many smaller motions. So in reality each color is being reduced to what Leibniz would call an "aggregate" or "assemblage" of shapes and motions, just as white reduces to an "assemblage of a number of small spherical mirrors" (GP 4:575–76/WF 141). On Leibniz's view, however, an assemblage or aggregate of things does not necessarily have the same ontological status as those things of which it is an assemblage. In particular, Leibniz maintains that aggregates have a merely mental existence, even when they are aggregates of things that exist outside the mind. So given this, there's nothing obviously incoherent about the suggestion that colors, which exist only in the mind, are reducible to assemblages of shapes and motions, since such assemblages also exist in the mind.

This fact is significant because Leibniz also emphasizes that aggregates and the like do not exist independently of perception, even if the items of which they are aggregates do. The point typically comes up in Leibniz's discussions of bodies being aggregates or assemblages of monads. Though he believes that as *per se* unities, the monads themselves do exist independently of their being perceived, the same cannot be said of aggregates of them. Like anything which exists, aggregates of monads have a kind of unity, but their unity is only a unity *per accidens* that is provided by the perceiving substance. They have their unity in perception, and therefore, Leibniz concludes, they have their being in perception too, being and unity being on his view interchangeable. As Philalethes, his representative in the "Conversation between Philalethe and Ariste," explains: "body does not have a true unity; it is only an *aggregate*, what the schools call *one per accidens*, an assemblage like a flock; its unity comes from our perception. It is a *being of reason*, or, rather, of *imagination*, a *phenomenon*" (GP 6:586/AG 263). Leibniz displays the inference from mental unity to mental being even more explicitly in this text from the *New Essays*:

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[A]t bottom it must be admitted that this unity of collections is only a respect or relation the foundation of which is in that which we find in each of the individual substances taken alone. Thus these *beings by aggregation* have only a mental unity, and consequently their being is also in a way mental, or phenomenal, like that of a rainbow. (NE 146)

Though in these texts Leibniz has in mind collections of substances or monads, it would be reasonable to infer that what he says about them applies to collections in general. For if collections of true unities have a merely mental unity and existence, then collections of phenomenal qualities such as shapes and motions could hope for no more. We may therefore conclude that on Leibniz's view aggregates or assemblages depend on perception and exist only in the mind, even if the aggregated things exist outside the mind and independently of perception.²⁹

But this is not the only or even the most salient point Leibniz could make in response to this first concern. Even apart from his admittedly idiosyncratic (though not obviously implausible) views on the nature of aggregates, there remains the fact that the tension between his subjectivism and his mechanism arises only if we assume that Leibniz, like nearly all early modern philosophers, believes that shapes and motions, unlike colors, exist outside the mind. Only under this assumption does his belief that colors exist only in the mind conflict with his belief that color is reducible to the micromechanical qualities of bodies. Yet this assumption is manifestly false. For Leibniz is no less a subjectivist about shapes and motions than he is about color.

It may come as little surprise that Leibniz was a subjectivist about the geometrical qualities of bodies during his later years, that is, from around 1700 until his death in 1716, since it was during this time that he expounded his monadological metaphysics in the clearest and most unequivocal terms. According to this metaphysics, everything in the created world ultimately reduces to monads or simple substances and their modifications, together with the phenomena that result from them; and in particular, the entire corporeal world, including bodies and all their qualities, reduce to phenomena (see, e.g., GP 2:270/AG 181; GP 6:589/AG 265). Hence, given his belief that phenomena exist only in the mind and have their being in perception, it stands to reason that Leibniz was a subjectivist about all aspects of the corporeal world during these later years. But in fact his most explicit and revealing endorsements of subjectivism about shapes and motions are to be found in the writings of his so-called "middle years," that is, roughly, the 1680s and 90s. For instance, here is what he says in an essay many scholars date to the 1680s: "Concerning bodies I can demonstrate that not merely light, heat, color, and similar qualities are apparent but also motion, figure, and extension. And that if anything is real, it is solely the force of acting and suffering, and hence that the substance of a body consists in this (as if in matter and form)" (A 6.4:1504/L 365).³⁰ I noted

²⁹For a further defense of this claim, see Adams (1994, ch. 9) and Lodge (2001).

