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PERCEPTION

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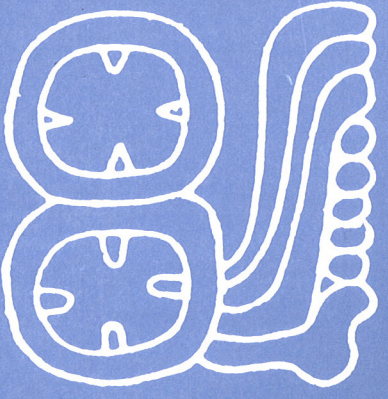

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Molyneux's Question

John Campbell

1 Phenomenal Experience of Shape in Sight and in Touch

Molyneux's Question concerns a man born blind, who can tell by touch which things are spheres and which are cubes, and who now gains the use of his sight. The question is whether he will be able to tell by vision which things are spheres and which things are cubes. The question is about the relations between perceptions of shape in different sensory modalities. Some of the issues which Molyneux was raising have been settled (Brand Bolton 1994, Rock 1984), but there are some problems which remain. I think that one question is whether there is a difference between the phenomenal characters of shape experience in sight and in touch. Of course there are many differences between visual and tactual experience. We are aware of different properties of things, such as colours or textures, through sight and through touch. And there it may be that there is some more general, indefinable but demonstrable difference between visual and tactual experience, a difference in the character of the experience which we use in practice to determine by which sense we are perceiving something; this seems to have been Grice's (1962) view. But we can for the moment set these points aside and ask whether there is any difference between visual and tactual experience of shape itself; whether the shape per-

ception itself has a different phenomenal character in sight than in touch.

What makes a perceptual experience an experience of shape? One possibility is that experiences have their own intrinsic geometry which exists independently of the perceiver's relations to the environment, that there is a phenomenal space in which sensations are configured (Strawson 1966). So there would be spatial properties and relations such as 'is a phenomenal straight line', 'is phenomenally to the left of', and so on. On this internalist view, the existence of a phenomenal geometry in our awareness of objects would be a primitive datum, not explained in terms of anything more fundamental. This view leaves it open that primitive consciousness of shape might be quite different in the different sensory modalities, which will all have their own phenomenal geometries.

An alternative possibility is that what makes one's consciousness consciousness of shape is the fact that one is using a neural system whose role is to pick up the shape properties of the objects in one's environment. The geometrical aspects of one's experience of objects will then be constituted by the geometry of the objects in one's surroundings. This is quite a radical externalism, and to bring this out we can contrast it with a more moderate view. On the more moderate view, sensations of shape, and indeed all perceptual experiences, are stratified into similarity classes prior to any environmental circumstances coming into play: they are intrinsically more or less like one another in this or that respect, such as experiential shape or colour. On this more moderate view, though, external considerations may ineliminably come into play when one tries to say which similarity class of sensations one is identifying: perhaps one can say which sort of sensation one is talking about only by saying that it is the sort of sensation produced by a cube in good light. The basis of this view is the need to allow for the possibility of illusion. Since I can have an experience of a cube which is not in fact produced by a cube, I need to be able to say that it is an experience of the sort which is characteristically produced by a cube in good light, and this presupposes a stratification of experiences into sorts which is prior to the question how they are produced, a stratification which is prior to any environmental considerations coming into play. So although this moderate view is externalist about how in practice we identify classes of perceptual experiences —we do it by reference to their characteristic causes— it presupposes a prior, internalist stratification of experiences into similarity classes.

The alternative, radical externalism holds that the initial stratification of experiences into similarity classes already demands the involvement of the environment, that experiences viewed purely internally would be an amorphous mass. The basis of this view is the point that the idea of a purely internal stratification of experiences gives us no way of understanding what it would be for the experiences of different people at the same time, or the experiences of a single person at different times, to be in the same similarity class. This was the point made in Wittgenstein's remarks on the idea of a private language. The alternative is to suppose that the sorting of sensations into similarity classes constitutively demands an appeal to the environment; and then, since the environment is shared by different perceivers, or by the same perceiver at different times, we have a commensurability between the experiences of different perceivers or the same perceiver at different times. The problem for this radical externalism is the possibility of illusion, since we cannot appeal directly to environmental factors to explain the sense in which an illusion of shape, for example, is experientially similar to a veridical perception of shape. I gestured at a solution to this difficult problem above, when I said that what makes one's consciousness consciousness of shape is the fact that one is using a neural system whose role is to pick up the shape properties of the objects in one's environment; so we would capture that similarity by appealing to the sameness of the underlying neural system, externally individuated. But that is only a gesture.

