

## In Touch With the Look of Solidity<sup>1</sup>

*Thomas Crowther*

The idea that some objects appear visibly solid is somewhere near the core of our notion of what it is for something to have the appearance of a material object. In turn, solid objects, and the visible appearances that manifest such solidity, have been at the centre of philosophical theorizing about visual perception and its character.<sup>2</sup> But many kinds of visually perceptible entities are not solid objects, and these things have visible appearances that seem to involve distinctive and characteristic departures from the appearance of solidity. The sea may look liquid, for example, rather than solid, and the vapour from an electronic cigarette may look gaseous. Shadows and rainbows do not look like material objects, and the respects in which they do not, at least in part, involve their failure to look solid. In this paper, I work towards some suggestions that may be capable of illuminating the varieties of non-solid looks. These suggestions emerge from a discussion of what is involved in something's having a solid appearance, and some proposals about the nature of solid looks. One overarching aim of the paper is to highlight the role played in an understanding of solid looks and the variety of non-material appearances by a distinctive kind of way in which material objects perceptibly take up space.

I first try to develop the idea that there is something particularly puzzling about solid appearance. In section 1, I spell out some assumptions about the notion of solidity as it figures in the discussion that follows, and some assumptions about the notion of the 'look' or 'appearance'

of a thing. In sections 2 and 3 I attempt to show that there are difficulties with two natural ways to attempt to explain the notion of solid appearance. In section 4, I discuss aspects of the account of solidity and solid appearance offered by M.G.F. Martin (2010). I shall attempt to show that Martin's discussion brings into focus some additional requirements on a good account of solid appearance though seems to leave our central question about the nature of solid appearance unanswered. In sections 5 and 6, I develop a different proposal about what it is for something to look solid, a proposal that is built around the connections between the notion of solidity, and the notions of touch and bodily action. I attempt to show that this proposal enables us to explain the puzzling features of solid appearances, and also offers a way to think of the varieties of ephemeral appearance. Section 7 provides some brief responses to natural worries about the account proposed.

The issues here are potentially very wide-ranging. A fully satisfactory development of the proposal I make here would develop further a number of ideas in the philosophy of perception, concerning various aspects of our awareness of space, and would involve more extended discussion of the nature of the capacities for touch and bodily awareness. In this paper, my aim is only to try to draw attention to some problems that need to be solved in arriving at a satisfactory understanding of the look of solidity and to sketch a solution to these problems that has some attractive features. Whether this solution can be fully substantiated is a question that will have to wait for further work

The notion of solidity that figures in the discussion that follows is broadly Lockean.<sup>3</sup> Locke famously argued that solidity is the property that is most distinctive of material objects, or ‘bodies’. He says “This of all other, seems the idea most intimately connected with, and essential to Body, so as no where else to be imagin’d, but only in matter.” (1975[1689]: II.iv.1.19–21). The idea that there are absolutely no material bodies that are not solid is controversial.<sup>4</sup> But nevertheless it is evident that there are substantive philosophical connections between the everyday notions of ‘body’, or material objecthood, and the Lockean notion of solidity. Of the notion of solidity, Locke says the following:

This is the *Idea* belongs to Body, whereby we conceive it *to fill space*. The *Idea* of which filling of space is, That where we imagine any space taken up by a solid Substance, we conceive it so to possess it, that it excludes all other solid Substances; and will for ever hinder any two other Bodies, that move towards one another in a strait Line, from coming to touch one another, unless it removes from between them in a Line, not parallel to that which they move in. This *Idea* of it the Bodies, which we ordinarily handle, sufficiently furnish us with. (1975[1969]: II.iv.2.27–35)

There are several ideas here. Solid things fill space, and they fill space up in such a way that they exclude other things from occupying that space. Locke elsewhere characterizes solid things as having ‘resistance’ and being ‘impenetrable’. He notes that while we can refer to solidity as impenetrability, being solid is having the property of being space-filling in that way which grounds the properties of impenetrability or exclusiveness. Solidity, Locke says, “carries something more of positive in it than *Impenetrability*, which is negative and perhaps a

consequence of *Solidity*, than *Solidity* itself” (1975 [1689]: II.iv.1. 17-19) I assume these general ideas about solidity in what follows.

Locke appears to identify this positive property directly with a primary quality or a collection of primary qualities. He says that solidity is “...one of the original or Primary qualities of Body” (1975 [1689]: II.viii.9: 135). There are difficulties with understanding the historical Locke’s position here.<sup>5</sup> But setting aside Locke’s commitments to corpuscularianism, it might seem natural to take a broadly ‘Lockean’ approach to solidity here to involve the view that solidity is a property the nature of which can ultimately be specified exhaustively and exclusively in terms of the vocabulary of basic physics. This would be to take solidity to be a property of the same general kind as having negative charge, or being constituted of H<sub>2</sub>O molecules.

Whatever the broadly Lockean credentials of this view, or however the historical Locke’s view is to be interpreted, solidity is not understood in this way in what follows. For any such candidate property specified in the vocabulary of basic physics, it seems that an object could be space-filling in a way that grounded its being impenetrable to other things without possessing that very property. It seems to be open that there are possible worlds in which the basic physical properties that objects possess, and the forces that their parts are subject to, are distinct from those present in this world, but which nevertheless contain solid objects. So for the purposes of what follows, solidity is taken to be causally grounded in the possession of properties specified in the vocabulary of basic physics, rather than identical with such properties. I will also assume in what follows that solidity is a ‘manifest perceptible’ property. The discussion that follows is an attempt to better understand what it may be for a property to be such. But prior to that discussion we might say that manifest perceptible properties are properties that are capable of being sense-perceived without the aid of any special technology that extends the reach of the senses, and which when sense-perceived in such ways are capable of revealing themselves to the perceiver as the properties they are. Properties specifiable in the vocabulary of basic physics, such as being

made of H<sub>2</sub>O, are not manifest perceptible properties. But I will take it that solidity is such a property.

The question that guides discussion here is what the nature of the visual appearance of solidity, or ‘looking solid’ is, where solidity is understood as a property that is not scientific in the above sense. The notion of appearance, in general, is the subject of intense philosophical dispute. Any discussion of this notion inevitably requires taking up a stance on certain fundamental questions. For there are basic disagreements within the literature about what a debate about appearances is a debate about. More relevantly, there are different conceptions of the notion of appearance, conceptions that have figured in some of the most historically influential discussions of appearance. These different conceptions suggest different ways of conceiving of the notion of things appearing solid.<sup>6</sup>

One way to understand the notion of appearance (or ‘appearing a certain way’) is to take it that appearances are either identical with conscious experience or with properties of conscious experiences. One might take it that appearing a certain way is for something to appear *to a subject* in some way, and also that for something to appear *to a subject* in some way is for a conscious event or process with phenomenal character of a certain kind to unfold in a subject. Understood in this way, questions about the nature of appearance are questions about the nature of perceptual experience. Questions of this kind are at the centre of research in recent philosophy of perception.<sup>7</sup>

Though I emphasize that my primary interest is in appearance itself rather than the varieties of looks talk, a different way of conceiving of the notion of looks is modelled on a notion that Martin (2010) calls (after related claims in Travis (2004)) the ‘evidential’ use of ‘looks talk.’ According to a conception of appearance modelled on this notion, for things to look or appear a certain way involves a proposition concerning the way that some object is being taken

to be true or being likely to be true on the basis of some visual evidence or other. This requires the truth of the relevant proposition to be epistemically possible for the subject. Adopting a conception of this kind in connection with the notion of solid looks, what it is for things to appear solid to a subject is for the subject to take the proposition that some object is solid to be true or likely to be true, and to take the basis for this likelihood to be how that object is visually presented.

In what follows, I will be drawing on a notion of appearance that contrasts with these two ideas. I here take appearance, or appearing a certain way, to be a property, or properties, of objects perceived rather than of experiences of objects. Where what is at issue is the ‘looks’ of an object, then what is at issue is a subset of those properties; the visible ones. This is a view of appearance that features, in different ways, in the work of J. L. Austin (1962), M.G.F. Martin (2010), Charles Travis (2004), and Bill Brewer (2011), amongst others. Some of the motivation for this approach to solid looks emerges in connection with a consideration of potential difficulties in taking the first two ideas as general models for looks or solid looks.

With respect to the first approach to appearance, perhaps there is some notion of appearance, say the notion of ‘things appearing some way to a subject’ which has application to experience in the way mentioned above. I don’t rule that out here. But much of our thought and talk about the appearances of things does not appear to take such psychological objects. When I say “Isaac has a glum appearance today” I am, at least on the face of it, saying something about Isaac: that there is a certain property (having a glum appearance, or appearing glum) that he possesses. Even if my saying that, on some particular occasion, may imply or express certain things about my psychology at the time of utterance, in saying what I do I don’t appear to be saying something about, or reporting on, my experience or any property of my experience. That also seems to be true of the idea that some object looks solid. Looking solid, on the face of it, is a way that the object is, not a way that some experience of mine is.

