

SECONDARY QUALITIES IN RETROSPECT

Tim De Mey & Markku Keinänen¹

ABSTRACT

Although the importance, both historically and systematically, of the seventeenth century distinction between primary and secondary qualities is commonly recognised, there is no consensus on its exact nature. Apparently, one of the main difficulties in its interpretation is to tell the constitutive from the argumentative elements. In this paper, we focus on the primary-secondary quality distinctions drawn by Boyle and Locke. We criticise, more specifically, MacIntosh's analysis of them. On the one hand, MacIntosh attributes too many different primary-secondary quality distinctions to Boyle and Locke. On the other hand, he forbears to attribute a particular primary-secondary quality distinction to them, which, at least in the case of Boyle, differs genuinely from his main distinction between the mechanical affections of matter and all of matter's other qualities.

1. Introduction

The distinction between primary and secondary qualities has both historical and systematic import.

Elements of and arguments for the original distinction still play a pivotal role in the contemporary debate on the ontological status

¹ Tim De Mey is Research Assistant of the Fund for Scientific Research - Flanders (Belgium). He has written a thesis on the ontological status of colour and is currently preparing a Ph.D.-thesis on thought experiments in science and philosophy. Markku Keinänen is researcher at the University of Helsinki. He has worked on the metaphysics of modality and is currently preparing a Ph.D.-thesis on recent ontological theories of properties, especially trope-theories and factualist theories.

of colour.² Present-day subjectivism about colour draws on, or is at least akin to conceptions of colour as a secondary quality, advanced by numerous seventeenth century scientists and philosophers. However, it depends on one's reading of the authors at issue, whether Galileo, Descartes, Boyle, Locke and others are labelled as forerunners of either dispositionalism or eliminativism about colour.³

² With Byrne and Hilbert (1997), we distinguish between four contemporary views on the ontological status of colour. (1) *Eliminativism* holds that although it certainly *appears* to be coloured, the world is not in this respect, as it appears to be. So according to eliminativism, no physical objects are coloured (see, e.g., Boghossian and Velleman 1991; Hardin 1993). (2) According to *dispositionalism*, colours are powers in objects to cause in normal perceivers in standard conditions certain kinds of visual experiences (see, e.g., Evans 1980; McGinn 1983). (3) Whereas dispositionalism claims that colours are secondary qualities, *primitivism* aligns them closely with primary qualities: primitivism holds more specifically that colours are irreducible properties of physical objects (see, e.g., Hacker 1987; Westphal 1991; Jackson 1996). (4) Finally, *physicalism* proposes to identify colours with physical properties of physical objects or of the light emitted or reflected by those object (for the former see, e.g., Hilbert 1987, for the latter see, e.g., Smart 1975; Armstrong 1987).

³ It is commonly recognised that Descartes, Boyle, Locke and others wavered between saying that colour is a property of experiences (i.e., roughly, eliminativism) and saying that colour is the disposition in objects to produce those experiences (i.e., roughly, dispositionalism). Boyle, e.g., sometimes uses the term 'sensible quality' to refer to qualities of bodies and sometimes to refer to the ideas in the mind that the qualities of bodies cause (Alexander 1985: 79; Anstey 2000: 79-80; Jackson 1968: 57; Mackie 1976: 15). Accordingly, some argue that, for Boyle, the sensible qualities are merely ideas in the mind (Keating 1993; Mandelbaum 1964). But to make things even more complicated, as far as sensible qualities *qua* qualities of bodies are concerned, there is textual and contextual evidence for two additional (and incompatible) interpretations: on the one hand the view that Boyle was a physicalist and on the other hand the view that he was a dispositionalist (Anstey 2000: 106). Jackson, e.g., argues that in Boyle "the power of a body to act on the senses in a given way by means of its qualities is called a "secondary" or "sensible quality," and it is distinguished both from the qualities on which it depends and from the effect of the percipient" (Jackson 1968: 56). Mackie (1976) and Curley (1972) agree with Jackson that, for Boyle, sensible qualities are dispositions, which are a category of being over and above the primary qualities, but nevertheless accuse Boyle of occasionally conflating the relevant dispositions with both their grounds and their effects (Anstey 2000: 68; Keating 1993: 310). See Alexander (1985) for still another interpretation of Boyle, i.e., the 'texture view'.

Maud (1995) explains similar tensions in Descartes and Locke in terms of a distinction, allegedly made by these philosophers, between (1) the naïve perceiver, for whom colour-

Margaret D. Wilson (1992) even uses the case of the sensible qualities as her main example of close interconnections, within the analytic tradition, between historical and philosophical writing. She argues, more specifically, that

recent and contemporary philosophers writing about sensible qualities often *do see* their problems as the same, or very nearly the same, as those of much earlier figures such as Descartes, Locke, and Berkeley (Wilson 1992: 194).