On this radically externalist picture, shape perception will be amodal, since the different senses will be picking up the very same properties of the objects around one. Insofar as we are externalist about shape perception, we have to think of it as amodal. For insofar as we are externalist about shape perception, we have to think of experience of shape as a single phenomenon, in whatever sense–modality it occurs, individuated by the external geometrical property. For it is in fact the very same properties that are being perceived by sight as by touch. One way to put this point is to say that if there is any question for the perceiver about whether it is the same property that is being perceived through vision as through touch, it must be possible to explain what the basis of this doubt is. And insofar as we are externalist about the character of shape perception, then there is nothing in the character of the experience itself to ground a doubt as to whether it is the same properties that are being perceived through vision as through touch.

This issue affects the way in which we interpret the primitive recognition of sameness of shape perceived in different modalities that we find even in very young children and in animals. On one view, we are simply exploring the ad hoc functional connections between differ-

ent perceptions. There is no rationality about, for example, primitive transference of what one has learned about a shape as presented in one modality to a presentation of that shape in another modality: sameness of the property perceived through sight and touch is not transparent to the perceiver. It may be true that visual perception of a shape and tactual perception of that shape have the same functional connections to behaviour and imagery, but that could be so without it being apparent to the perceiver that it is so. If we are internalist about the phenomenal character of shape perception, that is the obvious interpretation of the data. For the radical externalist, however, there is no difference in the phenomenal character of shape experience in sight and in touch. The sameness of property perceived in sight and touch is transparent to the subject, and cross–modal transfer is a rational phenomenon.

2 What Shape Perception Is

This gives one way of setting up the question of the sameness or difference of shape perception in sight and touch. But you might object that this is quite the wrong way in which to set up the problem. You might object that we have to think of shape properties in terms of their causal significance, and that shape perception is perception of this causal significance. In this section I will develop this causal approach to shape perception. Then I will argue that the approach is incomplete, and that there is still a crucial issue that is addressed by externalism about phenomenal experience of shape.

Before setting out the causal view of shape perception, let us look at the causal view of shape properties. One model for the description of a property in terms of its causal significance is provided by the familiar notion of a power of an object. A power is an input–output state of a thing, a disposition that it has to behave in a particular way in particular circumstances. For example, whether something is brittle is a matter of it tending to break when pressure is applied, for something to be striking is for it to be liable to draw notice, for someone to be drowsy is for him to be liable to fall asleep. These are input–output states. The canonical description of a power is:

> In trigger circumstances C, the object responds in way R.

When we describe the property in this way, we say what it is. If we can say what two properties A and B are in this format, then A is identical to B if the replacements for C and R are the same in the two descriptions. In the examples I have given so far, saying

what the property is might be taken to be a matter of defining the predicate we ordinarily use in ascribing the property to an object. But in general, saying what a property is need not be a matter of defining a term in ordinary use. Saying what magnetism is, or what gravity is, need not be a matter of defining a term as it is used in everyday English. But magnetism and gravity might nonetheless be powers. Or, if we want to keep the notion of definition, we might say that here we have 'real definitions', and that the above is the canonical form of the 'real definition' of an input–output property.