Turning to the second approach, perhaps it might turn out that the nature of such visible properties of objects can be understood, at least in part, in terms of epistemic notions. And perhaps it can be conceded there are various contexts in which our talk and thought about appearance has such an explicitly ‘evidential’ cast. Adopting the example offered in Frank Jackson (1977), I might say, prompted by the darkened house next door, “It looks as if they are out.”<sup>8</sup> Nevertheless, the idea that the notion of solid appearance, quite in general, can be understood simply in terms of some relevant subject’s taking the proposition that some perceived object is solid as true or likely to be true, on the basis of the visible evidence, should be resisted. Suppose I watch liquid mercury being piped through a tiny capillary into a hollowed out spherical space in the middle of a clear glass cube, until I can see that the mercury has filled that space up completely. If I think that the mercury looks solid, that is not for me to think that the proposition that the mercury is solid is true or likely to be true. I know that proposition to be false. Rather, I seem to think something about a visible property, or set of visible properties, of the quantity of liquid mercury: that those visible properties are of the looking solid type.

So the question about the nature of solid looks is not here understood as a question about the nature of experience or properties of experience, nor about what it is for some proposition to the effect that some object is solid to seem to a subject to be true, given the evidence. It is a question about the nature of some visible property of an object. This conception of appearance, and the appearance of solidity, in particular, is not uncontroversial, but I shall not offer further argument for it here. If what follows provides a promising explanation of the appearance of solidity, then that is a further form of indirect support for the general conception of looks on which it is based.

A final assumption about the appearance of solidity concerns knowledge of this property. I will assume that knowing what solid looks are, or what it is for something to look solid, where those looks are of the kind relevant to this discussion, requires visual experience of solid looks.

One cannot know what solid looks are, at least, in the primary sense that is at issue here, unless one has had visual experience of such solid looks. This contrasts, for example, with knowing what it is for something to be made of H<sub>2</sub>O molecules, or knowing what it is to have negative charge. Later in the paper we will discuss how there may be some sense in which there is such a thing as the look of being made of H<sub>2</sub>O. But even if there is some sense in which we may talk of something having a look of being so made, or looking negatively charged, experience of this look is not required to have knowledge of those properties. This then imposes a requirement on any account of solid looks: that it should be consistent with the fact that visual experience is required for knowledge of what it is for something to look solid. Let's say that any account should be consistent with 'the experience constraint'.

So our question is, what are solid looks? What is it for an object to visibly appear solid, where solidity is understood as a manifest perceptible property, not a scientific property, and where being visibly solid is some kind of property of the object? The next two sections explore difficulties with two different ideas about how to approach this question.

## 2.

Suppose we begin with cases of things having the visible appearance of redness or roundness. Recall that on the general approach to appearance being pursued here, for something to have the visible appearance of redness or of roundness is for the object to possess a visible property of some kind, not for experience to have some property. Let's suppose, further, for the sake of discussion, that for something to have the visible appearance of redness or to look red requires that it is disposed to look red to normal perceivers in relevantly normal circumstances. So an

object can have the visible appearance of redness or look red even though it fails to look red to a subject on a particular occasion, because the conditions fail to be relevantly normal. Given that redness is a property that is visible, the temptation in connection with the notion of the visible appearance of redness may be to identify the visible appearance of redness, with the visible property of being red itself. Approached in this way, the notion of a visible appearance of some property is not some special property of an object. It is just the familiar property of redness. The parallel proposal in the case of solidity at this point is that the appearance of solidity is to be identified with being solid, a property, it might be thought, that is visible in the same way as being red or round.

But there are difficulties with this proposal. The natural way to understand this proposal is to understand it in terms of the idea that solidity is an ‘observational property’. There are different ways of understanding the notion of an observational property. I here follow M. G. F. Martin (2010), who writes: “With the observational properties we have a necessary coincidence between having the look of that property and having that property (at least when the domain is restricted to objects that are visible, and visibly determined along dimensions relevant to each of its observational aspects.” (2010: 206). This suggests the idea that a property is observational if and only if (subject to the qualifications endorsed in the ellipsis) it follows from the fact that some object has that property that it has the appearance of that property, and it follows from the fact that the object has the appearance of that property that it has that property. Note that this is not the claim that for any property that is observational, it is not possible for it to be presented in a subject’s visual experience as other than it is. It is just the claim that with respect to observational properties of objects, the presence of a property of that kind entails that it has an appearance property, that that object can make itself systematically perceptually manifest to experiencers in a certain way. Martin suggests that being cubic is observational in this sense. If an

object is large enough to be seen and is visibly determined in dimensions relevant to shape, then if it is cubic it has the visual appearance of being cubic.

But solidity does not seem to be an observational property of an object in this sense. What visible properties are such that the possession of them is coincident with solidity? Colour and shape are clearly not such properties. Rainbows and beams of light are coloured and shaped but not solid. The projected holograms of deceased musicians that are used for offering concertgoers ‘virtual performances’ are coloured and three-dimensionally shaped and their spatial form exhibits the visible coherence and integrity over time that is characteristic of solid things, even though they fail to be solid. And so also can we conceive of solid things that lack the relevant appearance. Here is Martin (2010) again:

If we suppose that solidity is a visually manifest property... we must also concede that some solid objects (i.e. ones that have a nature beyond the purely visible realm) and some purely visible objects can take on the appearance of the other camp. An entirely solid glass arc may cunningly be made to present the appearance of a beam of light; a hologram, on the other hand, may appear to be the solid object whose appearance has been photographically captured. In both cases, we have something that has the appearance of what it is not. (2010: 207)

Perhaps there are visible aspects of these projected holograms that can be distinguished from the visible properties of the performer whose image is projected: they are transparent in a way that is not appropriate for an object of that kind, and the projection sometimes has glitches that make for minor distortions and kinks in its visible properties. Nevertheless, Martin (2012) invites us to conceive of what he calls a ‘perfect hologram’. A perfect hologram is a product of

optical technology more advanced than those we currently possess. A hologram of this kind is something that has visible properties that are identical with the visible properties of solid objects, but which is a light object, not solid. The notion of a perfect hologram seems to be coherent. But if it is coherent, then solidity does not seem to be an observational property, at least in the sense described above. So this first proposal about solid appearance must be rejected. There are no good candidates for visible properties of objects such that for an object to have those visible properties is necessarily coincident with solidity.

The central examples of non-observational properties are properties that are scientific in the sense described earlier. Take the property of being made of H<sub>2</sub>O. The visible appearance of being made of H<sub>2</sub>O, let's suppose, is being colourless, transparent and refractive. Something might have the look of H<sub>2</sub>O without being made of H<sub>2</sub>O. For example, on Twin Earth, as characterized in Putnam (1975), the stuff that is colourless, transparent and refractive and fills rivers and lakes is made of XYZ, a kind of chemical compound distinct from H<sub>2</sub>O. So also, something might be made of H<sub>2</sub>O without having the visual appearance of being made of H<sub>2</sub>O. It might be, for example, a further feature of the organic chemistry of Twin Earth that the stuff that is made of H<sub>2</sub>O doesn't look colourless and transparent, but looks only mostly transparent, and with a greenish-blue tinge.

But solidity, according to the ordinary conception of this property, is not a scientific property like being made of H<sub>2</sub>O. So, on the one hand, solidity cannot be identified with a collection of observational properties. On the other, neither can solidity be identified with a property of the most obvious kind of non-observational property.

Not only is solidity distinct from any scientific non-observational property. But what it is for solidity to be visible appears to be distinct from what it is for such scientific non-observational properties to be visible. The visible properties of being colourless, transparent and

refractive count as the visible appearance of being made of H<sub>2</sub>O given that there is a physical law that relates these properties. This relationship is contingent, and there is no intrinsic or necessary relation between having those visible properties and being made of H<sub>2</sub>O. Though being made of H<sub>2</sub>O can be said to have a visible appearance and be said to be visible, the visibility of H<sub>2</sub>O consists in the visibility of some other property to which being H<sub>2</sub>O is causally related. But this is not how things seem with respect to the visible appearance of solidity. If solidity were a property the visible appearance of which was to be understood in just this way, then a world in which the visible appearance of solidity were regularly causally associated not with solidity but, say, with heat, then the visible properties of the object would be the visible appearance of heat, and be the appearance of that property in no less a sense than those properties would be the appearance of solidity. But this seems false. And that suggests that there is some necessary connection between solidity and the visible appearance of solidity.

If this does not directly amount to a contradiction, the relation between solidity and the visible appearance of solidity is nevertheless puzzling. Were solidity an observational property, then we could account for the fact that the relation between solidity and the look of solidity appears to be intrinsic, and so distinct from the kind of relation that obtains between being made of H<sub>2</sub>O and having the visible appearance of being made of H<sub>2</sub>O. But solidity is not observational. Were solidity to be a non-observational scientific property, like being made of H<sub>2</sub>O, and were solidity to be visibly manifest in the same way that a non-observational scientific property like being made of H<sub>2</sub>O is capable of being visibly manifest, then we could account for the fact that solidity and the visible appearance of solidity are distinct from one another, and capable of being instantiated independently of one another. But solidity is not a non-observational scientific property, and solidity is not visible in the way that such non-observational scientific properties are visible.