Historians of philosophy tend to agree that the distinction is one of the hallmarks of modern philosophy. Although Locke, to whom the distinction is traditionally attributed, was more reluctant in this respect, Hume himself claimed that the distinction was one of the fundamental principles of modern philosophy. Apart from claims by philosophers embracing the distinction and by historians of philosophy interpreting them, the importance of the distinction is also revealed by its distorting impact on our interpretations of philosophers who didn't embrace it. E.g., Everson's recent analysis of Aristotle's account of perception identifies the fact that we embrace, in one form or another, the modern distinction between primary and secondary qualities, as the main caveat in arriving at a historically adequate interpretation of Aristotle (Everson 1997).

Given the importance of the seventeenth century distinction, both historically and systematically, it may come as a surprise that there is no consensus on its exact nature. Apparently, one of the main difficulties in its interpretation is to tell the constitutive from the argumentative elements. MacIntosh (1976) identifies sixteen different and independent

as-it-is-represented is simply the same as colour-as-it-is-experienced, and (2) the sophisticated perceiver, for whom colour-as-it-is-represented is a power to produce colour-as-it-is-in-experience (Maund 1995: 21-22). Bennett (1971) analyses these tensions in terms of two theses: according to the causal thesis, dispositional properties should be explained through the (categorical) primary qualities that constitute their physical bases, and according to the analytic thesis, the subjective element in the analysis of colour cannot be eliminated. Finally, Thompson (1995) shows how the two components Bennett distinguishes, actually give rise to the contemporary form of the debate between the subjectivist and the objectivist view of the ontological status of colour (see especially Thompson 1995: 29-33).

ways of drawing the primary-secondary in the seventeenth century. By contrast, Smith (1990) argues that

... what MacIntosh presents as a rag-bag of different distinctions are all fundamental ingredients and implications of a single, unified metaphysical and scientific perspective that emerged in the seventeenth century as *the* successor to Aristotelianism (1990: 224).⁴

Both MacIntosh and Smith exaggerate. MacIntosh is unfair in presenting statements, which are elements of or arguments for a distinction between primary and secondary qualities, as yet *other* such *distinctions*. Moreover, as Smith points out, as soon as something is introduced in the literature as a necessary condition for being a primary quality, MacIntosh takes it as a sufficient condition (Smith 1990: 228). On the other hand, Smith himself exaggerates when he implies that there is only one distinction between primary and secondary qualities, embraced by otherwise quite dissimilar scientists and philosophers as Galileo, Descartes, Boyle, Locke, Leibniz, Newton, etc.

In this paper, we focus on Boyle's and Locke's primary-secondary quality distinctions. Our aim is to tell the constitutive elements from the argumentative ones. To that end, MacIntosh's analysis of the different primary-secondary distinctions as found in Boyle and Locke will serve as a starting point (section 2). We then investigate whether some of the nine different distinctions MacIntosh attributes to Boyle (section 3) and to Locke (section 4) are not in fact elements of or arguments for a more restricted number of primary-secondary quality distinctions.

⁴ Interestingly, Smith (1990) is not so confident as Wilson (1992) that the problem of sensible qualities addressed by contemporary philosophers is "nearly the same" as the one addressed by Boyle, Locke, etc. He argues, e.g., that attempts by physicalists such as Smart and Armstrong to identify colour with an objective scientifically specifiable physical property are "out of touch with the traditional distinction" (1990: 222). Moreover, "the issues they address are but tangentially related to what the notions of primary and secondary qualities have meant to the history of philosophy" (1990: 223). See, however, Anstey (2000: 86-112) for arguments to the effect that Boyle precisely aimed at identifying colour with an objective scientifically specifiable physical property. See De Mey (forthcoming) for arguments against the physicalist view Smith envisages, i.e. Smart and Armstrong's disjunctive realism about colour.

2. Nine alleged primary-secondary quality distinctions

MacIntosh argues that there is no single distinction between primary and secondary qualities. Rather, there are many of them, “which are and have been thought of as one distinction because they sort a suitably small number of examples into the same pigeon holes” (1976: 88). MacIntosh is especially suspicious of the fact that the traditional lists of primary and secondary qualities are very short and very similar.⁵ Almost all conceptions of the distinction put extension, motion and rest, and solidity into the box of the primary qualities, and colour, smell, and taste into the box of the secondary qualities. According to MacIntosh, the whole debate illustrates that choosing examples from a too narrow range is a bad philosophical habit:

I suppose that there are an infinite, or at least an indefinitely large, number of qualities. How interesting a coincidence it is then, that everyone so regularly stops short with a list of half a dozen or so of each sort, and how surprising that there is so much overlap in the lists of exemplars they offer (MacIntosh 1976: 88-9).

In Boyle and Locke, MacIntosh finds nine different distinctions between primary and secondary qualities. He attributes three of them to both, three to Boyle and the remaining three to Locke.