Shapes are not input–output states in this sense. The shape of an object, as spherical or cubical, is not something that affects the behaviour of the object in a uniform way. The shape of an object is, of course, causally relevant to how it behaves. But exactly how it affects the behaviour of the object depends on what other properties the object has. For example, something chair–shaped has the capacity to support a seated human, but only if it is the right size, and only if it is made of rigid rather than thoroughly flexible materials. But being chair–shaped matters for being capable of supporting a seated human, being about the right size and made of rigid materials is not enough. This suggests that we might think of a shape property as something which affects the causal powers of the object that has it, but does so in a way that depends upon just which other properties the object has. For example, being spherical together with being hollow and made of a resilient material will mean that the thing is relatively easy to propel through the air, whereas if it is spherical, solid and made of a dense material it will be harder to get moving but travel for longer. We could put this more formally by saying that a 'conditional power' of an object is something which means that the object will have a certain power, if it has certain further properties. The canonical description of a conditional power is:

> If the object has further properties $Q_1, \ldots, Q_n$, then the object has power P.

The property of being cubical cannot be identified with any one conditional power. Being cubical involves having many conditional powers. Nevertheless, we could still identify being cubical with possession of a cluster of conditional powers. This is Shoemaker's (1984) theory of properties in general. Shoemaker holds that a property is a cluster of conditional powers. He does not hold the converse: that every cluster of conditional powers is a property. To constitute a property, a cluster of conditional powers must have a certain causal unity, not just any tossed–together collection of conditional powers will do. A cluster of conditional powers will constitute a property

only if it contains one or more conditional powers which are such that it is a consequence of causal laws that any object which has those conditional powers will also have all the other conditional powers in the cluster. In what follows I shall be developing this view, but going well beyond anything in Shoemaker's article.

On this view, there can be no more to the perception of shape than the perception of an object as having a certain cluster of conditional powers. But this needs some explanation. On the face of it, we do not perceive the shape of a thing as a collection of unsubstantiated threats and promises as to which powers it will take on in various hypothetical circumstances. We perceive the substance behind the threats and promises. So we need some preliminary explanation of what it could mean to perceive an object as having a cluster of conditional powers, before we can understand the argument that that is all we perceive the object to have.

We can begin on this by thinking about perception of simple powers. How does the fact that one perceives an object as having a simple power affect one's behavioural response to it? Suppose you perceive a cat as ready to pounce, for example. How you react will in part depend on what you make of the pouncing. For example, you might want to take advantage of the relative vulnerability of the cat to outside attack during the pounce. So then you will position oneself ready to take advantage, should the trigger to the pounce appear. In the case of a simple power, then, the behavioural response is conditional on whether one takes the trigger conditions to be met. It may involve acting to ensure that the trigger conditions are met, or to ensure that they are not met.

Suppose now we consider how perception of an object as having a conditional power would affect one's behavioural response to it. What we need is a conditionalisation of the account just given of the behavioural response to perception of a simple power. Suppose that you perceive an object as having a power P, conditionally on its further possession of properties $Q_1, \ldots, Q_n$. Then whether you have the behavioural response to the object which is appropriate to its having the simple power P will be conditional on whether you also know the object to have properties $Q_1, \ldots, Q_n$. And depending on whether you want the thing to have the power P, you may act to ensure, or to prevent the thing's having properties $Q_1, \ldots, Q_n$.

Finally, suppose we ask how perception of an object as having a cluster of conditional powers will affect one's behavioural response to it. This will be a matter of having a family of complex conditional behavioural responses of the type just indicated, one for each conditional power in the cluster. That one has grasped the causal unity

of the cluster will show up in the causal unity of one's behavioural responses. That is, there will be one or more of the family of responses which are such that if they are activated by perception, all the rest of the responses in the family are activated. There may be a single complex mechanism underlying all that family of behavioural responses.

We could give an account of shape perception which has the same general type of structure but which focuses on imagery rather than on action and manipulation. That is, we could have an account which sees the perception as being located in a space of imagistic reasoning. Perception of an object as having a simple power would be a matter of the kinds of imagistic transformation to which one was disposed to subject the image. So, for example, perceiving the cat as ready to pounce would come to this: if you asked yourself, 'What will happen if a mouse appears?', by imaging the appearance of a mouse on the scene, you would follow that up by imagining the cat to leap. This transition would be internal to your imagistic reasoning, it would not be a matter of having your imagery controlled by some explicit verbal reasoning.