³⁰On the dating of this essay, see A 6.4:1498.

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above that in Leibniz's terminology apparent qualities are qualities things have "only insofar as they act on us" (A 6.4:555), and that he thinks phenomena or appearances exist only in the soul. In saying that the shapes and motions of bodies are apparent rather than real, therefore, Leibniz seems to be suggesting that these qualities exist only in the mind and depend on perception for their existence.

Leibniz explains one of his reasons for treating shape as a phenomenon in another text from the same period, a 1687 letter to Arnauld:

[Matter] does not even have the exact and fixed qualities that could make it pass for a determined being ... since even shape, which is of the essence of an extended, bounded mass, is never exact or rigorously determined, because of the actual division to infinity of the parts of matter. There is never a globe without irregularities, or a straight line without intermingling curves, or a curve of a certain finite nature without being mixed with some other, and this in small parts as in large ones; so that shape, far from being constitutive of bodies, is not even an entirely real and determinate quality outside of thought, and we can never assign to some body a certain precise surface, as we could if there were atoms. And I can say the same thing about size and motion, namely, that these qualities or predicates are of the nature of phenomena, like colors and sounds, and though they involve more distinct knowledge, they can no more sustain a final analysis (GP 2:119/L 343)

In this intriguing passage, Leibniz argues that shape is "not even an entirely real and determinate quality outside of thought" and that it is "of the nature of phenomena, like colors and sounds." The precise nature of the argument is a matter of debate, and I will not enter into that debate here.³¹ But let me at least register that in my opinion the argument is most plausibly interpreted along the following lines. Leibniz claims that we "can never assign a definite and precise surface to any body, as could be done if there were atoms," because no matter what shape we might assign to a body—no matter what shape it might appear to have—closer inspection, perhaps with the use of an instrument, would reveal a different, more complex shape, which it would be natural to consider a closer approximation to the "true" shape of the body. This process of shapes giving way to shapes would eventually terminate, Leibniz thinks, if there were material atoms. But as he emphasizes in this passage, he rejects atoms and therefore must hold that no shape we could ever assign to a body could be anything more than just an apparent shape; it could not be the true shape of the body. So interpreted, this argument for the phenomenality of shape is structurally similar to the argument discussed in Section 1 above in which Leibniz purports to establish the phenomenality of color by appealing to the example of a green powder which looks yellow and blue when viewed through a microscope.

³¹See Adams 1994, 229-32; Levey 2005; Crockett 2005.

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Leibniz's main argument for the phenomenality of motion begins to take shape as early as the late 1670s. One of the more insightful versions can be found in a brief note from that period:

That matter and motion are only phenomena, or contain in themselves something imaginary, can be understood from the fact that different and contradictory hypotheses can be made about them, all of which nevertheless satisfy the phenomena perfectly, so that no reason can be devised for determining which of them should be preferred. In real things, on the other hand, every truth can be accurately discovered and demonstrated. Thus concerning motion I have shown elsewhere that it is not possible to determine which subject it is in; (A 6.4:1463/LC 257)

Leibniz alludes here to the equivalence of hypotheses concerning motion, that is, the idea that in any situation in which a number of bodies appear to move, what we experience is consistent with an infinite number of hypotheses, each of which assigns motion or rest to the bodies in a different way. He goes on to claim that we have no non-arbitrary way of determining which of these infinity of hypotheses is correct: "no reason can be devised for determining which of them should be preferred." Then he introduces the key premise of his argument, namely, that in real things "every truth can be accurately discovered and demonstrated." Since the equivalence of hypotheses about motion prevents us from discovering and demonstrating which bodies are moving and to what degree, Leibniz concludes that motion must not be real but rather a phenomenon or appearance.³² This is a conclusion which he repeats many times over the years, and the argument he usually seems to have in mind for this conclusion is this argument from the equivalence of hypotheses.

