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Perceptual Causality Problems Reflexively Resolved

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Causal theories of perception typically have problems in explaining deviant causal chains. They also have difficulty with other unusual putative cases of perception involving prosthetic aids, defective perception, scientifically extended cases of perception, and so on. But I show how a more adequate *reflexive* causal theory, in which objects or properties X cause a perceiver to acquire X-related dispositions toward that very same item X, can provide a plausible and principled perceptual explanation of all of these kinds of cases. A critical discussion of David Lewis's perceptual descriptivist views is also provided, including a defense of the logical possibility of systematic misperception or perceptual error for a perceiver, in spite of its empirical improbability.

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What is the role of causality or causal factors in perception? The standard problems associated with theories of perception giving some role to causal factors are well known, such as chain of causation problems--concerning which item in a causal chain of necessary conditions is perceived--and alleged causal deviancy problems under supposedly non-normal causal conditions.¹

In order to adequately handle such problems, one approach would claim that a comprehensive rethinking of the nature of perception in completely naturalistic dispositional terms is required. In this paper it is shown how such a recently developed reflexive theory, based on *reflexive dispositions*--in which a perceived object X causes X-related dispositions in the perceiver--may be used to resolve both standard and additional causal chain and causal deviancy problems.²

The reflexive theory claims that perception of any kind, whether specifically human, more generally biological, or purely mechanical, may be completely explained in terms of purely naturalistic causal structures, that include both actual and dispositional causal factors. The basic analysis of perception provided by the theory could be briefly stated as follows. An entity or organism Z perceives an object X just in case X causes a sensory subsystem $z1$ of Z to cause Z itself to acquire some X -related causal dispositions.³ This view may appropriately be described as a *reflexive* view of perception, in that according to it an object X causes Z --via X causing $z1$ to cause Z --to acquire dispositions related to that very object X itself.

Such a view of perception may initially be explained in evolutionary terms, which will also make its motivation clearer. In order for the evolutionary selection and development of species to occur, members Z of a species must have some way in which to acquire appropriate behavioral dispositions toward items X in their immediate or proximate environment. It is only by manifestations of such dispositions, via actual behavioral interaction with particular objects X in their environment, that individuals Z will succeed or fail, and hence indirectly influence the success of their respective species. But the only available, potentially reliable mechanisms by means of which individuals Z could acquire such X -related dispositions are ones such that the relevant target objects X themselves *cause* the individuals Z to acquire those X -related dispositions. For example, organism Z will not survive unless it can acquire a disposition to flee from dangerous predators $X1$, or to eat nutritious food $X2$. But in a purely naturalistic causal world, the only effective way for organisms Z to acquire such dispositions is if the close presence of

such predators X1, or food X2, is *itself* able to cause Z to acquire appropriate dispositions.⁴

One additional factor needs to be mentioned. Arguably in addition a specialized sensory subsystem z1 is required in Z, because different kinds of items in an environment are hard to identify, and hence only those organisms using reasonably efficient and specialized sensory mechanisms for the purpose would be likely to survive,⁵ via sensorily aided, reliable acquisition of appropriate dispositions toward the relevant kinds of environmental items X.

Also, the issue of the status of conscious perceptual states should be briefly discussed. In the reflexive theory, a perceptual state of perception of an object X involves a physical state that realizes some X-related disposition. But such a theory need take no immediate stand on the issue of the relation of such dispositional states to *conscious experiential states*, in terms of which causal theories of perception are usually discussed. The basic issues as to the relations between perceptual states of perception of some item X, and of their causes and effects, remain the same however those perceptual states themselves may further be analyzed or characterized. Thus there is no loss of generality or explanatory power in the present account, just because it does not here directly address issues concerning the nature of conscious experiential states.⁶

1. The Logical Parts of the Reflexive Analysis

According to the current reflexive view, Z perceives object X if and only if X causes sensory subsystem z1 of Z to cause Z to acquire some X-related disposition. The basic reflexive definition or analysis may be split into two causally linked, individually necessary and jointly sufficient conditions for Z to perceive X, namely:

- 1) X causally affects sensory subsystem z1 of Z;
- 2) Sensory subsystem z1 of Z causes Z to acquire some X-related disposition(s).

The first condition is similar to that of other causal theories of perception, with the important difference that the state thus produced in subsystem z1 is never, in and of itself, a complete perceptual state, since by itself it involves no reflexive disposition formation. (On which see Section 2).

Thus condition 1, though necessary for perception of X, is not sufficient for it to occur. The second condition is also necessary, in that only causation by X-caused changes in a sensory subsystem z1 could produce genuinely perceptually formed X-related dispositions in Z, as opposed to such dispositions produced in Z by some non-perceptual process. But equally, condition 2 by itself is not sufficient unless condition 1 is also satisfied, so that their joint satisfaction produces both necessary and sufficient conditions for perception of X to occur.

2. Sensory Subsystems are not Fully Perceptual

It follows from the current analysis of perception that a sensory subsystem $z1$ of an entity Z --whether Z is human, more generally biological, or mechanistic/robotic--is not in and of itself a fully *perceptual* subsystem, other than in the sense that it is a subsystem which causally enables Z itself to perceive items X . Thus at no time does the current state of subsystem $z1$'s internal causal activity, presumably usually involving some kind of classification activities with respect to the direct causal stimuli, qualify as a complete and self-sufficient perceptual state, namely as one of perception of X . Instead, on the current reflexive perceptual view, it is only the reflexive, X -related disposition formation or acquisition by Z itself, as caused by that subsystem $z1$, that qualifies as a genuine perceptual state of perception of X by Z . (In Section 5 this point will play an important role in dismissing many supposed causal deviancy cases).