The first distinction (henceforth [BL₁]) which can be found explicitly in both Boyle and Locke is the one between qualities which are *conceptually inseparable* from bodies and those which are not. In this context, MacIntosh (1976: 89-90) quotes the famous passage from *The Assayer* in which Galileo introduces a conceivability criterion to tell two groups of qualities from each other. Certain qualities, such as shape, are claimed to be “necessary accompaniments” of bodies in that it is impossible to conceive of bodies without them having these qualities. By contrast, it is possible, Galileo claims, to conceive of bodies without them having

⁵ The following comparison illustrates nicely MacIntosh’s disdain for the traditional lists of primary and secondary qualities: “When I consider them I am reminded of a sign I once saw outside a shop in a small village in Wales. It read: ‘Butter, Eggs, Bed & Breakfast, Woollen Goods, Souvenirs, Milk, Pop, Books, Etc.’” (1976: 101).

qualities such as colour, odour, etc.⁶

A second distinction (henceforth [BL₂]) MacIntosh attributes to both Boyle and Locke is closely related to [BL₁]. As a matter of fact, [BL₂] is found in Locke in conjunction with [BL₁]. Here primary qualities are those which are *universal in fact* because they are found to belong to all bodies. Interestingly, in this context MacIntosh (1976: 91) quotes Newton who admits that there is an apparent conceptual tie between body and extension, but nevertheless insists that at the end of the day this tie is to be considered an empirical matter altogether.

The last distinction (henceforth [BL₃]) between primary and secondary qualities made by both Boyle and Locke is the one between qualities whose changes are real and those, whose changes are merely “Cambridge changes” (MacIntosh 1976: 94-5). An object undergoes a Cambridge change if some claim true of the object becomes false without there being any real change, i.e. a change in the intrinsic characteristics of the object due to physical interaction with its environment. E.g., if *a* becomes smaller than *b* because *b* has grown in size, *a* underwent a Cambridge change.

Let us now list the three distinctions attributed by MacIntosh to Boyle but not to Locke. Firstly (henceforth [B₁]), Boyle holds that primary qualities are fundamental in that they are *explanatory*. Secondary qualities, by contrast, do not explain; rather, they have to be explained and if they are, it is in terms of primary qualities. Secondly (henceforth [B₂]), Boyle distinguishes between *relational* and *non-relational* qualities. And thirdly (henceforth [B₃]), Boyle singles out a particular kind of relational qualities, i.e. *dispositional* qualities.⁷

⁶ MacIntosh also notes that Galileo is careless here in that he contrasts “generic terms such as shape with more specific ones such as red” (1976: 90). Boyle and Locke are clearer on this: they contrast the ‘generic terms’. Therefore, [BL₁] should be taken as follows. When certain qualities are said to be ‘conceptually inseparable’ from bodies this means that the *determinables* as kinds are essential: all bodies must have some *determinate* (e.g., some shape) falling under each of these *determinables* (e.g., shape as such).

⁷ One can hardly maintain that dispositional properties are a kind of relational properties, since there are non-relational dispositional properties. However, we are following MacIntosh (1976: 96) here, who is, in turn, paraphrasing Boyle. In section 3 we will investigate whether Boyle holds that the sensible qualities are both relational and dispositional.

Let us now list the three distinctions attributed by MacIntosh to Locke but not to Boyle. Firstly (henceforth [L₁]), Locke distinguishes between *ideas* and the causes of those ideas, i.e., *qualities* or powers in bodies. Secondly (henceforth [L₂]), Locke claims that whereas our ideas of primary qualities *resemble* those qualities as they are in bodies, our ideas of secondary qualities *do not resemble* secondary qualities as they are in bodies. And thirdly (henceforth [L₃]), Locke holds that primary qualities are those which belong to objects as they are in themselves, i.e., independent of human existence or nature. Secondary qualities, by contrast, are *mind-dependent*.

In what follows we will evaluate MacIntosh's claim that in Boyle and Locke these theses constitute *different* ways of telling primary qualities from secondary ones. However, we will disregard [BL₃], because the use of the notion "Cambridge change" in relation to Boyle and Locke is irremediably anachronistic,⁸ and because MacIntosh himself claims that Boyle and Locke take [BL₃] to be equivalent to [L₃] (1976: 94).⁹

⁸ Take, e.g., the excerpt MacIntosh adduces to show that Locke holds [BL₃]: "Pound an almond, and the clear white colour will be altered into a dirty one, and the sweet taste into an oily one. What real alteration can the beating of the pestle make in any body, but an alteration of the texture of it?" (2.8.20). It is true that Locke speaks of a 'real alteration' here, but he goes on to identify that real alteration with "an alteration of the texture". Even at face value, this is rather a reductive explanation of an apparent change, than an attempt to rule out Cambridge changes. So adducing 2.8.20 in support of [BL₃] is anachronistic in that it leads us to interpret 'real alteration' in opposition with the fairly recent notion 'Cambridge changes', whereas a historically much more plausible interpretation is available.

⁹ One can of course wonder how Boyle can take [BL₃] to be equivalent to [L₃] without actually holding [L₃]. We believe that the excerpts quoted by MacIntosh in support of [BL₃] simply state what Bennett (1971) calls the "Causal Thesis" (see n. 3). Since [B₁] neatly captures Boyle's adherence to this thesis, the relevant excerpt from his *On the Origin of Forms and Qualities* rather supports [B₁] than [BL₃], let alone [L₃]. Moreover, if we are willing to go along with MacIntosh's proposal to interpret the excerpt anachronistically, i.e., in terms of Cambridge changes, what Boyle is saying is that we must admit Cambridge changes "unless we admit the doctrine I have been proposing" (Boyle, quoted by MacIntosh 1976: 95). So, clearly, what Boyle intends is an argument for *some* primary-secondary quality distinction, and not as yet another such distinction.