3.

Given our earlier assumptions, this tension does not seem to be resolved by taking the notion of looking solid to be understood in epistemic terms. There are different ways that such an idea might be developed, and various similar ideas have been pursued in the literature on varieties of ‘looks talk’.<sup>9</sup>

Here is a simple version of such a thought. Some particular object O has the visible appearance of F if and only if it has that visible property (or those visible properties), whatever it (or they) may be, that would constitute evidence for the judgement that O is F, or that would constitute a sufficient basis for knowledge that O is F. Though both approaches involve epistemic notions, this idea differs from the ‘evidential’ approach to appearance discussed earlier in two ways. First it is a view on which appearance is a property of an object, in a way that the earlier view was not. Second, this approach does not carry the implication that O’s appearing F entails that the proposition that O is F is taken to be true or likely to be true by one who experiences such a visible property of an object. So, on this view, the idea is that for a dog to look dangerous is for the dog to have those visible properties, whatever they are, that would constitute a sufficient basis for knowledge or justified belief that the dog is dangerous.<sup>10</sup> That is consistent with the dog not being dangerous, and with a subject experiencing the visible properties that would warrant such judgement while knowing full well that the dog is not dangerous. Perhaps, then, what it is for something to look solid is for it to have those visible properties, whatever they are, that would constitute evidence for a judgement of solidity.

The worry with this proposal is that one can know what it is for something to look solid in this sense without having any knowledge of solid looks, and without experience of the visible appearance of solidity. One might know that for any property F, something looks F if and only if

it has that visible property, whatever it is, that provides evidence for the judgement that something is F. And one may know that 'solidity' is a property that can be substituted into such a schema. But one may not know what visible solidity is, because one does not know what visible properties play this epistemic role, and fail to know this because one lacks experience of solid looking things. For example, one may know that dogs look dangerous when they have visible properties that are evidence for the judgement that the dog is dangerous without knowing that such dogs look agitated, wild-eyed, and prone to snarling and baring their teeth. That is what one needs experience of the look of dangerous dogs in order to know. A good account of solid looks should be consistent with what was earlier called the 'experience constraint'. And this proposal is not.

One suggestion at this point might be to distinguish between partial and complete grasp of what it is for something to look solid, and to add that a complete grasp of what it is for things to appear in this way requires knowledge of the visible property or properties that plays the relevant epistemic role in the case of solid objects. Experience of the look of solidity, it can then be said, is required in order to know what visible properties fill the role required by the general epistemic characterization of looks. So, it might be argued, this epistemic approach can be made consistent with the experience constraint.

But this just raises the question of what that visible property is that plays the relevant epistemic role. If the idea is just that the property that plays this role is that of looking solid, no substantive explanation has been given. The proposal then amounts to the idea that something looks solid if and only if it looks solid. This is trivially true, and doesn't illuminate the notion of solid looks. Alternatively, the suggestion may be that the visible properties that play the relevant epistemic role are a set of observational properties that, because solidity is distinct from any

observational property, does not include solidity itself. If that is the idea, then for all that has been offered on this approach, solidity may be just a scientific non-observational property like being made of H<sub>2</sub>O, and may be visible only in the way that being made of H<sub>2</sub>O is. But solidity is not such a property, nor visibly manifest in the way that such properties are. So the nature of looking solid remains unexplained on this approach.

This worry also attends a related way to understand the notion of appearance. One idea that emerges in different ways in the discussion of looks and looks talk is that the notion of things looking a certain way can be understood in terms of an explicit or implicit comparison to other things.<sup>11</sup> Suppose one thought that for something to look F is for that thing to look like F things, where to look like F things is to have that visible property, or those visible properties, whatever they are, such that in having them it is visibly similar to things that are F (in certain salient circumstances). Then for this rock formation to look like a witch's head is for that thing to have visible properties, whatever they are, the possession of which constitutes visible similarity to a witch's head (under certain salient conditions). So adopting this approach, something would look solid if it looks like something solid, where to look like something solid is to have those visible properties, whatever they are, such that in having them it is visibly similar to solid things (in certain salient conditions).

But then what it is for something to look solid is something capable of being known independently of experience of things that look solid. For one can know that things which look like they are solid are things which have those visible properties, whatever they are, in virtue of which they are visibly similar to solid things under various conditions, without knowing what those visible properties are, and so without knowing what the relevant look of solidity is. The response that a complete grasp or knowledge of what solid looks are requires knowledge of what properties fill this role focuses the question what the visible property is, or those visible properties are, which play this role. If the relevant property is simply 'looking solid', then this

account is not illuminating, for the nature of this property is what is in question. If the thought is that the relevant visible properties consist of a range of observational properties that do not include solidity (given that solidity is not observational) then for all that the account has provided us with, solidity is a scientific non-observational property, and visible in the way that scientific non-observational properties are. So looking solid also remains unexplained on this ‘comparative’ conception.

#### 4.

Some of these difficulties also appear to emerge in various places in the discussion of looks and solid looks offered by M. G. F. Martin (2010) and (2012), a discussion that informs the present work in a number of ways. I have here been drawing on Martin’s notion of an observational property, and I have followed Martin’s own reasons for taking it that solidity is not an observational property. Solidity is not an observational property because perfect holograms have a solid look, though they are not solid, and cleverly disguised glass lights can be solid yet internally illuminated in such a way that they do not have a solid look.

But though Martin takes it that solidity is not an observational property, he takes it that solidity is to be distinguished from such properties as being a tomato (and, by extension, such properties as being constituted from microscopic objects described in the vocabulary of basic physics). What is distinctive about the latter properties, he suggests, is that they are only contingently connected to their looks. For example, there are tomatoes that do not have the look of tomatoes, and there are things which have the look of tomatoes, but which are not tomatoes (tomato-visual-duplicates, or ‘schmatoes’). But this is not the case with solidity, he maintains. Anything that has the look of something solid has a look that is non-contingently connected with being solid. The look of solidity could not be the look, the visible appearance, of any other

property, in the way that the look of a tomato could be the very same look as the look of a schmato. And that is so, even if, in some particular case, the look of solidity is taken on by something that is not solid, as is the case in the example of perfect holograms. On Martin's view, perfect holograms are intrinsically deceptive, in necessarily presenting the look of things that they are not.

Another respect in which, for Martin, solidity is to be distinguished from such properties as being a tomato concerns one's knowledge of solidity through acquaintance. Martin argues that in the case of properties such as being a tomato, a subject may know of the appearance of tomatoes through acquaintance without being acquainted with the property of being a tomato. He says that if someone, 'William', has only ever encountered schmatoes (visual duplicates of tomatoes) and is then introduced to tomatoes, he will encounter a look that he already knows of, because the look of tomatoes is the same as the look of schmatoes. And he will also come to learn something about tomatoes:

In this possible scenario, it seems as if William learned something new in encountering a tomato for the first time, so his visual acquaintance with a sample tomato puts him in a position to know about some kind or property he had not encountered before: the kind tomato, and the property of being a tomato. Nonetheless, William recognized straight off the appearance that the sample had, so the appearance was not something new to him—it was something he already had knowledge of and was acquainted with. (2010, p.199)

But Martin suggests that matters are not like this with the visible appearance of solidity. In the case of solidity, we cannot in a similar way distinguish between acquaintance with the look of solidity and acquaintance with being solid. He says: “[I]f it is conceivable that someone should

have visual access to a world that contains no solid objects but did contain some holograms, then we would have to grant the possibility that someone can be acquainted with the property of solidity through encounter with these holograms, without ever having encountered an object that exemplified the property.” (2010, p.207).

Martin’s response to these apparent features of solidity is to qualify the ontology of looks. He says that it is not the case that looks properties of objects are to be identified with observational properties, because solidity is not observational. Yet solidity is a property that is capable of appearing in a way that properties like being a tomato are not. Looks properties are, thus, identified with the category of ‘*visually basic properties of objects*’, which are then characterized as ‘those by which visual resemblance is fixed’ (2010, p.207). This category includes observational properties, but also non-observational properties such as solidity.

The difficulty here is that it is not straightforward to get a grip on the category of ‘visually basic properties’ and what is distinctive of their visibility. On Martin’s approach, the basic feature common to observational properties like being red or being cubic, and putatively non-observational properties such as being solid, is that there is a non-contingent connection between the property and its appearance, or that the property ‘determines’ or ‘fixes’ facts about the visible properties. The feature that differs is that being solid determines visible properties in some such way that is consistent with the fact that solidity and the appearance of solidity can be instantiated independently of one another. What is needed at this point, it seems, is some further explanation of what the source of the difference between being solid and being a tomato is, and what it is that distinguishes the way that solidity determines visible appearance and the way that being a tomato determines visible appearance. But this question is not something that Martin discusses any further in his paper.

The picture is further complicated by Martin's claim, presented above, that in a world without solid objects, perceptual acquaintance with the appearance of solidity would guarantee perceptual acquaintance with solidity. The complication is that it is difficult to see how a property for which this is true could fail to be observational. For the natural way to read this claim, given that acquaintance is an extensional relation, is as depending on the idea that the appearance of solidity guarantees an instantiation of being solid. And that is just what it is for a property to be observational in Martin's terms. That acquaintance with solidity in a world without solid objects would entail that there is an instance of solidity also raises the question of what would instantiate that property in those circumstances.