As an extreme example showing the need for this dual kind of analysis, suppose that a person inadvertently looks directly at the sun X , and thereby causes his retinas $z1$ to be damaged by the intense light. This would clearly be a non-perceptual case of 'retinal sunburn', in which the retinal damage prevents the relevant perceptual subsystem $z1$ from being able to cause Z to acquire X -related dispositions. Or as a less extreme example, even if an item X does cause $z1$ to cause effects in Z , the effects may not be X -related ones, such as if an odor X coming from a kitchen immediately causes a person to think of a certain kind of food Y , without her actually becoming perceptually aware of the odor X itself, in spite of its immediate Y -directed dispositional effects upon her.

Thus, to repeat an earlier point in more traditional language, according to the reflexive view perception is *essentially* and *necessarily* an activity of reflexive disposition-formation, so that the preliminary stage of stimuli or information acquisition by subsystem z_1 , as caused by X , is no more than an efficient way to ensure that X is able to cause Z to acquire the most appropriate or relevant X -related dispositions. Thus, for instance, the current account of perception as necessarily involving reflexive disposition formation is fundamentally opposed to informational views of perception (e.g. Dretske 1981, Fodor 1990) which instead define perception primarily in terms of collection of information about the world, independently of any subsequent uses of that information by the organism Z .⁷

3. The Nature of Dispositions

What exactly is a reflexive perceptual *disposition*--an X -caused and X -directed disposition--on the present account? Minimally, the relevant concept of a disposition is of a causal power that is manifested under certain definite conditions C --as with the dispositional power of salt to dissolve when put into water--so that a reflexive disposition is an X -caused disposition that would result in behavioral manifestations involving X in conditions C . But an organism Z could acquire such a reflexive, X -caused disposition D toward X , even if the relevant conditions C were never in fact actualized, just as a salt sample may never in fact be dissolved in water.

This purely causal account of dispositional structure puts strong constraints on any purely evolutionarily based dispositional theory of perception, such as the present one. Only minimal, non-teleological evolutionary accounts could qualify as purely dispositional. For example, the kinds of teleofunctional accounts of perception provided by Dretske 1995 and Millikan 2004, according to which there are certain perceptual *proper functions*, that organisms would possess even in conditions where they misperceive because they fail to function properly, could not be explained in pure dispositional terms because of the possibility of such failures even under conditions in which a dispositional account would require success.

To be sure, cases of genuine perception that nevertheless qualify as cases of misperception still need to be explained, on any account of perception. On the current reflexive view, the differences between veridical and non-veridical perception would be explained in terms of *different* reflexive dispositions being acquired in each case. For example (see Sections 7-9), if the red color of an object X is misperceived by organism Z, Z would acquire e.g. green-related dispositions toward that red color, as manifested by sorting it with green objects rather than with red objects.

Also, there is no inherent restriction, in the current non-teleological account, on the *range* of conditions C under which an X-related disposition D might be manifested. Thus if a prey animal X causes predator Z to acquire a perceptual disposition D to eat X, this disposition might be manifested under a wide range of possible conditions, including various typical complex conditions in which X initially tries to avoid being eaten by Z, before Z succeeds. Such *persistent* X-related dispositions, which could be manifested in

various environmentally likely circumstances, could be completely explained in non-teleological evolutionary terms, in that only those predator species whose perceptually based prey-catching dispositions randomly happened to be *persistent enough*, relative to those of other competing species, would be likely to survive.

But the account remains non-teleological, with no included teleological concepts such as that of a proper function, in that the absence of a single necessary condition would still be enough to prevent an individual organism from possessing such a disposition D. For example, if a predator Z is paralyzed by some drug, then on the present account Z cannot acquire a *disposition* to eat, while paralyzed, a prey animal X, since the paralysis prevents there being any current actual conditions under which such a disposition could actually be manifested. (Whereas on teleological views, a paralyzed predator would still retain its proper function of eating prey animals such as X, no matter what the actual conditions are). Nevertheless, perception in a paralyzed state could still be possible, in that there might be relevant dispositions, acquired during the paralysis, which would be capable of being manifested at some later time when the animal was no longer paralyzed.

On the other hand, the relevant non-teleological concept of a persistent disposition is flexible enough to be usable in explaining some failures of perceptually-based attempts to do something X-related. For example, a baby Z might see its mother X, and in doing so perceptually acquire a disposition to touch her. But because of baby Z's underdeveloped motor skills, she might make several unsuccessful attempts to touch her mother before succeeding--or she might never in fact succeed. Nevertheless, it could still be true of Z that she had acquired a *disposition* from her mother to touch her, as long as

there were *some* likely conditions C under which Z could have succeeded, even if those conditions C did not actually obtain during her attempts.

Such a pattern of explanation is also relevant in 'veridical hallucination' cases such as those discussed by Grice and Lewis (see Sections 5 and 6). One might attempt to touch the pillar X apparently in front of oneself, but fail because the pillar one actually is seeing is off to one side, and reflected into one's eyes by a mirror. But one's perceptually acquired disposition to touch the pillar could still be a genuine persistent disposition, as long as there are further exploratory movements one could make, at least one of which would result in one actually touching the pillar. Doubtless natural phenomena, such as echoing sounds in rocky canyons, provide an evolutionary basis explaining why successful species tend to have such persistent perceptual dispositions, even in cases when perceptual stimuli might be misleading.

Another basic feature of a dispositional account of perception is that its natural mode of explanation is a broadly *conative* one--in terms of the evolutionarily fit desires and interests of the perceiver, as reflected in the dispositions that she acquires toward perceived items--rather than primarily a disinterested, epistemic one as with more standard theories. But any apparently paradoxical consequences of this difference can readily be dealt with. For example, the theory permits perception of items which the perceiver is *not* interested in, because in order to *discover* that she is not interested in them--and hence has no interest in further perceiving them--she first must minimally perceive them enough so as to be able to classify them as potentially interesting or not interesting. Thus, given that much perception is inevitably exploratory, as one moves into rooms, parking lots etc., and needs to quickly check on what items one might have to

deal with, a reflexive theory can explain, just as well as any other theory of perception, why one has an urgent initial epistemic interest in the basic characteristics of the relevant items. Hence a reflexive theory can also fully explain any epistemic aspects of perception, in any cases in which investigating them would in fact tend to further the interests of the perceiver--but without having to artificially limit all perceptual interests to purely epistemic interests, as do more standard perceptual theories.