3. Boyle

Before we start investigating to what extent MacIntosh is right in attributing six different primary-secondary quality distinctions to Boyle, it is useful to make a couple of preliminary remarks.

Firstly, Boyle didn't introduce the talk of primary and secondary qualities. The term Boyle uses to refer to what we now call the primary qualities is "the mechanical affections of matter". Moreover, the term "secondary qualities" only appears twice in his published works (Anstey 2000: 39).

Secondly, and more importantly, it is important to keep in mind that Boyle's interest in the sensible qualities (colour, odour, etc.) arose out of a desire to explicate all the qualities of bodies according to the corpuscular hypothesis. The corpuscular hypothesis corresponds to the idea that all macroscopic bodily phenomena should be explained in terms of corpuscles (submicroscopic particles), each of which can be fully characterised in terms of size, shape, motion, and texture (Downing 1998: 381).¹⁰

Now, it is clear that Boyle embraces [BL₁], i.e. that he uses an *a priori* essentiality criterion to tell the primary qualities from the secondary ones.¹¹ However, it is equally clear that for Boyle, essentiality is only a necessary and not a sufficient condition of primacy.

According to Boyle, the primary qualities of material bodies are (1) size, (2) shape, (3) motion or rest and (4) texture. Now while Boyle considers certain kinds of properties such as extension, divisibility, etc. to be essential to matter, he doesn't list them among the primaries. So for Boyle essentiality cannot be a sufficient condition of primacy.

Now [BL₂] is not very helpful in specifying what other conditions

¹⁰ See Downing (1998) for an assessment of the influence of Boyle's corpuscularianism' on Locke's account of the sensible qualities.

¹¹ The excerpt MacIntosh uses to show that Boyle actually holds [BL₁] also serves as textual evidence for [B₂] and will be quoted below. See Anstey (2000: 45-7) for an interpretation of other excerpts in which Boyle brings this essentiality criterion to the fore.

Boyle's primaries meet. As a matter of fact, [BL₁] implies [BL₂].¹² If a kind of property is not universal, in the sense that it is not always instantiated wherever there is matter then it cannot be essential. A property is an essential property of matter if matter without that property is *conceptually impossible*. If it turns out that matter without the property at investigation is *physically possible*, then the property at investigation does not have any change to pass the essentiality test. So the universality criterion of [BL₂] is weaker than the essentiality criterion of [BL₁].

[B₁], by contrast, specifies a further criterion primaries should meet.¹³ Qualities such as divisibility, impenetrability and extension are not included in Boyle's list of primaries, because in Boyle's view they make little or no contribution to the *explanatory power* of the corpuscular hypothesis. Only (1) size, (2) shape, (3) motion or rest and (4) texture, are required to give comprehensive mechanical explanations of phenomena.

The fact that texture is included in Boyle's list of primaries requires some explanation. After all, with the notable exception of Stewart (1987: 112), no interpreter takes Boyle as attributing texture to atomic corpuscles. Moreover, up to now we have specified two necessary conditions of primacy, i.e. [BL₁] and [B₁], and it is not intuitively clear whether, and if so how, texture meets them.

Texture is not essential at the atomic level because no atomic corpuscles have it, although it is of course derived from the shape, size, motion and posture of the atomic corpuscles. Texture is rather a structural property of particle aggregates and Boyle considers it to be an essential property of such molecular corpuscles: at the molecular level it is impossible for a corpuscle to lack texture. So here again we have the application of the essentially criterion [BL₁], only this time it applies to corpuscles at the molecular level.

Texture also meets [B₁]. As Anstey (2000: 47-50) points out, in his account of form and generation, Boyle assigns a very important role to

¹² Whereas [BL₁] states that there are kinds of properties bodies *must* have, [BL₂] states that there are kinds of properties bodies *invariably* have, independent of the question whether this is a necessary or a contingent fact.

¹³ The excerpt MacIntosh uses to show that Boyle actually holds [B₁] also serves as textual evidence for [B₃] and will be quoted below.

what he calls “primary concretions”.¹⁴ For Boyle, these insensible molecular corpuscles do virtually all the work in our causal and qualitative explanations of macroscopic bodily phenomena. Given their explanatory power it seems natural to focus on its essential attribute and that is texture.

Up to now, we have argued that [BL₁] implies [BL₂] and we have suggested that for Boyle the conditions specified in [BL₁] and [B₁] suffice for primacy. Let us now consider [B₂] and [B₃].