Notice that this argument from the relativity of motion resembles the relativity arguments for color and heat that Leibniz offers in his comments on Descartes' *Principles*. All these arguments begin with a premise to the effect that the appearance of the modification in question is relative to a perspective: the apparent colors of an object are relative to how it is viewed, the hotness or coldness of the water to which hand we use to sense it, and motions to which frame of reference we privilege over the others. Further, the arguments for color and heat, like the argument for motion, seem to rely at least implicitly on two additional premises: first, that we have no non-arbitrary way of discovering and demonstrating which appearance (if any) corresponds to reality, and second, that with real rather than apparent things "every truth can be accurately discovered and demonstrated." Leibniz's point would seem to be that if heat and color were real, non-apparent qualities of bodies, we would be able to discover and even demonstrate truths about bodies having or lacking those qualities, truths such as that certain bodies are hot while other are not,

³²Properly speaking, Leibniz's position is that we cannot discover the true subjects of motion *if* we consider motion in itself, rather than with respect to its cause. For more on this, see Puryear Forthcoming-b, §3.1; cf. Puryear Forthcoming-c, §1.

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and that some bodies are red while others are green, and so on. But because of the relativity of these qualities, he thinks, we will never be in a position to demonstrate such truths. Hence, he concludes that colors and other sensible qualities are not real but merely apparent qualities, and for the same reason he also concludes that motion is only an appearance.

For Leibniz, then, shapes and motions are just as subjective as colors, and for essentially the same reasons. All of them are perception-dependent features of the world, and all of them exist only in the mind. Thus, there's no obvious reason why colors and other such sensible qualities cannot be reduced to shapes and motions.

Similar considerations allow us to dispense with the second of the two worries raised at the beginning of this section. If bodies exist outside the mind, then it is hard to see how their colors and other qualities could exist only in the mind, since these qualities are supposed to be modifications or ways of being of bodies. On Leibniz's view, however, bodies do not exist outside the mind. Like colors, shapes, and motions, they are phenomena—beings of perception—and as such exist only in the mind.³³ There is therefore nothing obviously incoherent about his claim that colors are modifications of bodies. In fact, if bodies themselves exist only in the mind, then it stands to reason that their modifications would exist there too.

At the end of the day, then, Leibniz's metaphysics of color appears internally consistent. Considered against the background of certain widely held beliefs about the nature of bodies and their mechanical qualities, his subjectivism clearly stands in tension with his mechanist reduction. But given his own background beliefs, the two components of his theory appear perfectly compatible. There is nonetheless a catch. Although Leibniz's theory offers a number of advantages, it manages to achieve consistency only by being paired with a thoroughgoing idealism about bodies and their mechanical qualities that most philosophers would find highly objectionable. Indeed most would probably regard the theory's reliance on idealism as nothing less than a fatal flaw, one too great to be overcome by its comparatively paltry though still substantial attractions. Be that as it may, I hope to have shown that Leibniz's reflections on the nature of color are rich enough in insights and suggestive ideas to make those reflections worthy of our attention, even if in the end we find ourselves unable to accept his theory *in toto*.³⁴

³³See, e.g., Leibniz to Arnauld, 30 April 1687, GP 2:96–97, 100–101/AG 85–86, 89; Leibniz to de Volder, 30 June 1704, GP 2:268, 270/AG 179, 181; Leibniz to de Volder, n.d., GP 2:275–76/AG 181–82. The question when Leibniz came to think of bodies as phenomena has been the subject of considerable debate. I will not enter into that debate here, but let me at least register my support for the view that Leibniz adopted a phenomenalism about bodies rather early on, perhaps as early as 1677. Cf. Mercer 2001.

³⁴Versions of this material were presented to audiences at Washington University in St. Louis; the University of Miami; Stanford University; the University of Illinois at Chicago; the University of California, Santa Barbara; California State University, Chico; the University of Alabama; and the 2010 joint meeting of the North Carolina Philosophical Society and the South Carolina Society for Philosophy. I would like to thank the many discussants in these audiences, as well as Michael Pendlebury and an anonymous referee for this journal, for their insightful feedback.

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