So one might have different worries about Martin's discussion. Some claims suggest that by the lights of Martin's own account, solidity appears to be both non-observational and yet observational. And the idea of a property determining visible resemblance in a way that differs from the way that non-manifest properties like being a tomato do, but which is consistent with being non-observational, seems to remain in need of explanation.

Martin's discussion of solidity also allows us to focus some further questions about the substance of the notion of solid looks. Martin's approach to the visible appearance of solidity is framed by the idea that the distinction between solid objects and mere visibilia, which for him includes light objects and shadows, is itself something that can be visibly manifest to us in perception. The look of solidity can thus be understood as a kind of look that contrasts in various ways that are accessible to the perceiving subject with the way that light objects and shadows are characteristically manifest. The looks in question are not directly characterized, but the contrast between solidity and visibilia with respect to their manifest properties is described as a contrast between those things "which have determinations that relate just to the visible world, and those

whose nature extends beyond the purely visual.” (2010, p.207–7) Slightly expanded, solid objects are characterized as “[O]nes that have a nature beyond the visual realm.” (2010, p.207) The implication is that the look of solidity, for Martin, where that is to have a look the possession of which is what explains the visibly manifest contrast with visibilia like holograms and shadows is ‘looking to have a nature that extends beyond the purely visual realm’. This is the impression suggested by the following remarks:

So, one might hypothesize, one aspect of the visible world that is manifest to us, and an aspect of some objects that is also manifest, is whether they are pure visibilia or not. That is, echoing Locke, we might surmise it as a visibly manifest feature of solidity. (Albeit, for the term to encompass the intended domain, clouds or mists have to count as appearing solid even when thinly dispersed. (2010, p.207)

These claims are in tension with the everyday notion of solidity and looking solid. Perhaps under very special conditions of illumination some thinly spread clouds of mist might be non-misleadingly characterized as looking solid. But in the absence of such special stage setting, in our ordinary thought and talk about the look of things we do not generally pick out thin cloud and thinly dispersed mist as having a solid look. That is not to hold that we are tempted to characterize cloud and mist as having the appearance of things that are manifestly light objects, or visibilia. I take it that outside of certain special conditions of appearance, we are not so tempted, and we do not so describe them. It is to maintain that the everyday conception of looking solid is not the notion of a look of having a nature that extends beyond the visible realm, that is, the look of being more than a visible. Clouds and thinly dispersed mist are naturally conceived of as looking gaseous, or having the look of gases, not looking solid.

The distance between this notion of looking solid and our ordinary notion of looking solid is also manifest in reflection on the look of liquidity. When I look at the water of the Mediterranean stretching away in front of me the water does not have the appearance of a pure visible. That water, particularly visible stretches of water relatively distant from me, look possessed of aspects not manifest to sight. But where we are using the everyday notion of solidity and solid looks, we would not describe such water as looking solid. It looks liquid, where that is a look that we contrast with the look of solidity.

I do not present these remarks as an objection to Martin's account of solid looks. The charitable interpretation of the direction of discussion in the relevant passages of Martin (2010) is that what is here at issue is a conception of looking solid that is to be distinguished from the ordinary one, a conception that does special theoretical work in Martin's project in that paper. But granting this, we remain in need of an elucidation of the ordinary notion of visible solidity, where that is a notion of an appearance property that can be distinguished from looking liquid or looking gaseous. And we also need to resolve our question about whether solidity is observational or not. The basis of suggestions about both of these questions is a proposal about the nature of solidity, according to the everyday, non-scientific notion of that property.

## 5.

It is a natural thought that there is some philosophically significant connection between the notions of solidity and touch. This idea is a theme of much early modern work on 'the origins of ideas' and early modern discussion of the distinction between primary and secondary qualities.<sup>12</sup> Even if we assume that solidity is a property that perceivers can come into contact with through different perceptual modalities, there appears to be something special about the contact that perceivers have with solidity through touch and bodily action. The relevant question at this stage

is precisely how to understand these connections, and how they might function as part of a proposal about the character of solid looks. In this section I begin to develop some answers.

My proposal about how to answer these questions about solid looks takes a roundabout route. I begin by focussing on a different property: transparency. In his contribution to this volume, Mark Kalderon offers an account of the notion of transparency that figures in Aristotle's discussion of colour in *De Sensu*. In *De Sensu*, Aristotle characterizes colour as "...the limit of the transparent in a determinately bounded body" (III 439b11). Kalderon raises the question as to what Aristotle's implied distinction between 'bounded' and 'unbounded' here consists in. He suggests we should here understand the notions of 'bounded' and 'unbounded' in 'perceptual terms':

Nontransparent bodies, such as opaque solids, are perceptually impenetrable. Unlike transparent bodies you cannot see in them or through them. Their surface is the site of visual resistance; perceptual impenetrability determines a visual boundary through which nothing further can appear. Transparent bodies, in contrast, are perceptually penetrable. One can see in them and through them. The particulars arrayed in a transparent medium appear through that medium. The transparent is unbounded since it offers insufficient visual resistance to determine a perceptually impenetrable boundary. And this is true of transparent solids such as crystals and tortoise shells as well as transparent liquids such as air and water. (this volume, xx)

Transparent things don't offer resistance to the power of sight, and are thereby capable of being seen through. On this view, surface colour, and the corresponding notion of colour

appearing on the surface of an object, is the limit of volume colour, as an object or medium offers more and more visual resistance to sight. Kalderon offers the example of coloured solution being gradually mixed into the clear water of a tank. As the coloured liquid is added, it changes the volume colour of the water in the tank. The water will look less and less transparent as it offers more and more resistance to the power of sight to see through. In the limiting case, after a sufficient amount of colour has been added, the tank appears to contain a completely opaque coloured object. Whether a medium offers visual resistance or is perceptually penetrable will depend on the distance from which the medium is viewed. Media like air and water are transparent over short distances, but as the distance increases, the way that the medium scatters light causes more and more resistance to the passage of perception through it. The increasing blueness of the sky as the distance increases, and the increasing blueness of the water as the distance increases increasingly prevents the passage of sight further into the medium.

Suppose that some general notion of what it is for something to fill space is at work in the notion of transparency that Kalderon discerns in Aristotle's *De Sensu* remarks. Something is space-filling in this sense if it blocks off or fills out a region of space for the operation of some capacity or capacities. If something fills out space in this way, those capacities are not capable of being actualized in or through the relevant region of space, and cannot take, or discover objects within that region of space. A region of space is unfilled, empty, or 'penetrable' in this sense, if it is open for the operation of the relevant capacity, or presents no resistance or hindrance to the capacity being actualized through it or in it.

Then we might also see Kalderon's remarks about the relation between colour and surface as one manifestation of a more general conception of the relation between the notion of filling space in some way and the notion of a surface of something space-filling. In Kalderon's discussion, the notion of surface colour was explained in terms of the notion of the limit of surface colour. One might see this as a manifestation of the idea that regions of space can be

filled out more or less by what occupies them, depending on the degree to which they block off that region of space for the actualization of the relevant capacity. The limit notion here is that of a surface. A surface of something space-filling is the limit of something presenting a hindrance or an obstacle to the actualization of some capacity. This limit is determined by the point at which the capacity is no longer capable of operating at all, to any degree, through or in the relevant region of space.

If we had such a general conception of space-filling, we could type modes or manners of filling space by reference to the capacities actualizations of which are prevented or permitted. According to Kalderon's account of the *De Sensu* discussion, opaque objects would be taken to be space-filling *for sight*, that is to be things which block the power of sight from being actualized in or through the medium of empty space. Non-opaque or non-transparent objects are not space-filling for sight, or leave space open or unfilled for sight.

I want to propose that the notion of solidity, understood as manifest solidity, can be understood in a similar way. Solidity is the property of being space-filling for touch and bodily action. Things which are space-filling for touch and bodily action are things which block off space in such a way that they afford various kinds of actualizations of the capacity for touch and bodily action and prevent others. Things which are space-filling for touch and bodily action afford touch, in the sense of tactual contact, and associated kinds of haptic activity that involve touch, activities such as 'actively feeling around'. And, we might say, extending Kalderon's characterization of the perceptual notion, being space-filling in this way involves being blocked off for penetrative forms of touch and bodily action. Things that fill space in this way prevent parts of the body from moving through, or in, the region of space so filled out, and so do not afford reaching or feeling through but afford only pushing or pressing against.