4. Causal Chain Problems: What is Perceived?

As noted in the Introduction, the traditional problems associated with theories of perception giving some role to causal factors are well known. The problems may roughly be grouped into chain of causation problems and causal deviancy problems, though the two categories are closely interrelated as well. This Section will concentrate on causal chain problems, along with some attendant issues about the nature of perception.⁸

As a preliminary to discussing issues concerning possibly deviant causal chains, a brief analysis of causality and causal chains will now be provided. As for causality itself, for present purposes it will be adequate enough to say that A causes B just in case, in the prevailing conditions C, A is a necessary part of a sufficient condition for B to occur. For we want both that B would not have occurred unless A had (i.e., A as a necessary condition of B), plus that nothing more is needed, in conditions C, for B to occur than that A occurs (i.e., A as a sufficient condition of B in conditions C--which

conditions may supply, along with A, a more complete sufficient condition of B). A related formulation in terms of nomic connection will be invoked below.

A *causal chain* may then be defined as a series of such causal links for which *causal transitivity* holds--that if X causes Y, and Y causes Z, then X causes Z. However, causal transitivity cannot be taken for granted, since it is easy to produce counter-examples showing that not all apparent causal sequences are genuine transitive chains. If person A causes the polished state B of a floor, and if that polished state B causes another person Z to slip and break her neck C, it is highly questionable whether A *caused* the broken neck C, since, e.g., Z might have broken her neck some other way (so that A was non-necessary), or not broken her neck at all by avoiding that floor altogether (non-sufficiency of A with respect to the occurrence of C).

A simple way to avoid such problems of spurious causal chains is as follows. The transitivity requirement on a causal chain requires that any two items in the chain, no matter how widely separated, have the same causal relation to each other as do adjacent members in the chain. But, since individual causal links may also be characterized in terms of *nomic*, or at least *highly reliable* connections, a similar requirement may legitimately be imposed on the whole chain. Thus, in the above example, A strictly speaking did not *cause* Z to break her neck, because there is no nomic or highly reliable connection between A and the state of Z's neck. Or in other words, we should not allow our account of perceptual causality to be distorted by occasional random accidents--genuine causal chains must be just as reliable from start to finish as they are with respect to each link in the chain.

The relevance of such reliable causal chains to perception may then be established via an evolutionary argument. In terms of evolutionary fitness, those organisms *Z* would tend to be more successful whose reflexive perceptual *X*-related disposition-acquisition with respect to items *X* was primarily acquired through such reliable chains from *X* to *Z*, since non-reliable chains would likely lead to lesser, or no adaptive success at all. For example, if the loud sounds made by a predator were reliably related to its close proximity, then species accidentally acquiring the disposition to flee from it under such noisy circumstances would gain adaptive fitness from so doing, whereas in the absence of such reliable connections, no useful gains in fitness could be expected from fleeing-behavior caused by loud sounds.

As for the relevance of these points to reflexive perception, genuine causal chains would allow the first item in a chain to be perceived by an organism *Z*, even if the proximate cause of *Z*'s disposition acquisition was another, closer item in the relevant chain. For example, if predator *X* causes loud sound *Y*, and *Y* causes organism *Z* to acquire a disposition to flee from *X*, then this would count as a genuine case of perception by *Z* of *X*, even though *X* was not itself the proximate cause of the *X*-related disposition acquired by *Z*. Indeed, on the reflexive view, all perception is mediated by proximate sensory states in such reliable causal chains, so the above discussion is just a generalization of a basic feature of the reflexive view.

On the other hand, the following would not be a genuine case of perception, because of the lack of a genuine, reliable causal chain. *Z*'s son *X* promises *Z* that he will clean the kitchen floor. *X* does so, so that *X* causes the floor to become clean *Y* by cleaning it. *Z* sees the clean floor *Y*, and is caused by it to acquire a son-related

disposition to hug his son. Is this a case in which we have to say that Z perceived his son cleaning the floor, because X caused the clean floor Y, and the clean floor Y caused Z to acquire an X-related disposition?⁹ Answer: no, because there is *no reliable causal connection* between person X cleaning the floor, and person Z seeing the clean floor. Of course, doubtless *Z inferred*, on seeing the clean floor, that his son must have cleaned it, and hence wanted to hug him. But he had to make that *non-perceptual inference* precisely because, on the reflexive account, he could not have *perceived* his son cleaning the floor, because of the lack of a reliable causal connection between that event and the event he did perceive.

Turning now to causal chain problems, a basic question is, even for normal or non-deviant causal chains, the following: if some causal factor Y is a sufficient condition of Z perceiving something, what justifies the selection of one such factor Y in the chain of sufficient causal conditions rather than any other? Thus, if we are able to perceive an object X because X is a sufficient causal condition of that perceptual state, why do we not also, or instead, perceive any other items in the relevant causal chain, including, more remotely, whatever items caused X to be in its present state, or more proximately, any of the subsequent stages in cognitive processing of the X-related causal stimulus, up to and including the final concrete perceptual state itself? Why is not all visual perception perception of our retinal stimulation-patterns, or even of the final perceptual brain states that causally result from them?

It is a fundamental advantage of the current reflexive, disposition-based theory that it can provide a convincing solution to the above kinds of causal chain problems. On the reflexive view, the relevant item X in a normal causal chain which is perceived is the

one which causes dispositions specifically directed toward *it itself*--i.e., X itself--to be acquired by organism Z. Thus on the current view, the reason why it is e.g. a cup X on a table that one perceives, rather than the retinal stimulation Y1 that it causes, or a subsequent sensory classification Y2 of it, and so on, is because in normal perception it is only dispositions toward the cup X itself, and not toward one's retinal stimulations, or later classifications, that one actually perceptually acquires. Also, since the relevant X-related dispositions are broadly behavioral dispositions, whose manifestations are overt behavioral events such as someone picking up a cup X immediately subsequent to perceiving it, the reflexive view is readily testable in particular cases by normal third person observational methods, hence providing direct behavioral evidence for the claim that a disposition is X-related or X-directed in paradigm cases.