Whereas MacIntosh attributes most of the other alleged distinctions between primary and secondary qualities to several authors, he attributes [B₂] and [B₃] solely to Boyle. Moreover, MacIntosh’s comments are rather sparse here. [B₂] indicates that some qualities are relational and others are not, and [B₃] more or less defines dispositional qualities. As textual evidence for [B₂], the following excerpt is quoted:

... if we should conceive that all the rest of the universe were annihilated, except any of these intire and individed corpuscles ... it is hard to say what could be attributed to it, besides matter, motion (or rest), bulk, and shape ... But now there being actually in the universe great multitudes of corpuscles mingled among themselves, there arise ... two new accidents ... namely ... posture and order ... And when many corpuscles do so convene together as to compose any distinct body, as a stone, or a metal, then from their other accidents (or modes) and from these two last mentioned, there doth emerge a certain disposition or contrivance of parts in the whole, which we may call the texture of it (from Boyle’s *On the Origin of Forms and Qualities*, as quoted by MacIntosh 1976: 95-6).

What we get here is simply a definition of texture. We have already noted that Boyle includes texture in his list of primaries, that it meets the essentiality criterion (albeit at the level molecular corpuscles) and that it is required to give comprehensive mechanical explanations of phenomena.

¹⁴ Anstey (2000: 48) also elaborates on how Boyle conceived of these “primary concretions” and their supposed efficacy. He claims that the origins of the notion and the role that Boyle assigns them lie in the Anaxagorean notion of seeds.

So as far as texture is introduced here as a relational property,¹⁵ in opposition with the other primaries, which are non-relational, this only introduces some structure among the primaries, and is not yet another primary-secondary quality distinction.¹⁶

As textual evidence for [B₃], the following excerpt is quoted:

I do not deny but that bodies may be said in a very favourable sense to have those qualities we call sensible, though there were no animals in the world: for a body in that case may differ from those bodies which are now quite devoid of such quality, in its having such a disposition of its constituent corpuscles, that in case it were duly applied to the sensory of an animal, it would produce such a sensible quality which a body of another texture would not ... And thus snow, though if there were no lucid body nor organ of sight in the world, it would exhibit no colour at all ...yet it hath a greater disposition than coal or soot, to reflect store of light outwards, when the sun shines upon them all three. And so we say, that a lute is in tune whether it be exactly played upon or no, if the strings be all so duly stretched as that it would appear to be in tune, if it were played upon. But ... if there were no sensitive beings those bodies that are now the objects of our senses would be but dispositively, if I may so speak, endowed with colours, tastes, and the like; and actually but only with those more catholick affections of bodies, figure, motion, texture, etc. (from Boyle's *On the Origin of Forms and Qualities*, as quoted by MacIntosh 1976: 96).

Here, Boyle seems to argue for a dispositional account of the secondary qualities. Up to now, we have focused on the criteria primary qualities meet. This excerpt, by contrast, offers a positive characterisation of the secondary qualities. Does it call for another primary-secondary quality

¹⁵ However, given the fact that Boyle considers texture to be essential or *intrinsic* to molecular corpuscles, one can hardly call it a *relational* property. Posture, i.e., the position of a corpuscle *relative* to other corpuscles, is probably a better candidate.

¹⁶ It should be noted, however, that according to Alexander (1985) secondary qualities are, for Boyle, identical to textures. Sensible qualities, by contrast, are merely ideas in the mind. See Anstey (2000: 80-1) for arguments against the dichotomy between secondary qualities and sensible qualities on which Alexander's interpretation rests. For another criticism of Alexander's account, see Keating (1993).

distinction? Or is it rather an element of or argument for the distinction we have been discussing up to now?

One way to integrate [B₃] into our analysis of [BL₁], [BL₂], and [B₁], could be to conjecture that Boyle's distinction between primary and secondary qualities is in fact a distinction between categorical and dispositional properties. On such an analysis, [B₃] would characterise secondary qualities as dispositional properties, and [BL₁], [BL₂], and [B₁] would be the criteria Boyle puts to the fore to pick out the categorical properties.

Although the occasions on which Boyle directly contrasts his mechanical affections of matter with the sensible qualities are too rare to arrive at such a conclusion with great confidence, a qualified version of it can be maintained. After all, [B₃] and [B₁] are closely related. As a matter of fact, MacIntosh adduces the same excerpt to illustrate both. On the one hand, Boyle argues here for [B₃]: he claims that "bodies may be said in a very favourable sense to have those qualities we call sensible" and he goes on to specify that even without perceivers bodies have the disposition to reflect light selectively. On the other hand, he argues for [B₁]: he stipulates that this disposition should be explained in terms of the "constituent corpuscles" and the "more catholick affections of bodies, figure, motion, texture, etc."

So in this single excerpt Boyle seems to bring the two theses to the fore, which Bennett (1971) has dubbed the 'analytic thesis' and the 'causal thesis' respectively. Although rival interpretations of Boyle differ in the way they try to explain the tension that arises from his apparent commitment to these two theses, Boyle clearly didn't think of [B₃] and [B₁] as being irreconcilable. According to him, objects have dispositional properties that can be explained in terms of the categorical properties of their constituent corpuscles. Elaborating on the example of colour, he mentions two relevant dispositional properties: firstly, the disposition to produce sensible qualities in perceivers, and secondly, the disposition to reflect light selectively.¹⁷ They differ mainly in the conditions under

¹⁷ Obviously, much depends on how Boyle actually conceives of the relation between these two dispositions. See Hilbert (1987) for a recent defense of the idea that colours can be identified with the disposition of objects to reflect light selectively. Contemporary dispositionalists, by contrast, argue that colours should be identified with the disposition of objects to produce sensible qualities in perceivers.

which they are realized: whereas the disposition to reflect light selectively manifests itself independent of the presence of perceivers, the disposition to produce sensible qualities will only be realized when “duly applied to the sensory of an animal”.