How would perception of an object as having a conditional power affect the role of the perception in your imagistic reasoning? Here we need a conditionalisation of the account just given of perception of a simple power. Suppose that you perceive an object as having a power P, conditionally on its further possession of properties $Q_1, \ldots, Q_n$. What this comes to is that if you perceive it also to have $Q_1, \ldots, Q_n$, then you will imagistically manipulate the perception in the way appropriate to its having power P. And even if you do not initially perceive the object to have $Q_1, \ldots, Q_n$, if you then make the imagistic transformation of imagining it to have $Q_1, \ldots, Q_n$, you will then in further imagistic transformations proceed in the way appropriate to the object's having power P. That is, if you imagine the trigger to appear, you will further imagine the response to have been produced.

Finally, suppose we ask how perception of a cluster of conditional powers would affect the role of the perception in one's imagistic reasoning. This will be a matter of the perception being related in the way just indicated to a whole family of imagistic transformations, depending on just which further properties one perceived the object to have, or went on to imagine it as having. And the causal unity of the cluster of conditional powers would show up in the causal unity of this set of responses in one's imagistic reasoning. That is, if you located the perception thus and so with respect to one subset of the relevant family of imagistic transformations, it would automatically

be located appropriately with respect to all the rest of the family of imagistic transformations.

Whether we do it by looking at the behavioural implications of the perception, or by looking at the role of the perception in imagistic reasoning, then, it does seem that we can make sense of the idea of perceiving a shape as a family of conditional powers. The problem now is not to find what can be meant by saying that we perceive a shape as a family of conditional powers. There would only be a problem if we thought that perception of shape comes to any more than this; if we thought, for example, that perception of shape is perception of the categorical ground of a family of conditional powers, a point to which I now turn.

3 Shape Properties as Categorical

On the face of it, Shoemaker's account is analogous to functionalism about psychological properties. Suppose we take a particular shape property, and write down, in the above form, all the conditional powers which constitute it. This gives us a fragment of a theory, which says that there is a unique shape property such that.... In stating the theory, we will need to appeal to shape properties, in saying what powers the property may confer upon an object. For those powers will include interactions with other objects, and just what happens in those interactions will in turn depend in part upon the shapes of the other objects. Shoemaker's theory will in turn apply to those shape properties. Ultimately we will arrive at a global theory of the physical significance of shape properties. We can then construct the Ramsey sentence of the theory, which says that there is a set of properties satisfying the open sentence which results from replacing the shape predicates of the theory by schematic letters. From this we could extract non–circular definitions of each of the shape properties. As Shoemaker presents it, this is a global theory covering all physical properties of objects, not just shapes, but I shall concentrate on shape.

Once the causal view of properties is stated, there seems to be an obvious alternative. A conditional power is itself a power. As Shoemaker puts it at one point, a conditional power is a power to affect the powers of the object. It is a higher–order power. Now in general, we think of powers as having categorical grounds. A power of an object has to do with how the object is in various merely possible worlds. These truths about what goes on in various other possible worlds have to be grounded in the facts about the actual

world, otherwise we have let these other possible worlds take on lives of their own. So if an object has a power to affect its other powers, that power must itself have a categorical ground, a ground in what actually happens. So an alternative hypothesis to Shoemaker's about shape properties is that they are not clusters of conditional powers. Rather, they are the categorical grounds of clusters of conditional powers. Shape properties are the grounds of higher–order powers.

This view is not as straightforward as it may seem. One standard example of the relation between a disposition and the ground of the disposition is the relation between the solubility of salt and those aspects of the molecular structure of salt in virtue of which it dissolves in water. But on the face of it, this is a relation between different powers. It is a relation between the dispositional property of the salt, its solubility, and the dispositional characteristics of its constituent particles which are triggered when the salt is put in water. This does not seem to be a helpful model for the relation between the higher–order powers that a thing has in virtue of being a certain shape, and the shape of the thing.