To be sure, it is logically, though probably not evolutionarily, possible that there could be a group or species of perceivers who never perceptually acquired dispositions toward distal or environmental objects at all, but who instead were completely behaviorally absorbed in the images produced by such objects on their own retinas. (Certainly we could produce robotic equivalents of such perceivers if we wished to). Thus there is no logical or theoretical impediment to pure retinal perception, in spite of its evolutionary disadvantages.

A related point may be made concerning the introduction of specialized sensory subsystems z1 of Z. Though in purely causal terms admittedly there are possible cases in which an item X causes an organism Z to acquire X-related dispositions, without its doing so by first causing such a specialized subsystem z1 to cause Z to acquire the X-related dispositions, the engineering and hence epistemic disadvantages of such a process

also require us to deny a genuinely perceptual status to it. Hence there are any number of simple, causally reflexive processes to which we should deny perceptual status, such as in the case of a heavy object X falling onto Z's body, which directly causes the elasticity of Z's bone and muscular structure to apply an opposing force to the object X, which reaction formally qualifies as an immediately manifested X-related disposition of Z's to move X away from itself.

The evolutionary point of denying perceptual status to such simple reflexive events is that organisms in general cannot engage in efficient selective behavior with respect to them. For example, some degree of elasticity of muscular tissue is probably physically unavoidable, so no amount of evolutionary change could enable a species to completely eliminate this simple reflexive disposition, should it be desirable for the species to do so. It is much more efficient for a species to develop special-purpose sensory mechanisms z_1 , which could, for instance, enable an organism Z to genuinely perceive and acquire dispositions to avoid the falling object X prior to its crude, non-perceptual reflexive interaction with Z's bone and muscular structure. In a world in which only the fittest survive, there would be no point in having a more inclusive concept of perception, since evolutionary competition must have tended to minimize the incidence and causal significance of cases of simple, non-sensorily mediated reflexive causality in organisms.

To be sure, this is not to deny that there might be some evolutionary contributions of such simple reflexive causal mechanisms. Brittle organisms whose bones tend to crack because of average random collisions might be thereby at an evolutionary disadvantage relative to more physically flexible organisms. But again, specifically

perceptual causal structures or strategies make up a natural causal kind of reflexive disposition-formation, that in general is much more capable and efficient in producing adaptively fit reflexive dispositions than its simpler causal counterparts, even if there do turn out to be--as one probably should expect--a few isolated or accidental exceptions.

5. Deviant Versus Unusual Causal Chains

The previous Section discussed, among other things, the issue as to which particular item in a causal chain--even if it is a normal perceptual chain--should count as being the item that is perceived, given that each of the items in the chain is equally a causally necessary condition of the final perceptual state. The issue was resolved in favor of that item *X* in a chain that directly causes a sensory subsystem *z1* of organism *Z* to cause *Z* itself to acquire *X*-related dispositions. But there are also issues of unusual or deviant causal chains to be considered. An adequate perceptual theory must also explain, or at least convincingly explain away, our usual intuitions about such cases.

To begin, the reflexive theory can avoid a major supposed source of such problems, because it rejects a fundamental presupposition upon which such cases are often assumed to exist.¹⁰ Standard causal theories typically require causation of a perceptual state *S* by object *X* as a necessary condition of perception of *X*. But such theories typically also assume that causation of state *S* by *X* would be sufficient in cases of normal causation, so that any insufficiency in causation by *X* must, it is assumed, be due to a deviant causal chain between *X* and *S*.

However, as noted in Section 2, according to the reflexive analysis of the conditions of perception, the necessary condition that X causally affects sensory subsystem z1 of Z--where the state of z1 is functionally equivalent to state S in standard analyses--is *never* a sufficient condition of perception of X by Z, no matter how normal or ideal the causal conditions may be, simply because state z1 does not itself involve any acquisition of X-related dispositions. Hence the reflexive theory can simply refuse to engage in a quixotic hunt for a supposed distinction between normal versus deviant perceptual causation, because it has its own independent, dispositional condition for turning necessary causality by X into a sufficient condition for perception of X, namely that X-caused state z1 causes organism Z to acquire some X-related disposition.

To be sure, there are *unusual*, as opposed to deviant, ways in which objects X can be perceived, such as by using some kind of prosthetic aid to achieve normal perception. Also, there are causal arrangements under which something X can seem to be perceived in front of the perceiver, but which is in fact located elsewhere and actually seen via a mirror in the line of sight. These and other cases will be discussed here and in subsequent Sections. But the salient point is that the causality involved in such cases must meet exactly the same reflexive causal standards as more usual cases, if genuine perception is to be achieved.

Now usually the relevant issues are raised in terms of conscious perceptual experiences, so for present purposes it will be assumed that there is some adequate theory, whether reductive or not, that at least closely links such conscious episodes of perception of X with physical episodes of X-related disposition acquisition (which issue

is further discussed in the next Section).¹¹ One such deviant or unusual causal case played a prominent part in H. P. Grice's classic paper defending a causal analysis of perception (1961: 142). He envisages there being a pillar X in front of a perceiver P, which is nevertheless obscured from his gaze by a mirror that reflects into his eyes an image of another, identical-looking pillar Y. In such a case we would normally say that P sees pillar Y rather than pillar X, and give as our reason that it is pillar Y, and not pillar X, that *causes* person P's pillar-related perceptual experience. So it seems that causation by the relevant object Y of a person's perceptual experience is at least a necessary condition of perception of Y.

Nevertheless, such an example also involves a deviant causal chain, so that the example is also sometimes described as a case of 'veridical hallucination'.¹² It is a case where there is a pillar X in front of person P, and P sees a pillar in front of him having the same characteristics as the actual pillar X, but still he does not actually see pillar X. Thus in some sense his experience is both veridical, in correctly providing the actual characteristics of the pillar X in front of him, but a hallucination nevertheless because P does not actually see pillar X.