The idea of space as filled for touch and bodily action contrasts with the notion of space being unfilled or open for the movement of touch and the body. Regions of space are unfilled in this way when they do not afford touch and bodily activities involving touch but afford reaching, grasping, and more generally, bodily movement through. As in the discussion of the perceptual notion of transparency, we can accommodate the idea that space can be filled out more or less. Things may afford reaching and moving through more or less. One notion of a surface of what is space-filling for touch and bodily movement is the limit notion of the idea that things can fill out space for touch more or less. A surface is a boundary between a region where space is filled in a way that completely prevents the movement of the organs of touch into the space that is occupied, and a region of space through which touch and the body are able to move. Such boundaries can be touched and felt around but cannot be felt through or penetrated, only pushed against.<sup>13</sup>

Why must this account make reference to such capacities? An alternative suggestion at this point might be that solidity is just that property of filling out space in such a way that it has the power to exclude other objects from occupying the space that it occupies. On this approach, the relevant notion of impenetrability is not specified in terms of the power to resist parts of the body. The problem with this proposal is that solid things do not exclude every 'object.' A tightly focused beam of light is, in some very general sense, an object. It is something that has boundaries, properties and is capable of being referred to through the apparatus of singular reference. But beams of light can pass through transparent solids. Their passage through transparent solids involves their occupying the same space as the transparent solid. It is other *solid* objects, of course, that space-filling objects exclude from occupying the same space and resist the movement of.<sup>14</sup> But if we understand the property of solidity as that of filling space in such a way that whatever possesses it excludes and resists other *solid* objects, then although this claim is true, it seems that the notion of solidity has not been illuminated by the explanation.<sup>15</sup>

Someone might have the following worry. Suppose that the objects, the solidity of which is in question in the definition, are objects independent of one. Then such objects are solid if they fill out the space for touch and bodily action. But such objects are space-filling for touch and bodily action, only because the fingers and other body parts are also space-filling for touch and bodily action. Were they not, then space-filling objects wouldn't limit their movement. But then one understands what it is for such objects to fill out space in this way, it seems, only because one has a prior understanding of the fact that one's own body fills out the space for touch and bodily action in this way. So this proposal presupposes an understanding of solidity in just the way that the suggestion previously discussed did.<sup>16</sup>

It is true that an understanding of what it is for objects independent of one to fill the space for touch and action requires a grasp of the fact the way that one's own body fills out space in this way. But this is something that agents can be credited with a distinctively basic grasp of. There is not the space here to offer a full account of what such a grasp consists in. But amongst the constituents of such an account would be the idea that one's grasp of these properties of the organs of touch and the body is, for normal, suitably empowered perceiving subjects, proprioceptive.<sup>17</sup> That grasp is delivered by a mode of perceptual awareness of one's body and its parts that is non-visual, and does not present the body as one object amongst others. Through proprioception we are aware of the position of our body and body parts in space, but also aware of one's own body and its parts filling out the space that it occupies. This awareness is recessive in everyday consciousness, and it may be that it emerges in a distinctive way in tactual experiences in which the organs of touch make contact with other space-filling objects. But contact with other solid objects does not seem necessary for it.<sup>18</sup> In normal consciousness, the experience of moving a limb through empty space appears to have such awareness of the limb as filling space in this way as an irreducible ingredient. That such awareness is not essential visual,

and does not consist in one's awareness of the limb as an solid object independent of one is evident in the fact that such awareness can survive shutting one's eyes.

One further general worry about these suggestions is that in understanding solidity by reference to notions of touch and the body, solidity is taken to be subjective in some way that is not capable of accommodating the prima facie objective character of this property.

This worry ought to be resisted. On the view suggested, for an object to be space-filling in the relevant way is for it to fill out space in such a way that it has a power to resist the movement of touch and the body. That an object is solid in this sense is objective in that its being solid is independent of whether anyone is in tactual contact with it, or whether any anyone ever will be. Things existed which filled space in such a way that they grounded these powers prior to the existence of sentient creatures with the capacities for touch and movement, and would still have existed had animate agents never existed. This understanding of solidity is capable of being extended in different directions. There are things which are solid but which are too small to be touched by us. We understand the solidity of such things by analogy, by the imaginative extension of our bodily powers, or through the idea of a space for touch and bodily action that has different dimensions to our own.<sup>19</sup>

The proposal here does involve the idea that we understand such a property by reference to our bodily capacities, and in that sense involves the idea that solidity, in the manifest conception is a property that has to be understood in an 'agent-dependent' way. But whatever subjectivism this introduces into the notion of solidity is motivated. On the one hand, solidity, according to the manifest conception, cannot be identified with any scientific property. On the other, the idea that solidity can merely be specified in terms of impenetrability by other objects, or the power to exclude other objects, is either too strong, in failing to count transparent solid objects as solid, or appears to presuppose a grasp of what solidity is. In the next section I attempt to show that these proposals can help us to understand the notion of solid looks.

6.

Something looks solid when it looks space-filling for touch and bodily action. Looking space-filling for touch is a visible property of an object. We can understand what this visible property is through reflection on the conditions in which experiencing subjects can be visually acquainted with it. Looking space-filling for touch and bodily action is that visible property that experiencing subjects are visually acquainted with in the relevant conditions. Those who lack familiarity with these conditions will not be in a position to grasp what the relevant visible properties are.

To begin, it does not follow from the fact that an experiencing subject is visually acquainted with an object that possesses the look of solidity that the subject is visually acquainted with the look of solidity. A yacht at sea may be visibly solid (not being constructed in such a way as to look like a yacht shaped illuminated region of empty space, say). Yet viewing it from the shore, from many miles distant, through a fierce heat haze, an experiencer will not be visually acquainted with the visible solidity of that yacht. And again, while distant mountain ranges are solid, and look to be such, the viewer who views them from many miles distant will not be visibly acquainted with such solidity. They may look to the subject like a bank of clouds stretching across the horizon.

So what is distinctive of the conditions in which experiencing subjects are capable of being visually acquainted with the visible solidity of objects? A complete and fully detailed answer to this question goes far beyond what I can offer here. Here I can only motivate some ideas that provide an outline of a solution. We might begin with the following thought. Human beings are experiencing agents as well as experiencing subjects. As well as being subject to various perceptual processes that affect and modify them in various ways, human beings are

capable of moving themselves, and of engaging in intelligent intentional action in, and on, their perceived environment. Part of the many and various interrelations between perception and action in human experiencers are the ways in which perception makes the experiencing subject aware of the possibilities for action in his environment. Some of the ways in which perception makes the experiencing subject aware of the possibilities for action concern the possibilities for action within the environment in the immediate and near-immediate future. Perception most importantly provides a subject with awareness of where and how the animal can move, in the immediate and near-immediate future, given the disposition of perceptible objects in the immediate environment. Characteristically, a normally functioning human being is visually aware of a region of space, populated by visible objects, a region centred on himself and extending in front of him for some distance (though not indefinitely as far as is visible), as a space which is open for, or available for, immediate and near-immediate action, including haptic exploration.

For a subject to be aware of a region of space in this way does not seem to depend on the occurrence of bodily action. It is consistent with bodily immobility. Such awareness of a region of space as open for action in this way also does not seem to consist in cognition about space and its various practical properties. Not all agents for whom the environment is presented in this way are sophisticated enough to have a concept of space or of parts of space. It might be suggested that this perspective on space belongs to the agent who is in a position to engage in action on the environment, the agent who is poised for immediate bodily action. We could say that the awareness of a region of space around himself as open for immediate action is the manifestation of an agent's being 'capacitated with respect to bodily capacities'; that is, not merely possessed of such capacities for bodily action, but being in a position to use them. One who is capacitated with respect to bodily capacities is primed for action and so registers his visual environment in a way that is sensitive to the possibilities for action.<sup>20</sup>

We can make some further claims about the structure that this form of awareness takes. Where a subject is visually acquainted with visible objects, and such a state of practical capacitation obtains, the subject is aware of those objects as falling within the region of space that is available for immediate action. In turn, these objects of visual acquaintance, in these circumstances, have appearances the character of which seems intrinsically connected to the way that they are presented as falling within this space that is open for immediate action.

If an object of visual acquaintance is presented as having visibly solid appearance it looks possessed of a visibly solid surface. Objects that look possessed of a visibly solid surface appear to fill up the space for immediate action in appearing to provide limits to the capacity of touch and bodily action to reach further through the space that the object occupies. Things that look solid then look to close off or fill up the space through which touch and bodily action can move. Where an object of visual acquaintance visibly appears to provide a limit to the space that is open for immediate action in this way, such acquaintance necessarily involves an awareness of the space which is thereby limited, that region of space which one is aware of as open or unfilled for the passage of the body, and so, available for the body to pass through.

One manifestation of these connections between visual acquaintance with visible solidity and the idea of awareness of a space for immediate action, through which touch and the body can move unhindered, is the distinctive phenomenology of certain kinds of illusions of solidity. Under certain very special circumstances, distant cloud formations may present themselves as visibly solid objects. A distant cloud, under certain very specific lighting conditions, may present itself as a visibly solid teapot, say, or very nearly a visibly solid teapot. In such circumstances, one characteristically has an illusory experience of the distance between oneself and the cloud as being much smaller than it is. The character of the experience that one has can be explained on the account offered here. One is subject to an illusion of the distant cloud falling within that

region of space that is open for immediate action. But for things to be presented as falling within this region is for them to be presented as being much nearer to one than the distant cloud is, and than one knows the cloud to be.