One way to get at the intuitive thrust of the alternative to Shoemaker here is to recall the example of the square peg and the round hole. Why can't the peg get through the hole? As Putnam pointed out long ago, it is quite wrong to look for an explanation of this phenomenon at the level of quantum mechanics: a finely detailed story about the particles constituting the peg and the board is beside the point. We have to look for an explanation at the macroscopic level. And at the macroscopic level, the explanation is this. Because the peg and the board are both made of rigid material, and the length of the side of the peg is the same as the diameter of the hole, the squareness of the peg means that its diagonal is larger than the diameter of the hole, so the peg cannot get through. What, on Shoemaker's account, does the appeal to the squareness of the peg come to here? On this account, it is an appeal to a cluster of higher–order powers that the peg has. Now these will mostly be irrelevant to the problem at hand. But there is, in particular, the following: one of the cluster of higher–order powers is that if the object is rigid, then it will have the power to be unable to get through a hole with the same diameter as the length of its side. So since the object is rigid, it has the power to be unable to get through a hole with the same diameter as the length of its side. That is the explanation of why the peg cannot get through the hole. In effect, we have a *virtus dormitiva* explanation here. But there is a difference between this *virtus dormitiva* explanation and the original. Someone who explains the fact that opium puts people to sleep by saying that it has a dormitive power is at

any rate saying that the opium has this dispositional characteristic and holding open the possibility of explaining its possession of this disposition by appealing to microstructural features of the opium and human physiology. But in the case of the peg and the hole, we have, on Shoemaker's account, given a *virtus dormitiva* explanation and we know already that no deeper explanation in terms of microstructural properties will be forthcoming. That was Putnam's point.

This is not the only level at which explanation seems to be missing. We could have a theory about how in general the shape of an object affects its behaviour. The particular shapes of individual objects will be clusters of higher–order powers. But these clusters of higher–order powers are all systematically related. For example, suppose that you have a medium–sized object that is just too heavy to lift, and you have to get it to its destination by tipping it over and over along the ground. And suppose the object is flat, with a regular polygon as cross–section. If it is a triangle it will be quite hard to tip it over each time. If it is a square it will be easier, if a pentagon easier still. And if it has a thousand sides you can simply roll it. There is a generalisation to be had here, about the relation between the number of sides of the polygon and the ease with which the thing can be moved. On Shoemaker's view, the generalisation is simply a regularity holding between clusters of conditional powers. But that is not how we would ordinarily think of it. We would think that there are two levels of description here, one concerning the various shapes and the relations between them, and we would think of the level at which we talk about the relations between the shapes as explaining what we have at the second level of description, namely the relations between the conditional powers of the objects which have the shapes. On Shoemaker's account, however, we have only a single level of description, at which we describe the various clusters of conditional powers, and there is no explanation to be had of the relations between them.

The alternative to Shoemaker is to suppose that the shape property is the ground of the higher–order powers, so that we are not giving a *virtus dormitiva* explanation at all when we appeal to the shape of the peg in explaining why it does not get through the hole. We are appealing to the categorical property which explains why, at the macroscopic level, the thing behaves as it does. But this can hardly be thought to be the end of the story. The problems are just beginning at this stage. For now we have to explain what it means to say that the shape is a categorical property, how it can be that we have an explanation of the behaviour of the peg so readily.

From Shoemaker's perspective, the natural riposte is that all that has happened is that in explaining the behaviour of the peg we have appealed to a higher–order power of the peg, giving a *virtus dormitiva* explanation, and in saying that the property is 'categorical' we have declared ourselves to be quite happy with this state of affairs, and to have no intention of looking for a deeper microstructural explanation. Explanations come to an end somewhere, and all that is accomplished by labelling shape properties categorical is that we declare ourselves to be content for explanations to end with appeals to shape. But that is quite consistent with holding that shapes are higher–order powers.

What is Shoemaker's argument for his view? According to Shoemaker, the alternative to supposing that shape properties are clusters of conditional powers is to suppose that the identity of properties consists in something logically independent of their causal potentialities. This opens a number of possibilities. It ought to be possible for there to be properties which make no difference whatever to the behaviour of the things which possess them. There could be different properties that make, under all possible circumstances, exactly the same contribution to the causal powers of the things that have them. The potential of a particular property for contributing to the production of causal powers might change over time. Consequently, we could have no knowledge of the properties of a thing —since all we can know is the behaviour of the thing— and we would have no way of singling out a property in order to name it, and even if we did somehow manage to christen a property, there would be no way of there would be no way in which we could know that we had encountered the same property again. The crucial point in the argument is the idea that all we can know is the behaviour of a thing. The obvious riposte, from the proponent of the alternative view, is that we immediately perceive shape properties, and that what we perceive in perceiving shape properties are the grounds of higher–order powers. So there is nothing ineffable about shape properties so conceived; they are just what we ordinarily see and touch.