However, such a description of the situation is strictly incorrect for any causal theorist, since it has already been agreed that in such a case person P sees pillar Y rather than pillar X. Thus there is a genuine actual pillar seen by P, and hence his perception strictly cannot be a hallucination as usually defined, namely as seeing, or seeming to see, something that in actuality does not exist.

As for the current reflexive theory, it can accept, with Grice, that causation by the relevant object Y of a person's perceptual experience is at least a necessary condition of

perception of Y. However, an interesting issue arises with respect to the dispositional analysis of the perceptual episode, in that, for instance, if person P perceptually acquired a Y-related disposition to extend his arm so as to touch the pillar that is apparently in front of him, he would inevitably fail, since the actual pillar Y that he sees is located in a different position, suitable for it to be reflected into his eyes by the mirror in front of him. Thus the deviance of the causal chain in this case manifests itself in the inevitable incorrectness of the manifestation of at least some kinds of Y-related dispositions that might be caused in person P by Y.

Nevertheless, it would be wrong to regard this point as being especially problematic for the reflexive theory as opposed to other causal theories, because all of them must give some kind of account as to the contribution of the relevant deviantly caused perceptual episode to any resulting cognitive or motor activity on the part of person P. Also, the more deviant the relevant causal chain is, the more questionable, on any causal theory, is the claim that person P genuinely perceives the relevant object.

But more positively, the reflexive dispositional theory has at least two additional resources in dealing with such deviance or unusual causality problems that are not readily available to non-dispositional causal theories. The first resource is that a disposition can be reflexively X-related even if a particular manifestation of the disposition is behaviorally a failure, or incorrect. Thus for instance, a young baby's attempts to touch its mother's arm X may involve genuine X-caused dispositions to touch X, but the actual execution or manifestation of the disposition might fail because of the baby's undeveloped muscular control. Similarly, the failure of a dispositionally caused attempt

to touch an apparently nearby pillar is equally explainable in terms of the unusual prevailing causal conditions.¹³

The second resource available to the reflexive dispositional theorist is to distinguish any particular manifestation of a given disposition, such as a disposition to touch a seen object Y, both from the disposition itself, and from other possible ways of more correctly manifesting that very same disposition. Thus, just because person P might fail to touch pillar Y on his first attempt, and thereby fail to correctly manifest his Y-reflexive disposition D on that occasion, there is nothing to prevent him from exploring his environment more systematically until he does find the actual pillar Y that he saw, and then successfully manifesting that same disposition D to touch Y under those improved conditions. Thus, again, initial behavioral failures are no special problem for a reflexive dispositional theory, and indeed such theories have the two just-discussed, distinctive kinds of theoretical resources at their disposal that are not readily available to non-dispositional theories.

Thus, to summarize these points, a reflexive dispositional theory has the theoretical resources needed to fully dissolve or resolve deviant or unusual causal cases. First, it can avoid altogether many typical issues of normal versus deviant causal chains, insofar as they are based on illegitimate assumptions based on an inadequate, disposition-lacking conception of what is involved in causal sufficiency for perception of X. Second, the theory provides a clear standard for when any putative perceptual cases whatsoever involve genuine seeing of some object X--namely, just in case X did in fact cause a sensory subset z1 of Z to cause Z to acquire some X-related disposition(s), whether or not the perceiver was misled about some aspect of the perceptual situation by an unusual

causal path. And third, as shown above, the theory can also explain both the possible incorrectness of manifestation of some of the X-caused and X-related dispositions, and the possibility of further more successful manifestations for a persistent and well-motivated perceiver.

6. Direct Causation, Matching Experience and Prosthetic Vision

There are deeper issues raised by some causal deviancy cases that must now be discussed, which may usefully be approached via David Lewis's 1980 paper "Veridical Hallucination and Prosthetic Vision". Lewis argues that the moral to be drawn from a range of test cases he presents is that the kind of causality involved in genuine seeing involves relations of *counterfactual dependence*, as with normal cases of causal relations in non-perceptual contexts. On his view it is not sufficient for seeing X that one's current visual experience, when looking in the direction of X, currently matches X's actual appearance; in addition, it has to be the case that if X's appearance had been different, then one's experience would correspondingly have been different. Thus on Lewis's view, genuine seeing involves not only actual but also counterfactual matching experience. It also follows from Lewis's view that even some extreme cases of prosthetic seeing, such as a prosthetic eye that bypasses the normal retinal causality of seeing entirely via direct connections to visual areas of the brain (1980: 243) could still produce genuine seeing, as long as both the relevant counterfactual causal dependency relations are preserved, and the matching of visual experience to the actual appearance of putative objects of vision.

Comparing Lewis's view with the current reflexive dispositional view, the following points may be made.¹⁴ To begin, the reflexive view could support Lewis's claim that prosthetic vision could be genuine seeing. However, on the reflexive view, something more is required for it to be genuine seeing of an object X--beyond causation and experiential matching--namely that relevant X-related dispositions must be acquired during putative episodes of seeing X.

Also, as a counter-example to Lewis, it is conceivable that someone using such a prosthetic eye directed toward object X might be very suspicious of the equipment, and regard any apparent experiences of X that she has while using the device as being no more than a kind of internally projected film or virtual reality presentation, showing, not X itself, but only a filmic or video *representation* of X. Thus she would fail to acquire appropriate X-related dispositions, such as a disposition to attempt to actually touch object X in front of her, but instead she would only acquire filmic, or virtual reality-related dispositions.

Indeed, such suspicions conceivably might infect a whole culture, so that in fact prosthetic vision would fail to produce genuine seeing in a culture, even though it could have, because individuals had become psychologically affected to the extent that they failed to acquire dispositions toward real objects and properties when using the equipment. (This would be analogous to the possibility, discussed in Section 4, that people might acquire dispositions toward their retinal images, rather than to the objects thus imaged on their retinas). That such a situation is clearly conceivable shows that X-related disposition acquisition, for real objects X, during perceptual episodes is indeed a

necessary condition of their counting as being genuine episodes of seeing, and hence to that extent Lewis's analysis is inadequate as compared to the current reflexive analysis.