Visible solidity, understood along these lines, is distinct from visible opacity, where that notion is understood in terms of the earlier discussion of transparency. A human experiencer's visual experience of the world presents objects at various distances, and the awareness of objects at a distance brings with it the visual awareness of a transparent region of empty space through and in which objects are visible, and in which objects could come to light for sight. But an object like a polished glass sphere may look penetrable to the power of sight, in looking transparent, and yet look solid, in looking possessed of a surface that sets limits on the capacity of the body to act in or through the region of space it visibly occupies.

These ideas about visible solidity suggest a way of addressing the issue about solid looks raised in connections with Martin's discussion, in providing for a notion of solid looks that is capable of distinguishing between some of the varieties of ephemeral appearance. Visibilia such as beams of light or holograms characteristically do not look solid. That is not to say that they have such a thing as the appearance of non-solidity, in some generic sense in which that singles out some determinate way for things to look: the non-solid way. Corresponding to a basic range of broadly material looks are different kinds of looks determined by their different relations to the powers of touch and the body. Things like beams of light and holograms characteristically appear coloured or bright. But they also characteristically look penetrable to touch and bodily action. They do not look such as to afford tactual contact. Light objects such as these look such as to afford being reached into and through, in such a way that the passage of the body part through the boundary and into the light object is not detectable kinaesthetically.

Related suggestions might be made about the visible appearance of liquid things. Things that look liquid in this sense look penetrable to touch and open for the passage of the body

through them. This is a property that they share with the look of the holographic and of light objects. What distinguishes the visible appearance of liquid appear to be further characteristic properties of the surface of liquids, which contrast with the appearance of light objects and other pure visibilia. Things that look liquid characteristically appear to some degree unfilled for the actualization of touch and the body. An account of the differences between the appearance of light objects and liquidity ought to be sensitive to the differences in the visible properties of the boundaries of the lit and the liquid. The boundaries of liquid, unlike those merely illuminated regions of space that are completely unfilled for touch, characteristically appear as boundaries that afford touch and tactual contact. Boundaries of liquid characteristically look palpable to touch, but also look penetrable and displaceable by movement of a body part. Unlike things that look like light objects, though, in so far as they look liquid they appear to occupy space in a way that affords reaching and moving through in a way that is not completely unobstructed and involves tactual or proprioceptive contact with what's moved through.

Perhaps our talk of things looking gaseous or looking like quantities of gas—in a way that clouds characteristically appear, one might observe—also draws in some way on such knowledge of tactually determined appearances. A sensitive and fuller account of the varieties of non-solid appearances that had a place for the notion of gaseous appearance would be one that was able to illuminate the respects in which things which look gaseous appear both like and unlike light objects and liquids in different ways. Things like puffy, ragged-edged, very slowly morphing, cumulus clouds characteristically look gaseous. And in doing so, they look relevant similar in certain respects to light objects and holograms. They appear such as to leave space completely open. They look like one could put one's hand through them. But unlike the appearance of light objects, they look capable of being dispersed and destroyed through certain characteristic kinds of bodily actions that move through the space they occupy.

One problem that has been a thread for the discussion in this paper concerns whether solidity is an observational property or not, and how the relation between solidity and looking solid can be distinguished from the relation between being made of H<sub>2</sub>O and having the appearance of H<sub>2</sub>O. Given the proposals suggested in the previous two sections, the situation appears as follows. Solidity on the view adopted here appears to be non-observational, where what is at issue is the relation between solidity and the visible appearance of solidity. On the view discussed here, perfect holograms are things that look solid, in having those visible properties acquaintance with which involves the figure looking to fill out a region of space of which one is aware as open for immediate action. But perfect holograms possess such a look without being solid. This entails that on this approach, solid visual appearance has to be distinguished from solidity itself. Adopting this approach one resists the idea suggested in Martin's discussion that in being visually acquainted with the look of solidity, one is thereby visually acquainted with solidity itself.<sup>21</sup>

But given the suggestions pursued here, one has the resources to resist the idea that the relation between the visible appearance of solidity and solidity itself is just contingent, and no more than a matter of certain visible appearance properties being related in a lawlike way to the property of solidity. The visible appearance of solidity is an object visibly looking to fill out the space for touch and bodily action. This was explained in terms of the way in which agents are perceptually related to visible objects in a way that involves and is sensitive to their being capacitated with respect to bodily capacities. On this view, looking solid is a visible property the nature of which is elucidated by reference to a notion of tactile appearance, the notion of some object filling out space for touch and action. But this property is necessarily connected to solidity, given that what it is for some object is for it to have this tactile appearance is what it is for it to be solid. Solidity is observational, where the category of the observational is expanded to include

tactile appearance. So, put very crudely: Things can have solid visible appearance without being solid. Having solid visible appearance is to look solid feeling. But something cannot be solid feeling without being solid. It is this that explains why the relation between solidity and its appearance is not merely contingent.

The fact that taking solidity to be the property of being space-filling for touch and the body seems to have the consequence that the properties of feeling solid and being solid are necessarily co-instantiated (so that solidity is ‘observational’ in an expanded sense) might raise some doubts. For it might be argued that there are clear cases of things feeling solid and yet not being solid. If that were the case, solidity could not be understood in this way, because it has a false consequence.

But there are no such clear cases. One worry might derive from the characteristic properties of non-Newtonian substances, such as suspensions of cornflour in water. If one fills a swimming pool full of a suspension of cornflour in water, and moves quickly enough, one can run across it. The suspension is liquid, not solid. But for the suspension to take the weight of even the quickest runner, it must feel solid. Therefore, it might be said, solidity cannot be observational. But I dispute that the non-Newtonian substance, in the conditions described, is solid. What is distinctive of such substances is that they change their condition when pressurized in characteristic ways involving the sudden and concentrated exertion of force at their surfaces. Under pressure in this way, they become solid.<sup>22</sup> So it is not the case here that there is an example of something which is not solid but which feels solid.<sup>23</sup>

A further potential counterexample might be provided by the following case. A highly advanced civilization might artificially engineer a substance that is solid, but which changes its condition when anyone approaches it in order to touch it: it becomes suddenly transformed into a liquid, say. Isn’t this a substance which, in the pre-liquid phase, is solid, but which does not feel solid, in the sense of filling space in a way that resists touch and the movement of the body?<sup>24</sup> For

any attempt to touch such stuff causes it to transform into liquid. Here we should maintain that before turning liquid the substance is solid, and feels solid, in the sense of having solid tactile appearance. The respect in which such a substance is not capable of being touched while it is in the solid state is contingent in some basic sense. The very idea that the sophisticated nanotechnology works to prevent the surface from being touched or contacted by the body implies that the substance is contactable and space-filling for touch. The mechanism in a case like this simply reliably works to stop this possibility from being actualized.

## 7.

I want to address what might seem a natural source of worry about the account suggested here. Considering this worry will allow us to clarify some aspects of the current proposal, and identify a number of questions for further research.

George Molyneux asked Locke whether a man born blind, on regaining his sight in maturity, would be capable of distinguishing between two visibly presented shapes, a cube and a sphere, the distinction between which previously he had only been aware of through touch.<sup>25</sup> Molyneux supposed that he would not.<sup>26</sup> Locke agreed, and seems to introduce Molyneux's question as support for his proposal that "[T]hat the *Ideas we receive by sensation, are often in grown People alter'd by the Judgment, without our taking notice of it.*" (1689: II.IX.§8, 18–20) He goes on to illustrate this:

[W]e having by use been accustomed to perceive, what kind of appearance convex bodies are wont to make in us; what alterations are made in the reflections of Light, by the difference of the sensible Figures of Bodies, the Judgment presently, by an habitual custom, alters the Appearances into their Causes: So that from that, which truly is variety of shadow or colour, collecting the Figure, it makes it pass for a mark of Figure. And frames to itself the perception of a convex figure, and an uniform colour; when the *Idea* we receive from thence, is only a Plain variously colour'd as is evident in Painting. (1689: II.IX.§8, 24–33)

Suppose, that for shape, we substitute ‘solidity’. And suppose that we are invited to share the conviction that a man who had recently regained his sight was acquainted with solidity as a tactually discernible property of objects, that is, he knew through the sense of touch what it was for an object to limit the space for his bodily movement and haptic touch in various ways, but was not in a position to tell that solid objects were solid on the basis of visual perception. Let us suppose, further, that the reason why he was not in a position to tell that solid objects were solid on the basis of visual perception is that such a subject did not have a visual experience of the solid look of the object. Would this be problematic for the proposal that has been sketched out here? Would this not show that the solidity of an object is not capable of figuring as visible appearance, at least where the notion of what is visible is strictly understood?