Finally, we would like to pinpoint an important lacuna in MacIntosh’s analysis. One of the numerous distinctions between primary and secondary qualities that MacIntosh identifies in his paper has actually an Aristotelian origin. Aristotle distinguishes between the common sensible qualities, i.e. qualities which can be perceived by several senses, and the proper sensible qualities, i.e. qualities which can be perceived by one sense only.

Interestingly, MacIntosh attributes this distinction to Descartes, Leibniz and Berkeley, but not to Boyle, nor to Locke (for the latter, see section 4). However, in the *Christian Virtuoso, II*, Boyle does make the distinction (Anstey 2000: 58-9).

This Aristotelian way of telling two groups of qualities from each other doesn’t seem to have anything to do with Boyle’s primary-secondary distinction (or distinctions) as we have discussed it (or them) up to now. Take the conjunction of $[BL_1]$, $[B_1]$ and $[B_3]$. What does the fact that some qualities are perceived with more than one sense have to do with the fact that the very same qualities pass the essentiality test and that they have explanatory power? Or take $[B_3]$. What does the fact that some qualities are perceived by one sense only have to do with the fact that the very same qualities are dispositional?

So we found that Boyle indeed proposes different primary-secondary quality distinctions. However, by showing how they are related, we reduced five of the distinctions MacIntosh attributes to Boyle to one single distinction. However, Boyle’s genuinely different conception of the distinction between primary and secondary qualities, i.e. the one between common and proper sensibles, is one that MacIntosh forbears to attribute to Boyle.

4. Locke

MacIntosh doesn’t attribute the Aristotelian distinction between common and proper sensible qualities to Locke either. We admit that Locke doesn’t explicitly draw it, and that he doesn’t use it directly as an

argument for his distinction (or if MacIntosh is right: one of his distinctions) between primary and secondary qualities either. However, there is a passage of Locke's *Essay* in which he rejects scepticism with respect to the existence of the outer world, and one of his argument against this thesis draws on the fact that "our *senses* in many cases bear *witness* to the truth of each other's report concerning the existence of sensible things" (4.11.7).¹⁸ But since, as he mentioned earlier, "there are some ideas which have admittance only through one sense, which is peculiarly adapted to receive them" (2.3.1), that reason to believe in the existence of the outer world is at once a reason to doubt the outer existence of colour and the other secondary qualities. In these cases the senses do not bear witness to each other's report concerning the outer existence of the qualities at issue. So, *pace* MacIntosh, we suggest that Locke candidly uses the distinction between qualities which can be perceived by several senses and those which can be perceived by one sense only, to support his distinction between primary and secondary qualities.

Nevertheless, MacIntosh claims that there are in fact *several* distinctions between primary and secondary qualities in Locke, and in what follows we will evaluate this claim.

Let us start with [L₁]. It is certainly true that Locke distinguishes between ideas and the causes of those ideas, i.e., qualities or powers in bodies. Take, e.g., the following passage:

These are two very different things, and carefully to be distinguished; it being one thing to perceive, and know the *Idea* of White or Black, and quite another to examine what kind of particles they must be, and how ranged in the Superficies, to make any Object appear White or Black (2.8.2).

However, almost all commentators agree that this distinction is a necessary preliminary to Locke's primary-secondary quality distinction,

¹⁸ This is but one of four arguments Locke puts forward to argue for the thesis that we are justified in trusting the "notice" our senses give us of the existence of "things without us" (4.11.3). Other arguments include (1) that our senses do not produce any perceptions by themselves (4.11.4), and (2) that we can easily tell the difference between actually perceiving something and merely contemplating it (4.11.5 and 4.11.6).

which is in fact a further distinction between two kinds of qualities. In the following passage Locke reiterates the distinction between ideas and their causes, i.e. qualities, this time without using corpuscularianism to justify it:

Whatsoever the mind perceives *in itself*, or is the immediate object of perception, thought, or understanding, that I call *idea*; and the power to produce any idea in our mind, I call *quality* of the subject wherein that power is (2.8.8).

So, if not for corpuscularianism, why should we make this distinction between ideas and qualities? As matter of fact, Locke is very clear on that in the passage immediately preceding the one just quoted:

To discover the nature of our *ideas* the better, and to discourse of them intelligibly, it will be convenient to distinguish them *as they are ideas or perceptions in our minds*; and *as they are modifications of matter in the bodies that cause such perceptions in us*: that so we may not think (as perhaps usually is done) that they are exactly the images and resemblances of something inherent in the subject; most of those of sensation being in the mind no more the likeness of something existing without us, that the names that stand for them are the likeness of our ideas, which yet upon hearing they are apt to excite in us (2.8.7).