Another more pervasive difference in our accounts concerns the issue of matching of visual experience to object appearance. A reflexive theory does not need to impose such a requirement, for reasons that will become clear. But for Lewis, some close degree of matching is a necessary condition of genuine seeing, even though he does not insist on perfect matching (p. 245). However, persons with serious eye diseases, such as cataracts, may only see things in a very blurry way that is very substantially unlike the actual appearance of the scene being perceived. But surely they do genuinely see, even though very imperfectly. (This case is discussed further in Section 9). Or there are current cases of prosthetic seeing that involve, for instance, relatively crude cases of cross-sensory stimulation, in which an array of points on someone's back, or tongue, are used to transmit simple visual information to them (Bach-y-Rita 2002).

To be sure, in experiential terms such cases are very unlike normal seeing, in that there is only a very minimal degree of matching. But counterfactual causal dependency plus energy transfer is still preserved in such cases, and persons using such equipment do acquire normal dispositions toward the objects of their putative perception. Hence there is no principled reason to deny that such cases are genuine cases of seeing. The reflexive account can accept both very poor quality seeing and crude kinds of prosthetic vision as being genuine ways of seeing things, whereas Lewis's account is unable to do so.

Blindsight phenomena, in which persons are able to respond to visual information that they have acquired, even though the normal phenomenology of seeing is entirely absent in such cases, provide another, more extreme class of cases in which the reflexive

account can, but Lewis's account cannot, explain the genuineness of the perception involved.¹⁵

The reflexive theory provides a much more general and comprehensive account of perception, which can apply just as well to non-experiential kinds of perception such as earthworm or insect perception, or to robotic kinds that are not biological at all. Human blindsighted seeing, highly limited though it is, serves to emphasize this continuity of human perception with broader kinds, so that Lewis's experiential matching cannot be a necessary condition of perception in general. Surely it is undeniable that visual and other kinds of perception occur at every level in the biological world, whether or not the relevant organisms have any capacity for conscious perceptual experience.

Nevertheless, an attempt will be made in the following Section to interpret Lewis's experiential matching requirement more sympathetically, as a way to explore further relevant issues about causality and perceptual correctness.

7. Perceptual Descriptivism Undermined

The previous Section rejected David Lewis's experiential matching necessary condition for genuine seeing on several grounds, including its extreme parochialism in a world teeming with an indefinite variety of biological kinds of visual perception to which experiential criteria of any kind are almost certainly inapplicable. However, there is a more sympathetic possible interpretation of his view, as follows. The idea might be that in order for any kind of perception to count as genuine, it must, insofar as it has a

perceptual content of any kind, at least be predominantly accurate or correct with respect to its descriptive content, in order to qualify at all as genuine perception of the relevant seen objects and scenes.

Or in other words, his view, which he regards as an intuitive or commonsense view, might best be regarded as a defense of a commonsense *descriptivist* view of perceptual reference, which requires predominant accuracy or correctness of content in order to qualify as hitting its target at all. Then the specifically experiential matching part of his claim could be regarded as no more than an application of commonsense descriptivism to normal experiential human perception.¹⁶ Viewed thus, his view could be applied much more broadly, including to e.g. insect perception as well, namely that whatever the content of an insect's perceptual episodes may be, that content necessarily must be predominantly correct, even if the perceptual episodes involve no experiential components at all.

As an example of such a commonsense descriptivist view, a widely held intuitive view about pictures or paintings is that they represent that object or scene which they most *resemble*.¹⁷ Thus it is natural to regard visual perception along similar lines, as involving a kind of mental picture of the world, such that its experiential content must be of, or about, whichever object or scene it most resembles.

However, the reflexive theory can completely bypass such descriptivist views. Recall that the reflexive theory is able to identify which object X in a causal chain is the object perceived because of the existence of reflexive dispositions with respect to that object X, dispositions whose behavioral manifestations provide evidence as to which object was the relevant seen object. Hence no experiential matching is required to fix

perceptual reference on the reflexive view. Indeed, there is an interesting, though only partial, analogy with causal or direct reference theories of names, which appeal to an original baptism ceremony to fix the reference of a name rather than to some correct description of the named object. On the reflexive account, perceptual reference is similarly fixed non-descriptively, except that the fixing happens at the time of a perceptual episode of X-related disposition acquisition, with later behavioral manifestations of that X-related disposition providing evidence as to which particular object was perceptually referred to.

A significant advantage of this non-descriptivist, direct reference view of perceptual contents is that it can also accommodate the possibility of both correct as well as incorrect perception of an object X and its properties. To put the issue in a broader, more intuitive semantic perspective, propositions are bivalent, in that they can be true or false. Declarative expressions of propositions about worldly objects X require both that a particular such object X should be identified, usually by a name or definite description, and then that something should be said about that pre-identified object X, which can be true or false of it.

Similarly, the most intuitively plausible semantics for perceptual contents would also regard them as being, if not proposition-like, at least capable of bivalent semantic values of correctness or incorrectness. With the direct reference view of perceptual contents made possible by a reflexive dispositional analysis of them, the identification of the object X being referred to is simply a matter of X-related disposition acquisition, so that the substantive or descriptive content of the perceptual episode, as provided by the *specific kinds* of X-related dispositions acquired, can be used to indicate something

correct or incorrect about X, hence explaining the possibility of perceptual error with respect to the properties of some object X of perception.¹⁸

This issue will now briefly be re-described in a more naturalistically precise manner. A perceiver's subsequent overt behavior will provide evidence as to which object X she acquired dispositions toward, during a perceptual episode of X-related disposition acquisition. But that behavior can also provide evidence of either correct or incorrect X-related dispositions as well. As a simple example, a person could be asked to sort various colored objects into different bins, one bin for each color. When she picks up one of the objects X, and puts it in a bin, the issue as to which object it was that she has just perceived is immediately settled--it was object X. But that behavioral episode can also provide evidence as to whether or not she had also perceived the *color* of object X correctly, depending on whether or not she put X into the correct bin for its color.