It is not clear why. It is natural to respond that there are certain requirements on the development of the capacities involved in being visually acquainted with visible solidity, and those who have been born blind have missed out on these stages of development. This causes them to lack a capacity they might otherwise have possessed. There are many questions about exactly what kinds of psychological capacities, perceptual and agential, this way of being related to the environment involves. Addressing this issue goes far beyond the scope of this paper. In

advance of such discussion, however, it seems likely that two central ingredients of such a story would be the exercise of capacities for bodily action and haptic exploration through, and in, an environment that is simultaneously visibly presented to one, and a grasp on the notion of solidity, through one's practical engagement with objects that fill out the space for touch. It is a plausible thought that over some period of time in early infancy, sight and touch are co-ordinated in such a way that visual awareness of visible solidity emerges. It is an empirical question how the capacities and structures that support this way of being related to one's environment develop, and how they relate to the subject's development of visual capacities.<sup>27</sup> Such an account would detail how sub-personal representations of light, colour and shape, relate to sub-personal representations of tactile properties of objects, and how both of these representations are coordinated with the motor system.

None of this entails that mature human experiencers, who are related to their environment in a way that involves the notion of awareness of a space for touch and bodily action, are not capable of being visually acquainted with the look of solidity, or that the property that such mature experiencers are so acquainted with is not a visible property. Those whose course of perceptual and agential development has proceeded normally are those for whom new visible properties of the environment have come into view. For such experiencers, the presence of such visible properties is not something that need be established through technology-involving extensions of visual capacities, or by inference from what vision provides in the light of knowledge of the lawlike relation between appearance of a certain kind and solidity. These seem to be basic respects in which looking solid in the sense explained here is a visible property of objects.

Perhaps some might read Locke's remarks as providing the material for a response to even this claim about the experience of mature human perceivers. This response is that even for such mature human experiencers, what purports to be acquaintance with visible solidity is really

the judgement that some visually perceived object is solid, made on the basis of past experience (presumably of what happens when the object is touched) and the visually presented evidence. This might be explicitly presented as an ‘error theory’. Things do not appear this way to us. But that is because we make the relevant judgement “without our taking notice of it” (1689: II.IX.§8.20) and because the such judgement “is performed so constantly, and so quick, that we take that for the Perception of our Sensation, which is an *Idea* formed by our Judgement.” (1689: II.IX.§8.33–36)

It is barely plausible that where the notion of judgement is understood in the ordinary sense, as the notion of a rational mental action, that one could judge that *p* and have no knowledge or awareness of one’s judging that *p*.<sup>28</sup> So suppose we set aside the idea that the cognitive representation is judgement, and focus on the more generic notion of ‘belief’. The proposal would then be that acquaintance with an object’s being visibly solid is a case of perceptual belief that an object is solid, (or perhaps the perceptual- demonstrative belief that *that* object is solid). Though various different developments of this idea might be possible, and a full response cannot be developed here, there is very good reason to think that visual acquaintance with solid appearance cannot be understood in these terms.

An obvious difficulty is that one might be visually acquainted with the visible appearance of solidity even while knowing, and so not believing, that the object is not solid. That is the circumstances that obtain if one is presented with a perfect hologram, but in which one knows, on the basis of other sources, that one is looking at a perfect hologram. More generally, it seems to be visual acquaintance with the solid look of an object that puts one in a position to entertain perceptual-demonstrative beliefs that that object is solid, rather than the perceptual-demonstrative belief about solidity itself constituting the visual encounter with solidity. Furthermore, in epistemically optimal conditions it seems to be the fact that some perceived object has a solid

look that provides the warrant for a perceptual belief to the effect that some visible object is solid. It is difficult to see how this thought is to be reconstructed in terms of the present idea, given the assumption that what warrants a belief is something distinct from itself.

A further worry is the following familiar line of thought. The belief that an object is solid requires that the subject have a concept of solidity. Assuming that possession of the concept of solidity requires the subject to be capable of thinking thoughts involving the notion of solidity, then having the perceptual belief that an object is solid requires that the subject have the capacity to think thoughts involving the notion of solidity.<sup>29</sup> But it seems false that visible acquaintance with the look of solidity (or, in general, the visual experience of visible solidity) requires the capacity to think thoughts involving the notion of solidity.<sup>30</sup> We want to be able to accommodate the idea that infant human beings and non-rational animals are capable of visual acquaintance with the look of solidity, even if they cannot think thoughts about solidity. There is no similar reason to think that the practical orientation to the environment that is a condition for visual acquaintance with the look of solidity is inaccessible to infant human beings, at a certain stage of maturity, and non-rational animals.

## 8.

My goal here has been to attempt to say something about why the visible appearance of solidity is particularly puzzling, and to make some suggestions about the nature of solid looks. The basis of these proposals is a notion of what it is for something to be solid, according to the manifest conception. The proposal is that solid things fill out the space for touch and action. Though many different proposals about the notion of appearance invoke various different respects in which notions of perception or subjectivity are invoked in helping to get a grip on the relevant property, what is distinctive about this approach is the idea I identified from reflection on Kalderon's

discussion of transparency; the idea that solidity can be understood in terms not only of the perceptual and bodily capacities but the idea of a region of space through which such capacities operate and in which they can take objects. I suggested that we can come to understand visible properties through reflection on the kinds of circumstances in which experiencing subjects can be acquainted with them. This led to the idea that our visual experience of our perceptible environment presents things as falling in a space for immediate touch and bodily action, and that acquaintance with visible solidity involved the idea that objects are presented as filling out or blocking off this space.

At the outset of this paper, I noted that the idea that objects are solid, and look solid, is key to our conception of those objects as material, and as appearing material. If the suggestions here are near the mark, then important parts of our conception of material objects and of material appearance implicate notions of touch, bodily agency, and the idea of a structured space through which such capacities can be actualized, and in which their actualization is characteristically limited. This leaves a range of questions open. Clearly, important questions remain about the way in which we understand touch as revealing aspects of manifest solidity. But the most central questions concern the details of how we might best understand the idea of the awareness of a space as available for immediate action, and what is involved when the visible world reflects back to us in this way our capacity for structured practical engagement with it.

## REFERENCES

Aristotle (1984) *The Complete Works Of Aristotle; Revised Oxford Translation*, ed. By J.

Barnes. Bollingen Series. Princeton, N. J.: Princeton University Press.

Austin, J. L. (1962) *Sense and Sensibilia*. Oxford: Oxford University Press.

- Ayers, M. R. (1991) *Locke*. 2 vols. London: Routledge.
- Bolton, M. B. (2007) 'The Taxonomy of Ideas in Locke's *Essay*', in Newman, L. (ed.) *The Cambridge Companion to Locke's "Essay Concerning Human Understanding"*.  
Cambridge: Cambridge University Press.
- Brewer, B. (2011) *Perception and Its Objects*. Oxford: Oxford University Press.
- Byrne, A. (2009) 'Experience and Content', *The Philosophical Quarterly*, 59, 236, pp. 429–451.
- Campbell, J. (1996) 'Molyneux's Question', in Villanueva, E., (ed.) *Perception (Philosophical Issues 7)*, pp. 301-18.
- Chisholm, R. (1959) *Perceiving*. Ithaca, NY: Cornell University Press.
- Crane, T. (1992) 'The Nonconceptual Content of Experience', in Crane, T. (ed.), *The Contents of Experience*. Cambridge: Cambridge University Press.
- Crane, T. (2006) 'Is There A Perceptual Relation?', in Gendler, T. S. and Hawthorne, J. (eds.) *Perceptual Experience*. Oxford: Oxford University Press.
- Crowther, T. (2006) 'Two Conceptions of Conceptualism and Nonconceptualism', *Erkenntnis*, 65 (2), pp. 245–276.
- Eilan, N. (1993) 'Molyneux's Question and the Idea of an External World', in Eilan, N., McCarthy, R., and Brewer, B. (eds.) *Spatial Representation: Problems in Philosophy and Psychology*. Oxford: Blackwell, pp.219- 235.
- Gendler, T. S. and Hawthorne, J. (eds.) (2006) *Perceptual Experience*. Oxford: Oxford

University Press.

Gibson, J. J. (1950) *The Perception of the Visual World*. Boston: Houghton Mifflin.

Gibson, J. J. (1979) *The Ecological Approach to Visual Perception*. Boston: Houghton Mifflin.

Higginbotham, J. (2002) 'On Events in Linguistic Semantics', Higginbotham, J., Pianesi, F, and Varzi, A. C. (eds.), *Speaking of Events*. New York, Oxford University Press.

Hume, D. (2000) *A Treatise of Human Nature*. Edited by David Fate Norton and Mary Norton. Oxford: Oxford University Press.

Jackson, F. (1977) *Perception: A Representative Theory*. Cambridge: Cambridge University Press.

Jacovides, M. (2007) 'Locke's Distinction Between Primary and Secondary Qualities', in Newman, L. (ed.) *The Cambridge Companion to Locke's "Essay Concerning Human Understanding"*. Cambridge: Cambridge University Press.

Kalderon, M. (2015) *Form without Matter*. Oxford: Oxford University Press.

Kalderon, M. (this volume) 'Aristotle on Transparency'

Locke, J. (1975) *An Essay Concerning Human Understanding*. Edited by Peter. H. Nidditch. Oxford: Oxford University Press.

Mackie, J. L. (1976) *Problems from Locke*. Oxford: Clarendon Press.

Martin, M. G. F. (1992) 'Sight and Touch', in Crane, T. (ed.) *The Contents of Experience*. Cambridge, Cambridge University Press.