So ideas, in the proper sense, i.e., that of “perceptions in our minds”, are suspect.¹⁹ They are suspect because we don’t know, at face value, which of them resemble “something inherent in the subject”. Obviously, Locke also suggests here that the relation between *most* ideas and their causes in the objects is as arbitrary as the relation between words and the ideas they denote, but more on that later. The point here is that the distinction between ideas and qualities is not, as MacIntosh suggests, a primary-secondary quality distinction in its own right, but rather a prerequisite of Locke’s proper primary-secondary quality distinction.

¹⁹ Following, among others, Boehm (1984: 112), we consider the distinction in 2.8.8 as a correction of the distinction in 2.8.7. The merit of the correction, however, is merely a terminological one: whereas in 2.8.7 ideas can be both ‘perceptions in our minds’ and ‘modifications of matter in the bodies that cause such perceptions in us’, 2.8.8 stipulates that we should call the former ‘ideas’ and the latter ‘qualities’.

Let us now consider [L₂], i.e. Locke's so-called resemblance thesis, and [L₃], i.e. the thesis that primary qualities are those which belong to objects as they are in themselves, independent of human existence or nature. At face value, [L₂] is a consequence of the suspicion motivating [L₁] that most ideas do not resemble anything inherent in the subject. MacIntosh refers to the following excerpt to illustrate [L₂]:

... the ideas of primary qualities of bodies are resemblances of them, and their patterns do really exist in the bodies themselves, but the ideas produced in us by these secondary qualities have no resemblance of them at all. There is nothing like our ideas, existing in the bodies themselves. They are, in the bodies we denominate from them, only a power to produce those sensations in us: and what is sweet, blue, or warm in idea, is but the certain bulk, figure, and motion of the insensible parts, in the bodies themselves, which we call so (2.8.15).

And the textual evidence MacIntosh offers for [L₃] is the following sentence: "The bulk, figure, number, situation, and motion or rest of their [bodies] solid parts ... are in them, whether we perceive them or not ..." (2.8.23). For our answer to the question whether [L₂] and [L₃] are, as MacIntosh suggests, different distinctions between primary and secondary qualities, we need to quote Locke's definition, in the very same paragraph, of the secondary qualities:

The power that is in any body, by reason of its insensible primary qualities, to operate after a peculiar manner on any of our senses, and thereby produce in *us* the different ideas of several colours, sounds, smells, tastes, &c. (2.8.23).

In both excerpts, Locke claims that secondary qualities are in bodies the powers that produce certain ideas *in us*. So the mind-dependence of the secondary qualities, which is supposed to be the upshot of [L₃] is also clearly stated in the excerpt supporting [L₂]. Moreover, without [L₂], [L₃] doesn't make much sense. [L₃] defines two kinds of properties, but it doesn't bring the reason to differentiate between them to the fore. [L₂], by contrast, motivates such a distinction between mind-dependent and mind-independent properties.

Note that [L₂] is primarily a claim about ideas and that [L₃] is primarily a claim about qualities. Now, ideas are mind-dependent, and

qualities are, at least in the strict sense of [L₁], mind-independent. Clearly, [L₃] doesn't simply reiterate [L₁]. So if Locke starts talking in [L₃] of the mind-dependency of certain qualities, we are confronted with a terminological riddle. Unless, of course, our *ideas* of those qualities can, somehow, be differentiated from our *ideas* of other so-called mind-independent qualities. And [L₂] delivers just that.

So we hold that [L₃] is Locke's main distinction between primary and secondary qualities. Furthermore, [L₂] specifies what the mind-independence of the primary qualities and the mind-dependence of the secondary qualities amount to. Secondary qualities are mind-dependent in that "the ideas produced in us by these secondary qualities have no resemblance of them at all" (2.8.15). Primary qualities, by contrast, are mind-independent in that our "ideas of primary qualities of bodies are resemblances of them, and their patterns do really exist in the bodies themselves" (2.8.15).

Finally, we have to consider briefly the role of [BL₁] and [BL₂]. The fact that they occur in Locke's 2.8.9 is puzzling, since both, but especially [BL₁], are at odds with Locke's brand of empiricism. However, we agree with Downing (1998) that their function is primarily to highlight the intelligibility and status of corpuscularianism. Moreover, [BL₁] and [BL₂] illustrate how experience *cum* reflection on it, allows us to conceive of such a distinction between qualities as the primary-secondary one (Downing 1998: 396-405).

5. Conclusion

MacIntosh attributes too few and too many primary-secondary quality distinctions to Boyle and Locke. He forbears to attribute the proper-common sensible distinction to them. However, in one of the rare passages in which Boyle directly contrasts the sensible qualities with his main affections of matter, he explicitly draws this Aristotelian distinction. Moreover, although Locke doesn't distinguish between proper and common sensibles directly, we have argued that one of Locke's reasons to doubt the outer existence of secondary qualities is the fact that they are perceived by one sense only.