In terms of the corresponding perceptual experience of a human perceiver, presumably an incorrect bin placement of a colored object corresponded to an experiential episode in which the relevant object seemed to have the incorrect color--underlying which conscious episode would be the unconscious acquiring of the relevant incorrect disposition. But since this kind of analysis, whether or in dispositional-behavioral or experiential terms, could be provided for any observable property of an object X, at least in principle it would be possible for *all* of a person's perceptually acquired dispositions toward an object X to be incorrect dispositions. Thus the reflexive theory can be used to show that perceptual descriptivism is false, in that there need not even be a single description of a person's X-related perceptual content which matches any correct descriptions of the actual object X itself.

Nevertheless, that abstract possibility should not be confused with what is most likely to be true of most organisms most of the time. Evolutionary survival pressures will likely have ensured that the winning or surviving species have mainly acquired correct perceptual dispositions, so that Lewis's commonsense view that perception generally involves close matching will be true de facto, even though it is not a necessary feature of the concept of perception itself. Also, no claim is being made that an organism, all of whose perceptual dispositions were incorrect, could survive for long, or even exhibit coherent behavior.

8. The Reflexive Theory Extended to Property Dispositions

The discussion at the end of the previous Section showed the need to make the reflexive theory more precise with respect to issues of property perception. For the following kind of problem could be raised: someone *Z* might see an object *X*, and subsequently behave in some color-related way toward it, such as by verbally describing it as red, or by putting it into a bin for red items. However, even granting that the behavior by *Z* is adequate evidence of a recent formation of a color-related disposition toward *X*, more evidence is required to prove that the disposition was *perceptually* formed. Certainly the person perceived the object *X*, but he might have done so by perceiving some of its other properties *G*, such as its shape or size, rather than by perceiving its color *F*. It just might happen that some *deviant causal process* in the

person existed, so that when he perceptually acquired a G-related disposition toward X, then he also acquired an F-related disposition, even though the latter disposition was not itself perceptually acquired. Thus for example, a person obsessed with the color red might associate it with various shapes or sizes, and so acquire red-related dispositions whenever those shapes or sizes are perceived. Such additional deviant causation cases must be excluded as genuine cases of perception of redness.

To explain further, the basic issue is that genuine perception of *anything* on a reflexive view--whether an object, or a property--requires that the relevant item *itself* cause subsystem z1 to cause Z to acquire the relevant disposition. Thus on a genuine reflexive view, it ought to be specifically the *color* of object X--or whatever corresponding, purely naturalistic physical properties explain color perception--that causes Z to acquire a color-related disposition toward X for genuine cases of color perception. Mere direct causation by object X itself often would not be specific enough to capture the precise property-F-related causal factors, that should reflexively cause F-related dispositions with respect to X, for genuine perception of X's property of being F to occur.

Now the explanatory basis for normative discussions, such as that just provided in the previous paragraph, is provided by simple facts about evolutionary fitness. In circumstances in which it is most adaptive to be able to discriminate one color from another effectively, such as when hunting for non-poisonous berries whose color is only slightly different from that of poisonous ones, those organisms will tend to survive who acquire color-related dispositions when and only when it is specifically the color of the berries that causes them to acquire those dispositions. Also, the greatest survival

advantage will tend to accrue to those organisms whose perceptually caused color-related dispositions are also generally correct rather than incorrect.

As to how the definition of reflexive perception should be extended so as to include property as well as object causation and disposition acquisition, the simplest and most metaphysically neutral approach is to allow X to be either an object or a property in the definition, rather than simply an object as previously, as follows:

Z perceives object or property X if and only if X causes sensory subsystem z_1 of Z to cause Z to acquire some X -related disposition,

with the understanding that a 'property' is either some particular physical instantiation of a property, or a nominalistic property trope, either of which would, as with objects (including events etc.) have causal powers and a particular spatio-temporal location. Some implications of this extension of the reflexive theory to cover property perception will be discussed in the next Section.

9. The Genuineness of Defective Perception

As mentioned above, some implications of the extension of the reflexive theory to cover property perception will now be discussed. To begin, once issues of correct versus incorrect perception arise, discussion of property perception becomes unavoidable, since incorrect perception of objects is normally explained in terms of incorrect perception of

their properties. Also, as argued above, by the standards of the naturalistic reflexive theory, genuine property perception, whether correct or incorrect, must be based on objective, direct causation by whatever purely physical properties provide the physical basis of the relevant kind of property.

What, then, does it now mean to say that a person with some advanced eye disease due to cataracts can nevertheless still genuinely see things, even if only in a very limited way (as mentioned in Section 6 as a counter-example to Lewis)? The answer is that 'capable of seeing things' means, then as now, that a kind of *quantificational* seeing ability applies to the person, namely that there are *some* properties K, for some objects X, such that, for those properties and objects, they are capable of acquiring K-related dispositions toward the K properties of those objects X.

Now the K properties themselves need not be objective physical properties having a definite causal status. For example, the person Z may see only a vague colored shape of an object moving about in her visual field. But what is needed is that there are objective physical properties L which provide a supervenience base, possibly only statistically specifiable, for such vague supervenient properties K, such that those statistically specified properties L directly cause the person's defective eyes z1 to cause Z to acquire K-related dispositions, such as a disposition to move sideways to avoid a collision with a vaguely seen object X that looms up within her visual field. In such a case, the relevant K property might be informally described as that of the increasing closeness of a large object X, to which property K of object X person Z perceptually acquires a K-related correct disposition to step aside so as to avoid collision with object X.

At this point it is useful to contrast the reflexive naturalist strategy with more conventional covariational, information-theoretic approaches such as that of Dretske. At least initially, Dretske was claiming that the existence of a mental or perceptual representation of a fact, such as that of object X being a certain shape, required a nomic covariation, or probability of 1, between property and perceptual state (1981).