- Martin, M. G. F. (2002) 'The Transparency of Experience', *Mind and Language*, 17, pp. 376– 425.
- Martin, M. G. F. (2010) 'What's in a Look?', in Nanay, B. (ed.) *Perceiving the World*. Oxford: Oxford University Press, pp.160-225.
- Martin, M. G. F. (2012) 'Sounds and Images', *British Journal of Aesthetics*, 52 (4), pp. 331-351.
- Nanay, B. (ed.) (2010) *Perceiving the World*. Oxford: Oxford University Press.
- O'Shaughnessy, B. (1989) 'The Sense of Touch'. *Australasian Journal of Philosophy* 67 (1), pp.37–58.
- O'Shaughnessy, B. (2000) *Consciousness and the World*. Oxford: Oxford University Press.
- Parsons, T. (1990) *Events in the Semantics of English*. Cambridge, Mass.: M.I.T. Press.
- Peacocke, C. (1993) 'Intuitive Mechanics, Psychological Reality and the Idea of a Material Object.' In Eilan, N., McCarthy, R., and Brewer, B. (eds.) *Spatial Representation: Problems in Philosophy and Psychology*. Oxford: Blackwell, pp.219- 235.
- Siegel, S. (2010) *The Contents of Visual Experience*. Oxford: Oxford University Press.
- Smith, A. D. (2002) *The Problem of Perception*. Cambridge, Mass.: Harvard University Press.
- Smith, A. D. (2003). *Husserl and the Cartesian Meditations*. London: Routledge.
- Soteriou, M. (2013) *The Mind's Construction*. Oxford: Oxford University Press.
- Soteriou, M. (2016) *Disjunctivism*. London: Routledge.

Soteriou, M. (forthcoming). 'Dreams, Agency and Judgement'. *Synthese*.

Spelke, E. S. and Van de Walle, G. (1993). 'Perceiving and Reasoning about Objects', in Eilan, N., McCarthy, R. and Brewer, B. (eds.) *Spatial Representation: Problems in Philosophy and Psychology*. Oxford: Blackwell, pp. 219- 235.

Travis, C. (2004) 'The Silence of the Senses'. *Mind*. 113 (449), pp. 57- 94.

---

<sup>1</sup> Many thanks for detailed comments and helpful discussion are due to Hemdat Lerman, Matthew Soteriou, Guy Longworth, Mark Kalderon, Naomi Eilan, Christoph Hoerl, Matthew Nudds and Clare Mac Cumhaill. Versions of this paper were given at a workshop on Perception and Action at the University of Warwick, in March 2016, at the Inter-University Centre in Dubrovnik in April 2016 and to graduate classes at the University of Warwick. Thanks to participants on those occasions, in particular, Mohan Matthen, Jack Shardlow and Greg Horner. I owe particular thanks to Hemdat Lerman for very helpful and detailed comments on this work.

<sup>2</sup> See, for example, the essays collected in Gendler and Hawthorne (2006) and Nanay (2010).

<sup>3</sup> See Locke (1975, Book II, Chapter IV). For discussion of Locke's account of solidity see Ayers (1991, Vol. 1, Ch. 21) and Mackie (1976, Ch. 1 particularly section 3).

<sup>4</sup> See Peacocke (1993) for discussion.

<sup>5</sup> For relevant discussion see Ayers (1991, Vol.1, Part 1), Bolton (2007), Jacovides (2007).

<sup>6</sup> See, in particular, Chisholm (1957), Jackson (1977), Travis (2004), and Martin (2010).

<sup>7</sup> For discussion see the essays collected in Gendler and Hawthorne (2006), and Nanay (2010). For naïve realist accounts of the nature of perceptual experience see Martin (2002),

---

(2006), Travis (2004), Brewer (2011), Soteriou (2013)(2016). For intentionalist accounts see Byrne (2009), Siegel (2010) and Crane (2006).

<sup>8</sup> Jackson (1977) takes this to characterize an ‘epistemic’ use of a ‘looks-sentence’. See Martin (2010) for discussion of the relation between the notion of epistemic looks discussed in Jackson (1977) and the notion of an ‘evidential’ use of a ‘looks-sentence’.

<sup>9</sup> See Chisholm (1957, ch.4), Jackson (1977), Travis (2004), and Martin (2010).

<sup>10</sup> The example is from Jackson (1977, p.33).

<sup>11</sup> There is interesting discussion of ‘looks like’ talk in Austin (1962, p.40-1). Chisholm (1957) and Jackson (1977) distinguish comparative looks statements from ‘epistemic’ looks statements and ‘non-comparative’ looks statements. Martin (2010) defends the idea that there is a tri-partite distinction between looks statements, of a kind broadly in line with Jackson and Chisholm’s proposals, but charges that Jackson and Chisholm fail to correctly understand this distinction. The basis of Martin’s discussion is a novel semantics of ‘comparative looks-statements’. Constraints of space prevent me from engaging more fully with this aspect of the discussion in Martin (2010), though the general character of Martin’s proposal figures below in connection with the idea that that full understanding of the comparative requires knowledge of what visible properties fill the comparative role.

<sup>12</sup> See in particular Locke (1975 [1689]: II.iv.) and Hume (2000), 1.4.4.

<sup>13</sup> Smith (2002, p.152ff) gives a central place in his discussion of the nature of perceptual consciousness to the notion he calls ‘*the Anstoss*’. He says: “This phenomenon is that of a check or impediment to our active striving, as when we push or pull against things.” (2002, p.53). Much of what Smith says about the Anstoss is consistent with, and closely complements, the ideas about manifest solidity that I suggest here. I do not have the space here to engage with the many questions about the relationships between the proposal here and Smith’s account.

---

<sup>14</sup> This is clear in the way that Locke himself introduces the notion of solidity in the *Essay* at II.IV.2.

<sup>15</sup> The dialectic here closely resembles Hume's argument in the *Treatise* that 'the modern philosophy' provides no adequate conception of solidity. See Hume (2000, 1.4.4.)

<sup>16</sup> Thanks to Christoph Hoerl for pressing me on this.

<sup>17</sup> For relevant discussion see O'Shaughnessy (2000, chapters 23 and 24). See also O'Shaughnessy (1989).

<sup>18</sup> This is a claim directed towards the tactual awareness of normal mature human beings. It is consistent with the idea that the relevant mode of tactual awareness of body parts as space-filling is established simultaneously with awareness of independent solid objects as space-filling for touch in tactual contact with them. On this issue see Smith (2002, p.156-8), O'Shaughnessy (1989), and Martin (1992).

<sup>19</sup> See Locke (1975 [1689], II.vi.1.23)

<sup>20</sup> Aspects of this proposal suggest some of the claims elaborated in Gibson (1950) and (1979), to the effect that the environment of the perceiver contains 'affordances' for action and behaviour, and that in suitable conditions the perceiver is capable of registering these affordances. (See, in particular, Gibson (1979, chapter 8). It is true that I take the manifest notion of solidity to be partly specified in bodily terms, and so 'what it affords for touch and action'. And it is true that this is a property here taken to be visually perceptible.

Nevertheless, my interest at this stage of the argument concerns how visible appearances figures within a perceiving subject's visual experience, and involves the assumption that first personal reflection is capable of revealing the nature of such experience to us. It is not at all clear that Gibson took his account to be an attempt to understand visual experience in this way, nor that this assumption about enquiry into the nature of experience is one that would be acceptable to him. Thanks to Hemdat Lerman for discussion here.

---

<sup>21</sup> Though it is worth emphasizing that for reasons given earlier, it is unclear that the notion of visible solidity that is the target of Martin's discussion is the same as that which is at issue here.

<sup>22</sup> For an entertaining example see <https://www.youtube.com/watch?v=BN2D5y-AxIY>. It is worth pointing out that the fact that the relevant substances change their properties given various changes in proximate environmental conditions—most obviously, temperature—is a perfectly general feature of all of the substances discussed in the paper so far.

<sup>23</sup> Thanks to Guy Longworth for pressurizing me about non-Newtonian substances.

<sup>24</sup> In conversation, Christoph Hoerl presented something like this case (though without necessarily committing to whether it is indeed a good counterexample).

<sup>25</sup> See Locke (1975 [1689]: II.ix.8.)

<sup>26</sup> For an overview of empirical research on Molyneux's problem see. For discussion of some of the philosophical issues Molyneux's question raises see Eilan (1993) and Campbell (1996).

<sup>27</sup> While there is room for much further dispute about exactly what such research shows, existing studies on infant visual perception of solidity suggest that infants are capable of visually perceiving solidity at around three months. For example, Spelke and Van de Walle (1993) show that infants exhibit preferential looking towards stimuli that are made to violate 'impenetrability constraints' on objects. Spelke's work provides no reason to think that the look of solidity has any particular connection with touch, in the way that I have suggested here.

<sup>28</sup> For discussion of the relation between judgement and self-knowledge see O'Shaughnessy (2000, chs. 3 and 5), and Soteriou (forthcoming).

<sup>29</sup> See Evans (1982, pp.223–7).

<sup>30</sup> See Crane (1992), Crowther (2006).