The central issue is whether the connections between shape perception and action, or between shape perception and imagistic reasoning, exhaust the content of the shape perception. One way to put Shoemaker's view is as the view that these connections do exhaust the content of the shape perception. Then we have the functionalist account of our ordinary way of thinking about shape properties: shape properties are properties with a certain functional role, a functional role which is in effect specified by the pattern of connections between shape perception and action, or the pattern of connections

between images in imagistic reasoning. On the alternative view, these connections do not exhaust the content of shape perception. In addition to these connections, shape perception provides knowledge of the shape property as the ground of all the functional patterns that are specified. The problem then is to explain just what this further knowledge provided by shape perception is, and to explain its relation to these further connections and patterns of functional role.

You might suggest that what makes it the case that we ordinarily perceive the categorical grounds of conditional powers, rather than families of conditional powers is that there is more to perception of shape than the kinds of functional connections indicated so far in that for ordinary humans, perceptions of shape can be input to explicit explanations of the behaviour of the objects around one, for example in explaining the inability of the peg to get through the hole. But one can certainly perceive shapes without being able to engage in these explanations. You could show the ability to discriminate shapes perceptually, respond behaviourally to shapes in appropriate ways, and engage in imagistic reasoning about shapes. You could do all that, and still have no capacity to appeal to shape in giving explanations of the phenomena around you. An animal could display all the phenomena here, and still the question of how things are to be explained might never be an issue: for the animal, the question of explanation simply does not arise. You might suggest that this is a difference between animal and human perception: that animals perceive shapes as clusters of conditional powers, whereas humans perceive them as the grounds of clusters of conditional powers. But it seems worth pursuing the question whether an account at the purely perceptual level can explain how it could be that we are perceiving shapes as categorical.

4 Primitive Consciousness of Shape

One way to approach the question is to ask whether we can make anything of the idea of a primitive consciousness of shape, prior to grasp of the causal role of the shape of an object. This would have to be perception of shape as categorical, since there is no grasp of causal role. There would be little room in such a use of shape predicates for the possibility of correction of error in judgements about the presence or absence of a particular shape. There can be illusions of shape —the straight stick that looks bent in water— but not much sense could be made of the possibility of illusion at this primitive level. We can check whether something really is a cube

by measuring it, we can check whether something is approximately spherical by rolling it, but these procedures would not be available at the primitive level. In using such tests we are exploiting the fact that the shape of an object typically results in possession by the object which has it of various causal characteristics, and that is precisely what we trying not to take on board here, at the primitive level. But perhaps we can nonetheless talk about a primitive experience of shape even in the absence of an ability to recognise illusions. For example, we might train an animal to respond in a particular way to a presentation of the shape 'A', and it might succeed in the tasks we set it even if it was quite unable to distinguish between veridical and illusory presentations of an 'A': we would still have here a primitive kind of shape perception. The animal would have some grasp of the contingency arbitrarily set up by the experimenter —for example, to press the bar on the left when an 'A' is present— but this contingency could not be regarded as one of a cluster of conditional powers constituting the shape property.

If we are to talk about a primitive consciousness of shape as categorical, we have to keep in mind the systematic character of shape perception. That is, perception of various shapes is not a matter of exercising a set of disjoint perceptual capacities; there has to be a background geometry for perceptions of various different shapes. It is instructive to compare shape predicates with natural kind terms. In the case of 'gold', for example, you might first be conscious of the characteristic appearance of gold, and then later learn which conditional powers gold has. So there certainly is such a thing as primitive consciousness of gold, even though at this level one would have little understanding of the possibility of perceptual illusions of gold. One disanalogy between natural kinds and the case of shape predicates is that there is no analogue of the background geometry in the case of natural kinds: the various appearances of the various natural kinds really are disjoint, whereas the appearances of the various shapes are all systematically related. Another disanalogy is that there does not have to be any very apparent connection between the appearance of gold and the nature of the conditional powers which something has in virtue of being gold. In contrast, in the case of squareness, for example, the appearance of the thing, the way in which one is primitively conscious of the property, does seem to be closely related to the conditional powers a thing has when it is square. There are four singularities, the corners, in the appearance of the square, and there are four singularities, the corners, in the causal behaviour of the square. What these disanalogies suggest is that the assignation of causal significance to shapes is not done on a shape–by–shape basis:

it is done by giving physical significance to the background geometry of primitive consciousness of shape. The relation between a particular experienced shape and a particular set of conditional powers would then be a consequence of a more general physical geometry.

The kind of primitive consciousness of shape I am describing is, though, extremely primitive. There would be none of the complex of functional connections to action and imagistic reasoning which I described earlier. That means that we have to consider the question what makes it so that this consciousness is consciousness of shapes.

Recall the radical externalism which I began by describing. On this view, what makes one's consciousness consciousness of shape is the fact that one is using a neural system whose role is to pick up the shape properties of the objects in one's environment. The geometrical aspects of your experience of objects are constituted by the geometry of the objects in your surroundings. On this view, the character of experience as perception of shape can be secured without having to consider the relations of the perception to imagery and action. You could have the right perceptual relations to the geometry of the objects around you even though your perceptions did not have the kinds of relation to action and imagistic reasoning that I described earlier, and in that case you would have a primitive perception of shape as categorical. This might be the case of, for example, the animal which can be trained to respond in a particular way to the presence of an 'A' shape, even though it may be incapable of much in the way of complex behavioural responses or imagistic reasoning involving that shape.

Earlier I also remarked the possibility of an internalist account of shape experience, on which sensations are configured in a sensational space, and we have properties and relations such as 'is a phenomenal curve', 'is phenomenally parallel to', and so on. This would also suggest the possibility of a kind of primitive awareness of shape, on which it could be prior to the complex of functional connections to action and imagistic reasoning described above. And this would be an awareness of shape as categorical. But these sensational characteristics are supposed to be known from one's own case, it is your own experience of shape that gives you knowledge of what these sensational characteristics are. So this view has no way of explaining what it is for sensational experiences of shape to be the same or different in different observers, or for a single observer over a period of time.

The point about both of these accounts, though, is that they suggest how there could be more to the content of shape perception than the complex of functional connections to action and imagistic

reasoning that I described in §2. If the content of shape perception is exhausted by this complex of functional connections, then it is hard to see how perception of shape could be perception of shape as categorical, rather than perception of shape as the cluster of conditional powers specified by the complex of functional connections. If, on the other hand, there is a further dimension to shape perception, what I have been calling primitive consciousness of shape, then this could only be perception of the shape property as categorical, and this dimension of shape perception will be what explains our having the conception of shape properties as categorical. As I said in discussing the kinds of causal explanations in which we appeal to the shapes of things, we do take ourselves to have the conception of shape as categorical. One reason for the appeal of the idea of primitive consciousness of shape is that it explains how we could have come by that conception.

Both the externalist and internalist aim to give an account of this primitive consciousness of shape, the further dimension of shape perception. I want finally to look at the implications of these views for the ability to recognise sameness of shape perceived in sight and in touch.

5 Cross–Modal Equivalences

I said earlier that the internalist view of primitive consciousness of shape leaves it open that the sensation of shape may be quite different in different sensory modalities. But the reason for this is that the internalist has no general account of sameness of difference of sensation of shape. That is obvious when we reflect on the question whether different people, or a single person at different times, have the same sensations of shape. On the internalist account, we simply have no way of answering this question. The obvious way of providing an account is to move in the direction of the externalist, drawing in environmental considerations, so that sameness or difference of experience depends on the sameness or difference of the geometrical properties of the objects perceived. But then, as I said earlier, this suggests that there will be a sameness in primitive consciousness of shape across the sensory modalities, since it is the very same geometrical properties that are being perceived through sight and through touch. Sameness of shape experience across person, time and sense–modality all hang together.