Such a view is entirely unable to explain how a cataract patient can see anything, because Dretske rejects weak statistical links as being informationally indefensible. However, the alternative reflexive strategy is to exploit the fact that a defensible causal strategy is still available to such persons with poor sight, namely, that they can improve their odds of coping with their environment above a pure chance level by acquiring behavioral dispositions based on inputs from their admittedly very deficient perceptual apparatus. Both the perceptual objects and relevant properties are specified dispositionally or behaviorally, so issues of mental representation are resolved or avoided, and the loose statistical fit between actual physical properties and more vaguely defined higher level functional or behavioral properties is scientifically acceptable, as long as the dispositional strategy is actually capable of working, i.e., of indeed improving the practical skills of perceivers in coping with their environments above a pure chance level, i.e., above the level achievable without such kinds of sensory input. Hence, though initially the reflexive view might seem to be quite demanding in its causal requirements for genuine perception to occur, it is also capable of being flexibly reinterpreted without compromising its reflexive causal standards.

10. Sensorily Extended Perception

Another important topic related to property perception is that of what could be called *sensorily extended* perception. For example, the probes that NASA scientists have sent to the outer planets are able to return data that provides visual and other kinds of sensory evidence of conditions on those other planets and their moons. The issue then becomes whether such methods of scientific *observation*, and the epistemic quality of their results, can be explained or integrated with the same current reflexive theory of perception, which purports to be a general-purpose theory as to how causal inputs to sensory subsystems can produce reflexive dispositions of any kind whatsoever, including presumably any of the kinds that motivate scientists in their collecting of data and theorizing about it.

The main theoretical innovation required to explore this possibility is just the addition of an additional sensory subsystem z_2 to the standard reflexive model, which is caused by some observed object X to cause a human scientist's own sensory subsystem z_1 to cause the scientist Z to acquire X -related dispositions. Of course, for this to be an observational or perceptual model, it must be the object X itself, and not the new intermediary or extended sensor z_2 , to which the scientist must acquire dispositions.

Now initially this proposal might seem intuitively misguided, in that if a non-scientist looks at a photograph of one of the moons of Saturn, for instance, which is the output of the extended sensor z_2 , he will likely deny that he is seeing the moon itself, but instead claim to be seeing only a photograph of the moon. However, the scientist can

reply that, though it is true that the average non-scientist may acquire only dispositions toward the photograph z2 when seeing it, scientists generally are trained so as to instead acquire dispositions toward the photographed object X itself when seeing such photographs, so that they instead use such photographs etc. as extended sensors, in order to achieve genuine perception of the moon itself.

However--and here is where the issue about perception of properties becomes relevant--it certainly is true that in looking at a still photograph of a moon, there is only a highly restricted range of properties K of the actual moon to which one can acquire legitimately perceptual K-related dispositions merely by inspection of the photograph. Thus the layman's claim that this is not genuine perception of the moon is justified to the extent that not every property of the relevant moon, which could have been seen with the naked eye in real time from the same vantage point as that of sensor z2, is perceptually available merely by looking at the photograph.

Nevertheless, genuine perception is, according to the reflexive theory, a matter to be assessed one object or property at a time, so the scientist's claim to genuinely perceive certain restricted features K of the moon via the photograph could both be true, and be consistent with the layman's intuitive view that such a specialized kind of use of a photograph lacks the comprehensiveness of access to the properties of an object X that is characteristic of normal real-time seeing of nearby objects. Hence, in sum, there seems no principled reason as to why scientific observation in general, as with less specialized forms of perception, should not also be understood in reflexive dispositional terms.

Thus, to summarize the results of this paper, the purely naturalistic reflexive theory of perception is able to resolve both standard and additional perceptual problems, concerning both normal and deviant or unusual causal chains, that notoriously beset causal theories of perception, and to do so without resorting to the myopic species chauvinism common to most discussions of human perception, from which one would never guess that perception is a universal biological phenomenon. It is also able to explain the possibility of incorrect perception, as part of its rejection of 'perceptual descriptivism'. The theory also has some potential credentials as an account of scientific observation generally, but that and other remaining issues will have to be pursued elsewhere.¹⁹

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NOTES

¹ For representative discussions see Grice 1961, Strawson 1974, Lewis 1980, Vision 1993, Coates 2000.

² The author's previous papers on the theory include Dilworth 2004, 2005a and 2005b. The overall view has some similarities with the straightforward externalist and functionalist view defended by Jackson and Pettit 1988.

³ Property perception will be discussed in Section 8.

⁴ See Dilworth 2005a.

⁵ To be sure, one cannot assume that optimal efficiency has been generally achieved by species. For cautionary discussions on such issues see Dupre 1987 plus Orzack and Sober 2001.

⁶ A view that is supported by the prevalence of various doxastic causal theories of perception, which make no essential reference to perceptual experiences. See, e.g., Vision 1993, esp. p. 345.

⁷ See Dilworth 2004.

⁸ For a useful recent discussion of the issue, referred to as the 'distance problem', see Price 1998, which also makes much use of Davies' earlier 1983 discussion.

⁹ My thanks to an anonymous referee for this example. See also Price 1998 for a related case.

¹⁰ Paul Coates summarizes the general form of many such arguments in his 2000.

¹¹ I provide an initial version of such an analysis in Dilworth 2005b.

¹² See also the discussion in the following Section on David Lewis's paper on the topic.

¹³ See also the explanations in Section 3 here, and Dilworth 2005a.

¹⁴ Lewis's main topic is intransitive seeing, rather than the seeing of objects, but that point will not affect the issues to be discussed.

¹⁵ For a discussion of blindsight see Vision 1998.

¹⁶ For a recent analysis of Lewis's broader descriptivist views see Stalnaker 2004.

¹⁷ For criticisms of such resemblance views see Lopes 1996.

¹⁸ For a general account of the pervasive difficulties in accounting for representational error, including perceptual error, see Cummins 1996.

¹⁹ My thanks to the Editor, and to an anonymous referee for very helpful comments.