On the other hand, the nine primary-secondary quality distinctions that MacIntosh does attribute to Boyle and Locke can be reduced to two.

Boyle conceives of primary qualities as being essential to matter and explanatory. Since Boyle characterizes the secondary qualities as being dispositional, and since he stipulates that they are to be explained in terms of (and thereby can be traced back to) the primary qualities, his distinction almost boils down to a distinction between categorical and dispositional properties.

Locke's main distinction, by contrast, is the one between mind-dependent and mind-independent properties. We have argued that Locke's distinction between ideas and qualities is a necessary preliminary of it, and that his famous resemblance thesis serves as a specification of the mind-dependency of the secondary qualities and the mind-independency of the primary ones.

Universiteit Gent
University of Helsinki

REFERENCES

- Alexander, P. (1985), *Ideas, Qualities and Corpuscles: Locke and Boyle on the External World*. Cambridge: Cambridge University Press.
- Anstey, P.R. 2000. *The Philosophy of Robert Boyle*. London,: Routledge.
- Armstrong, D.M. (1987), Smart and the secondary qualities. In Pettit, P., R. Sylvan and J. Norman (eds.) *Metaphysics and Morality: Essays in Honour of J.J.C. Smart*. Oxford: Blackwell.
- Bennett, J. (1971), *Locke, Berkeley, Hume: Central Themes*. Oxford: Oxford University Press.
- Boehm, R. (1984), *Ideologie & Ervaring: Materialen voor een ideologiekritiek op fenomenologische grondslag*. Gent: KRITIEK.
- Boghossian, P.A. and J.D. Velleman (1991), Physicalist theories of color. *Philosophical Review* 100: 67-106.
- Byrne, A. and D.R. Hilbert (eds.) (1997), *Readings on Color: The Philosophy of Color*. Cambridge: MIT Press.
- Curley, E.M. (1972), Locke, Boyle and the Distinction between Primary and Secondary Qualities. *Philosophical Review* 81: 438-64.
- De Mey, T. Forthcoming. Disjunctive realism about colour. In De Mey, T. and M. Keinänen (eds.) *Problems from Armstrong*. Helsinki: Acta Philosophica Fennica.
- Dowling, L. (1998), The Status of Mechanism in Locke's *Essay*. *The Philosophical Review* 107: 381-414.

- Evans, G. (1980), *The Varieties of Reference*. Oxford: Clarendon Press.
- Everson, S. (1997), *Aristotle on Perception*. Oxford: Oxford University Press.
- Jackson, F. (1996), The primary quality view of color. In Tomberlin, J. (ed.) *Philosophical Perspectives* 10. Cambridge: Blackwell.
- Jackson, R. (1968), Locke's Distinction between Primary and Secondary Qualities. In Armstrong, D.M. and C.B. Martin (eds.) *Locke and Berkeley*. New York: Doubleday.
- Hacker, P.M.S. (1987), *Appearance and Reality: A Philosophical Investigation into Perception and Perceptual Qualities*. Oxford: Blackwell.
- Hardin, C.L. (1993), *Color for Philosophers: Unweaving the Rainbow*, Expanded Edition. Indianapolis: Hackett.
- Hilbert, D.R. (1987), *Color and Color Perception: A Study in Anthropocentric Realism*. Stanford: Center for the Study of Language and Information.
- Keating, L. (1993), Un-Locke-ing Boyle: Boyle on Primary and Secondary Qualities. *History of Philosophy Quarterly* 10: 305-23.
- McGinn, C. (1983), *The Subjective View: Secondary Qualities and Indexical Thoughts*. Oxford: Clarendon Press.
- MacIntosh, J.J. (1976), Primary and Secondary Qualities. *Studia Leibnitiana* 8: 88-104.
- Mackie, J.L. (1976), *Problems from Locke*. Oxford: Oxford University Press.
- Mandelbaum, M. (1964), *Philosophy, Science and Sense Perception*. Baltimore: Johns Hopkins University Press.
- Maund, B. (1995), *Colours: Their Nature and Representation*. Cambridge: Cambridge University Press.
- Sargent, R.-M. (1995), *The Diffident Naturalist: Robert Boyle and the Philosophy of Experiment*. Chicago: Chicago University Press.
- Smart, J.J.C. (1975), On some criticisms of a physicalist theory of colors. In Cheng, C. (ed.) *Philosophical Aspects of the Mind-Body Problem*. Honolulu: University Press of Hawaii.
- Smith, A.D. (1990), Of Primary and Secondary Qualities. *The Philosophical Review* 99: 221-54.
- Stewart, M.A. (1987), Review of Alexander (1985). *The Locke Newsletter* 18: 105-18.
- Thompson, E. (1995), *Colour Vision: A Study in Cognitive Science and the Philosophy of Perception*. New York: Routledge.
- Westphal, J. (1991), *Colour: A Philosophical Introduction*. Oxford: Basil Blackwell.
- Wilson, M.D. (1992), History of Philosophy in Philosophy Today; and the Case of the Sensible Qualities. *The Philosophical Review* 101: 191-243.