Recognition of sameness of shape across sensory modality is a very primitive phenomenon; to give some sense of it, it may help to give

a brief review of some of the ways in which it can show up (for further discussion, see Streri 1993). There are transfer–of–learning paradigms, in which an animal is trained to give a certain response when a particular shape is presented in one modality. In the test phase, the animal is presented with that shape in a different sensory modality, and transfer has occurred if it produces the response. There are paradigms in which the same or different shapes are simultaneously presented in both modalities, and the subject is interrogated about the relation between them. For example, an ape may be able to see one object through a window while at the same time manipulating two objects, one in each hand, one of which is the same shape as the seen object and the other of which is a different shape to the seen object. The task set for the animal is to pull on the felt object which is the same shape as the seen object. The animals are trained over a period of weeks to give the same–shape response for a particular pair of shapes, and then in the test phase they are given a new set of shapes. Success is managing to give the correct 'same shape' response for the new shapes. And animals do manage this. The same kind of set–up can be used where the matching is touch to vision rather than vision to touch. Here the animal is given one object it can grasp but not see, and simultaneously shown two objects behind a transparent window. The animal has to indicate which seen object is the same shape as the felt object, by pressing on the appropriate window. Studies on children tend to use habituation. For example, the child may be simultaneously presented with an object it can see but not touch and an object it can touch but not see. Children have their attention drawn to these objects. They lose interest more quickly if the objects are the same shape than if they are different shapes. Alternatively, in one study using a complex of mirrors, children were presented with a seen object of one shape at the place where they could feel an object of a different shape to be. They registered their appreciation of this by surprise or distress reactions. Finally, there are paradigms in which the same or different shapes are presented successively in different sensory modalities. For example, one set–up exploited the fact that infants prefer to grasp and manipulate objects which make a noise when shaken than those which do not. First the infants were shown two objects visually, out of their reach. Then one of the objects, which made a noise when shaken, was presented to the child, behind a screen where it could manipulate it but not see it. Then the child was shown the two initial objects again, and its preference noted. There is a simpler family of approaches in which the child is allowed to manipulate an object it cannot see, then visually presented with the object together with

a new object. If children systematically prefer to look at one rather than the other of the new and old objects, that shows cross–modal transfer. And the experiment may test matching in the reverse direction, so that we consider whether it identifies the sameness of shape of one of a pair of grasped objects to an object that was seen earlier.

On the radically externalist view of primitive consciousness of shape, the phenomenal experience of shape is the same in sight and in touch. It will be in consequence of this amodal character of shape perception that this cross–modal transfer occurs, and cross–modal transfer will be a rational phenomenon. No ground for doubt as to whether one is perceiving the same shape properties through sight as through touch will be provided by an intrinsic experiential difference between the geometry of vision and the geometry of touch, for there is no such intrinsic, phenomenal difference. There may still be further phenomenal differences between and touch, which may tip us off as to which sense we are using, but these will be extrinsic to the geometrical characteristics of the perceptions. And it will be possible for different geometrical descriptions to be given of the very same shapes in sight than in touch; indeed, two different visual perceptions of the same shape may give different geometrical descriptions of it, as when one object is a rotated version of another, similarly shaped thing. In this case it may still be informative to be told that the shapes are the same; so if vision and touch give different geometrical descriptions of the same shape, it may still be informative to be told that it is the same shape one is seeing as touching. But given the unity of the underlying, externally constituted geometry of the two senses, it will be possible for the perceiver to determine *a priori* that it is the same shape that is in question. There is no return here to the incommensurability of shape perception in the two modalities which the internalist tries to ground in a root difference in the sensational character of the experiences of sight and touch.

On this radically externalist view of primitive perception of shape, grasp of the causal significance of an object's having a particular shape will be a derivative phenomenon, dependent on one's giving a physical interpretation to the perceptual geometry. And it will be in consequence of this amodality of primitive perception of shape that we in practice assign the same causal significance to shapes perceived through any modality.[1]

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[1]Earlier versions were given as talks at Edinburgh, St. Andrews and Stirling Universities, at a seminar in Oxford and to the Oriel discussion group. This talk was prepared with the support of the British Academy.

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